BRITISH STANDARD

BS 5131 :
Section 4.9 :
1991

Methods of test for

Footwear and footwear materials

Part 4. Other components

Section 4.9 Fatigue resistance of heels of ladies' shoes

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 matériaux pour chaussures
Partie 4. Autres composants
Section 4.9 Résistance à la fatigue des talons des chaussures de dames

Prüfung von Schuhwerk und Schuhwerkstoffen
Teil 4. Weitere Einzelteile
Abschnitt 4.9 Dauerbeanbspruchbarkeit von Damenschuhabsätzen

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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 It supersedes BS 5131: Section 4.9: 1975, which is withdrawn.

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Method

1 Scope

This Section of BS 5131 describes a method for determining the ability of heels of ladies' shoes to withstand the repeated small impacts imposed by normal walking. Although intended primarily for plastics heels, the procedure is also usable for testing steel heel dowels on their own.

While the method is applicable to all types of high heels of any construction, it is particularly useful for injection-moulded plastics heels which incorporate a steel dowel reinforcement. The shape of some heels is such that they have a high fatigue resistance. It is usually considered unnecessary to test such heels for fatigue resistance.

2 Principle

A heel is subjected to blows, each of specified energy, delivered by a pendulum once a second. Testing continues until failure of the heel takes place, or until satisfactory fatigue resistance is obvious.

3 Apparatus and material[1)]

3.1 *Heel fatigue-testing apparatus,* incorporating a motor-driven pendulum which can deliver blows to a test specimen assembly, each blow having an energy of 0.68 J, at the rate of one blow per second. The apparatus is clamped either on to a solid built-in bench, or on to a rigid free-standing frame anchored to the floor (see note). An example of a suitable apparatus is shown in figure 4.9/1.

NOTE. If the apparatus is not firmly mounted, there is partial loss of energy on impact, thereby producing false results.

The apparatus has the following features.

(a) *Pendulum,* consisting of a circular steel bob of diameter 57 ± 1 mm and thickness 20 ± 1 mm, which is fixed by a circular shaft of diameter 12.5 ± 1.0 mm to a hub on the bearing axle. The distance from the centre of the bob to the centre of the hub is 152 ± 2 mm. The moment of the pendulum when it is held horizontally is 0.68 ± 0.02 N·m (0.070 ± 0.002 kgf·m).

(b) *Striker head,* consisting of a strip of metal 6.0 ± 0.5 mm thick, 20 ± 1 mm wide and 35 ± 2 mm long with the striking edge rounded to a radius of 3.0 ± 0.5 mm. The head is fixed rigidly to the pendulum bob so that the striker tip and centre of the bob lie on the same circle of swing of the pendulum and are 63.5 ± 2 mm apart.

(c) *Rebound damper,* for the pendulum.

(d) *Base clamp,* for holding the metal mounting tray (**3.2**) and for adjusting it vertically and horizontally to achieve correct alignment of the heel tip.

(e) *Counter,* for recording the number of blows.

(f) *Overshoot cut-out device,* which operates when the pendulum overshoots a broken heel stem at complete failure.

3.2 *Metal mounting trays,* an example of a suitable apparatus being shown in figure 4.9/2, each to contain a heel set in low melting point metal alloy (**3.3**).

3.3 *Metal alloy,* melting point between 100 °C and 150 °C.

4 Preparation of test specimen assemblies

4.1 Take three heels and prepare three test assemblies from them. To do this set each heel in a dry metal mounting tray (**3.2**) using the procedure described in **4.2**.

4.2 Place the heel centrally in the tray so that the seat breast edge is against a flat end of the tray and the heel tip points upwards as illustrated in figure 4.9/2. Heat the metal alloy (**3.3**) until it is at the lowest temperature at which it will flow into all parts of the tray. Pour it into the tray, filling the space around the heel to within 3 mm from the top of the tray. Allow the metal alloy to cool and set, thereby providing a rigid mounting for the heel.

5 Procedure

5.1 With the pendulum in the rest position, insert a test specimen assembly in the inclined part of the base clamp of the heel fatigue-testing apparatus (**3.1**) with the back of the heel facing the pendulum. Set the test specimen assembly at a suitable angle to the horizontal so that the blow will be applied approximately at right angles to the heel stem.

Adjust the position of the test specimen assembly in the base clamp until the striker barely contacts the heel 6 mm below the heel tip. Set the counter to 'zero' (or note the reading), and start the machine, ensuring that the overshoot cut-out device is activated.

[1)] For information on the availability of suitable apparatus and material 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.

5.2 At intervals of 60 min check whether any damage has developed that still allows the pendulum to continue in motion. If it has, record the number of blows shown by the machine counter and describe the type of damage.

5.3 If damage develops and becomes so severe that the overshoot cut-out device stops the machine (termed 'complete failure'), record the number of blows and describe the type of damage.

5.4 If a complete failure has not occurred after 20,000 blows (approximately 5 h 30 min) discontinue the test and describe any damage that has developed.

5.5 Damage involving fracture or cracking of the heel at the point of impact of the striker is regarded as invalidating this test since it is due to the effect of the striker acting as a chisel rather than fracture of the heel due to impact at the heel as in wear. If such damage occurs, report it together with this explanation.

5.6 Test the other two test specimen assemblies by the same procedure.

6 Expression of results

Express the result for each test specimen assembly in one or more of the following ways, as appropriate:

(a) the number of blows at which damage was first detected, as described in **5.2**;

(b) the number of blows at which complete failure occurred, as described in **5.3**;

(c) the fact that no complete failure occurred within 20,000 blows, as described in **5.4**;

(d) the fact that damage involving fracture or cracking of the heel at the point of impact occurred, as described in **5.5**.

7 Test report

The test report shall include the following items.

(a) results for each heel, expressed in accordance with clause **6**;

(b) descriptions of the damage or complete failure corresponding to test results **6**(a), **6**(b), **6**(c) and **6**(d) as applicable;

(c) nature and full identification of the test specimen;

(d) reference to this method of test i.e. BS 5131 : Section 4.9;

(e) date of testing.

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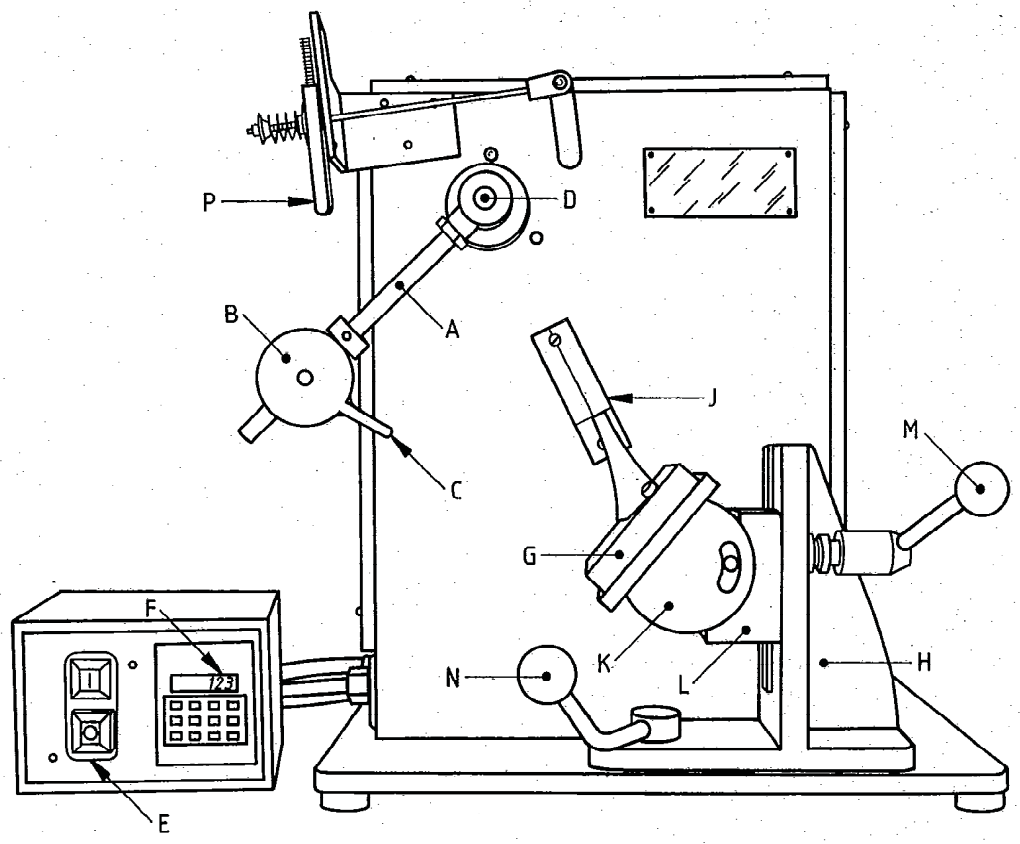

A Pendulum
B Pendulum bob
C Striker head
D Hub
E Power supply switch
F Counter
G Test specimen assembly
H Vertical locking plate
J Sighting plate for aligning the heel
K Base clamp for rotational orientation
L Clamp for vertical orientation
M Device for locking K and L against H
N Horizontal locking device
P Rebound damper, for the pendulum

Figure 4.9/1 Heel fatigue-testing apparatus

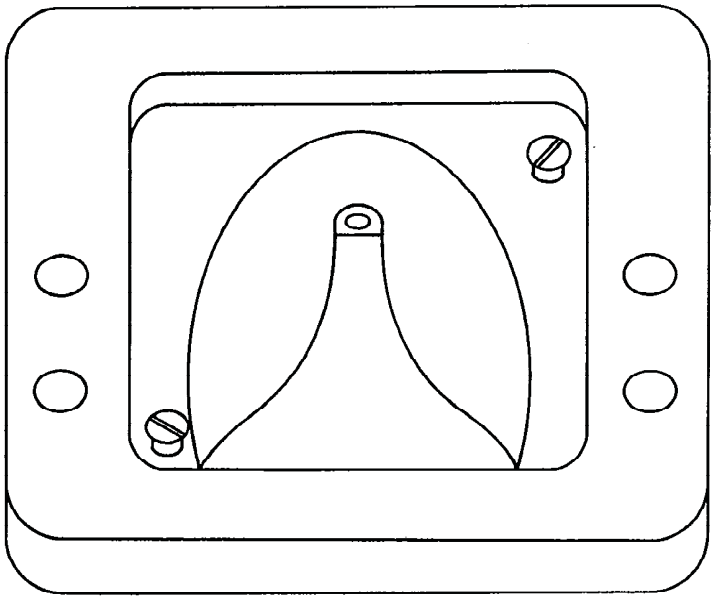

Figure 4.9/2 Metal mounting tray with heel in position before addition of molten metal alloy

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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 31 January 1991

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