BRITISH STANDARD

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+A1:2011
Incorporating Corrigendum No. 1

Combustion modified flexible polyurethane cellular materials for loadbearing applications — Specification

ICS 83.100; 83.140.01

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee PRI/71, upon which the following bodies were represented:

British Plastics Federation
Furniture Industry Research Association (FIRA)
Furniture, Timber and Allied Trades Union
MoD — UK Defence Standardization
National Bed Federation Limited
Society of Motor Manufacturers and Traders Limited

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Amendments issued since publication

Amd. No.	Date	Comments
16373	July 2006	Change to Figure 1
A1	July 2011	See foreword

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Contents

Foreword

This British Standard has been prepared by Technical Committee PRI/71. BS 3379:2005 superseded BS 3379:2003, which was withdrawn. However, it should be noted that BS 3379:1975 remains current because it is called up by the UK Furniture Regulations for defining the standard test foam for use in the flammability test for textiles.

BS 3379:2005+A1:2011 supersedes BS 3379:2005 which is withdrawn.

The start and finish of text introduced or altered by Amendment No 1: 2011 is indicated in the text by tags ▮A1⟩ ⟨A1▮. Minor editorial changes are not tagged.

NOTE BSI Customer Services will respond to purchase orders for BS 3379 by supplying copies of the 2005 edition. Copies of the 1975 edition can be obtained by quoting "BS 3379:1975".

The 2005 revision of BS 3379 was undertaken as a result of the adoption of the technically similar International Standard ISO 5999 as BS EN ISO 5999:2004. BS EN ISO 5999:2004 classifies foam in the same manner as this standard but does not identify UK oriented flammability classes.

With effect from 1 March 1989 only "combustion modified" materials have been legally permitted under the Furniture and Furnishings (Fire) (Safety) Regulations 1988 [1], the Furniture and Furnishings (Fire) (Safety) (Amendment) Regulations 1989 [2] ▮A1⟩ and the Furniture and Furnishings (Fire) (Safety) (Amendment) Regulations 2010 [3] ⟨A1▮ for use in domestic upholstered furniture, mattresses and bed bases. BS EN ISO 5999 makes no reference to these UK National Requirements and therefore contains no criteria for the classification of the fillings required for such applications.

The main change incorporated in this new edition is the deletion of all requirements for foams that are not "combustion modified" as such materials are within the scope of BS EN ISO 5999:2004.

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

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

In particular, attention is drawn to the following statutory regulations:

a) the Furniture and Furnishings (Fire) (Safety) Regulations 1988 [1];

b) the Furniture and Furnishings (Fire) (Safety) (Amendment) Regulations 1989 [2];

▮A1⟩ c) the Furniture and Furnishings (Fire) (Safety) (Amendment) Regulations 2010. [3]. ⟨A1▮

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 11 and a back cover.

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1 Scope

This British Standard specifies requirements for flexible loadbearing combustion modified, polyurethane cellular materials, manufactured in block, sheet and strip form, in moulded and fabricated shapes and as reconstituted material.

〈A1〉 Materials defined as combustion modified are those that meet the legal and technical requirements of the Furniture and Furnishings (Fire) (Safety) Regulations 1988 [1], the Furniture and Furnishings (Fire) (Safety) (Amendment) Regulations 1989 [2] and the Furniture and Furnishings (Fire) (Safety) (Amendment) Regulations 1989 [3] for use in domestic upholstered furniture, mattresses and bed bases. 〈A1〉

NOTE 1 Annex A reproduces the relevant test requirements.

In addition to the definitive requirements, this standard also requires the items detailed in Clause **3** to be documented. For compliance with this standard, both the definitive requirements and the documented items have to be satisfied.

NOTE 2 Recommended applications for the range of flexible polyurethane cellular materials specified in this standard are listed in Annex B.

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.

BS 4023:1975*, Specification for flexible cellular PVC sheeting.*

BS EN ISO 1798*, Flexible cellular polymeric materials — Determination of tensile strength and elongation at break.*

BS EN ISO 1856*, Flexible cellular polymeric materials — Determination of compression set.*

BS EN ISO 2439*, Flexible cellular polymeric materials — Determination of hardness (indentation technique).*

BS EN ISO 2440*, Flexible and rigid cellular polymeric materials — Accelerated ageing tests.*

BS EN ISO 3385*, Flexible cellular polymeric materials — Determination of fatigue by constant-load pounding.*

BS ISO 13362*, Flexible cellular polymeric materials — Determination of compression set under humid conditions.*

3 Information and requirements to be agreed and documented

The following information to be supplied by the purchaser shall be fully documented. For compliance with the standard both the definitive requirements specified throughout the standard and the following documented items shall be satisfied:

a) colour of the material (see Clause **5**);

b) surface condition (see Clause **7**);

c) component mass (see Clause **8**);

d) dimensions (see Clause **9**);

e) cleanliness of reconstituted foam (see **10.3**).

4 Designations

4.1 Type

For the purposes of this British Standard each grade shall be divided into five types as follows:

— type CM-B combustion modified conventional slab stock;
— type CM-HB combustion modified high-resilience block;
— type CM-M combustion modified conventional moulded;
— type CM-HM combustion modified high-resilience moulded;
— type CM-RE combustion modified reconstituted.

NOTE Purchasers can sometimes request that the materials are supplied with profiles or cavities introduced. Manufacturers or suppliers may meet this additional demand using materials that are classified in accordance with Table 1.

4.2 Classes for materials of types CM-B, CM-HB, CM-M and CM-HM

Materials of types CM-B, CM-HB, CM-M and CM-HM shall be further subdivided into five classes based on performance in the constant load pounding test described in BS EN ISO 3385.

The five classes and their intended type of service, given in Table 1, shall be defined by the maximum indentation hardness loss over the range of hardness index values from 0 N to 650 N, as shown in Figure 1 and Figure 2.

Table 1 — Classification of service type

Class	Type of service
X	Extremely severe
V	Very severe
S	Severe
A	Average
L	Light

EXAMPLE

A material with an initial indentation hardness index of 140 N would be classified as shown in Table 2.

Table 2 — Example of classification for a material with an initial indentation hardness index of 140 N

Range of indentation hardness loss N	Class
0 to 17	X
18 to 31	V
31 to 44	S
45 to 55	A
56 to 63	L

Any material with an indentation hardness index of 140 N and with a hardness loss greater than 63 N does not conform to the requirements of this standard.

4.3 Hardness grade

The materials shall be tested in accordance with BS EN ISO 2439 and graded by the indentation hardness index ranges given in Table 3.

For moulded products BS EN ISO 2439:2001 Method A shall be used.

NOTE The reported value may be either the indentation hardness index of the core material or the product hardness index (obtained by testing the finished product).

Table 3 — Hardness grading

Hardness grade	Indentation hardness index or product hardness index N
30	25 to 40
50	41 to 60
70	61 to 85
100	86 to 110
130	115 to 150
170	155 to 190
210	195 to 235
270	240 to 295
330	300 to 360
400	365 to 425
470	430 to 520
600	525 to 650
NOTE 1 BS EN ISO 2439 requires that values of indentation hardness up to 100 N are quoted to the nearest unit and those over 100 N to the nearest 5 N. NOTE 2 Some manufacturers will not always wish to fit all their materials exactly into these hardness grades. Therefore on occasions it will be necessary to quote two consecutive grades to identify a material.	

EXAMPLE

For a combustion modified (CM), high-resilience block material (HB) intended for very severe service (V) with an indentation hardness index (I) of 180 N (170) the designation is CM-HB-V-170(I).

5 Structure and composition

The materials shall consist of polyurethane flexible materials with a network of cells.

NOTE 1 The materials are usually available with cells substantially open and interconnecting and free from abnormalities affecting their performance.

NOTE 2 Materials are normally supplied with a slight odour that is neither objectionable nor harmful.

Where a particular colour is required it shall be specified by the purchaser [see Clause **3** item a)].

6 Construction

The materials shall be supplied in block, sheet or strip form, or in moulded or fabricated shapes.

Repaired material shall be deemed to conform to the requirements of this standard if the material used in repairs is of the same composition and quality as the original product and provided that such repairs do not affect the performance, size and shape.

When components are repaired and fabricated, any adhesives used shall not damage the material and the resulting bonds shall be at least as strong as the material itself.

The area of the bond shall be sufficient to withstand the service conditions, e.g. a bonded thin overlay shall be bonded over sufficient area to prevent rucking in service.

7 Surface condition

There shall be no loose skin on surfaces. Mould parting marks and other surface blemishes shall be not worse than the quality levels specified by the purchaser [see Clause **3** item b)].

8 Component mass

The mass of a component, when required, shall be as specified by the purchaser [see Clause **3** item c)].

9 Dimensions

The dimensions of components made from the material shall be as specified by the purchaser [see Clause **3** item d)], subject to the tolerances given in Table 4 and Table 5.

NOTE The trimming allowances are the sole responsibility of the designer. The actual dimensions of a flexible polyurethane material article used in upholstering should normally be greater than the nominal dimensions by a small amount in order to allow the material to be compressed slightly by a cover made to the nominal dimensions.

Table 4 — Tolerances on length and width

Dimensions mm	Tolerance mm
Up to and including 250 (except for fabricated components)	+5, –0
Up to and including 250 (fabricated components only)	+10, –0
Over 250, up to and including 500	+10, –0
Over 500, up to and including 1 000	+20, –0
Over 1 000, up to and including 1 500	+30, –0
Over 1 500, up to and including 2 000	+40, –0
Over 2 000	+50, –0

Table 5 — Tolerances on thickness

Dimensions mm	Tolerance mm
Up to and including 25	+3, –0
Over 25, up to and including 100	+4, –0
Over 100	+6, –0

10 Physical and chemical requirements

10.1 Hardness loss

When tested in accordance with the method described in BS EN ISO 3385, the indentation hardness loss of the material shall be not greater than the maximum shown in Figure 1 and Figure 2 for the class and indentation hardness index of the material supplied.

10.2 Other properties

The properties of the material shall be as given in Table 6, Table 7 and Table 8 as appropriate.

The standard test specimens used for the tests listed in Table 7 shall not include the surface skin, the adjacent layer of denser material or any portion where there is an obvious defect (see Note). A minimum of 5 mm shall be removed.

In all cases, the surface condition of the specimens shall be stated in the test report.

NOTE It is permissible to test specimens of moulded materials with skin if the thickness of the moulding is insufficient to yield specimens of appropriate size after removal of 5 mm of surface material.

10.3 Reconstituted materials

NOTE 1 Reconstituted material (type CM-RE), because of its good fatigue properties combined with poorer compression set, tensile strength and elongation at break properties is specified separately in Table 8.

The indentation hardness of CM-RE materials shall conform to Figure 1 and Figure 2 for class V materials.

NOTE 2 Type CM-RE material is generally used as thin, firm padding, or to provide reinforcement for the other materials.

Reconstituted foam shall conform to the cleanliness requirements specified by the purchaser [see Clause **3** item e)].

Table 6 — Property requirements for all types of materials

Property	Requirement	Method of test
Organic material staining	No staining	BS 4023:1975, Appendix D
Low temperature flexibility	No tears or cracks	BS 4023:1975, Appendix C
Loss in tensile strength after humidity ageing for 3 h in saturated steam at (105 ± 2) °C in accordance with BS EN ISO 2440	Maximum loss 30 % of original value	BS EN ISO 1798
Loss in tensile strength after heat ageing for 16 h at 140 ± 2 °C in accordance with BS EN ISO 2440	Maximum loss 30 % of original value	BS EN ISO 1798
NOTE The depth of skin to be removed during preparation of the test specimen can vary considerably, depending on the general configuration of the moulded shape.		

Table 7 — Property requirements for all types of materials except CM-RE materials

Property	Method of test	Property requirement				
		Class X	Class V	Class S	Class A	Class L
Compression set (maximum) %	BS EN ISO 1856:2001, Method A at 75 % compression	8	8	12	15	15
Humid compression set (maximum) %	BS ISO 13362	15	30	50	—	—
Elongation at break (minimum) %	BS EN ISO 1798	90	90	90	90	90
Tensile strength (minimum) kPa	BS EN ISO 1798	50	50	50	50	50
Tensile strength after heat ageing for 16 h at (140 ± 2) °C (minimum) kPa[a]	BS EN ISO 2440 BS EN ISO 1798	35	35	35	35	35
Tensile strength after humidity ageing for 3 h in saturated steam at (105 ± 2) °C (minimum) kPa[a]	BS EN ISO 2440 BS EN ISO 1798	35	35	35	35	35
[a] Not less than 70 % of the measured un-aged tensile strength or the value given, whichever is the greater.						

Table 8 — Property requirements for type CM-RE materials

Property	Method of test	Requirement
Indentation hardness loss (maximum)	BS EN ISO 3385	As specified in Figure 1 and Figure 2 for class V material
Compression set (maximum)	BS EN ISO 1856:2001 Method A at 75 % compression	20 %
Elongation at break (minimum)	BS EN ISO 1798	70 %
Tensile strength (minimum)	BS EN ISO 1798	50 kPa

11 Marking

The materials shall be clearly and permanently marked by means that are non-staining and non-injurious to them. The following information shall be provided:

a) the manufacturer's identification;

b) the manufacturer's date code;

c) the designations of the material as given in Clause **4**;

d) where applicable, the indentor location and the location of any skin on the hardness index test specimen;

e) the number and date of this British Standard, i.e. BS 3379:2005.

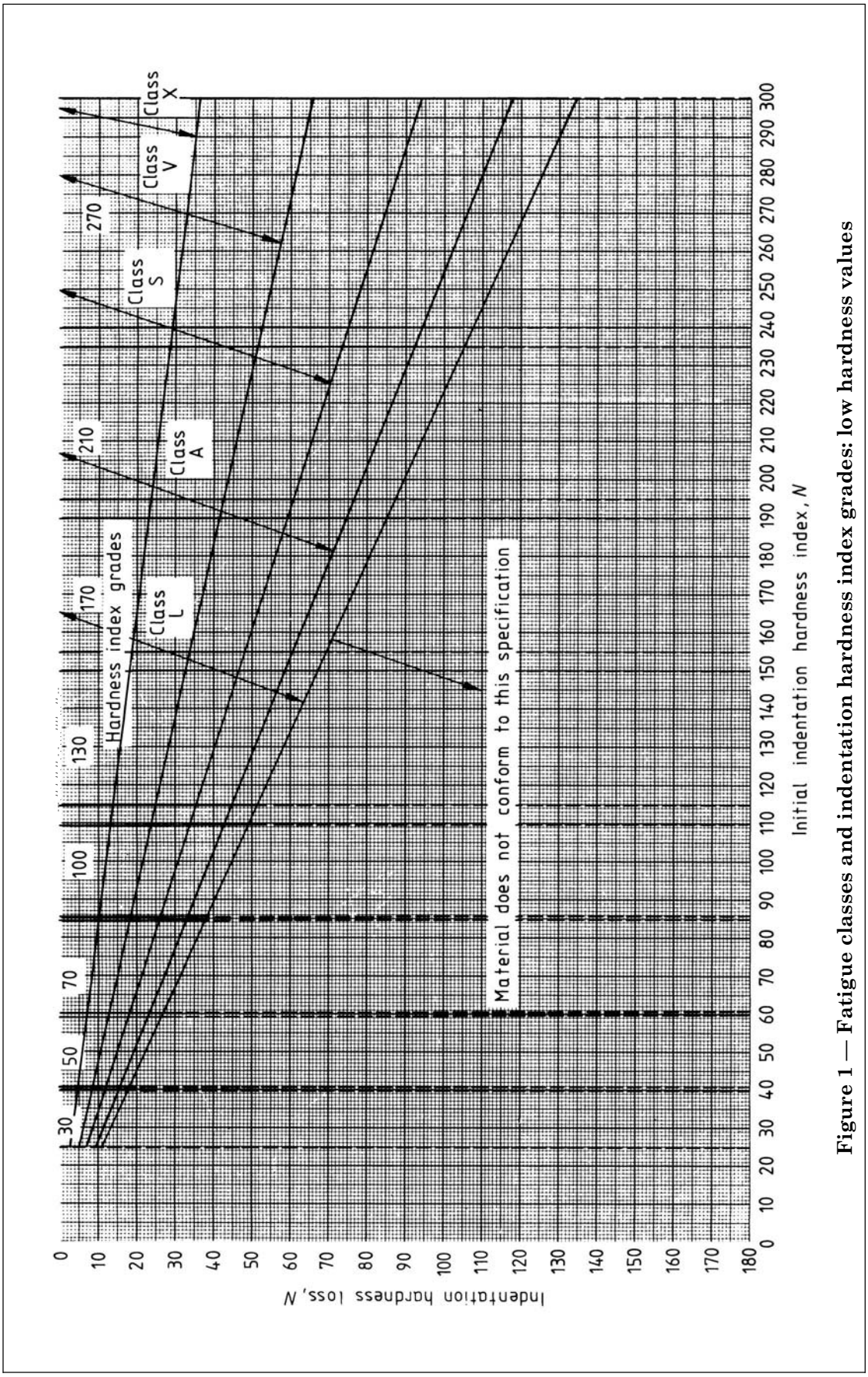

Figure 1 — Fatigue classes and indentation hardness index grades: low hardness values

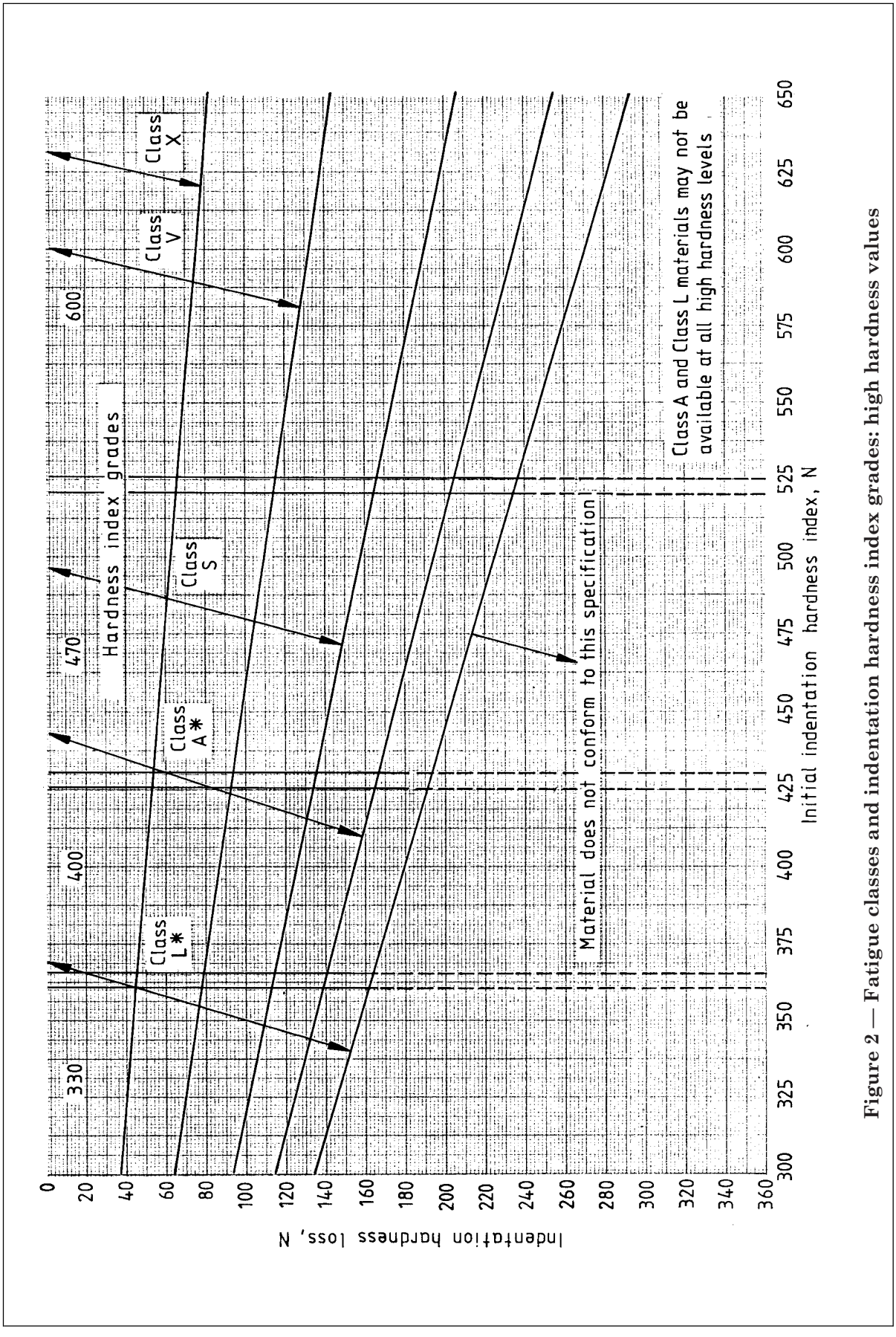

Figure 2 — Fatigue classes and indentation hardness index grades: high hardness values

Annex A (informative)
Schedule 1 to the Furniture and Furnishings (Fire) (Safety) Regulations 1988

NOTE This annex reproduces verbatim the Furniture and Furnishings (Fire) (Safety) Regulations 1988 Part 1, Ignitability test for polyurethane foam in slab or cushion form [1,2,3].

1. The foam shall be tested in accordance with the method set out in BS 5852-2:1982 using cover fabric corresponding to the specification set out in paragraph 2 below.

〉A1〈 2. The fabric shall be made of 100 % flame-retardant polyester fibre. The construction of the fabric shall be woven to a plain weave. The yarn in the warp shall be spun to a linear density of 37 tex ± 10 %. The yarn in the weft shall be spun to a linear density of 100 tex ± 10 %. The fabric shall be scoured and heat set.

The fabric shall be woven so as to have a finished fabric construction of:

a) 20.5 ± 1 yarn threads/cm in the warp;

b) 12.5 ± 1 yarn threads/cm in the weft

Its mass shall be 220 g/m^2 ± 5 %. 〈A1〉

3. The test rig as specified in Clause **6.1.1** of BS 5852-2 shall have expanded steel platforms of not less than (28 × 6) mm mesh size. The test rig is placed on a metal tray of sufficient dimensions to collect any debris falling from specimens being tested. The rig and debris tray shall be mounted on a weighing balance with a remote readout having a full-scale deflection of at least 0 kg to 20 kg to an accuracy of 2 g.

4. The foam under test, cut to the specified dimensions is placed on the test rig, covered with the fabric specified in paragraph 2 above and tensioned with clips as set out in BS 5852-2:1982. An ignition source 5 crib is placed in position. The mass of the complete assembly is determined ("initial mass"). The test shall be carried out in accordance with BS 5852-2:1982. In particular flaming or smouldering failure shall be determined against the criteria of Clause **4** of BS 5852-2:1982. After flaming and smouldering has ceased, any debris which has become detached from the specimen shall be removed. The remaining mass of the assembly ("final mass") is then recorded.

5. If failure against the criteria of Clause **4** of BS 5852-2:1982 has occurred, but only by way of the damage exceeding the limits defined in Clauses **4.1** (e), **4.1** (f) and **4.2** (f), and provided that the resultant mass loss (initial mass less final mass) is less than 60 g, the foam passes the ignitability test.

Annex B (informative)
Typical applications for each class of material

Table B.1 gives recommendations covering typical applications for the five classes of material. The class listed is the lowest recommended for that application.

Material classes X, V, S, A and L of flexible polyurethane cellular material are based on the results of the specified constant load pounding test and the resulting performance ranking of a range of materials would be the same for any individual application. The different severity of various applications has been taken into account in framing these recommendations.

Table B.1 — Typical applications

Class	Type of service	Recommended application
X	Extremely severe	Heavy duty contract seats Heavy duty public transport seats
V	Very severe	Public transport seats Cinema and theatre seats Contract furniture seats
S	Severe	Private and commercial vehicle seats Domestic furniture seats[a] Public transport backs and armrests Cinema and theatre backs and armrests Contract furniture backs and armrests Domestic foam mattress cores[a]
A	Average	Private vehicle backs and armrests Domestic furniture backs and armrests[a] Component layers for domestic mattresses (excluding cores)[a]
L	Light	Padding[a] Scatter cushions[a] Pillows[a]

[a] See the foreword for information on legal requirements.

Bibliography

Standards publications

BS 3379:1975, *Specification for flexible urethane foam for loadbearing applications.*

BS 5852-2:1982, *Fire tests for furniture — Part 2: Methods of test for the ignitability of upholstered composites for seating by flaming sources.*

BS 7176:1995, *Specification for resistance to ignition of upholstered furniture for non-domestic seating by testing composites.*

BS 7177:1996, *Specification for resistance to ignition of mattresses, divans and bed bases.*

BS EN ISO 5999:2004, *Polymeric materials, cellular flexible — Polyurethane foam for load-bearing applications excluding carpet underlay — Specification.*

Other publications

[1] GREAT BRITAIN. Furniture and Furnishings (Fire) (Safety) Regulations 1988. SI 1988 No. 1324. London: The Stationery Office.

[2] GREAT BRITAIN. Furniture and Furnishings (Fire) (Safety) (Amendment) Regulations 1989. SI 1989 No. 2358. London: The Stationery Office.

〉A1〈 [3] GREAT BRITAIN. Furniture and Furnishings (Fire) (Safety) (Amendment) Regulations 2010. SI 2010 No. 2205. London: The Stationery Office. 〈A1〉

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