BRITISH STANDARD

BS 3356:1990

Incorporating Amendment No. 1

Method for

Determination of bending length and flexural rigidity of fabrics

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 Committees TCM/24, upon which the following bodies were represented:

Association of Consulting Scientists
British Nonwovens Manufacturers' Association
British Polyolefin Textiles Association
British Textile Employers' Association
British Textile Machinery Association
British Textile Technology Group
Confederation of British Wool Textiles Limited
International Wool Secretariat
Man-made Fibres Producers' Committee
Ministry of Defence
SATRA Footwear Technology Centre
Soap and Detergent Industry Association
Society of Dyers and Colourists
Textile Institute

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 August 1990

First published March 1961
Second edition August 1990

The following BSI references relate to the work on this standard:
Committee reference TCM/24
Draft for comment 89/36835 DC

ISBN 0 580 19293 8

Amendments issued since publication

Amd. No.	Date of issue	Comments
6337	June 1991	Indicated by a sideline in the margin

Contents

Foreword

This British Standard has been prepared under the direction of the Textiles and Clothing Standards Policy Committee and forms a revision of BS 3356:1961 which is withdrawn.

The principal change introduced in this revision is that the method has been brought up to date by making minor changes throughout the text. At the time of publication of this British Standard no corresponding international standard exists.

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 4, 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.

1 Scope

This British Standard describes a method for determination of the bending length and flexural rigidity of textile fabrics and certain nonwovens by means of a fixed-angle flexometer.

The method is not applicable to fabrics that curl or twist badly when cut into small pieces, nor to fabrics that show a noticeable time effect when allowed to bend under their own mass.

NOTE 1 The use of this method for nonwovens should be agreed between the interested parties.

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

2 Principle

A rectangular strip of fabric is supported on a horizontal platform in a direction perpendicular to one edge of the platform. The strip is extended in the direction of its length so that an increasing part overhangs and bends down under its own mass. When the tip of the specimen has reached a plane passing through the edge of the platform and inclined at an angle of 41.5° below the horizontal, the overhanging length is equal to twice the bending length of the specimen.

The flexural rigidity is obtained from the bending length and the mass per unit area of the fabric.

NOTE For the majority of fabrics the bending length will not exceed 100 mm, in which case the overhanging length will not exceed 200 mm.

3 Definitions

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

3.1
flexural rigidity

the ratio of the small change in bending movement per unit width of the material to the corresponding small change in curvature, expressed in mg cm

NOTE This quantity is a measure of the resistance of the fabric to bending by external forces. It is related to the quality of stiffness that is appreciated when a fabric is handled, in the sense that fabric having a high flexural rigidity tends to feel stiff.

3.2
bending length

the cube root of the ratio of the flexural rigidity to the mass per unit area of the fabric expressed in cm. It is equal to the length of a rectangular strip of material that will bend under its own mass to an angle of 7.1°

NOTE 1 This quantity is one of the factors that determines the manner in which a fabric drapes. It is related to the quality of stiffness that is appreciated by visual examination of the draped material, in the sense that fabrics having a high bending length tend to drape stiffly.

NOTE 2 Samples with the warp threads parallel to the long edge are identified by warp bending length and warp flexural rigidity. Samples with the weft threads parallel to the long edge are identified by weft bending length and weft flexural rigidity.

4 Apparatus

4.1 *Fixed-angle flexometer* as shown in Figure 1, comprising the following essential features.

A slide S rests on a horizontal platform P. The upper surface of the slide is calibrated with a scale which indicates bending length directly in units and tenths of a unit. For the angle of inclination of 41.5° (see clause **3**) unit graduations of the scale on the slide are uniformly spaced 20 mm apart. When the front edge of the slide coincides with the front edge of P, the zero of the scale on S coincides with a datum line D on the instrument. Two sighting lines L_1 and L_2 pass through the upper forward edge of P and are inclined at an angle of 41.5° below the horizontal, and are inscribed on the transparent side pieces of the instrument. The under surface of S is covered with a layer of high friction material such as sheet rubber and the upper surface of P is polished so that, when S is moved, it will carry forward a specimen placed between the slide and the surface P. The width of the slide S shall be 25 mm and its mass shall be 180 ± 2 g.

NOTE 1 The range of the instrument is governed by its size. It is convenient to be able to determine bending lengths of about 80 mm to 100 mm in which case the overhanging length of the specimen is 160 mm to 200 mm.

NOTE 2 Except where otherwise indicated the above requirements are nominal.

4.2 *Means of measuring length* to an accuracy of at least 1 mm.

4.3 *Means of measuring time* to an accuracy of ± 1 s.

5 Atmospheres for conditioning and testing

Atmospheres for conditioning and testing shall be as follows.

a) For preconditioning, an atmosphere of relative humidity not more than 10 % and of temperature not more than 50 °C shall be used[1)].

[1)] An oven at 50 °C under ordinary room conditions will give the required low humidity. For some fabrics the temperature of 50 °C may not be permissible. In such case the relative humidity of 10 % should be obtained by the removal of moisture from the air used for preconditioning.

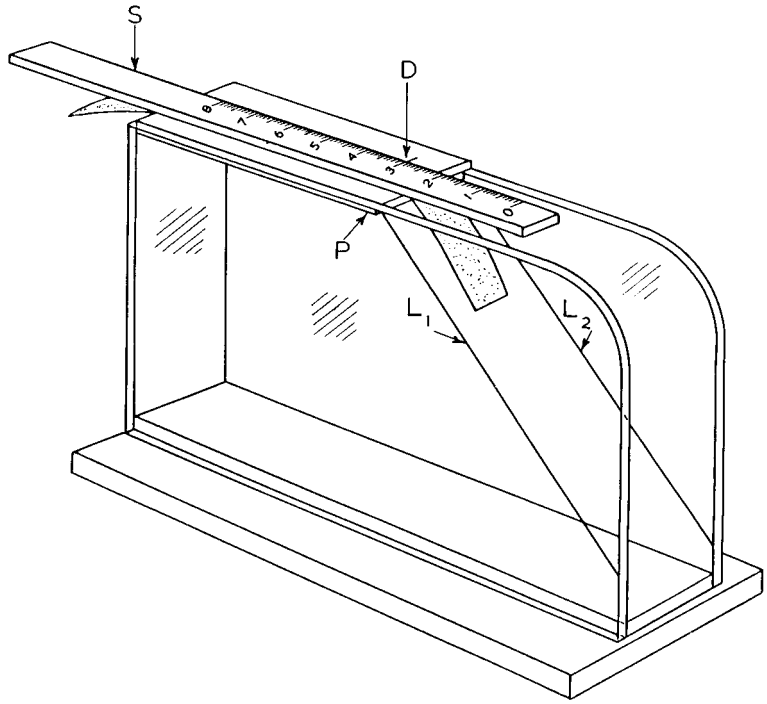

Figure 1 — Apparatus for determining flexural rigidity

b) The conditioning and testing atmosphere shall be the standard temperate atmosphere for testing textiles defined in BS 1051, i.e. an atmosphere of 65 ± 2 % relative humidity at a temperature of 20 ± 2 °C.

NOTE The results can vary considerably if the specified conditions are not used.

6 Test specimens

Cut rectangular specimens 25 ± 1 mm wide and 200 ± 1 mm long from the fabric to be tested.

At least three specimens shall be taken with their warp threads parallel to the long edge (subsequently referred to as warp specimens), and an equal number with their weft threads parallel to the long edge (subsequently referred to as weft specimens).

Cut the specimens so that, as far as possible, no two warp specimens contain the same warp threads and no two weft specimens contain the same weft threads. Selvedges, end pieces and creased or folded places shall not be included in the specimens. Handle the fabric and the specimens as little as possible.

NOTE For fabrics other than woven fabrics, specimens should be taken in the machine and cross machine directions.

7 Procedure

Precondition the test specimens for at least 4 h in the atmosphere specified in clause **5** a) and then expose them to the standard atmosphere for testing [see clause **5** b)] for not less than 24 h or until the mass of a specimen does not change by more than 0.25 % at intervals of 2 h. Test the specimens without their removal from this atmosphere.

Lay the specimen on a smooth horizontal surface terminated at one end by a straight edge, so that the length of the specimen is at right angles to, and one end is level with, that edge. Move the specimen lengthwise over the edge at a uniform rate of approximately 25 mm in 5 s, until the end of the specimen comes into line with the two lines L_1 and L_2. Measure the length of fabric protruding beyond the edge.

Make a similar determination with the other face of the same end of the specimen uppermost.

Test the other five specimens in the same way.

NOTE It will be found helpful in carrying out this procedure to place the flexometer so that the zero of the scale lies towards the observer and at a level that enables the scale to be read with comfort. The position of the end of the specimen relative to the sighting lines may then be observed in a mirror suitably placed or attached to one side of the instrument.

8 Calculation and expression of results

Read the bending length direct from the scale.

Calculate the mean bending length C for warp and weft directions separately.

Using the appropriate mean value, calculate the flexural rigidity G, in mg cm, separately for the warp and weft directions by the following formula:

$$G = 0.10\ MC^3$$

where

M is the mass per unit area of the fabric, in g m^{-2} determined in accordance with BS 2471.

9 Test report

The test report shall include the following particulars:

a) number and date of this British Standard, i.e. BS 3356:1990;

b) details of the sample tested;

c) mean warp bending length;

d) mean weft bending length;

e) mean warp flexural rigidity;

f) mean weft flexural rigidity;

g) number of warp specimens tested;

h) number of weft specimens tested.

blank

Publications referred to

BS 1051, *Glossary of terms relating to the conditioning, testing and mass determination of textiles.*

BS 2471, *Methods of test for textiles — woven fabrics — determination of mass per unit length and mass per unit area.*

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: 020 8996 7002. Fax: 020 8996 7001.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL