BS EN 13772:2011

BSI Standards Publication

Textiles and textile products — Burning behaviour — Curtains and drapes — Measurement of flame spread of vertically oriented specimens with large ignition source

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National foreword

This British Standard is the UK implementation of EN 13772:2011. It supersedes BS EN 13772:2003, which is withdrawn.

BSI, as a member of CEN, is obliged to publish EN 13772:2011 as a British Standard. However, attention is drawn to the fact that during the development of this European Standard, the UK committee voted against its approval as a European Standard.
During the revision process, the UK committee maintained its objection to several technical aspects of this standard. The UK committee is concerned that the application of EN 13772:2011 in its current form could produce test results that might be subject to dispute or litigation.

The key concerns are:

1. The behaviour of some fabrics under test is such that they cannot be said to conform to the requirement in EN 13772:2011, 10.8 ("the specimen shall still be under radiation and remain so during the whole test”). Under radiation, thermoplastic materials melt away from the heat source and so can no longer be deemed to "still be under radiation and remain so during the whole test".
2. The cleansing procedure given in EN 13772:2011 is not intended to demonstrate durability of the fire retardancy of the fabric. This leaves it uncertain whether fabrics would be “fit for purpose” for some applications.
3. Whilst the first marker thread is used in this standard it should not be used to assess the flammability performance of the sample as the marker may be severed by the ignition of combustible gasses liberated from the sample during the initial radiation phase of the test. The severance of the first thread by this mechanism is very sensitive to ambient conditions and is not reproducible under the stated test conditions.

Users of this standard are advised to treat test results with caution. The UK committee advises that BS 5867-2:2008 offers a more reliable method for assessment of textiles used in the manufacture of curtains, including the assessment of durability of the tested performance.

The UK participation in its preparation was entrusted to Technical Committee TCI/66/-/8, Burning behaviour.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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English Version

Textiles and textile products - Burning behaviour - Curtains and drapes - Measurement of flame spread of vertically oriented specimens with large ignition source

Textiles et produits textiles - Comportement au feu - Rideaux et tentures - Mesurage de la propagation de flamme d'éprouvettes orientées verticalement, avec une source d'allumage importante

Textilien und textile Erzeugnisse - Brennverhalten - Vorhänge und Gardinen - Messung der Flammenausbreitungseigenschaften von vertikal angeordneten Messproben mit großer Zündquelle

This European Standard was approved by CEN on 3 December 2010.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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Foreword

This document (EN 13772:2011) has been prepared by Technical Committee CEN/TC 248 “Textiles and textile products”, 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 July 2011, and conflicting national standards shall be withdrawn at the latest by July 2011.

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 supersedes EN 13772:2003.

The main differences between this standard and the previous version are:

— all three marker threads shall be used;

— tolerances for the position of the electric radiator and for the tension of the marker threads have been introduced;

— the metal grid below the specimen has been defined more precisely;

— major adjustments to the cleansing procedure.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

In order to assess the burning behaviour of curtains and drapes two test methods were established, i.e. EN 1101 for the measurement of ignitability (based on EN ISO 6940) and EN 1102 for the measurement of flame spread (based on EN ISO 6941).

EN ISO 6941 measures the flame spread of vertically oriented specimens exposed to a defined small flame**.** This allows the flame spread properties of ignitable products to be determined. Nevertheless this test method is not suitable to assess products that do not ignite. The measurement of the length or area destroyed by the small flame is questionable as shown by round robin testing. There is a risk that products which pass the small flame test, can still be ignited with a larger ignition source.

The equipment used in EN ISO 6941 has therefore been modified by adding a radiator, which radiates on the lower part of the specimen in order to boost locally and temporarily the ignition of the specimen. The combination of this radiation and the small flame application simulates the action from a larger flaming source. With this combined ignition source some materials, not ignitable with the small flame, may ignite. Some of these will self extinguish, when the action from the ignition source has ceased, while others will self-propagate.

For this purpose, a European research project (CT 96-2057) was set up to establish a small scale test method for assessing the burning behaviour of curtains and drapes using a large ignition source. Reaction to fire parameters like smoke development, heat release and toxic components were not taken into account. The project involved eleven laboratories from nine European countries.

In order to select the relevant characteristics of burning behaviour in terms of classification and to assess the repeatability and reproducibility, 15 samples of commercially available fabrics representative for the main product groups on the market were tested with the large ignition source test method. Most of them had a flame retardant treatment or coating. The material selection included standard and fire retardant polyester, cotton, modacryl, wool, chlorofibre and glass fibre and represented different structures and fibre blends.

The occurrence of flaming debris, the severance of marker threads and the time to sever marker threads (first and third threads) were selected as representative parameter to assess the burning behaviour of the samples. Other burning behaviour characteristics such as after-flame and after-glow times did not bring any extra relevant information and were discarded.

An inter-laboratory test was conducted in 1997 with ten laboratories, each testing 15 materials. Repeatability and reproducibility were assessed through statistical analysis. Consequently, some improvements were introduced in the method. Good agreement was also found with national test methods in use in various European countries or regions (France, Germany, Belgium, the Netherlands, Italy, Scandinavia and the United Kingdom).

1 Scope

This European Standard specifies a method for the measurement of flame spread of vertically oriented textile fabrics intended for curtains and drapes in the form of single or multi-component (coated, quilted, multilayered, sandwich construction and similar combinations) fabrics using a large ignition source.

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 367:1992, *Protective clothing — Protection against heat and fire — Method of determining heat transmission on exposure to flame*

EN 13773:2003, *Textiles and textile products — Burning behaviour — Curtains and drapes — Classification scheme*

EN ISO 139:2005, *Textiles — Standard atmospheres for conditioning and testing (ISO 139:2005)*

EN ISO 3175-2, *Textiles — Professional care, drycleaning and wetcleaning of fabrics and garments — Part 2: Procedure for testing performance when cleaning and finishing using tetrachloroethene (ISO 3175-2:2010)*

EN ISO 3175-3, *Textiles — Professional care, drycleaning and wetcleaning of fabrics and garments — Part 3: Procedure for testing performance when cleaning and finishing using hydrocarbon solvent (ISO 3175-3:2003)*

EN ISO 3175-4, *Textiles — Professional care, drycleaning and wetcleaning of fabrics and garments — Part 4: Procedure for testing performance when cleaning and finishing using simulated wetcleaning (ISO 3175-4:2003)*

EN ISO 6330:2000, *Textiles — Domestic washing and drying procedures for textile testing (ISO 6330:2000)*

EN ISO 6941, *Textile fabrics — Burning behaviour — Measurement of flame spread properties of vertically oriented specimens (ISO 6941:2003)*

EN ISO 10528, *Textiles — Commercial laundering procedure for textile fabrics prior to flammability testing (ISO 10528:1995)*

3 Term and definition

For the purposes of this document, the following term and definition applies:

3.1
flaming debris
material separating from the specimen during the test procedure, falling below the initial edge of the specimen and igniting a filter paper

4 Principle

A heat flux of a defined energy is applied to a specified area of the lower part of the backside of the vertical specimen. After a period of exposure (30 s), the small flame defined in EN ISO 6941 is applied for 10 s to a small piece of cotton fabric fixed around the bottom edge of the specimen.

The possible flame spread is measured through the severance of marker threads.

5 Health and safety of test operator

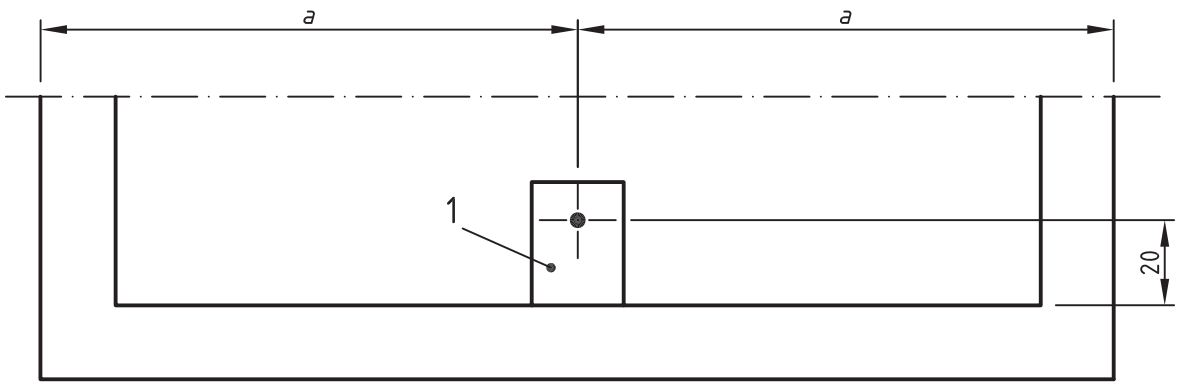
Burning materials may produce smoke and toxic and corrosive gases which can affect the health of operators. Between tests the atmosphere of the testing location, which should be of adequate dimensions to avoid endangering the health of operators, should be cleared of smoke and fumes by an extractor fan or other means of ventilation.

6 Apparatus and materials

This standard uses the equipment according to EN ISO 6941 modified as below.

6.1 Specimen holder: The specimen holder according to EN ISO 6941 has to be modified. To prevent the cotton cloth from falling down the specimen holder shall be equipped with an extra pin positioned centrally 20 mm from the bottom of the specimen on the holder (see below Figure 1).

Dimensions in millimetres



Key
1 extra pin

Figure 1 — Lower part of the specimen holder according to EN ISO 6941 equipped with an extra pin

6.2 Electric radiator, made in a ceramic material and radiating over a circular area with the diameter (100 ± 5) mm. The radiator is heated by an electric resistor, formed in a spiral, which is covered by a (1-1,5) mm thick layer of transparent quartz.

6.3 Electric variable transformer to set the voltage needed to get the heat radiation according to Clause 7.

6.4 Copper disc calorimeter: The calorimeter and allied equipment shall be in accordance with EN 367:1992, 5.2.

6.5 Movable shield made of a non-combustible material of low thermal conductivity; it is placed between the radiator and the test specimen. At least the full width of the lower part (200 mm) of the test specimen shall be shielded.

6.6 Marker threads that shall be of pure cotton with a linear density of (45 ± 5) tex. All three marker threads as specified in EN ISO 6941 are used. The position of the threads is given in Figure 3. The threads shall be under a tension equal to that produced by a weight of (75 ± 25) g. A possible arrangement for this is given in the same Figure 3.

6.7 Gas: commercial propane gas shall be used.

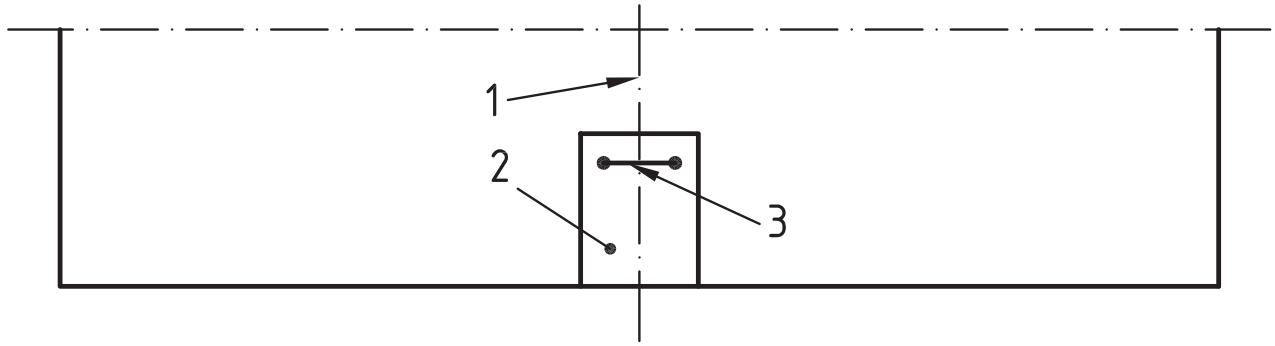
6.8 Cotton cloth: bleached fabric, plain weave, weight (160 ± 20) g/m². The material shall be washed one time before use according to EN ISO 6330:2000, programme 2A, drying procedure A, 1 g/l of the reference detergent IEC shall be used.

6.9 Staple to fasten the cotton cloth to the specimen.

6.10 Filter paper: area specific mass (80 ± 20) g/m², thickness (0,20 ± 0,05) mm, alpha cellulose content > 95 %.

6.11 Metal grid: stainless steel grid, to be placed horizontally (50 ± 5) mm below the lower edge of the specimen. The dimensions of the grid shall be (110 ± 20) mm × (150 ± 20) mm, the mesh size of the grid is not critical. Provision should be made to allow the free movement of the gas burner.

6.12 Anemometer capable of measuring air speed at a level of (0,1-0,2) m/s.



Key

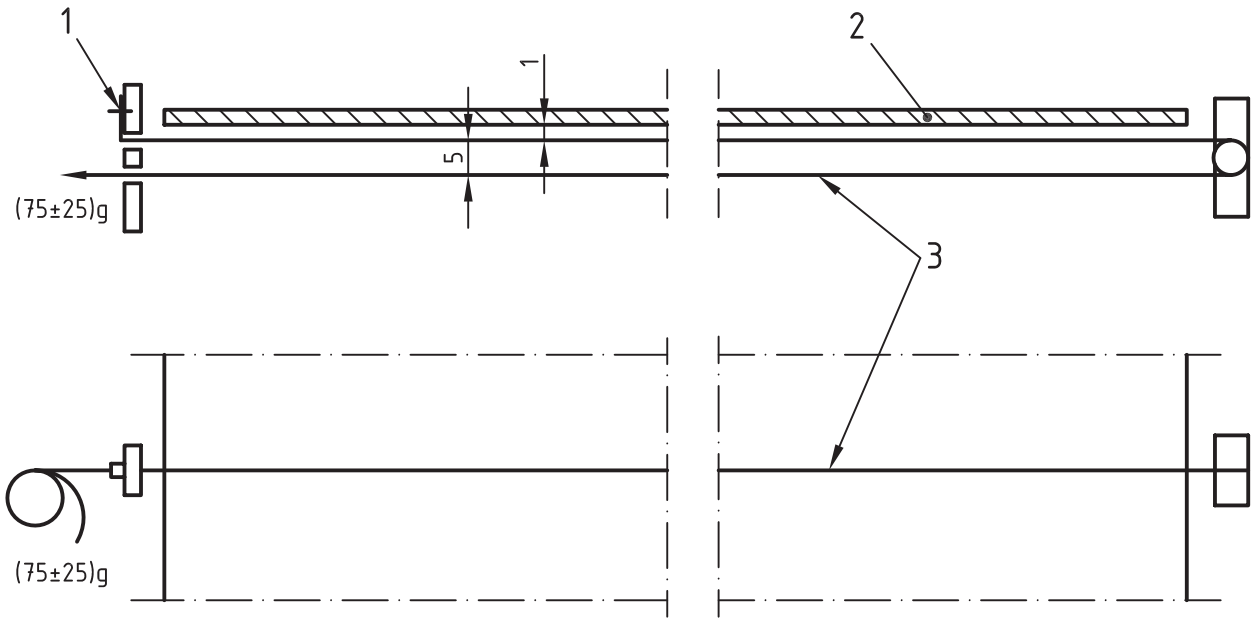
1 centre of the specimen

2 cotton cloth

3 staple

Figure 2 — Position of pieces of cotton cloth on the specimen

Dimensions in millimetres

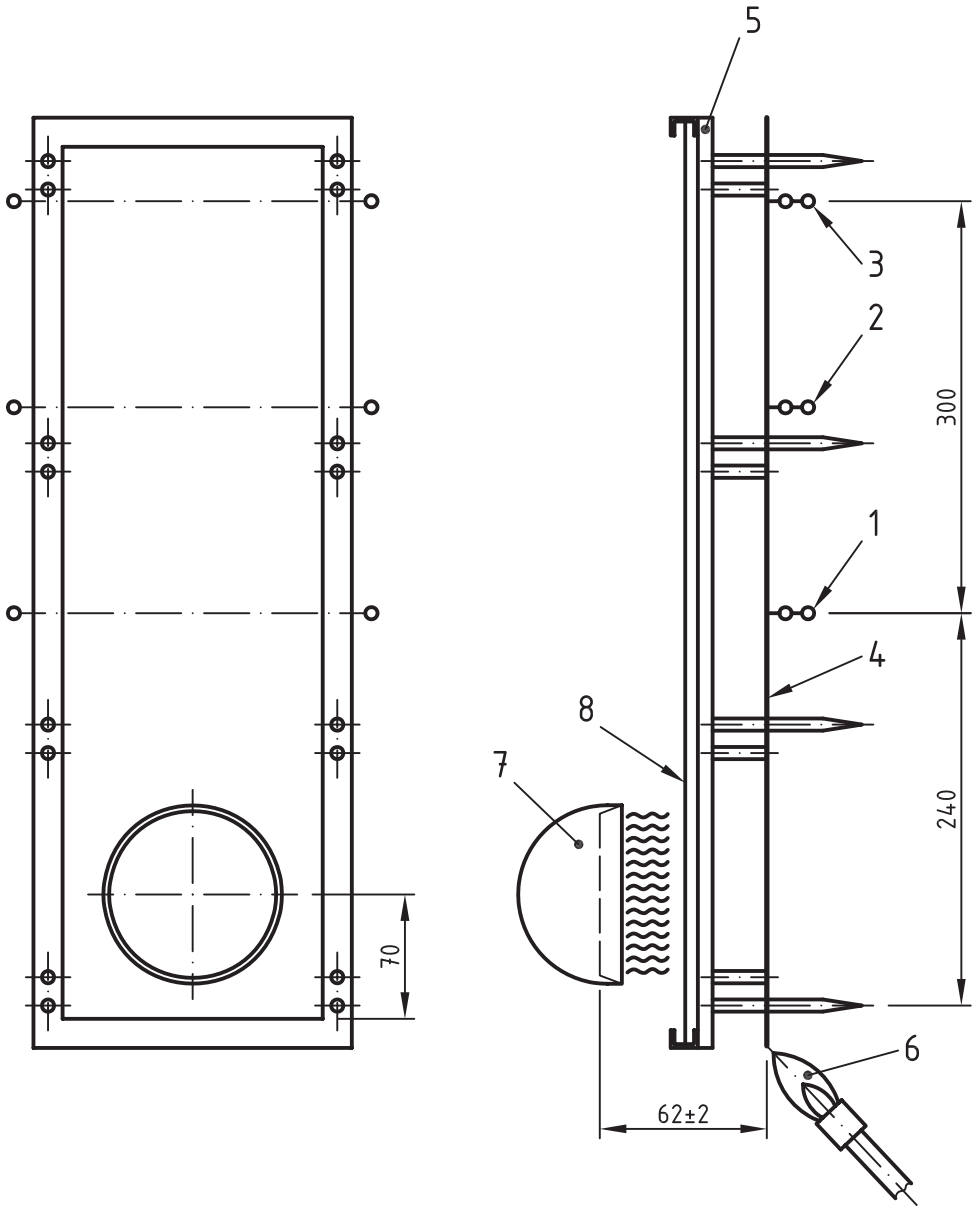


Key

1 fastening point
2 specimen
3 marker thread

Figure 3 — Positions and possible arrangement for marker threads

Dimensions in millimetres



Key

1 first marker thread
2 second marker thread
3 third marker thread
4 fabric specimen
5 specimen holder
6 flame
7 radiator
8 shield

Figure 4 — Equipment for combined test with heat radiation and a small flame (to be modified in accordance with EN ISO 6941)

7 Calibration

7.1 General

A calibration shall be carried out to ensure that the radiator output, measured by the calorimeter temperature rise, is within the prescribed limits.

7.2 Procedure

Mount the radiator as shown in Figure 4. Mount the copper disc calorimeter centrally in front of the radiator at the position of the test specimen. The centre of the radiator shall be at (62 ± 2) mm from the centre of the calorimeter and at (70 ± 2) mm from the bottom of the test specimen position. The plane areas of both radiator and calorimeter shall be parallel. Put the shield in its position between the radiator and the calorimeter.

Switch the radiator on with the variable transformer and wait (20 ± 1) min to let the radiator output stabilize. Then remove the shield and let the temperature of the calorimeter disc increase to at least 100 °C. Measure the time needed for a temperature rise from 40 °C to 100 °C. Close the shield immediately or remove the copper disc calorimeter to protect it from excess heat.

The average temperature rise of the calorimeter between 40 °C and 100 °C shall be (3,0 ± 0,1) °C/s. If this is not the case, the calibration procedure shall be repeated and the output voltage of the transformer shall be adjusted to a value which fulfils the requirement.

NOTE The calibration can alternatively be carried out separately without using the test rig, but the relative positions of the radiator and calorimeter should be maintained.

8 Sample and test specimens

8.1 Sample

The test sample shall normally be taken so as to be representative of the materials as used in complete curtains and drapes. Single materials can also be tested, but if combined with other materials their behaviour can be different.

8.2 Cleansing

All samples shall be tested as received, i.e. before cleansing.

Fabrics that are suitable for repeated cleansing shall also be tested after cleansing in accordance with one or more of the following procedures, as applicable:

— commercial laundry processes: twelve standard washing cycles in accordance with EN ISO 10528;

— domestic laundry processes: twelve standard washing cycles in accordance with the relevant procedure of EN ISO 6330;

— dry cleaning processes: six dry cleaning cycles according to EN ISO 3175-2, -3 or -4.

Fabrics treated with non-durable finishes to meet the classification requirements of EN 13773:2003, 5.1 shall not be subject to any cleansing.

8.3 Test specimens

8.3.1 General

All materials or material combinations shall be pre-treated as indicated in 8.2.

8.3.2 Size of specimens

The size of each specimen shall be (560 ± 2) mm × (170 ± 2) mm.

8.3.3 Number of specimens (both before and after cleansing)

Cut four specimens from each of the length direction and the width direction. Extra specimens may be needed if re-testing is necessary.

The specimens shall consist of one or more layers of materials according to the construction of the curtain or drape.

Unless otherwise specified the specimens shall not contain features of construction such as seams, pleats, etc. Nevertheless the test specimens shall contain pattern or design features when they are a specific part of the fabric such as Jacquard construction.

8.3.4 Insertion of cotton cloth

The size of each cotton cloth shall be (50 ± 2) mm × (20 ± 2) mm. Take a piece of the cotton cloth and fasten it on the specimen at the ignition point. This is done by folding it around the specimen edge and fastening it with a staple (see Figure 2).

9 Conditioning

Condition the test specimen at least 24 h in the standard atmosphere of (20 ± 2) °C and (65 ± 5) % relative humidity according to EN ISO 139:2005.

10 Procedure

10.1 Hold the anemometer at the same height as the centre of the radiator at the position of the specimen and keep the vertical air movement at less than 0,2 m/s. Once measured, the anemometer shall be removed.

10.2 Mount the burner in the position for edge ignition defined in EN ISO 6941.

10.3 Light the burner, adjust the length of the flame (vertical position) to (40 ± 2) mm and preheat for at least 2 min.

10.4 Switch on the radiator, using the same distance to the specimen and the same adjusted voltage as used in the calibration and let at least 20 min elapse before the first test.

10.5 Move the shield in position between the radiator and the specimen.

10.6 Mount a specimen, taken in the long direction, and fasten the marker threads. Record which side of the specimen is turned to the radiator.

10.7 Position a piece at least (150 × 100) mm of filter paper on the metal grid below the specimen.

10.8 Remove the shield and expose the fabric to radiation.

Move the burner into position after (30 ± 1) s radiation and let it be there for (10 ± 1) s (the specimen shall still be under radiation and remain so during the whole test).

10.9 Measure the times from the start of the flame application to the severance of the marker threads.

10.10 Note any flaming debris, as defined in 3.1.

10.11 Measure the destroyed length defined as the distance from the original edge to the farthest evidence of damage to the specimen due to flame impingement or radiation. Include areas of partial or complete consumption, charring or embrittlement, but not areas sooted, stained, warped or discoloured.

10.12 Test another specimen in the same direction exposing the other side to the radiator, making the same measurements. Note which side gives the worst result:

— by noting which marker threads are reached;

— if the first thread is severed for both specimens, take note of the longest damaged length;

— if the third thread is severed for both specimens, take note of the time elapsed to the severance of the third thread;

— if no marker threads are severed choose the side, which gave the longest destroyed length.

10.13 Test the other two specimens with the side which gave the worst result.

10.14 Test the specimens taken in the width direction in the same way.

11 Test report

The report shall at least include the following information:

a) reference to this European Standard;

b) any deviations from this standard;

c) reference of tested material;

d) description of the tested material;

e) date of testing;

f) cleansing procedure or a statement that the material is not intended to be cleansed;

g) testing results for individual specimens (before and after cleansing):

   1) the severing of any marker threads;

   2) time to severance of the third marker thread;

   3) destroyed length;

   4) flaming debris.

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