

Methods of test for

Flammability of textile fabrics when subjected to a small igniting flame applied to the face or bottom edge of vertically oriented specimens

UDC 677.014.27:614.841.411:536.468:543.874

Confirmed October 2008

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- Association of Heavy Textile Proofers of Great Britain
- Bolton Institute of Higher Education
- British Burn Association
- British Carpet Manufacturers' Association Ltd.
- British Clothing Industry Association
- British Plastics Federation
- British Steel Corporation
- British Textile Employers' Association
- Chemical Industries Association
- Chief and Assistant Chief Fire Officers' Association
- City of Bradford Conditioning House
- Consumer Policy Committee of BSI
- Department of the Environment (Building Research Establishment)
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- Ministry of Defence
- Soap and Detergent Industry Association
- Society of Motor Manufacturers and Traders Ltd.
- Textile Institute
- Textile Research Council
- Warrington Fire Research Centre

This British Standard, having been prepared under the direction of the Textile and Clothing Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 29 September 1989

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First published November 1976

The following BSI references relate to the work on this standard:
Committee reference TCM/30
Draft for comment 87/45459 DC

ISBN 0 580 17341 0

Amendments issued since publication

Amd. No.	Date of issue	Comments
6509	June 1990	
8308	December 1994	Indicated by a sideline in the margin

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Foreword

This British Standard has been prepared under the direction of the Textiles and Clothing Standards Policy Committee. It supersedes BS 5438:1976, which will be withdrawn when legislation which relates to BS 5438:1976 has been amended.

BS 5438 was introduced in 1976 and described three test methods for observing and measuring aspects of the flammability of textile fabrics when subjected to a small igniting flame applied to the face of a vertically oriented specimen. These test methods were subsequently specified in British Standard performance specifications for sleepwear, blankets, curtains and drapes, industrial protective clothing, tentage etc.

In some instances modifications to the original test procedures have been introduced in these performance specifications, notably reduced pinning. This reduced pinning has been found to give more realistic, although less reproducible results.

In 1994 BS 5438 was amended as a result of the publication of BS EN 26940 and BS EN 26941, which together partially superseded it. Tests 1A and 1B were deleted (superseded by the tests in clause 8 of BS EN 26940) as were tests 3A and 3B (superseded by the tests in clause 8 of BS EN 26941).

It should be noted that the procedure in clause 9 (test 2a), although retained for the time being, has been adopted in EN 532. In due course EN 26940, EN 26941 and EN 532 will be replaced by a new set of International/European Standards that will correspond to the six test methods in BS 5438:1989, which will then be withdrawn.

Advice on the choice of test method and acceptance criteria is given in Appendix C. Attention is also drawn to PD 2777:1994 which provides additional information on the development of BS 5438 and related standards.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 16, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 1. General

1 Scope

This British Standard describes methods of test for flammability of textile fabrics by observing and measuring the limited flame spread and of vertically oriented test specimens when subjected to a small igniting flame applied to the face or bottom edge. Test specimens can be of a single fabric or any combination of materials representative of the product in use, e.g. coated, multi-layered fabrics.

NOTE 1 Wherever practical, trimmings should be tested as part of the fabric assembly on which they are or will be used.

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard the following definitions apply.

2.1

glowing

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

(Extracted from BS ISO 4880.)

2.2

ignition

flaming of the test specimen for a period of 1 s or more after removal of the igniting flame, unless otherwise specified in performance requirements

2.3

flaming debris

material separating from the specimen during the test procedure and falling below the initial lower edge of the specimen and continuing to flame as it falls

2.4

hole

a break in the fabric at least 2 mm × 2 mm in size caused by melting, glowing or flaming. If the hole is crossed by any material it is described as discontinuous

NOTE This definition applies only to face ignition tests.

2.5

duration of flame

the length of time for which a material continues to flame, under specified test conditions, after the ignition source has been removed

(Extracted from BS ISO 4880.)

NOTE 1 Also called afterflame time.

NOTE 2 Flaming debris is not included in this definition.

2.6

afterglow time

the time for which a material continues to glow, under specified test conditions, after cessation of flaming or after removal of the ignition source, ignoring glowing debris

(Extracted from BS ISO 4880.)

NOTE Also called duration of afterglow.

2.7

flame application time

the time for which the igniting flame is applied to the test specimen

2.8

minimum ignition time

the minimum flame application time required to cause ignition (2.2) of the test specimen

2.9

flame spread time

the time taken by a flame on a burning material to travel a specified distance under specified test conditions, measured from when the igniting flame is applied

2.10

damaged length

the maximum extent of damaged material measured in a vertical or a horizontal direction, whichever is the greater, on each test specimen

NOTE Methods for measurement of damaged length are given in Appendix A.

2.11

surface flash

rapid spread of flame over the surface of a material without ignition of its basic structure

(Extracted from BS ISO 4880. See also BS 4569.)

3 Conditioning and testing atmospheres and location

3.1 Conditioning. Condition the test specimens for at least 24 h in an atmosphere having a temperature of 20 ± 5 °C and a relative humidity of 65 ± 5 %. If testing is not carried out immediately after conditioning place the conditioned test specimens in a sealed container. Begin testing each specimen within 2 min of removing it from either the conditioning atmosphere or the sealed container.

3.2 Testing atmosphere. Perform the tests in an atmosphere having a temperature of 15 °C to 30 °C, relative humidity of 55 ± 20 % and air movement which is less than 0.2 m/s at the commencement of the test and is not influenced further by mechanical devices operating during the test, and where the volume of air surrounding the test location is such that the test will be unaffected by any reduction of oxygen concentration. Where test 3 is to be performed in an open-fronted cabinet, make provision for mounting the specimen at least 300 mm from any wall.

NOTE 1 Draught shields may be required to restrict air movement in the region of the flame application.

NOTE 2 The testing location should be provided with means of removing smoke and fumes.

4 Health and safety of operators

There is a considerable risk with these tests and suitable precautions shall be taken.

NOTE 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. It should be ensured that the required atmosphere and air movement for testing are restored (see 3.2) after evacuation of smoke and fumes.

5 Apparatus

NOTE Since some products of combustion are corrosive, it is essential that the equipment should be constructed of material which will not be adversely affected by the fumes.

5.1 Mounting frame capable of holding the burner, test specimen holders and marker threads in the desired positions described in clause 6 and 11.4.2 [see Figure 1 and Figure 3(c)].

5.2 Gas burner¹⁾ having the dimensions given in Figure 2 and capable of being fixed vertically, horizontally or inclined at 30° to the vertical and capable of being moved quickly from stand-by positions, where the tip of the burner is at least 50 mm in front of the test specimen, to the operating positions described in 6.1.2 and 6.2.2 (see Figure 4).

NOTE Small differences in the design and dimensions of the burner can influence the configuration of the burner flame and so affect the results of the tests.

5.3 A supply of commercial butane complying with the requirements of BS 4250.

5.4 Test specimen holders

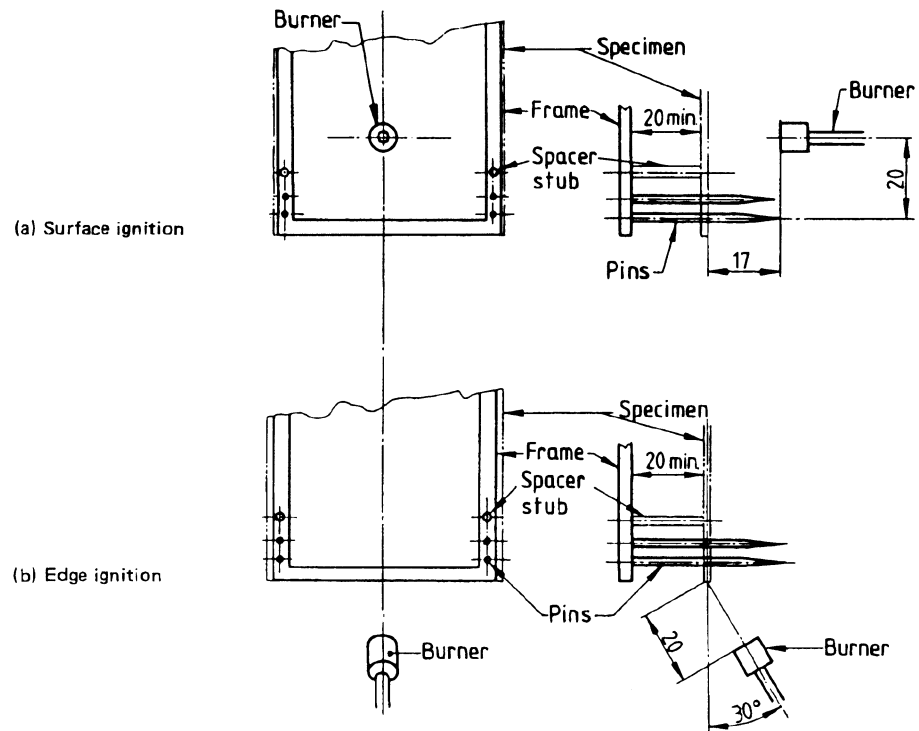
5.4.1 Text deleted

5.4.2 Test specimen holder for tests 2A and 2B consisting of a rectangular metal frame having a test specimen support pin of maximum diameter 2 mm and minimum length 27 mm at each corner of a rectangle of length 190 mm and width 150 mm. Spacer stubs of diameter 2 mm and minimum length 20 mm are provided adjacent to the test specimen support pins. The distance from the centre of a test specimen support pin to the edge of the frame is 5 mm and the distance from the centre of a test specimen support pin to the centre of the adjacent spacer stub is 6 mm [see Figure 3(b)].

NOTE The dimensions of the test specimen are given in 9.3 and 10.3.

5.4.3 Text deleted

¹⁾ For information on the availability of such a burner apply to BSI Enquiries, Linford Wood, Milton Keynes, MK14 6LE



All linear dimensions in millimetres.

Figure 1 — Test specimen holder and burner ignition location