

Methods of test for

Footwear and footwear materials —

Part 1: Adhesives —

Section 1.3 Preparation of test assemblies using adhesives (other than hot melt adhesives) for heat resistance (creep) and peel tests

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

Confirmed January 2011

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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 28 February 1991

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First published as Subsection 1.1.3 March 1976
Second edition as Section 1.3 February 1991

The following BSI references relate to the work on this standard:
Committee reference TCM/39
Draft for comment 89/36218 DC

ISBN 0 580 18683 0

Amendments issued since publication

Amd. No.	Date	Comments

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Foreword

This Section of BS 5131 has been prepared under the direction of the Textiles and Clothing Standards Policy Committee. It supersedes BS 5131-1.1.3:1976, which is withdrawn.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, 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 Section of BS 5131 describes methods for preparation of the test assemblies required by Sections 1.1 and 1.2 for determination, respectively, of the resistance of bonded joints to heat (creep test) and to peeling. This Section includes methods for preparation of the adhesive and of the adherends. It covers most types of bonding used in the footwear industry except hot melt adhesive bonds which are covered in Section 1.7.

The types of bond include stuck-on bonds made by the use of applied adhesives (both solvent-based and water-based), injected-on bonds using thermoplastic sole materials, e.g. polyvinylchloride (PVC), thermoplastic rubber, and moulded-on direct vulcanized rubber sole bonds. The methods of preparation are applicable to a wide variety of combinations of materials, but the peel and creep tests of Sections 1.1 and 1.2 require at least one adherend to be flexible.

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

2 Principle

Rectangular pieces of adherend materials are prepared and bonded to form a test assembly from which the test specimens required by Sections 1.1 and 1.2 can be cut. Bonding may be by one of the following means:

- a) by the use of heat reactivated solvent-based adhesive;
- b) by the use of heat reactivated water-based adhesive;
- c) by injection moulding of thermoplastic rubber or PVC;
- d) by direct moulding-on a vulcanizing rubber compound.

A paper or tape insert is incorporated in each bonded assembly to provide non-bonded legs which can be gripped.

3 Apparatus and materials¹⁾

3.1 Cutting device, consisting of a sharp hand knife.

3.2 Roughing device, consisting of either:

- a) a sharp rotary wire brush, with wire of 0.375 mm diameter (28 SWG) and having a linear roughing speed of 10 m/s to 25 m/s;
- b) 80 grit abrasive paper, complying with BS 871 and mounted on a roller with a surface speed of 10 m/s to 25 m/s.

3.3 Cotton wool pad

3.4 Solvent for surface preparation, consisting of either methyl ethyl ketone (preferred) or ethyl acetate (allowed).

3.5 Strip of paper or adhesive tape

3.6 Solvent based halogenation primer

3.7 Brush, with stiff bristles and with no metal parts or metal-coated parts.

3.8 Brush, with soft bristles and with no metal parts or metal-coated parts.

NOTE There are indications that traces of some metals will degrade or catalyse degradation of some constituents of some primers, hence the requirement that the brushes do not contain metal parts or metal-coated parts.

4 Preparation of adherends

4.1 General

4.1.1 Preparation and techniques

To form a strong bond it is usually necessary to prepare the surface of the adherend so as to remove contaminants and weak surface layers, thereby rendering the bonding surface accessible to, or compatible with, the adhesive. The most common techniques are roughing of the surface by mechanical means and cleaning of the surface by wiping with a suitable solvent. Clauses 4.1.3 and 4.1.4 give the techniques for these two preparation methods. Clause 4.2 gives the preparation method which is appropriate for the different adherends together with instructions relating to priming.

4.1.2 Number and size of test assemblies

4.1.2.1 Creep testing

4.1.2.1.1 Produce sufficient test assemblies so that, for each test condition being investigated (see clause 9 of Section 1.1:1991), 15 test specimens 30.0 ± 0.5 mm by approximately 100 mm can be cut from the test assemblies.

4.1.2.1.2 Mechanical surface preparation (referred to as roughing) often produces irregular edges. Consequently, where roughing of adherend material is required (see 4.1.1) first cut the adherend material using a suitable cutting device (3.1) into rectangles approximately 70 mm by 100 mm (preferred) or approximately 70 mm by a multiple of 100 mm (allowed) in order that the test assemblies will be of the dimensions shown in Figure 1 or Figure 2. Cut the adherend material in the same direction for each test assembly.

¹⁾ For information on the availability of suitable apparatus and materials including adherends to perform this test, apply to Enquiry Section, 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.

4.1.2.1.3 Where roughing of adherend material is not required (see 4.1.1) either:

- a) prepare the specimens in accordance with 4.1.2.1.2; or
- b) cut the adherend material into rectangles 30.0 ± 0.5 mm by approximately 100 mm.

Thus, the test assemblies will be of the dimensions shown in Figure 1, Figure 2 or Figure 3. Cut the adherend material in the same direction for each test assembly.

NOTE 1 Preparation in accordance with 4.1.2.1.2 ensures that all the edges of the test specimens will be cut after mechanical surface preparation of the adherend has been carried out, thereby ensuring that the test specimens do not have any irregular edges.

NOTE 2 In a few cases the direction of cutting affects the peel strength result, notably polyurethane (PU) coated fabric uppers and cellulose board insoles. In such cases, treat each cutting direction as a different test condition.

4.1.2.2 Peel testing

Produce sufficient test assemblies so that, for each test condition being investigated (see Section 1.2), four test specimens 30.0 ± 0.5 mm by approximately 50 mm can be cut from the test assemblies. Proceed as described in 4.1.2.1.2 and 4.1.2.1.3, but with these dimensions, in order that the test assemblies will be of the dimensions shown in Figure 4, Figure 5 or Figure 6.

4.1.3 Roughing

Support the rectangles of material on a smooth flat block and rough the surface to be bonded in two directions, each of which is parallel to the subsequent direction of peeling or bond separation and each of which is from the approximate centre of the non-bonding area to the edge of the rectangle, as illustrated in Figure 1, Figure 2, Figure 4 or Figure 5. Rough using a suitable roughing device (3.2). Ensure that the face to be bonded is roughed over its entire area. In the case of the test assemblies for the creep test, ensure that the surface is level at the boundary where the two directions of roughing meet or overlap. (See note 1.) In the case of the test assemblies for the peel test, ensure that the boundary where the two directions meet or overlap is within that area which will be subsequently covered by the paper or tape insert. (See note 2.)

NOTE 1 The adherends are bonded to each other at the boundary where the two directions of roughing overlap but provided that there are no apparent ridges or troughs (which could be produced if there was material which had not been roughed, or had been heavily roughed twice at a place where roughing overlapped) the test results will not be affected.

NOTE 2 The adherends are not bonded to each other at the boundary where the two directions of roughing overlap, this being prevented by the paper or adhesive tape insert.

4.1.4 Solvent wiping

Soak a cotton wool pad (3.3) with the solvent (3.4). Wipe the surface of the material to be bonded avoiding flooding but ensuring the removal of any contaminants. Leave the material for a sufficient time to permit evaporation of all solvent residues before bonding.

NOTE Evaporation of solvent residues normally takes about 15 min.

4.1.5 Insertion of paper or adhesive tape

At a suitable point in the preparation procedure (that is, either immediately before or immediately after applying the adhesive) insert a strip of paper or adhesive tape (3.5). Insert it in the appropriate position on the adherend in order to permit the opening of the end of the test specimen thereby providing legs to enable the test apparatus to grip the two outer layers of the test specimen. If this insertion is carried out using paper and before adhesive is applied, staple the paper in place.

Where it is desired in peel testing to measure the force necessary to break through the surface of an adherend, e.g. some coated fabrics, as well as the subsequent average peeling force, apply paper, by stapling, or adhesive tape before application of adhesive to that adherend. For peel testing where this is not desired, apply a strip of paper or adhesive tape at the appropriate position (as shown in Figure 1, Figure 2 and Figure 3) on one of the adherends, usually the upper material, at right angles to the direction of roughing after application of the adhesive.

For injected-on PVC bonds, use adhesive tape: for direct moulded-on rubber bonds, staple the paper insert to the upper material.

NOTE The use of adhesive tape or paper with a staple is to provide an insert which does not lift during moulding. The insert is subsequently bonded in the test assembly but will facilitate opening of the bond when the test specimen is tested.