BRITISH STANDARD

BS 3424-5: 1982

Testing coated fabrics —

Part 5: Methods 7A, 7B and 7C. Methods for determination of tear strength

IMPORTANT NOTE. It is recommended that this Part be read in conjunction with the information in Part 0 "Foreword and general introduction".

UDC 677.077.652:678.066.2:677.017.424.28:620.176.245

Foreword

The tear strength of the coated fabric is measured on a fabric strength testing machine by observing the force indicated or recorded when tearing through at least 60 mm of the material. Three alternative methods are described. Methods 7A and 7B give a measure of the median and maximum tear strength by the tongue tear test and are used to determine the force of tear propagation. Method 7B is of value for coated linen or rip-stop fabric. Method 7C describes a single tear test and can be used to determine the force to initiate and propagate tear.

In reviewing method 7A, much consideration was given to ISO 4674 which was published in 1977 by the International Organization for Standardization (ISO). Apart from differences in specimen size, the major difference between ISO 4674 and the present method 7A is in terms of trace analysis. The method of trace analysis specified in ISO 4674 does not produce results which are representative of the overall trace. Because of this, and the fact that there was insufficient evidence to show that ISO 4674 was more reproducible than method 7A, the decision was taken not to adopt ISO 4674 as a British Standard to replace method 7A. This Part supersedes method 7 of BS 3424:1973.

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.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 6, 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.

This British Standard, having been prepared under the direction of the Fibres, Yarns and Fabrics Standards Committee, was published under the authority of the Board of BSI and comes into effect on 30 September 1982

The following BSI references relate to the work on this standard:
Committee reference FBM/13
Draft for comment 81/35879 DC

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Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

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1 Scope

This Part of this British Standard describes means of determining the tear strength of coated fabrics using a constant rate of traverse cloth tensile testing machine.

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

2 Method 7A. Median value tongue tear

2.1 Apparatus

2.1.1 *A low inertia, autographic constant rate of traverse cloth tensile testing machine* of a suitable range, power-operated at a rate of 100 ± 10 mm/min. Under the conditions of use, the error of the indicated or recorded maximum force at any point in the range in which the machine is used does not exceed ± 1 % of the force. The width of jaws is not less than the width of the specimen.

2.2 Preparation of test specimens. Five specimens 200 mm × 60 mm shall be cut with the longer dimension in the longitudinal direction of the roll and five more specimens shall be cut with the longer dimension in the transverse direction of the roll. The strips shall be evenly spaced from the full usable length and width of the sample and not within 50 mm of the salvedge.

In each specimen a lengthways tongue 100 mm × 20 mm shall be cut, as shown in Figure 1; the line abcd shall be drawn on each face of the specimen at a distance of 50 mm from the end of the tongue.

In the case of coated fabrics of high tear strength, if the tongue breaks or threads are pulled from the fabric instead of being broken, wider specimens, 200 mm × 150 mm, shall be used with the tongue 50 mm wide.

2.3 Conditioning. Condition the test specimens in accordance with method 4 (i.e. Part 2 of this standard). If determinations are to be made on wet test specimens, totally immerse these for a minimum of 1 h at 20 ± 2 °C in an aqueous solution of a non-ionic wetting agent of concentration not more than 0.1 % (*m*/*m*). Thoroughly rinse in water and test within 1 min of removal from the water.

2.4 Procedure. Carry out the tests in the atmosphere for conditioning and testing specified in method 4 (i.e. Part 2 of this standard).

Adjust the testing machine to give the rate of clamp movement given in **2.1.1** and select an appropriate load capacity range. Fit the autographic recorder chart and check agreement between the dial and chart readings. Disengage any pawls or other arrestments which would prevent two-way movement of the weighting device. Set the clamps 100 mm apart.

Clamp the tongue of the specimen symmetrically in the headstock jaws so that the line bc is just visible (see Figure 2). Similarly, grip the legs of the specimen symmetrically in the traversing jaws so that the lines ab and cd are just visible and the legs of the specimen are parallel to the force of tear.

Place the recorder pen in contact with the chart at zero, set the traversing jaws in motion and record the fluctuations in force as the tear proceeds. After 60 mm of the fabric have been torn through, remove the pen and disengage the drive.

2.5 Calculation and expression of results. The trace obtained consists of a series of peaks each representing the force at which the fabric has torn, and troughs, each corresponding to the fall of the force after the tear (see Figure 3). Emphasize the peaks on the charts by a pencil dot, ignoring that part of the trace representing the first 10 mm of tear (normally the first 20 mm of the trace) and find the median value of the corresponding force readings. This is best done by counting the total number of peaks and the number in successive force ranges until the middle reading in order of value is isolated (see note to Figure 3). Record the median value to the nearest newton.

NOTE Experience has shown that the median peak value approximates closely to the arithmetic mean of the peak values but is easier to determine.

Determine the mean of the median values in newtons for the five specimens as the longitudinal or transverse tear strength according to whether longitudinal or transverse threads respectively are torn.

2.6 Test report. The report shall include the following particulars.

a) The description of the coated fabric.

b) The mean tear strength in both the longitudinal and transverse directions; indicating clearly that the results are based on median values and report the method of test used, i.e. method 7A of BS 3424-5:1982. If the tear is not substantially along the axis of the specimen, report that the material as untearable in that direction.

c) The specimen size used.

d) Details of any deviations from the standard test procedure.

3 Method 7B. Maximum value tongue tear

3.1 Apparatus. The same apparatus as described in **2.1** is required except that only a means of recording the maximum force attained during the test is required.

3.2 Preparation of test specimens. Five specimens 200 mm × 60 mm shall be cut with the longer dimension in the longitudinal direction of the roll and five more specimens shall be cut with the longer dimension in the transverse direction of the roll. The strips shall be evenly spaced from the full usable length and width of the sample and not within 50 mm of the selvedge.

In each specimen a lengthways tongue 100 mm × 20 mm shall be cut, as shown in Figure 1; the line abcd shall be drawn on each face of the specimen at a distance of 50 mm from the end of the tongue.

In the case of coated fabrics of high tear strength, if the tongue breaks or threads are pulled from the fabric instead of being broken, wider specimens, 200 mm × 150 mm, shall be used with the tongue 50 mm wide.

3.3 Conditioning. Condition the test specimens in accordance with **2.3**.

3.4 Procedure. Carry out the tests in the atmosphere for conditioning and testing described in method 4 (i.e. Part 2 of this standard).

Adjust the testing machine to the rate of clamp movement given in **2.1.1** and select an appropriate force capacity range. Disengage any pawls or other arrestments which would prevent two-way movement of the weighting device. Set the clamps 100 mm apart.

Clamp the tongue of the specimen symmetrically in the headstock jaws so that the line bc is just visible (see Figure 2). Similarly, grip the legs of the specimen symmetrically in the traversing jaws so that the lines ab and cd are just visible and the legs of the specimen are parallel to the force of tear.

Set the traversing jaws in motion. After 60 mm of the fabric have been torn through, remove the pen and disengage the drive.

3.5 Calculation and expression of results. The trace obtained may consist of a series of peaks as shown in Figure 3, or a relatively smooth curve as shown in Figure 4. From the five maximum values recorded determine the mean value in newtons as the longitudinal or transverse tear strength according to whether longitudinal or transverse threads respectively are torn.

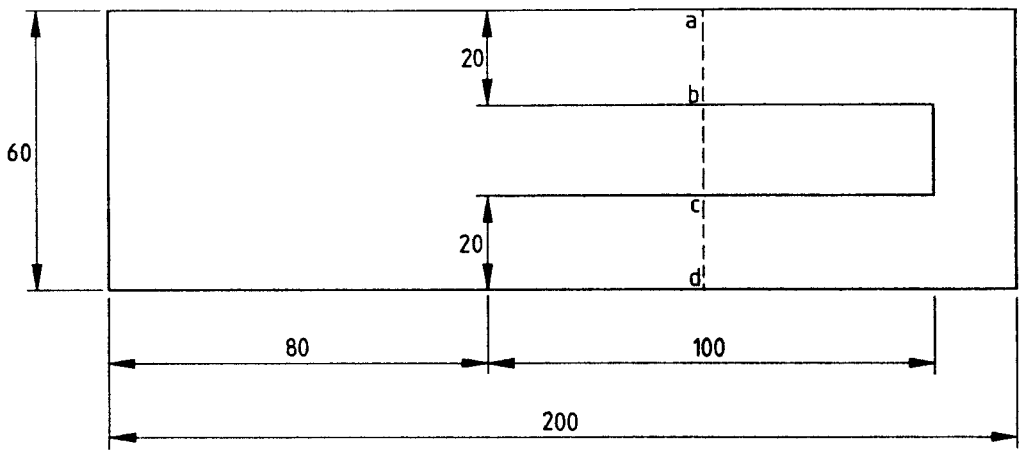
3.6 Test report. The test report shall include the following particulars.

a) The description of the coated fabric.

b) The mean tear strength in both the longitudinal and transverse directions. Indicate clearly that the results are based on maximum values and report the method of test used, i.e. method 7B of BS 3424-5:1982. If a rip-stop fabric has been tested, report the number of rip-stop bars per unit length of the sample and the number torn through per specimen during the test.

c) The specimen size used.

d) Details of any deviation from the standard test procedure.



All dimensions are in millimetres.

Figure 1 — Specimen for methods 7A and 7B

4 Method 7C. Single tear

4.1 Apparatus. The same apparatus as described in **2.1** is required.

4.2 Preparation of test specimens. Five specimens as shown in Figure 5 shall be cut, each measuring 75 mm × 25 mm with the longer dimension in the longitudinal direction of the roll and five more specimens shall be cut in the transverse direction. The selection shall be spaced so as to cover fairly evenly the full width and available length of the sample, avoiding only the uncoated edge or actual selvedge ends. If the fabric contains rip-stop bars, at least one of these shall be included in the length to be torn.

In the case of coated fabrics which tend to slip in the jaws of the test instrument or if the tongue breaks or threads are pulled from the fabric instead of being broken, wider specimens shall be used.

4.3 Conditioning. Condition the test specimens in accordance with **2.3**.

4.4 Procedure. Carry out the tests in the atmosphere for conditioning and testing described in method 4 (i.e. Part 2 of this standard).

Adjust the testing machine to the rate of clamp movement given in **2.1.1** and select an appropriate force capacity range. Check agreement between dial and chart readings. Ensure that two-way movement of the force measuring device is not prevented by pawls or ratchets.

Clamp one tongue of the test specimen in each jaw of the machine as shown in Figure 6 and start the machine.

The test is complete when the whole test specimen has been torn apart.

4.5 Calculation and expression of results. The trace obtained will generally consist of an initial peak followed by a number of peaks and troughs at a lower value of tearing strength than that of the initial peak (see Figure 3). The initial peak gives the force required for initiation of tear while the median of the subsequent peaks, obtained as in method 7A, gives the force required for propagation of tear. Determine the mean of the median values in newtons for the five specimens as the longitudinal or transverse tearing strength according to whether longitudinal or transverse threads respectively are torn.

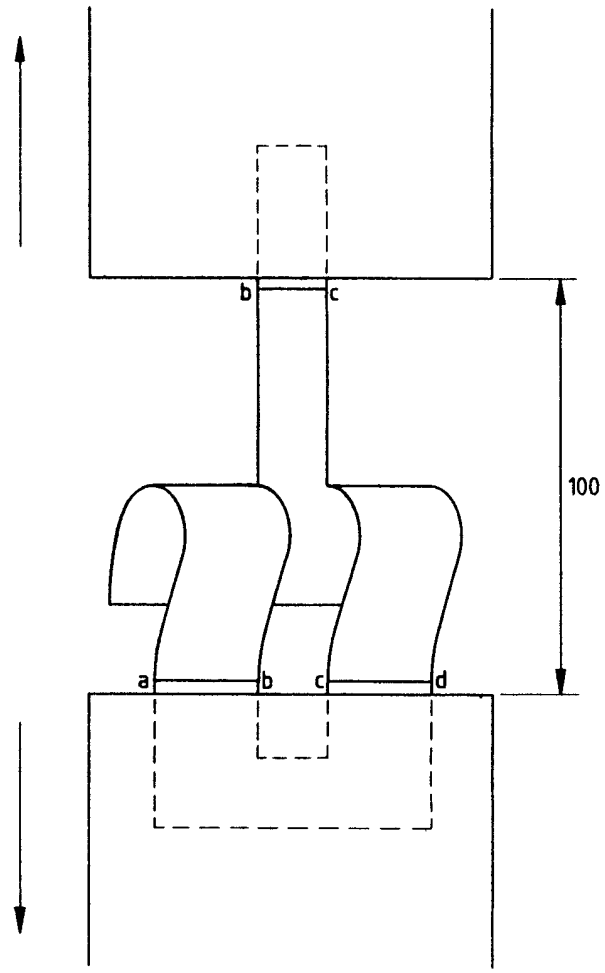
4.6 Test report. The test report shall include the following particulars.

a) The description of the coated fabric.

b) The mean tear strength and, if required, the force required to initiate tear, in both the longitudinal and transverse directions. If the tear is not substantially along the length direction of the specimen, report the material as untearable in that direction under the conditions of the test. Indicate clearly that the results are based on median values and report the method of test used, i.e. method 7C of BS 3424-5:1982.

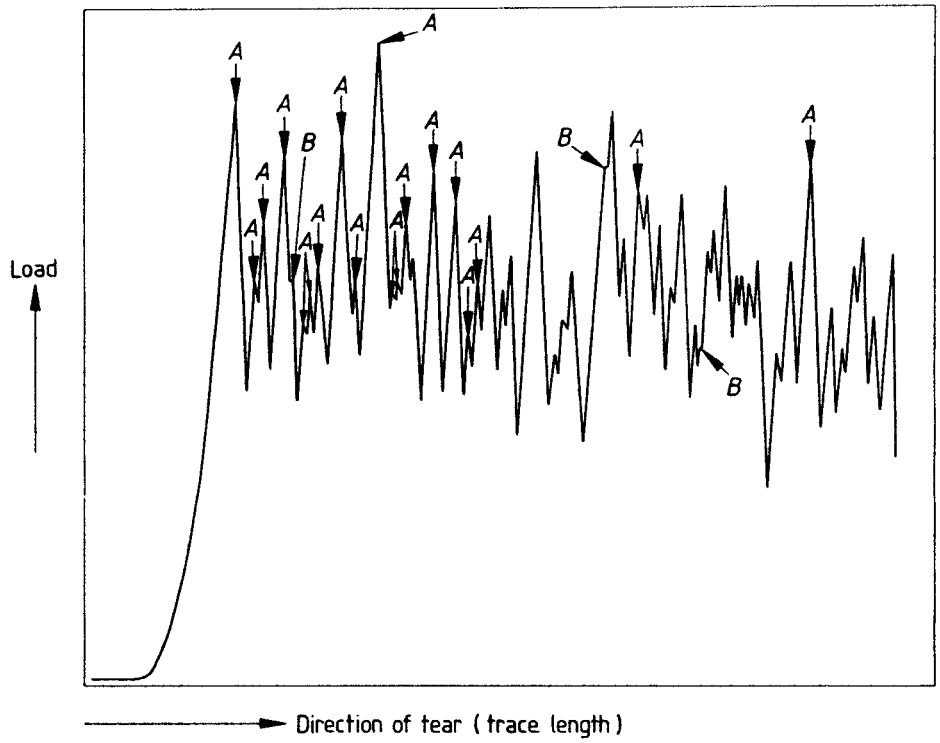
c) The specimen size used.

d) Details of any deviation from the standard test procedure.

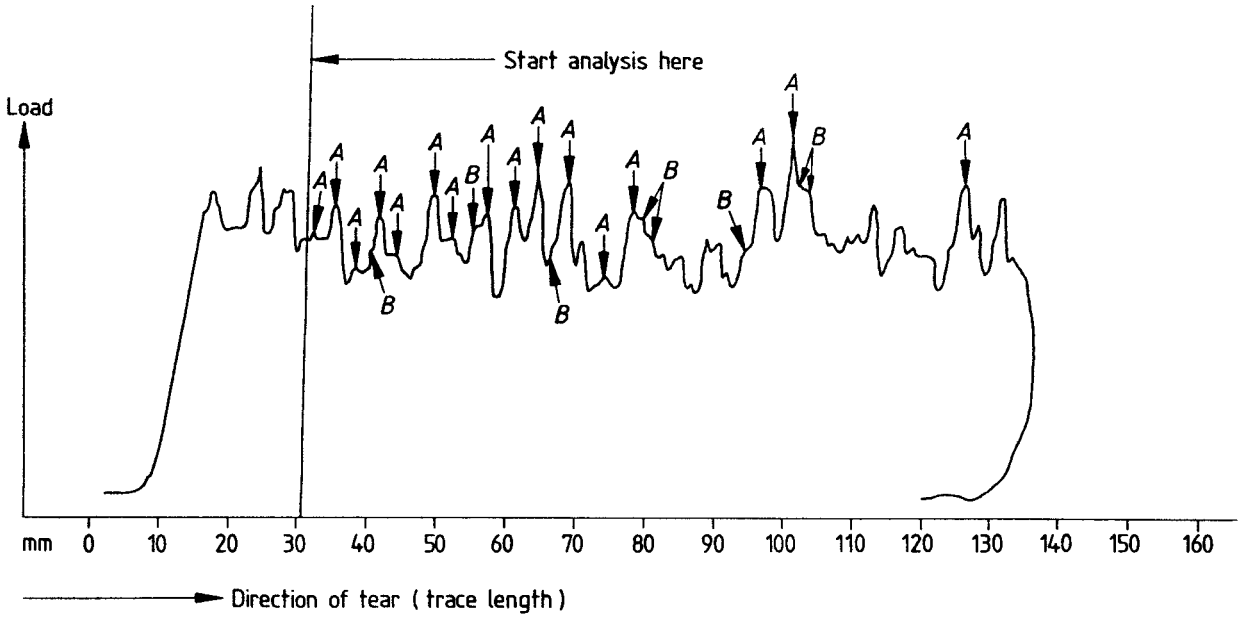


Dimension is in millimetres.

Figure 2 — Method of clamping specimen using method 7A and method 7B



(a) Electronic response time



(b) Mechanical response at low inertia

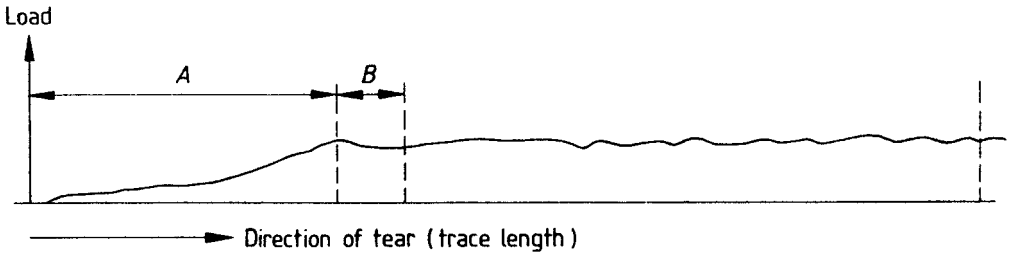
NOTE *Determination of median value.* Figure 3(a) represents a typical autographic trace. A "peak" is a point on the trace where the gradient changes from positive to negative. Points marked A are peaks, points marked B are not peaks. The importance of the peaks in the trace is that they give the force on the specimen at the instant of rupture.

The median value of tearing resistance is the value such that half the number of peaks have higher values and half have lower values.

To determine the median value, count the total number of peaks (N). If N is an odd number, count downwards, starting at the uppermost peak, a number of peaks equal to $(N + 1)/2$. The number of the last peak counted is the median peak.

If N is an even number, the median value is taken as midway between peaks $N/2$ and $(N/2) + 1$.

Figure 3 — Typical autographic traces



NOTE The type of trace illustrated is not suitable for use in determining median values. This type of trace is usually associated with high inertia instruments and with certain types of nonwoven substrates. In such cases, if the instrument is capable of indicating the average or mean force exerted during the test, the value so indicated can be reported as the mean tear strength, without reference to the trace.

This type of trace can be used where only maximum values are required (i.e. method 7B).

Figure 4 — Autographic trace without definite peaks

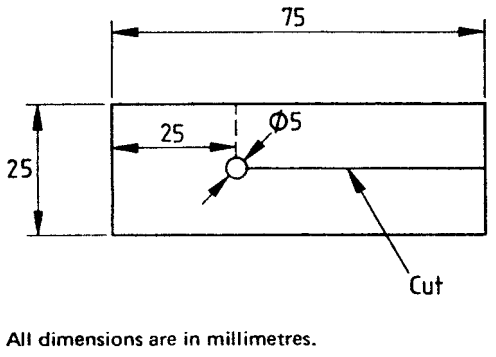


Figure 5 — Specimen for method 7C

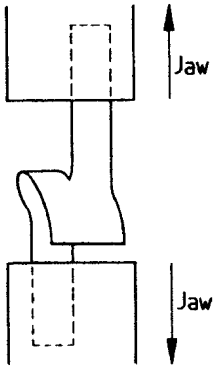


Figure 6 — Method of clamping specimen

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Publications referred to

BS 3424, *Testing coated fabrics.*
BS 3424-2, *Conditioning and selection of test specimens.*
ISO 4674, *Fabrics coated with rubber or plastics — Determination of tear resistance*[1)].

[1)] Referred to in the foreword only.

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