

भारतीय मानक

फुटवियर की परीक्षण पद्धतियाँ

भाग 2 फुटवियर का कार्यकारिता परीक्षण, शैंक के कड़ेपन का परीक्षण, उपल्लों की क्रैकिंग के लिए लास्टोमीटर परीक्षण; और उपल्लों के कपड़ों, लेषित कपड़ों, पैतावे के अस्तर और अन्य अस्तर सामग्री के लिए कार्यकारिता परीक्षण

Indian Standard

METHODS OF TEST FOR FOOTWEAR

PART 2 FOOTWEAR PERFORMANCE TEST, STIFFNESS TEST FOR SHANKS,
LASTOMETER TEST FOR CRACKING OF UPPERS; AND PERFORMANCE
TEST FOR UPPER FABRICS, COATED FABRICS, SOCK LINING AND
OTHER LINING MATERIALS



ICS 61.060;19.020

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FOREWORD

This standard (Part 2) was adopted by the Bureau of Indian Standards after the draft finalized by the Footwear Sectional Committee had been approved by the Chemical Division Council.

This standard prescribes the methods of test for ascertaining the performance of footwear, stiffness of shanks, the extent of influence of foot-pressure and flexing under conditions of normal-wear on the performance of uppers, particularly, the cracking of upper at or near the vamp (the lastometer test) and performance test for coated fabrics, sock lining and other lining materials.

From the users' point of view, comfort in wear and performance in actual use are the two basic requirements of footwear. For this purpose, it is necessary that the finished footwear is suitably tested before it goes to the customer.

Some of the tests for footwear prescribed in this standard can be done only at the manufacturer's end, while others can be done both at the manufacturer's end and at the user's end. This aspect has been specifically mentioned for all the test methods prescribed in this standard.

Composition of the Committee responsible for formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

METHODS OF TEST FOR FOOTWEAR

PART 2 FOOTWEAR PERFORMANCE TEST, STIFFNESS TEST FOR SHANKS, LASTOMETER TEST FOR CRACKING OF UPPERS; AND PERFORMANCE TEST FOR UPPER FABRICS, COATED FABRICS, SOCK LINING AND OTHER LINING MATERIALS

1 SCOPE

This standard (Part 2) prescribes the methods of test for footwear performance test, stiffness of shanks, lastometer test for cracking of uppers at or near the vamp and performance test for upper fabrics, coated fabrics, sock lining and other lining materials.

2 REFERENCE

The Indian Standard listed below contains provisions which through reference in this text, constitutes provisions of this Indian Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this Indian Standard are encouraged to investigate the possibility of applying the most recent edition of the Indian Standard indicated below:

<i>IS No.</i>	<i>Title</i>
IS 2050 : 1991	Glossary of terms relating to footwear (<i>first revision</i>)

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 2050 shall apply.

4 PERFORMANCE TEST FOR FOOTWEAR UPPER AND BOTTOM

4.1 General

4.1.1 *Applicability of the Method*

This test is applicable to all types of footwear with cemented, welted, moulded or injection moulded (DMS/ DVP/DIP) soles. This is a destructive test and can be performed both at the manufacturer's end and at the user's end.

4.1.2 The objective of this test is to measure:

- a) the cracking of the outsole at the forepart, between the forepart and the waist and in front of the heel breast;
- b) the separation of the outsole from the upper or from the platform or separation of the platform from the upper at the waist or at the forepart;
- c) the cracking of the platform at the waist or at the forepart;
- d) the cracking or delamination of the back part of insole;
- e) the breakage of the shank;
- f) the separation of the insole from the upper; and
- g) the cracking of upper across the joint.

4.2 Conditioning

Condition the samples at $27 \pm 2^\circ\text{C}$ temperature and 65 ± 5 percent relative humidity for at least 24 hours before carrying out the test.

4.3 Apparatus

4.3.1 *Shoe Flexing Machine*

The machine shown in Fig. 1 or its equivalent machine shall be used for testing.

4.3.1.1 The forepart of the footwear is held down to a fixed platform and the heel of the footwear is held down to a flexing frame. The frame moves up and down by means of a motor, crank fly wheel and a shaft system at a constant (adjusted) angle.

4.4 Procedure

4.4.1 Adjust the angle of flexing at the required angle (*see* Table 1) by varying the position of the connecting rod in the crank fly wheel, as shown in Fig. 2. The footwear does not normally flex more than 45° under conditions of normal-wear. Mark on the insole of the shoe the average position of the ball joint of the foot. The machine foot end and the leg end can slide forward or backward relative to the clamp. Adjust the position of the machine foot and leg in the footwear such that the rear edge of the foot aligns with the ball joint mark and the flexing line of the footwear aligns with the fulcrum of the flexing frame as judged by the eye. Clamp the other odd of the pair also in the machine in the

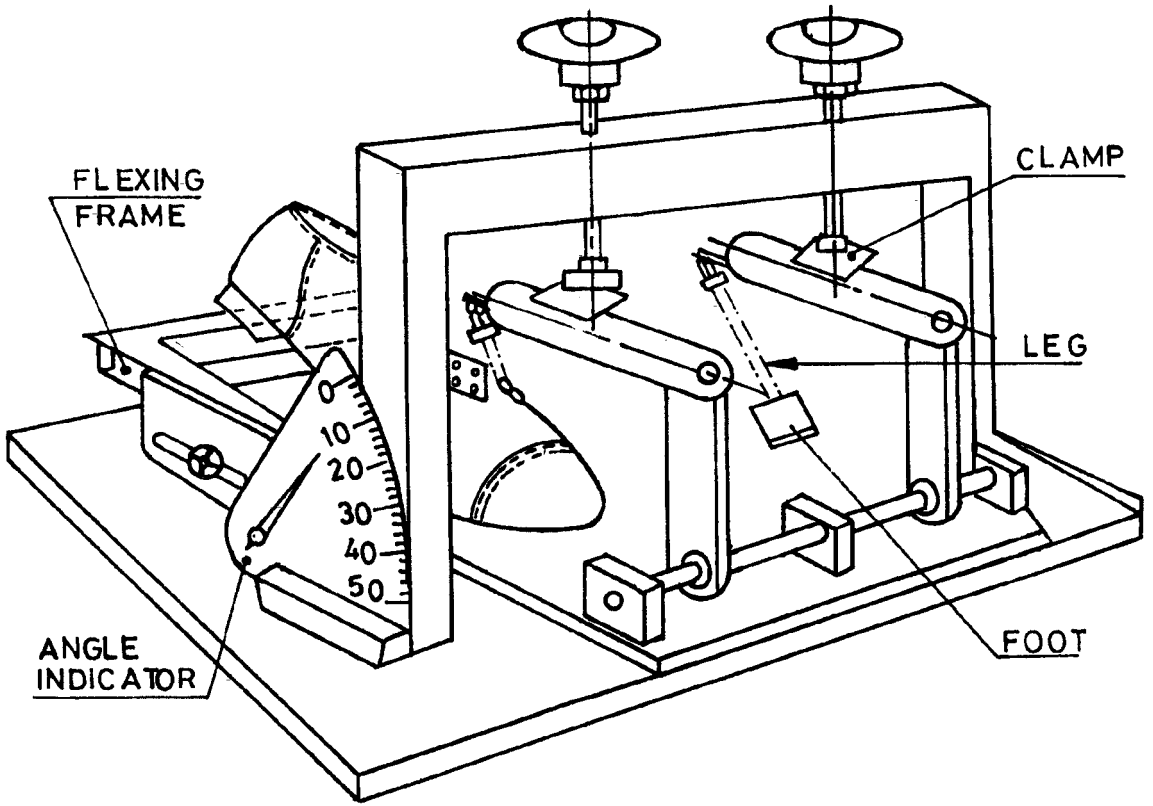


FIG. 1 SHOE FLEXING MACHINE

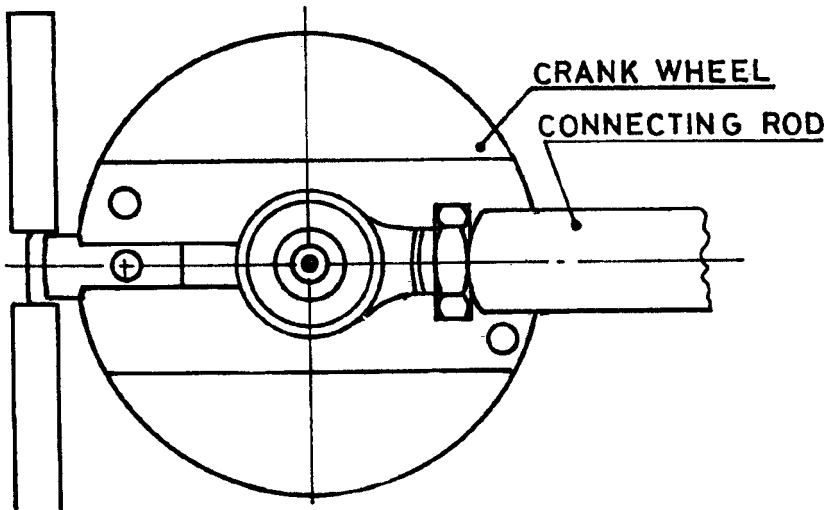


FIG. 2 ADJUSTMENT OF ANGLE OF FLEXING

Table 1 Suggested Flexing Angles for Different Styles of Footwear

(Clause 4.4.1)

Sl No.	Footwear Style	Suggested Flexing Angle
(1)	(2)	(3)
i)	<i>Ladies (Platform Styles)</i>	
	a) Clogs	10°
	b) Sandals, boots	15°
	c) Courts	20°
	d) Lace-up casuals	25°-30°
ii)	<i>Ladies (Non-platform Styles)</i>	
	a) Sandals	35°
	b) Courts	35°
	c) Casuals	35°
iii)	<i>Men and Boys (Platform Styles)</i>	
	a) Slip-on casuals	25°
	b) Lace-up shoes and boots	30°
iv)	<i>Men and Boys (Non-platform Styles)</i>	
	a) Slip-on shoes and boots	45°
	b) Lace-up shoes and boots	45°

same way. Angular scale of the pointer is set to zero by rotating the pointer knob. Check that the footwear flexes in the correct manner and to the desired angle by turning the flexing machine through a complete flexing cycle manually.

4.4.2 Set the time switch off the machine at 60 hours and start the machine. Allow the footwear to flex for at least 50 000 times. After the completion of the required number of flexing cycles, remove the footwear from the machine and examine for the following:

- The cracking of the outsole at the forepart, between the forepart, and the waist and in front of the heel breast;
- Separation of the outsole from the upper or from the platform or separation of the platform from the upper at the waist or at the forepart;
- Cracking of the platform at the waist or at the forepart;
- Cracking or delamination of the back part of insole;
- Breakage of the shank;
- Separation of the insole from the upper; and
- Cracking of upper across the joint.

5 STIFFNESS TEST OF SHANKS

5.1 General

5.1.1 Applicability of the Method

This test is applicable to all types of footwears and of all constructions having shank. This test can be performed both at the manufacturer's end and at the user's end.

5.1.2 The objective of performing this test is to measure the flexural rigidity of shank, a characteristic which is a measure of stiffness.

5.2 Apparatus

5.2.1 Shank Stiffness Tester

Steel shank stiffness tester (see Fig. 3 or its equivalent apparatus) shall be used for testing. This apparatus consists of an adjustable clamp (A), a loading clamp (B) and the deflection is measured.

5.3 Procedure

5.3.1 Remove the shank from the insole and measure its dimensions. Fix the heel end of the shank to the adjustable clamp (A) in level with the back of the clamp, and fix it firmly. This ensures that minimum 32 mm of the shank is clamped. Fix the loading clamp (B) firmly to the other end of the shank so that the end of the shank is in level with the forward edge of the clamp. Adjust the angle of the adjustable clamp (A) so that the shank is horizontal between the two clamps. Adjust the dial gauge such that its end just touches the end of the loading clamp (B).

5.3.2 Apply 0.2 kg weight to the hook of the loading clamp (B). Wait for one minute and take the dial reading (a_1). Remove 0.2 kg weight and wait for one minute. Add 0.4 kg weight and again wait for one minute. Take the dial reading (a_2). Similarly, note the dial readings after applications of 0.6 kg weight (a_3) and 0.8 kg weight (a_4) for one minute each.

5.4 Calculation

The flexural rigidity (S) of the shank in kg/cm^2 is calculated as:

$$\text{Flexural rigidity (S), in kg/cm}^2 = \frac{WL_1^3}{3a}$$

where

W = increment weight (200 g);

L_1 = length of the shank (L) from the edge of rear clamp to the rear edge of the loading clamp + 1/2 the depth of the loading clamp (that is, 6 mm), in cm;

= $L + 0.6$ cm; and

a = $1/10 (3a_4 + a_3 - a_2 - 3a_1)$, in cm.

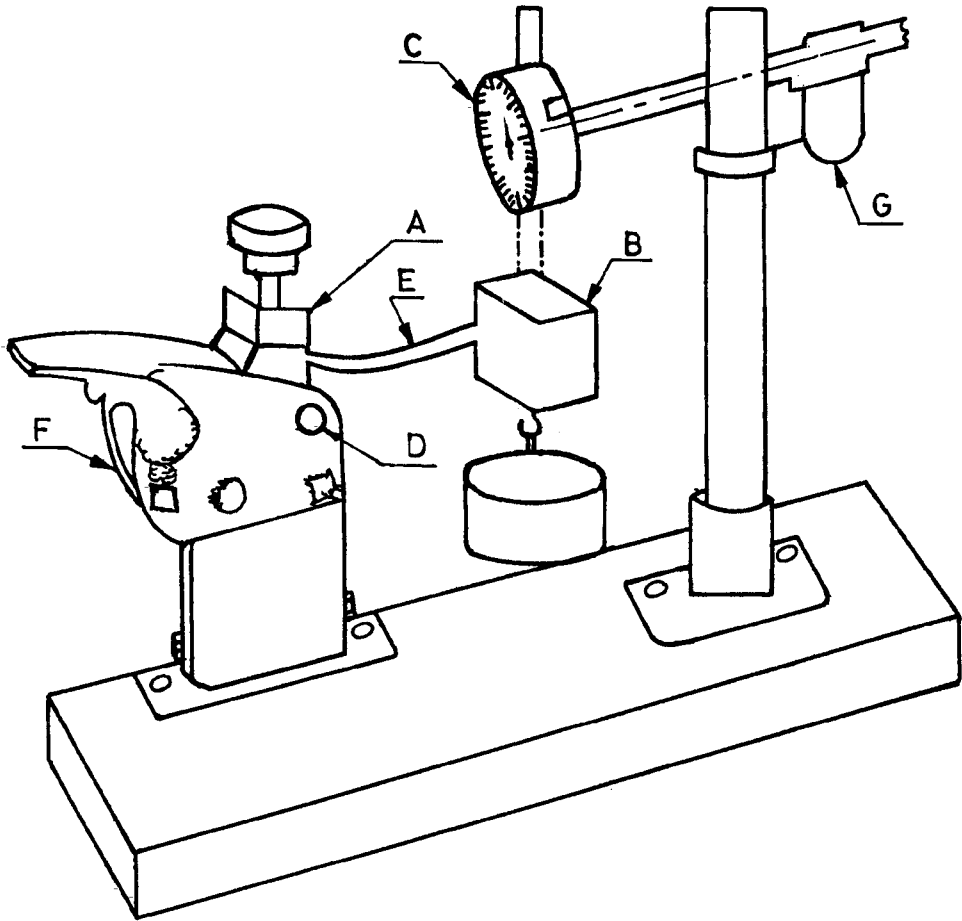


FIG. 3 STED SHANK STIFFNESS TESTER

6 LASTOMETER TEST FOR UPPERS

6.1 General

6.1.1 Applicability of the Method

This test is applicable to the footwear uppers of both leather and synthetic materials. This is a destructive test and can be carried out both at the manufacturer's end and at the user's end.

6.1.2 The objective of this test is to ascertain whether the upper used in the footwear is weak or has variable stretch properties. In both these cases, the upper may crack under the effect of foot pressure and flexing under conditions of normal wear.

6.2 Outline of the Method

Test sample disc of upper material is clamped round its edge and mounted on the sample holding disk of the lastometer, (see Fig. 4). The wheel is then rotated to thrust a metal bulb of 6.25 mm diameter on to the centre of sample disc at right angles to its plane. The moment the test sample starts cracking, the load and distension are recorded.

6.3 Test Sample

Cut out the samples from the vamp portion of the shoe. Remove the lining attached to it and clean the surface. The test sample is a disc of upper material of 44.5 mm diameter and has two semi-circular cut-outs of 3 mm diameter (see Fig. 4).

6.4 Conditioning

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

6.5 Apparatus

6.5.1 Lastometer

Lastometer (see Fig. 4) or its equivalent apparatus to measure load and distension at the grain crack for upper leather and load and distension at rupture of synthetic upper materials.

6.6 Procedure

6.6.1 Remove the cup nut and the clamping ring, and turn the wheel until the distension gauge reads zero.

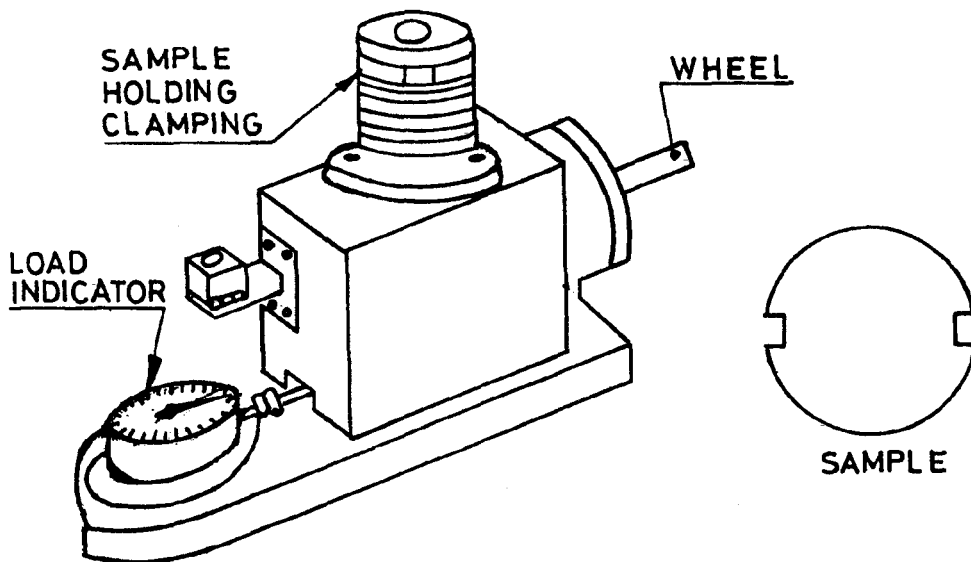


FIG. 4 LASTOMETER

Place the test piece grain side up (for leather) on the clamping head with the two pegs located in the semi-circular cut-outs. Place the clamping ring on the top of the test piece and screw down tight, first by hand and then by clamp. The reading on pointer of the load gauge is set to zero. The hand wheel is turned at the rate of one revolution per second.

6.6.2 When the grain begins to crack, stop rotating hand wheel and record the load and distension. In the case of synthetic upper material note the load and distension when it ruptures.

7 PERFORMANCE TEST FOR COATED FABRICS, SOCK LINING AND OTHER LINING MATERIAL

7.1 General

7.1.1 Applicability of the Method

This method is applicable to all upper fabrics, plastic coated fabrics, sock lining and other lining materials and can be carried out both at the manufacturer's end and at the user's end.

7.2 Test Samples

Cut four circular test pieces of 45 mm diameter each; two each for dry and wet abrasion tests.

7.2.1 Also cut four square pieces 127 mm × 127 mm of standard wool fabric to act as mild abrasives for rubbing the test pieces in Lissajous pattern.

7.3 Conditioning

Condition the test pieces at $27 \pm 2^\circ\text{C}$ temperature and 65 ± 2 percent relative humidity for 24 hours.

7.4 Apparatus

Martindale abrasion tester or its equivalent apparatus shall be used to measure the degree of abrasion (see Fig. 5). The machine shall have a horizontal base plate of 127 mm diameter, a circular clamp to hold the worsted fabric abrasive, specimen holders — four in number and a load to keep the specimen over the abrasive material.

7.5 Procedure

7.5.1 Dry Test

7.5.1.1 Remove the four specimen holders. Take each of the four specimen holder in turn, unscrew the knurled ring, insert the test specimen and reassemble the holders by exerting the pressure downwards to keep the test specimen flat.

7.5.1.2 Lift off the top frame of the tester. Unscrew the wing nuts of the abrasive holder, lay new felt, replace the circular frames and nuts and screw down tightly. Replace the top frame of the tester with the studs engaging the slots. The total load on the test piece shall be 0.68 kg.

7.5.1.3 Replace the specimen holders with the test specimen. Set the counter to zero and switch on the tester. Run the tester and inspect the test pieces after 100, 200, 400, 800, 1 600 and 3 200 cycles. The damage to all the upper materials is assessed as slight, moderate and severe.

NOTE — In the case of combine fabric, assess each component individually.

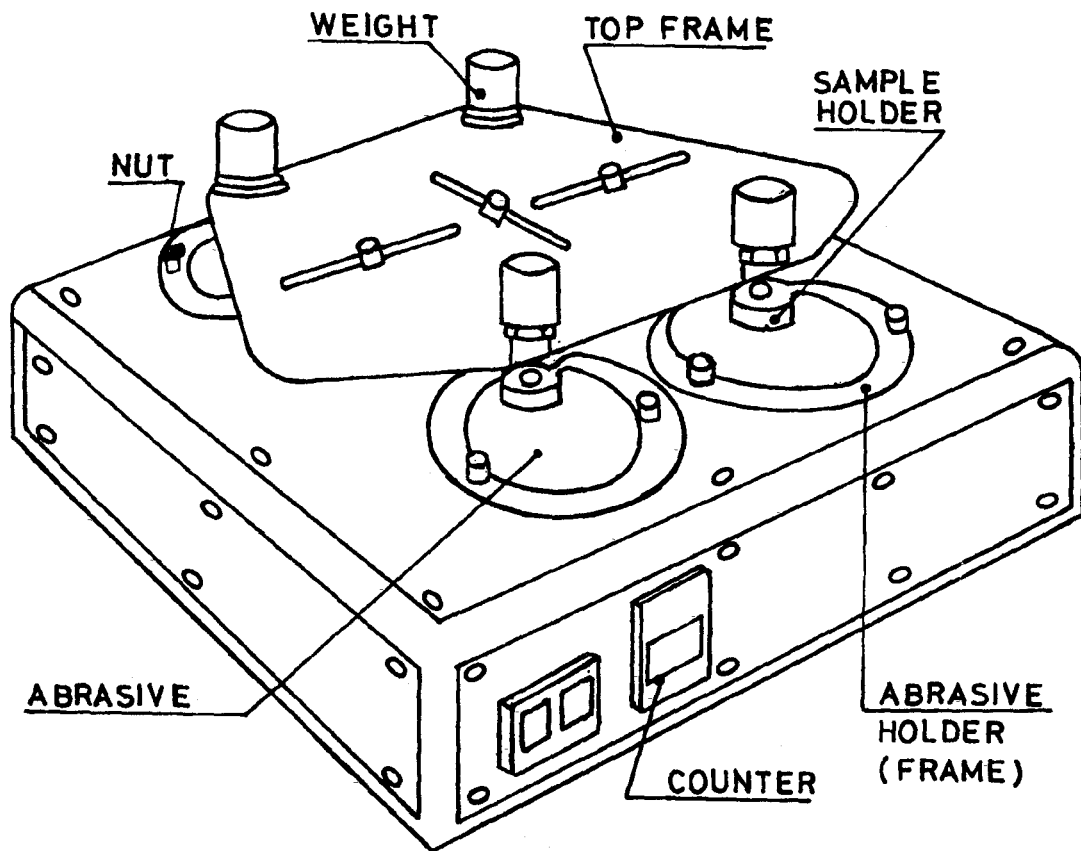


FIG. 5 MARTINDALE ABRASION TESTER

7.5.1.4 Use a square piece of 180 A emery paper for testing the plastic coated materials. Use the test piece holder which gives an abraded area of 6.5 cm² and apply a load of 595 g. Stop the tester after every 200 revolutions, assess the damage and clean the abrasive material. Stop the machine after 700 revolutions and examine the plastic surface by naked eye for breakdown of coating, colour change and loss of gloss.

7.5.2 Wet Test

The effect of perspiration of foot on the abrasion resistance of all the lining materials and the inner/side of the upper material of the unlined footwear is assessed by the wet test. Soak the felt under the pad and the worsted abrasive cloth before the test and squeeze lightly to remove excess water. Mount the soaked test specimen on the abrasion tester and follow the same procedure as described in 7.5.1. Assess the damage caused to all the materials as slight, moderate and severe.

ANNEX A**(Foreword)****COMMITTEE COMPOSITION**

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Methods of Sampling of Test for Footwear Subcommittee, CHD 19 : 1

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Amendments Issued Since Publication

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