

*Indian Standard*

METHODS OF TEST FOR FOOTWEAR

**PART 1 DIMENSIONS, FITTING, ADHESION TEST, PEEL  
TEST, HEAT RESISTANCE TEST AND AGEING TEST**

*( First Revision )*

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First Reprint JANUARY 1997

UDC 685.312 : 620.1

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**BUREAU OF INDIAN STANDARDS**

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NEW DELHI 110002

*Indian Standard*

## METHODS OF TEST FOR FOOTWEAR

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## IS : 8085 ( Part 1 ) - 1986

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# *Indian Standard*

## METHODS OF TEST FOR FOOTWEAR

### PART 1 DIMENSIONS, FITTING, ADHESION TEST, PEEL TEST, HEAT RESISTANCE TEST AND AGEING TEST

*( First Revision )*

#### 0. FOREWORD

**0.1** This Indian Standard ( First Revision ) was adopted by the Indian Standards Institution on 24 October 1986, after the draft finalized by the Footwear Sectional Committee had been approved by the Chemical Division Council.

**0.2** This standard was originally published in 1976 and is revised to include adhesion test at sides, peel test, heat resistance test and ageing test. From the users point of view, comfort in wear and performance in actual use are the two basic requirements of footwearers. For this purpose, it is necessary that the footwear is suitably tested before it goes to the customer.

**0.2.1** Other methods of test would be covered in Part 2 of this standard.

**0.3** Some of the tests for footwear can be done only at the manufacturer's end, while others can be done both at the manufacturer's and the consumer's ends. Where the former situation applies, this fact has been specifically mentioned.

**0.4** In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960\*.

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#### 1. SCOPE

**1.1** This standard prescribes the methods of test for dimensions, fitting, adhesion test at toe and side, peel test, heat resistance test and ageing test.

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\*Rules for rounding off numerical values (*revised*).

**1.1.1** The method for testing the dimensions and fitting covers all types of footwear made on lasts and adhesion test, heat resistance test and ageing test cover only cemented/moulded on/injection moulded and peel test covers only closed footwears.

## **2. TERMINOLOGY**

**2.1** For the purpose of this standard, the definitions given in IS : 2050-1967\* shall apply.

## **3. TEST FOR DIMENSIONS AND FITTING**

### **3.0 General**

**3.0.1** *Applicability of the Method* — This test is applicable to all types of footwear made on lasts.

**3.0.2** The object of this test is to ensure that the footwear is made on a correct last in respect of dimensions ( shape and size ) and fitting.

### **3.1 Procedure**

**3.1.1** Measure and record the dimensions of the footwear in respect of size and fitting at the positions specified in the relevant material specification.

**3.1.2** A quick check for correctness of dimensions can be done at the manufacturer's end by making use of the standard model of last corresponding to the size and fitting of the footwear. For this purpose, dust the standard last with French chalk and insert it into the footwear. Feel the footwear on the last to ascertain whether the last fits flush with the footwear.

## **4. ADHESION TEST ON CEMENTED/MOULDED ON/INJECTION MOULDED SOLE**

### **4.0 General**

**4.0.1** *Applicability of the Method* — This test is applicable to all types of footwear with cemented/moulded on/injection moulded ( DMS/DIP/DVP ) sole.

**4.0.2** The object of this test is to measure the adhesion strength between the stuck on and moulded on soles and the uppers to ensure satisfactory adhesive bond.

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\*Glossary of footwear terms.

## 4.1 Conditioning

**4.1.1** Carry out the test after the completion of the curing time as specified by the footwear manufacturer ( *see* Notes 1 and 2 ). Samples for test should be protected from exposure to light and atmosphere, as far as possible.

NOTE 1 — The properties of upper and bottom material ( bond/moulded rubber ) change continuously with time, particularly during first 20 to 24 hours. The footwear manufacturer should indicate the curing time of the adhesive for the purpose of the test.

NOTE 2 — All footwears manufactured by cold curing method shall be given a rest period of minimum 24 hours before testing.

**4.1.2** Condition the samples at  $27 \pm 2^\circ\text{C}$  and  $65 \pm 5$  percent relative humidity for at least 24 hours before testing.

## 4.2 Apparatus

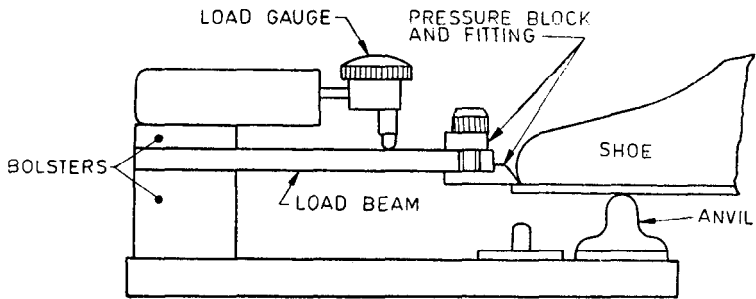
**4.2.1 Adhesion Tester** — SATRA Sole adhesion tester or its equivalent ( *see* Fig. 1A and 1B ) for measuring the toe, heel and sides adhesion strength. The instrument consists of anvil, toe pieces with packing pieces provided to adjust the height of the anvil to suit the sole thickness and a load-measuring beam to record the load applied.

## 4.3 Procedure

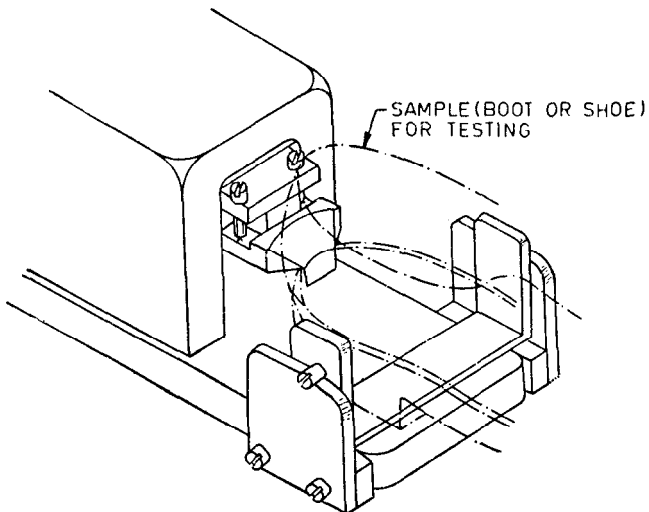
**4.3.1 Adhesion at Toe** — Select the pressure block and toe piece which conforms to the shape of the toe of the footwear sampled for testing and attach it at the end of the load-measuring beam. Adjust the height of the anvil to suit the sole thickness, using the packing pieces provided, so that the forepart of the sole be horizontal or tends slightly downwards towards the toe. Check the zero of the load gauge for correctness, avoiding any error.

**4.3.1.1** Place the footwear with last on the anvil and insert the toe piece of the instrument in the feather line groove between sole and upper. Grasp the footwear firmly and press down on the back of the last to increase the load steadily. Apply the load in such a manner that the test is completed in 5 seconds. In case of rubber or PVC sole, push the footwear hard against the pressure block ( at the time of applying load ) to prevent the toe of the footwear from slipping out of the toe piece of the instrument.

**4.3.1.2** Read the load on the measuring beam of the instrument when the sole begins to separate from the upper. Record the reading as maximum value, as the load starts dropping after this value when further separation takes place. Examine and record the type of separation, whether tearing or failure in material ( upper/sole ), lack of adhesion to material, cohesive failure of the adhesives or incomplete coalescence of the adhesive.



1A Sole Attachment Test Apparatus



1B Sole Attachment Test Apparatus with Stirrup in Position

FIG. 1 SOLE ADHESION TESTER

**4.3.2 Adhesion at Heel** — Remove the anvil from the base of the instrument and fix up the stirrup attachment properly. Select the tow piece of the instrument which conforms to the curvature of the heel and attach it to the load beam.

**4.3.2.1** Place the heel of the footwear in the stirrup so that its rear touches the toe piece. Adjust the toe piece in level with the groove so that it is between the heel and upper. Raise the footwear and add one or more stirrup packing pieces between the heel and stirrup, till correct height is obtained. Insert the toe piece in the groove between the heel and upper. Apply load in such a manner that the test is completed in 5 seconds.

**4.3.2.2** Read the load on the measuring beam of the instrument when the heel starts separating from the upper. Record the load and examine as described in **4.3.1.2** for reporting.

**4.3.3 Adhesion at Sides** — Select the pressure block and side piece which conforms to the shape of the sides of the footwear sample for testing and attach it at the end of load-measuring beam. Adjust the height of the anvil to suit the sole thickness, using the packing pieces provided so that the side tends slightly downwards. Check the zero of the load gauge for correctness, avoiding any error.

**4.3.3.1** Place the footwear with last on the anvil and insert the side in the feather line groove between sole and upper. Grasp the footwear firmly and apply load in such a manner that the test is completed in 5 seconds.

**4.3.3.2** Read the load on the dial of instrument when the side starts separating from the upper. Examine and the report as described in **4.3.1.2**.

**4.3.3.3** To check the pull indication in the adhesion tester, a suitable flat bar be held at the end of the load measuring beam, on the free side standard weight may be placed or hanged to read the load on dial of the instrument.

## **5. PEEL TEST**

**5.1** This test is applicable to all types of closed footwear with cemented, moulded and injected soles ( *see* Fig. 2 ).

**5.2** The object of this test is to measure the bond strength between the upper to sole or upper to insole.

**5.3** In general, this test is regarded as **destructive** test.

### **5.4 Apparatus**

**5.4.1** A tensile testing machine, preferably of constant rate traverse type. The grips or clamps shall be capable of holding the test pieces and ply to be separated without slipping. The machine be equipped with autograph recording of the load required to cause separation of the piles.



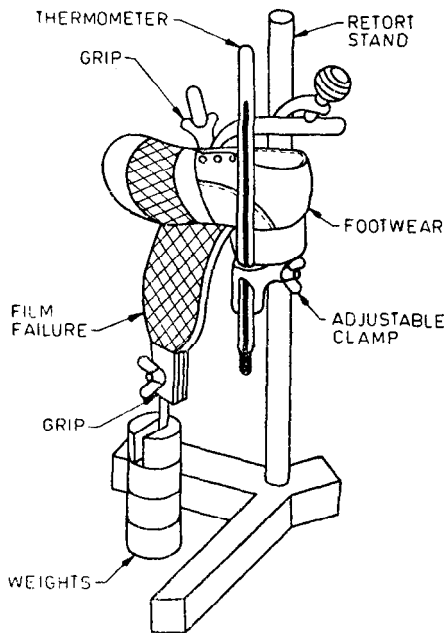


FIG. 2 PEEL TEST APPARATUS

**5.4.2 Calibration of the Equipment** — Calibrate the load scale of the test equipment by a convenient method at least every six months to ensure that the error does not exceed 2.0 percent of the applied load.

**5.5 Procedure** — Cut strips from the footwear of size  $2.5 \times 1.5$  cm. Separate the two surfaces with a sharp knife from the two components up to 5 cm from the edge piece on the machine, with the body of the test piece in the non-driven grip and the ply to be separated on the other grip so that the angle of separation is approximately  $180^\circ$ . Start the machine at a uniform rate of travel of the grip at 5.0 to 25.0 cm/minute. Record the load to cause separation.

**5.6 Expression of Results** — Express the bond strength in kg/2.5 cm width required to cause separation.

## 6. HEAT RESISTANCE TEST

**6.1** This test is based on the effects of temperature on the viscosity of the adhesive, which ultimately effects bond strength. Hence, adhesives, having more heat resistance will pass the test.

**6.1.1 Apparatus**

- a) Thermostatically controlled oven, and
- b) Supporting stand with two clamps and variable load up to 5 kg.

**6.2 Procedure** — Separate sole from upper at the toe portion by means of pliers until a grip can be secured. Clamp the two ends, toe portion and sole. Expose the footwear at 70°C for 60 minutes, while still at 70°C, suspend a 5 kg mass from the sole. Observe the displacement of the bond of various intersole.

**6.3 Results**

- |   |   |
|---|---|
| a) If separation occurs drastically and the sole easily comes off | UASATISFACTORY for wear in a tropical climate |
| b) If after 60 minutes very slight separation occurs              | SATISFACTORY for wear in a tropical climate   |

**7. AGEING TEST**

**7.1** This test is intended to find out the deterioration of bond strength with heat.

**7.2 Apparatus**

- a) Thermostatically controlled oven, and
- b) Supplying stand with two clamps and variable load up to 5 kg or tensionometer.

**7.3 Procedure** — Keep the footwear inside oven at 70°C for 4 hours. Cool the footwear unless the temperature comes down to room temperature. Measure the bond strength as explained in 5.5.

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