SLOVENSKI STANDARD
SIST EN 16733:2016

01-julij-2016

Preskusi odziva gradbenih proizvodov na ogenj - Ugotavljanje dovzetnosti gradbenih proizvodov za neprekinjeno tlenje

Reaction to fire tests for building products - Determination of a building product's propensity to undergo continuous smouldering

Prüfungen zum Brandverhalten von Bauprodukten - Bestimmung der Neigung eines Bauprodukts zum kontinuierlichen Schwelen

Essais de réaction au feu des produits de construction - Détermination de la propension d'un produit de construction à subir un feu couvant continu

Ta slovenski standard je istoveten z: **EN 16733:2016**

ICS:

13.220.50	Požarna odpornost gradbenih materialov in elementov	Fire-resistance of building materials and elements

SIST EN 16733:2016 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 16733

May 2016

ICS 13.220.50

English Version

Reaction to fire tests for building products - Determination of a building product's propensity to undergo continuous smouldering

Essais de réaction au feu pour les produits de construction - Détermination de la propension d'un produit de construction à subir un feu couvant continu

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Ref. No. EN 16733:2016 E

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European foreword

This document (EN 16733:2016) 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of an identical text or by endorsement, at the latest by November 2016, and conflicting national standards shall be withdrawn at the latest by February 2018.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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

This standard is produced in response to the EC mandate M/385. CEN/TC 127 was requested to develop this test method to determine possible glowing combustion behaviour in building products. This test method forms part of the present EC classification system for the reaction to fire.

Task Group 6 of CEN TC 127/WG4 was created to develop this test method. In the early stages of its development, it was found that the term ‘glowing combustion’ as defined in EN ISO 13943 does not completely characterize the specific combustion behaviour of a building product. In particular, the increase of temperature which is considered as typical for the process of smouldering is not considered in the EN ISO 13943 definition. Therefore the task group made a clarification and changed the term glowing combustion to smouldering combustion. Smouldering is defined in this standard as 'combustion of a material without flame and with or without visible light’. This includes glowing combustion.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This test method has been developed considering methods NT FIRE 002 and NT FIRE 035 and standards BS 5803-4 and Önorm B 3800. It specifies a test for determining the propensity of products to smoulder continuously when tested in a vertical orientation. The method does not impose a mechanically influenced airflow through the test specimens since this would not represent most end-use conditions.

Safety warning

The attention of all persons concerned with managing and carrying out this 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. Operational hazards may also arise during the testing of specimens and the 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.

Adequate means of extinguishing the specimen should be provided, bearing in mind that some specimens may produce severe flaming during the test. A hand water spray or an inert gas suppression system e.g. compressed nitrogen which can be directed to the burning area should be available together with other means, such as fire extinguishers etc.

In some cases, smouldering may be difficult to extinguish completely and immersion in water may be necessary.

1 Scope

This European Standard specifies a test method to determine the propensity (ability) of a building product to smoulder continuously when exposed to an open flame under the influence of natural convective airflow.

It is intended for all building products classified according to EN 13501-1. Details as to how the products is mounted and fixed for this test are given in the relevant product standards. The field of application of the test results is defined in the product standards.

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 13238 *Reaction to fire tests for building products — Conditioning procedures and general rules for selection of substrates*

EN 60584-1 *Thermocouples — Part 1: EMF specifications and tolerances (IEC 60584-1)*

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

3 Terms and definitions

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

3.1
product
material, composite or assembly about which information is required

3.2
material
basic single substance or a uniformly dispersed mixture of substances e.g. metal, stone, wood, concrete, mineral wool

3.3
composite
combination of materials which are generally recognised as discrete entities e.g. coated or laminated materials

3.4
assembly
fabrication of materials and/or composites e.g. sandwich panels

3.5
exposed surface
surface of the product which is subjected to the heating conditions of the test

3.6
test specimen
representative piece of the sample (prepared for testing in accordance with instruction)

3.7
smouldering
combustion of a material without flame and with or without visible light. This includes glowing combustion

Note 1 to entry: Smouldering is generally evidenced by an increase in temperature and/or by the presence of effluents.

3.8
progressive smouldering
self-propagating exothermic oxidation that is not accompanied by flaming combustion

Note 1 to entry: It can be accompanied by glowing.

3.9
sustained flaming
persistence of flaming for a period greater than 10 s

3.10
flame spread
propagation of flame away from the source of sustained flaming

3.11
glowing combustion
combustion of a material in the solid phase without flame but with emission of light from the combustion zone

4 Principle

One test specimen is vertically mounted and exposed to constant heat from a propane gas burner with its flame impinging on the specimen surface. Smouldering is detected by measuring temperatures by using thermocouples installed at defined distances within the vertical test specimen and the observation of sustained flaming following re-ignition.

5 Test apparatus

5.1 Main apparatus

NOTE All dimensions given in the following description are nominal unless tolerances are specified.

The main apparatus is shown in Figures 1, 2 and 3. The apparatus includes:

— specimen holder;

— propane burner;

— wire mesh box (Figure 4);

— six thermocouples inside the specimen connected to a recording device (Figure 5);

— specimen holder frame to hold flexible or thin products in place (Figure 6).

5.1.1 Test specimen holder

The specimen mounting frame shall hold the specimen 50 mm above the test floor. This shall be accomplished by the use of two spacers or supporting devices, maximum 50 mm high x 50 mm wide and 100 mm long placed at the outer edge of the specimen, mounted on the floor upon which the bottom edge of the test specimen shall be located. (See Figures 1, 2 and 3).

The test specimen shall not be continuously covered from top to bottom on the vertical side edges. The maximum cover on the vertical edges of the specimens shall consist of two clamps on each side each not more than 40 mm in height. Neither the top nor the bottom edges of the specimen shall be covered in any way.

For thin or flexible test specimens, a planar surface shall be maintained. This can be achieved either by clamping between the sections of flat steel frame, 800 mm × 300 mm, with a frame width of 10 mm and a thickness of 3 mm or by using a single frame with pins on all four edges upon which the specimen shall be supported. (See Figure 6).

5.1.2 Wire mesh box

For loose fill material the specimen holder shown in Figure 4 shall be used. The specimen holder shall consist of a steel framed wire mesh box, 800 mm high, 300 mm wide and 100 mm deep. The top of the wire mesh box is open and remains open for the test. The wire mesh shall be zinc-coated with a width of mesh 9 mm ± 1 mm and a wire size 1 mm ± 0,2 mm. (See Figure 4).

5.1.3 Propane burner

The burner shall be of the Teclu type (see Figure 7). The nominal inner diameter of the burner is 10,3 mm and the nominal inner diameter of the outer tube is 14,95 mm. The gas nozzle shall have an inner diameter of 0,5 mm ± 0,1 mm. The straight part of the burner tube shall have a length of 100 mm ± 10 mm, the conical part shall have a length of 35 mm ± 3 mm. The lower part of the opening of the conical part shall have an inner diameter of 30 mm ± 5 mm.

Propane having a purity of at least 95 % shall be used.

The air supply to the burner shall be fully open. The propane flow rate of the burner shall be 100 g/h ± 5 g/h. (0,85 l/min ± 0,05 l/min).

5.1.4 Thermocouples in the test specimen

Six sheathed type K thermocouples according to EN 60584-1 with outer diameter of 1,5 mm shall be positioned within the test specimen. The thermocouples shall be located in the positions as shown in Figure 5.

The tips of the thermocouples shall be positioned on the centre line of the test specimen at 100 mm intervals measured vertically from the centre line of the burner (see Figure 5). These thermocouples shall be within the test specimen at half the actual specimen thickness. The thermocouples shall be mounted from the reverse face of the test specimen.

The thermocouples shall be supported by a framework at the rear of the test specimen, 40 mm x 80 mm x 855 mm. This framework shall be positioned at least 50 mm from the reverse face of the test specimen.

5.1.5 Recording device

A recording device shall be used to record the temperatures during the test. The recording device shall be capable of recording data at least every 30 s.

5.2 Additional equipment

5.2.1 Flowmeter

The flow of propane to the burner shall be controlled and measured with a flowmeter. This shall have an accuracy of ± 3 %.

5.2.2 Timing device

This shall have an accuracy of ± 1 s per h.

5.2.3 Anemometer

A hot wire anemometer with an accuracy of 0,1 ms^{-1}.

5.2.4 Fire extinguishing board

A calcium silicate board (suggested size 850 × 320 × 10 mm) shall be used to extinguish any flaming established after removal of the burner. The board shall be placed over the face of the specimen to extinguish any flaming.

6 Test specimens

6.1 General

The test specimens shall be cut from a sample which is representative of the product to be tested.

6.2 Dimensions and number of test specimens

6.2.1 At least two specimens shall be cut for test.

6.2.2 The test specimens shall be rectangular with the dimensions (800 ± 3) mm × (300 ± 3) mm.

6.2.3 The test specimen shall be tested at its end-use thickness up to a maximum of 100 mm. If the test specimen is symmetrical reduce the thickness from the reverse side to 100 mm. If the specimen is unsymmetrical then the thickness shall be reduced from the reverse side however both sides of the specimen shall be tested.

A product with directional properties shall be tested in both directions. In this case test one specimen in each direction and complete the test using the worst orientation.

6.2.4 The test specimen shall be positioned in the test specimen holder.

6.2.5 If the material under test is too small to obtain a test specimen in the correct dimensions, the test specimen may be produced from several small pieces. However, the portion exposed to the gas flame shall be in one piece. The dimensions of the pieces making up such a test specimen shall be specified in the test report.

6.3 Loose fill materials

Loose fill products shall be fitted into a wire mesh box (see Figure 4) in such a way that the density specified by the manufacturer is achieved (see 5.1.2).

7 Conditioning of specimens

Test specimens shall be conditioned as described in EN 13238.

8 Test procedure

8.1 The test shall be carried out in an environment essentially free from air currents. The room temperature shall be 20 °C ± 10 °C and the air velocity measured using the hot wire anemometer according to 5.2.3 at 100 mm and 600 mm above the test floor and 100 mm away from the front and rear edges of the test pieces shall not exceed 0,2 ms^{-1} in any direction. The effluent gases shall be extracted without causing any draught near the test specimen to exceed 0,2 ms^{-1} in any direction.

8.2 The test specimen shall be positioned in the specimen holder and six thermocouples shall be positioned within the test specimen (see 5.1.4 and Figure 5).

8.3 The burner shall be ignited and allowed to stabilize for at least 2 min.

8.4 Start the data logger or chart recorder.

8.5 The test shall commence when the burner is placed in position. The burner shall be placed centrally with the axis horizontal and perpendicular to the surface of the test specimen and 100 mm above the bottom edge of the specimen. The distance from the front surface of the burner head to the exposed surface of the specimen shall be 60 mm ± 2 mm. (See Figure 1).

At the same time as the burner is positioned, the timing device shall be started.

8.6 Expose the specimen to the flame for 15 min.

8.6.1 If the product ignites whilst the burner is being applied, monitor the burning. If the specimen needs to be extinguished due to flame reaching 200 mm above the top of the specimen for a period of more than 30 s, this test method is not suitable for the product being evaluated.

8.6.2 After 15 min the burner shall be removed. The fire extinguishing board shall be applied to the face of the specimen for a period of 20 s.

If the specimen ignites again within 60 s after removal of the fire extinguishing board, apply the board again for a further 40 s. If the specimen again ignites after removal of the fire extinguishing board, the test shall be stopped. This test method shall be deemed to be not suitable for the product being evaluated.

This process has to be done carefully to avoid any interference in the test specimen behaviour.

8.7 If the specimen ignites within 5 min after removal of the burner the fire extinguishing board shall be reapplied for a further 20 s.

8.8 The behaviour of the test pieces during the test and their condition after the test shall be observed. This includes sustained flaming, distance of flame spread, melting, spalling, charring, expansion, shrinkage, delamination or any other behaviour.

8.9 At least two test specimens shall be tested for a formal test. Further specimens shall be tested where the product has directional properties (see 6.2.3).

8.10 The apparatus shall be cooled to ambient temperature between successive tests.

9 Termination of test

9.1 The test shall be terminated:

a) after 6 h or