BS 5131 : Section 5.4 : 1978
[Sole peeling]
UDC 685.31 : 620.1 : 685.312.12 : 668.3.018

British Standard Methods of test for

Footwear and footwear materials

Part 5. Testing of complete footwear

Section 5.4 Sole bond peeling strength

Méthodes d'essai des chaussures et des matériaux entrant dans leur confection
Partie 5. Essai de la chaussure complète
Section 5.4 Résistance à l'écaillement du joint de la semelle

Prüfverfahren für Fussbekleidung und Fussbekleidungswerkstoffe
Teil 5. Prüfen der fertigen Fussbekleidung
Abschnitt 5.4 Abschälfestigkeit der Sohlenverbindung

NOTE. It is recommended that this Section should be read in conjunction with the information in the General introduction to BS 5131, published separately.

1. Scope

This Section describes a method for determining the strength of the bond between sole and upper at various points of the sole of finished footwear. The method is applicable to moulded-on and stuck-on soles where the sole is attached directly to the lasted margin of the upper and projects sufficiently beyond the feather line to provide a grip.

2. Principle

Test pieces, consisting of a strip of sole and an attached strip of upper with the insole still present, are cut from the footwear, and the forces required to peel the upper from the sole are measured.

3. Definition

For the purposes of this Section of BS 5131 the following definition applies.

feather line. The line of a shoe where the upper meets the bottom, the part of the bottom involved being the welt, rand, or sole, depending on the method of shoe construction.

4. Apparatus

The following apparatus is required.

4.1 *Tensile-testing machine,* continuous recording, with a jaw separation rate of 100 ± 20 mm/min and a force range of:

(a) 0 N to 600 N for moulded-on soles;
(b) 0 N to 300 N for stuck-on soles.

The tensile-testing machine jaws shall be fitted with clamps, 25 mm to 30 mm wide, capable of firmly gripping the sole section and the upper section, respectively, of the test piece. Pincer-type clamps have been found suitable for gripping the extended edge of the sole.

4.2 *Press knife,* or other suitable cutting equipment, capable of cutting a 25 mm wide test piece from the edge of the shoe.

5. Conditioning and testing atmosphere

Whenever possible, condition the test pieces for 48 h at 20 ± 2 °C and 65 ± 2 % relative humidity and carry out the test in this atmosphere. If this is not possible, the test pieces should be tested not sooner than 24 h after manufacture or after any artificial ageing treatment.

6. Preparation of test piece

6.1 **Position.** Whenever possible, cut test pieces from three positions, A, B and C, where

(a) pieces A and B are from the area of widest swell of the forepart and as near to the inner and outer foot joint positions, respectively, as is possible, consistent with obtaining an edge capable of being held firmly by the pincer clamp; and

(b) piece C is from the forward tip of the toe.

In addition, cut test pieces from other positions if required.

For all test pieces avoid seams and overlaps on the upper.

6.2 Dimensions. Using the press knife cut through the upper, insole and outsole to produce test pieces 25 mm wide, with the sides at right angles to the edge of the sole, and of length about 30 mm measured from the feather line. Then cut through the insole and outsole across each test piece to shorten this part to about 15 mm measured from the feather line. The side view of the cut out test piece is shown in figure 5.4/1.

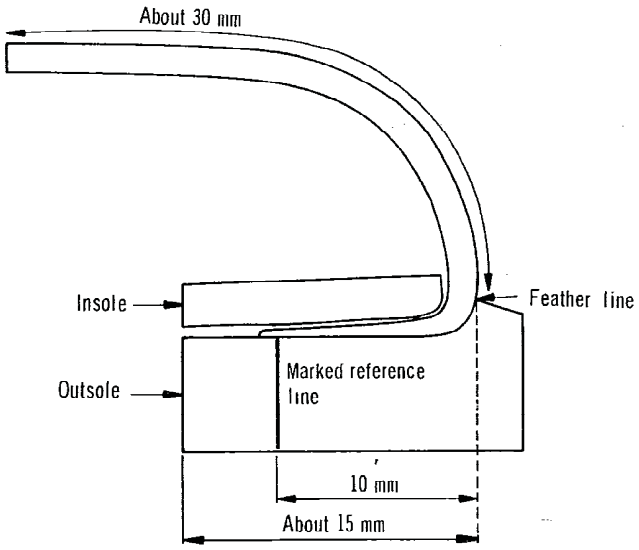

Figure 5.4/1. Side view of cut out test piece

6.3 Reference line. On each test piece edge mark a vertical line 10 mm from the feather line on the sole. (See figure 5.4/1.)

6.4 Insole. The test piece may be tested with or without the insole present. In many worn shoes the insole will be loose, making no contribution to the strength of the bond between upper and sole and becoming detached from the upper and sole as the test piece is cut. If desired, an insole which is not loose may be removed from the test piece before the peeling test is carried out. The presence or absence of the insole shall always be recorded for inclusion in the report.

7. Procedure

Carry out the following procedure on each test piece.

7.1 Firmly clamp the free end of the upper in one clamp of the tensile-testing machine and the edge of the sole in the other (see figure 5.4/2). Make sure that the end of the sole/insole does not touch the upper clamp.

7.2 Separate the jaws of the tensile-testing machine at a rate of 100 ± 20 mm/min while recording continuously the force exerted. Mark on the force-extension record the point where initial bond failure occurs. Continue peeling the bond until the reference line is reached.

7.3 Observe the type of bond failure as the peeling proceeds. 'Legging' of the adhesive as the sole and upper are separated indicates cohesive failure.

8. Calculation and expression of results

8.1 From the force-extension record for each test piece obtain the maximum force (*E* in figure 5.4/3) and the initial force *F* corresponding to the marked point of initial failure. Use the following procedure to obtain the mean force (see figure 5.4/3 which shows typical forms of the record obtained).

Draw line AB through the point of initial failure and perpendicular to the extension axis. Draw line CD through the point corresponding to the 10 mm reference line and perpendicular to the extension axis. Draw line GH parallel to the extension axis so that the area between GH and the line of the graph (shaded in figure 5.4/3) is the same above and below GH. Record as the mean force that corresponding to GH.

For each test piece express the initial maximum and the mean force in newtons per centimetre width (i.e. divide the measured forces by 2.5).

8.2 Examine the test piece after peeling. Note the type(s) of failure and whether these changed as the peeling proceeded.

NOTE. The types of bond failure may be classified as follows:

(a) failure of adhesion to either adhered material;

(b) failure of adhered material, surface layer;

(c) failure of adhered material, below surface;

(d) cohesive failure of adhesive (this is best picked out by its appearance as peeling is taking place);

(e) non-coalescence of adhesive films.

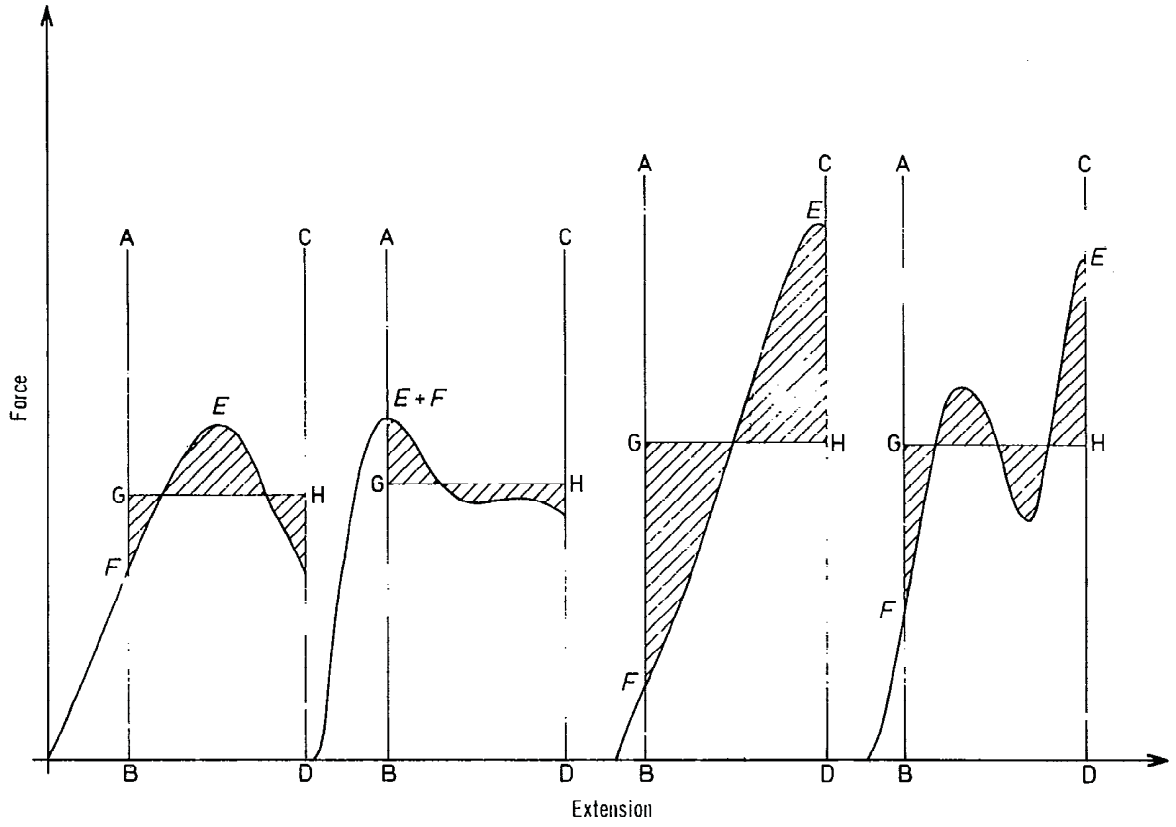

Figure 5.4/3. Typical forms of the force-extension record
(The insole may not always be present)

9. Test report

Include the following items in the test report for each test piece:

(a) the result, expressed in accordance with **8.1**;

(b) the position in the shoe from which the test piece was taken, by reference to locations A, B and C;

(c) whether or not the insole was included as part of the test piece;

(d) type(s) of failure occurring, expressed in accordance with **8.2**;

(e) the nature and full identification of the sample, including the age of the sample after manufacture and/or any period of artificial ageing, and the details of the conditioning;

(f) reference to the method of test (i.e. BS 5131 : Section 5.4);

(g) the date of testing.

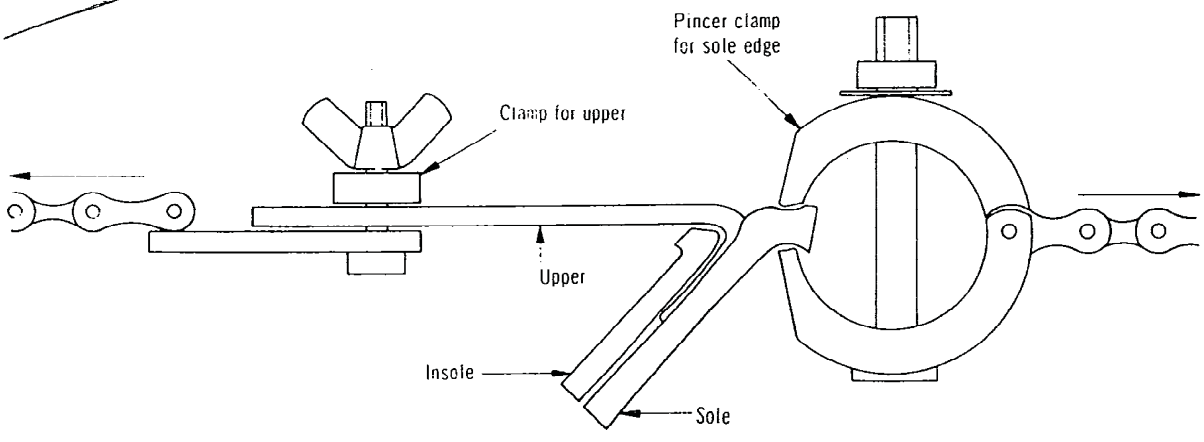

Figure 5.4/2. Test piece being peeled apart

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Methods of test for footwear and footwear materials
Section 5.4 Sole bond peeling strength

Revised text

AMD 2958
July 1979

New clause 6.4
Insert the following new clause 6.4:

'**6.4 Insole.** The test piece may be tested with or without the insole present. In many worn shoes the insole will be loose, making no contribution to the strength of the bond between upper and sole and becoming detached from the upper and sole as the test piece is cut. If desired, an insole which is not loose may be removed from the test piece before the peeling test is carried out. The presence or absence of the insole shall always be recorded for inclusion in the report.'

AMD 2958
July 1979

Figure 5.4/1 Side view of cut out test piece
Insert the following after the title;

'(The insole may not always be present)'.

AMD 2958
July 1979

Clause 9. Test report
After paragraph (b) insert the following new paragraph (c):

'(c) whether or not the insole was included as part of the test piece;'

Reletter existing paragraphs (c) to (f) as (d) to (g) respectively.
