BRITISH STANDARD

BS 5131 : Section 3.6 : 1991

Methods of test for

Footwear and footwear materials

Part 3. Uppers, textiles and threads

Section 3.6 Abrasion resistance of shoe laces

NOTE. It is recommended that this Section should be read in conjunction with BS 5131 : Part 0, published separately.

Méthodes d'essai des chaussures et des matériaux pour chaussures
Partie 3. Dessus de chaussures, textiles et fils
Section 3.6 Résistance à l'usure par frottement des lacets de chaussures

Prüfung von Schuhwerk und Schuhwerkstoffen
Teil 3. Oberleder, Textilien und Fäden
Abschnitt 3.6 Abreibfestigkeit von Schuhbändern

STANDARDS

Foreword

This Section of BS 5131 has been prepared under the direction of the Textiles and Clothing Standards Policy Committee. It supersedes BS 5131 : Section 3.6 : 1979, which is withdrawn.

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

Method

1 Scope

This Section of BS 5131 describes a method for determining the abrasion resistance of shoe laces. Shoe laces are tested in the dry (conditioned) state and in the wet state in cases where poor wet abrasion resistance is suspected (mainly laces containing viscose).

2 Principle

A shoe lace is abraded by rubbing it backwards and forwards through a reference eyelet under tension. The number of cycles required to break the shoe lace is determined. Tests are carried out on both dry and wet specimens.

NOTE. The wear on a shoe lace, which ultimately causes it to break, is produced mainly by rubbing against the edge of the eyelet rather than by one section of shoe lace rubbing against another section of shoe lace.

3 Apparatus[1)]

3.1 *Conditioning cabinet or room,* maintaining an atmosphere of 20 ± 2 °C and 65 ± 2 % r.h.

3.2 *Apparatus for abrading the shoe lace,* the essential features of which are illustrated in figure 3.6/1. The eyelet, clenched in a rectangle of fibreboard, is held at an angle of 45° to the horizontal and the shoe lace passes through it. One end of the shoe lace is held in a clamp and is moved horizontally backwards and forwards with a stroke of 76 ± 2 mm by a crank worked by a wheel rotating at a uniform speed of 100 ± 10 r/min.

A 454 ± 5 g mass is suspended from the other end of the test specimen so that the shoe lace is held under continuous tension during the abrasion cycle. This mass is guided by suitable tubes or rods so that during the test it can move only up and down and cannot swing sideways. The machine is fitted with a counter which stops when the test specimen breaks. A simple way of achieving this is by the shoe lace tensioning weight falling on to a counter cut-out switch. The machine is also fitted with a pre-set counter switch, so that when desired the machine can be made to stop after a pre-set number of cycles.

3.3 *Reference eyelets,* brass, nominal 4.5 mm internal diameter, each being individually mounted in a piece of fibreboard to enable it to be fitted in the abrasion machine. A piece of rigid fibreboard such as pattern board 25 mm × 38 mm × 3 mm is suitable, with a 5 mm diameter hole in the centre. The eyelet is then inserted and clenched in the normal way using a machine or hand tool made for this purpose.

3.4 *Reference shoe lace,* used for 'running-in' the reference eyelets before they are used to test any other lace. A round cotton lace, with core, which has an abrasion resistance when tested with the reference eyelet in the range 10 000 to 20 000 cycles is suitable.

4 Conditioning

Where the shoe laces are to be tested by the dry test method (**6.2**), place the shoe laces in the conditioning cabinet or room (**3.1**). After 48 h, cut the test specimens (see clause **5**). Carry out the test in this atmosphere.

Where the shoe laces are to be tested by the wet test method (**6.3**), do not condition the shoe laces.

5 Preparation of test specimens

From the shoe laces cut six test specimens, each about 180 mm to 200 mm long. If sufficient shoe laces are available, cut each test specimen from a separate shoe lace. If necessary, shoe laces as short as about 100 mm may be tested by tying string to each end of the shoe lace provided that the shoe lace and not the string rubs against the eyelet during the rubbing stroke. Record whether the test specimens consisted of shoe lace or shoe lace and string.

6 Procedure

6.1 Pre-polishing the reference eyelet

Before a new eyelet is suitable for use as a reference eyelet, pre-polish it and remove any surface irregularities that would otherwise affect the test results. In order to do this, load the apparatus (**3.2**) as described in **6.2** using a reference shoe lace (**3.4**) and pre-set the machine to run for 10 000 cycles. Then take the mounted eyelet out of the machine, turn it round (top-to-bottom, not back-to-front), replace it, and polish the other side of the eyelet hole diameter for 10 000 cycles using a new length of reference shoe lace, thereby producing a reference eyelet (**3.3**).

NOTE. Tests have shown that for the first 10 000 cycles approximately, the eyelet is somewhat more severe in its abrasive action. After that, the test result is not dependent on the extent to which the eyelet has been used, up to about 100 000 cycles. Consequently, reference eyelets may be re-used provided that the side of the eyelet hole which is to be used has not already been subjected to 100 000 cycles or is not expected to reach that figure during the duration of the test.

[1)] For information on the availability of suitable apparatus to perform this test, apply to Enquiry Section, BSI, Linford Wood, Milton Keynes, MK14 6LE quoting the number of this standard and the clause number referring to the items concerned. Enclose a stamped addressed envelope for reply.

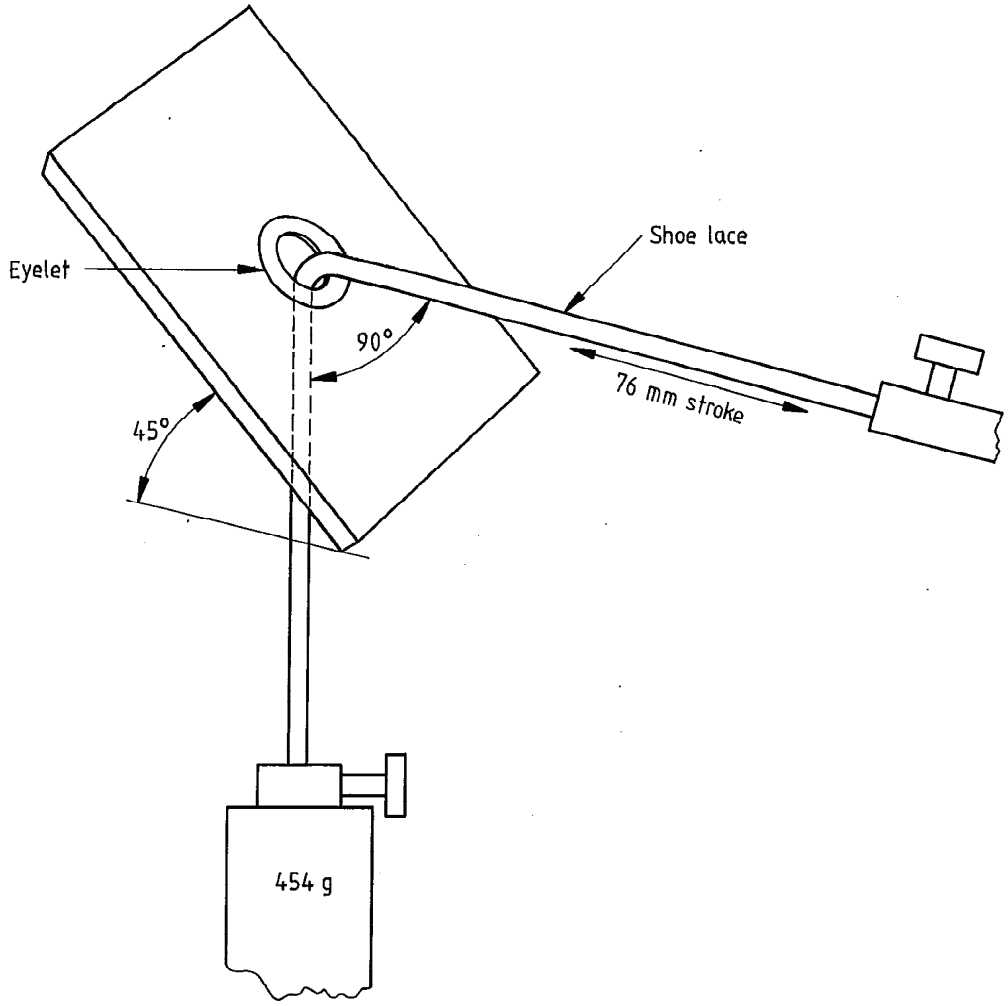

Figure 3.6/1. Apparatus for abrading the shoe lace

6.2 Dry test method

6.2.1 Set the counter of the apparatus (**3.2**) to zero. Fit a reference eyelet (**3.3**), clenched side downwards, into the apparatus.

6.2.2 Turn the driving mechanism of the apparatus by hand until the horizontally reciprocating clamp is as near as possible to the reference eyelet. This position corresponds to the lowest position of the tensioning mass. Insert and clamp one end of a test specimen in the horizontally reciprocating clamp. Pass the other end of the test specimen through the eyelet and hang from it the 454 g mass so that the underside of the mass is 10 mm or more clear of the cut-out switch below when the shoe lace is under full tension. Turn the machine through a complete cycle by hand and ensure that, firstly, at the topmost point of the movement, the weight does not come out of its guide tube or off its guide rod secondly, where short lengths of shoe lace are being used as test specimens, the eyelets are being rubbed by the shoe lace for the whole of the cycle; and thirdly, that the shoe lace rubs against the part of the eyelet which has already been run in.

6.2.3 Start the machine and leave it to run continuously until the test specimen has broken.

6.2.4 Test the remaining five test specimens in the same manner.

6.3 Wet test method

6.3.1 Soak the test specimens by total immersion in distilled or deionized water at 20 °C for 1 h. When complete wetting of test specimens that are normally resistant to wetting is essential, an aqueous solution of not more than 1 g/L of a non-ionic wetting agent may be used instead of water.

6.3.2 Test the wet test specimens according to the procedure described in **6.2**. Re-wet the wet test specimens in situ at 30 min intervals. To do this, either drip the water directly onto the wet test specimen or apply the water using a soft brush.

7 Expression of results

Record the number of cycles necessary for each shoe lace to break as a result of abrasion. Record the highest and lowest results of the six tests and the median value (the arithmetic mean of the middle two results). Record the results for the dry and wet tests separately.

NOTE. Some types of shoe lace tend to give results with a skew distribution. In these circumstances, the median is a better guide to average performance than the arithmetic mean of all the results.

8 Test report

The test report shall include the following items:

(a) type of the test specimens (i.e. shoe lace, or shoe lace and string) (see clause **5**);

(b) number of cycles for each test specimen to break as a result of abrasion;

(c) results expressed in accordance with clause **7**;

(d) nature and full identification of the sample(s);

(e) reference to this method of test, i.e. BS 5131 : Section 3.6;

(f) date of testing.

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Textiles and Clothing Standards Policy Committee (TCM/-) to Technical Committee TCM/39, upon which the following bodies were represented:

British Footwear Manufacturers' Federation
British Leather Confederation
British Rubber Manufacturers' Association
British Steel plc
Consumer Standards Advisory Committee of BSI
Cork Industry Federation
Footwear Components Federation
Footwear Distributors' Federation
Institute of Trading Standards Administration
Iron and Steel Trades Confederation
Lancashire Footwear Manufacturers' Association
Mail Order Traders Association of Great Britain
Ministry of Defence
National Union of Footwear, Leather and Allied Trades
Office of Fair Trading
SATRA Footwear Technology Centre

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

British Adhesives and Sealants Association
British Paper and Board Industry Federation
British Plastics Federation
Multiple Shoe Retailers' Association
RAPRA Technology Ltd.

This British Standard, having been prepared under the direction of the Textiles and Clothing Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on
31 January 1991

First published January 1979
Second edition January 1991

The following BSI references relate to the work on this standard:
Committee reference TCM/39
Draft for comment 89/36223 DC

ISBN 0 580 18820 5

Amendments issued since publication

Amd. No.	Date	Text affected

BSI, 2 Park Street, London W1A 2BS BSI, Linford Wood, Milton Keynes MK14 6LE