भारतीय मानक

Indian Standard

IS 8085 (Part 16) : 2023
ISO 24266 : 2020

फुटवियर की परीक्षण पद्धतियाँ

भाग 16 पूरे जूते के फ्लेक्सिंग स्थायित्व

Methods of Test for Footwear

Part 16 Flexing Durability for Whole Shoe

ICS 61.060

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June 2023 **Price Group 7**

Footwear Sectional Committee, CHD 19

NATIONAL FOREWORD

This Indian Standard (Part 16) which is identical with ISO 24266 : 2020 'Footwear — Test methods for whole shoe — Flexing durability' issued by the International Organization for Standardization (ISO), was adopted by the Bureau of Indian Standards on the recommendation of the Footwear Sectional Committee and approval of the Chemical Division Council.

The standard on 'Methods of test for footwear' has been published in several parts. This part is an adoption ISO 24266 which specifies two test methods for the determination of the flexing durability of whole shoes.

The other parts of this Indian Standards are:

IS	*Title*
IS 8085	
(Part 1) : 1986	Dimensions, fitting, adhesion test, peel test, heat resistance test and ageing test (*first revision*)
(Part 2) : 1999	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
(Part 3) : 2021	Upper sole adhesion
(Part 4) : 2019	Resistance to crack initiation and growth belt flex method
(Part 5) : 2019	Longitudinal stiffness of shanks
(Part 6) : 2021	Abrasion resistance of uppers, linings and insocks
(Part 7) : 2021	Deformability of upper
(Part 8) : 2019	Delamination resistance of uppers
(Part 9)	Tear strength of uppers linings and insocks (*under preparation*)
(Part 10)	Heel attachment for whole shoe (*under preparation*)
(Part 11)	Attachment strength of straps, trims and accessories (*under preparation*)
(Part 12)	Tensile performance of elastic materials (*under preparation*)
(Part 13)	Seam strength for uppers, lining and insocks (*under preparation*)
(Part 14)	Water vapour permeability and absorption for uppers and lining (*under preparation*)
(Part 15)	Washability in a domestic washing machine for whole shoe (*under preparation*)

(*Continued on third cover*)

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Indian Standard

METHODS OF TEST FOR FOOTWEAR

PART 16 FLEXING DURABILITY FOR WHOLE SHOE

1 Scope

This document specifies two test methods for the determination of the flexing durability of whole shoes. The two methods might not give comparable results.

NOTE The selected test method depends on agreement between relative parties who use this test method or product standards which reference this test method.

These methods are not applicable to the whole shoes with heel height more than 50 mm, or the thickness of flexing area of the soles more than 25 mm, or flexing angle less than 45° according to ISO 17707:2005, Clause 6.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 18454, *Footwear — Standard atmospheres for conditioning and testing of footwear and components for footwear*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Principle

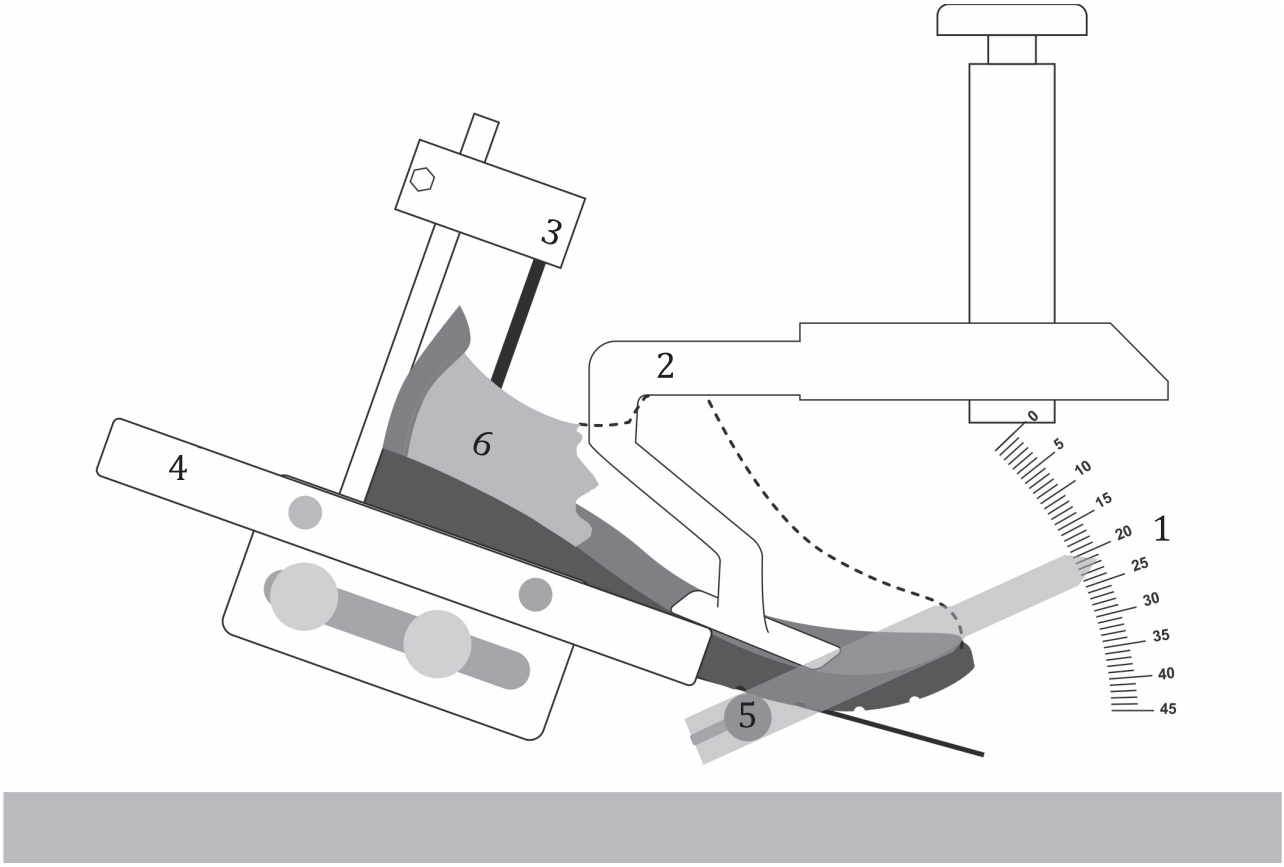
The footwear specimen is repeatedly flexed through a specified angle about its normal flexing line by a test machine. After a predetermined time or number of flexes the footwear is subjectively assessed for signs of damage.

5 Apparatus

5.1 Method A

5.1.1 Flexing machine. See Figure 1.

5.1.1.1 A means of firmly clamping any type of footwear at the heel and toe. A number of toe clamps will be necessary to ensure all sizes of footwear can be clamped securely.



Key

1 flexing angle indicator
2 front holding clamp
3 rear holding clamp
4 shoe platform
5 flexing axis
6 test piece (whole shoe)

Figure 1 — Flexing machine (method A)

5.1.1.2 A system of flexing the footwear about its flexing line at a rate of (140 ± 10) cycles per minute through a range of flexing angles.

5.1.1.3 A means of recording either the number of flexes or the duration of the test providing the speed of the machine is constant and known.

5.1.2 Vernier callipers, to an accuracy of better than 0,02 mm.

5.2 Method B

5.2.1 Flexing machine. See Figure 2.

5.2.1.1 The flexing angle can be adjusted between 0° to 55°, see Figure 2.

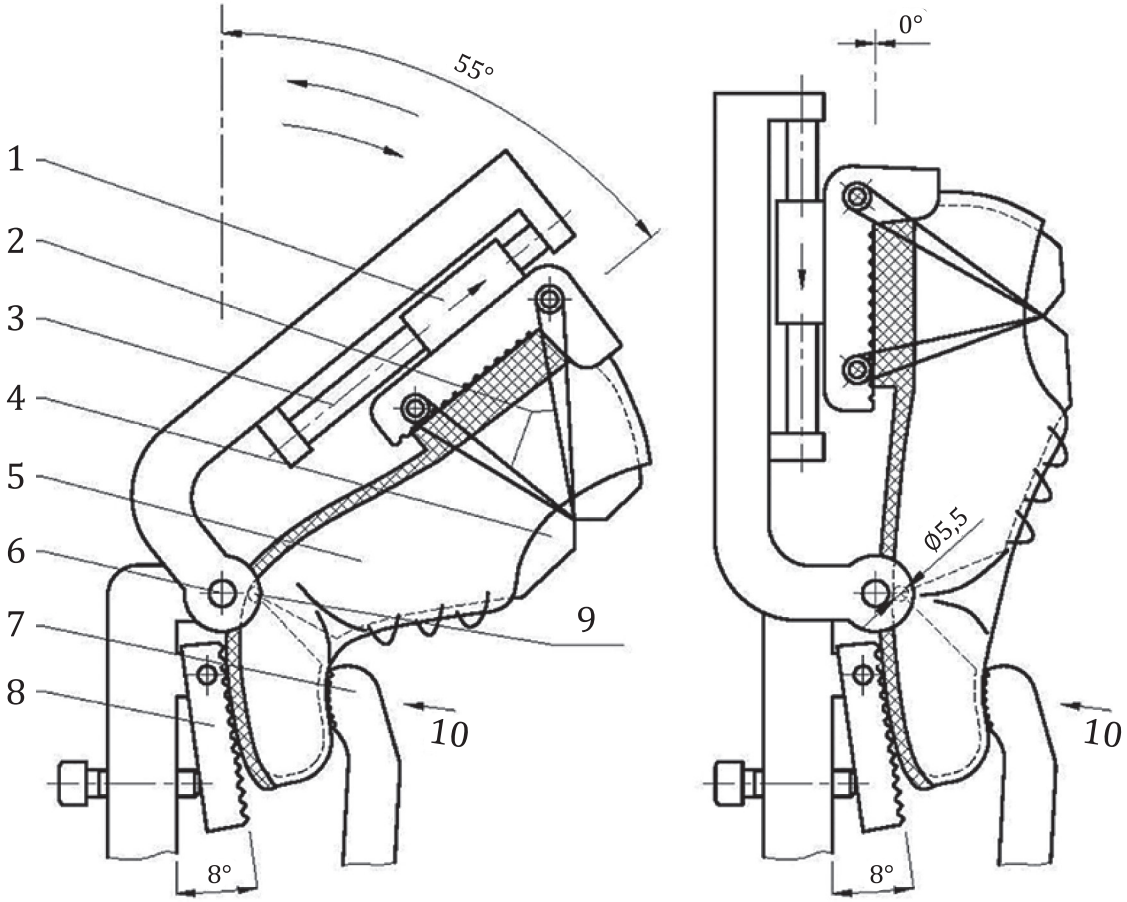
5.2.1.2 The flexing frequency can be adjusted between 100 cycles to 300 cycles per minute.

5.2.1.3 Sample holder shall be able to fasten the sample firmly to ensure it will not loosen during test. The inclination angle of sample holder is adjustable to make sure test sample can be under normal condition without flex in any directions when the machine is at the minimum flex angle.

5.2.1.4 A means of stopping the machine automatically after the specified flexing cycles.

5.2.1.5 A means of blasting air to the flexing area of sample to prevent overheating.

Dimensions in millimetres



Key

1 slider
2 strings used to fix the back of the sample
3 slide rail
4 flexing last
5 sample (whole shoe)
6 flexing central axis
7 front part of the clamp
8 adjustable backer
9 flexing axis of the last
10 sample holder

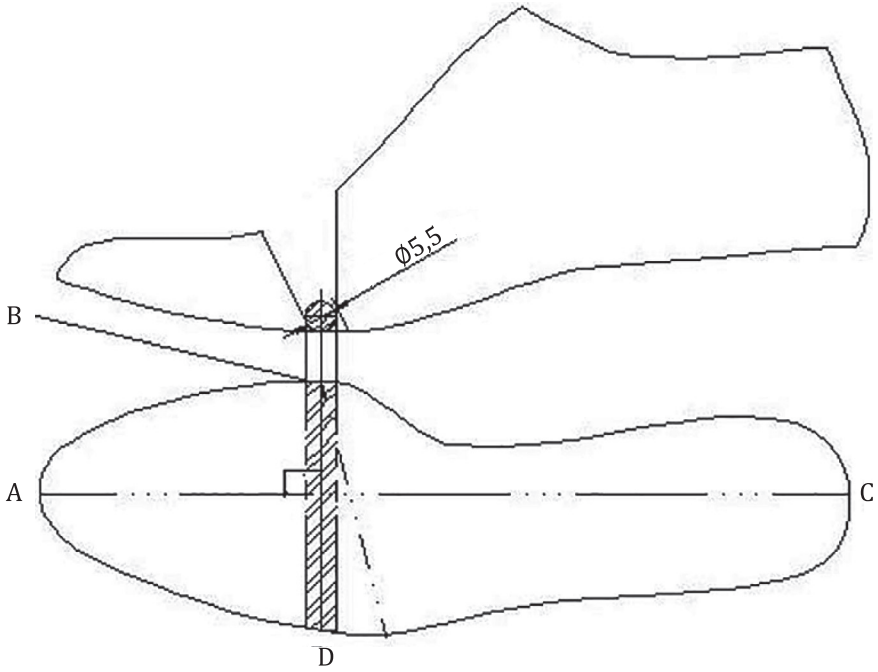
Figure 2 — Flexing machine (method B)

5.2.2 Flexing last

5.2.2.1 Steel axis in the bottom of the last should be fixed in a way that the last flexing at the joint position and the bottom of the last should be smooth when the last keeps at normal and flexing position (see Figure 3), a size of Ø 5,5 mm × 40 mm is commonly used.

5.2.2.2 The maximum flexible angle of the flexing last is no less than 50°.

Dimensions in millimetres



Key

AC	central line
B	ball point at the medial points of the last
BD	steel axis

Figure 3 — Flexing last

5.2.3 **Vernier callipers**, to an accuracy of better than 0,02 mm.

5.2.4 **Cutting tool**.

The cutting tool is shown in Figure 4.

Means of firmly clamping the footwear is advisable to minimize the risk of breaking the cutting tool as it is withdrawn from the outsole.

6 Sampling and conditioning

6.1 Use at least one pair of whole shoes for each test.

6.2 Place all test pieces in a standard controlled atmosphere in accordance with ISO 18454 for at least 4 h prior to test. The test shall also be carried out under this controlled atmosphere.

Dimensions in millimetres

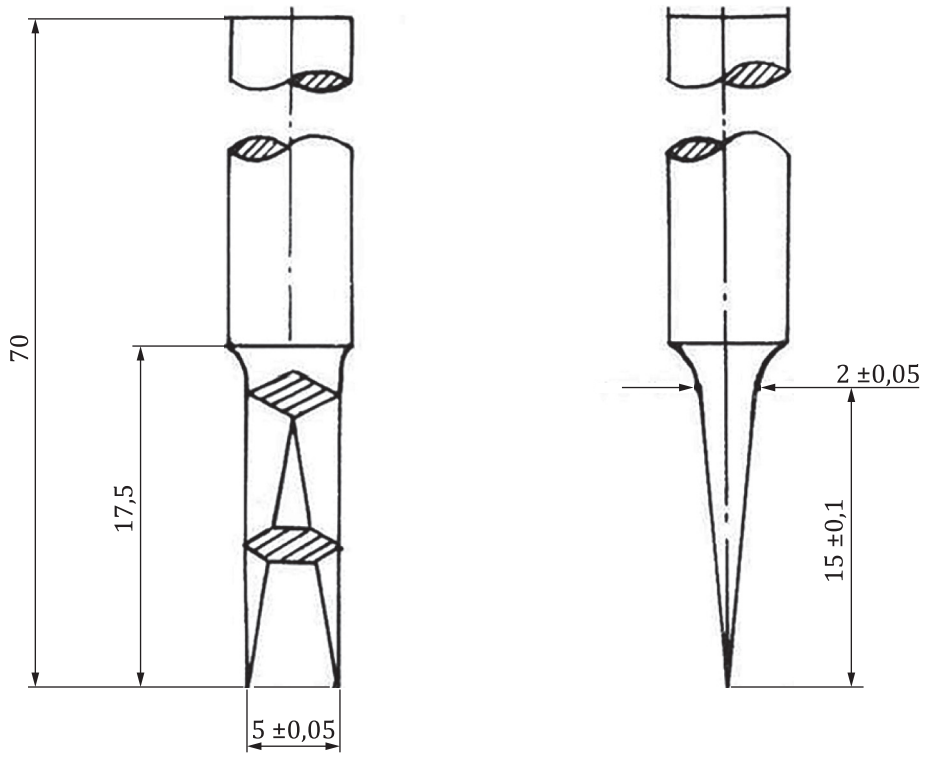


Figure 4 — Schematic diagram of cutting tool

7 Test method

7.1 Method A

7.1.1 Check the surface of shoes. Clean the surface of samples with gauze and ethanol if it is dirty.

7.1.2 Draw a line down the length of the footwear insole from the centre of the heel toward the centre of the toecap.

7.1.3 Mark point B on line A (see Figure 5). The distance from the centre of the heel to point B is given in Table 1. This corresponds to the typical position of the metatarsophalangeal joint from the wearer's foot.

7.1.4 Mark a second point on the line drawn (5 ± 1) mm closer to the heel than the point marked as point B in Figure 5.

7.1.5 Draw a line across the width of the insole passing through the second point and at 90° to the first line. This is the flexing line of the footwear (see Figure 5).

7.1.6 Set the flexing machine to the footwear through an angle of (30 ± 1)° similar to that experienced during normal walking.

7.1.7 Secure the footwear in the machine to make the flexing line pass under the centre of both holes in the toe clamp (see Figure 5).

7.1.8 Operate the flexing machine. After approximately 500 cycles, check to assure that the footwear is still securely clamped. Run the machine again.

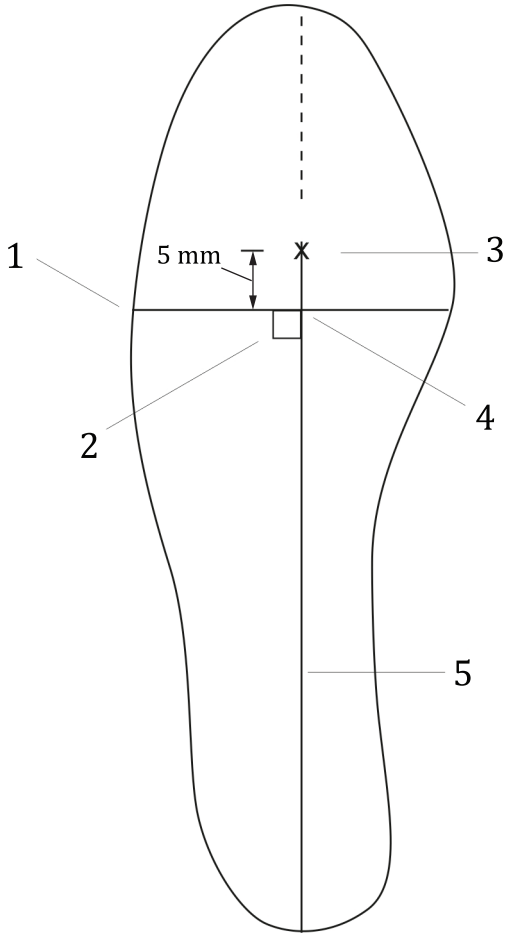
7.1.9 Conclude the test when the footwear has been subjected to a total of 50 000 flexing cycles (flexing speed of 140 cycles per minute).

NOTE Optional intermediate inspections are possible under customer request.

Different number of total cycles may be tested under customer request.

Table 1 — Average distance from the heel end of the insole to the metatarsophalangeal joint position of the foot

Mondopoint / EUR size	Heel/ball length on insole
	mm
125 / 20	82
130 / 21	87
135 / 22	92
/ 23	97
/ 24	102
155 / 25	107
160 / 26	112
165 / 27	116
/ 28	120
180 / 29	125
185 / 30	130
190 / 31	135
/ 32	139
205/ 33	143
/ 34	147
220/ 35	152
/ 36	157
/ 37	164
240 / 38	166
/ 39	172
/ 40	174
260 / 41	180
/ 42	184
/ 43	189
280 / 44	193
/ 45	197
/ 46	201
300 / 47	207



Key

1 flexing line
2 90° angle between the two lines
3 typical position of ball joint (point B)
4 second point (C)
5 line A

Figure 5 — Marked insole

7.2 Method B

7.2.1 Check the surface of shoes. Clean the surface of samples with gauze and ethanol if it is dirty.

7.2.2 Fix the corresponding flexing last (5.2.2) in the shoes, using preferably a last 5 mm smaller than the size of the sample.

7.2.3 Flex the sample, mark the flexing point at both sides of the shoe and draw a flexing line between the 2 points, along the sole.

7.2.4 Clamp the sample in the flexing machine (5.2.1) firmly. The flexing line, steel axis of flexing last and the axis of sample holder should be all aligned at the horizontal level.

7.2.5 Keep the machine at the minimum flexing angle, observe the heel if the shoe is at normal position without bearing any strain, if not, adjust the clamp angle until the shoe is in normal position.

7.2.6 Adjust the machine to the defined angle of 50° ± 1° (it can be chosen in the range of 0° to 50° if specified).

7.2.7 Adjust the flexing rate to (230 ± 10) cycles per minute, (it can be selected from 100 cycles to 300 cycles per minute for special requirements).

7.2.8 If needed, cut a 5 mm puncture through the sole in the middle of flexing line.

The cut will be required or not depending on the following:

a) The agreement between the relative parties;

b) the product specifications referring to this test method;

c) The structure of the sole.

The cut shall not affect the structure of the sole; for instance, if there is an air/liquid cushion in the flexing area, it shall not be cut.

If the sole thickness is over 15 mm, the tester can make a puncture by flexing the sample.

7.2.9 Clear the counter of the test machine, and pre-set 40 000 flexing cycles (follow product standards if it specifies any other requirements). Open the air blast and then start the machine.

7.2.10 During the test, observe the clamping status. Stop the test and make adjustments if the sample gets movement or the flexing position changes.

7.2.11 After the completion of preset cycles, keep the flexing machine at maximum flexing angle, measure the length and number of new cracks using Vernier callipers (5.2.3). If there is a puncture, measure the extended crack length.

7.2.12 Remove the sample from the machine, keep the sample in normal condition, examine and record the changes of upper, sole, upper/sole (including foxing, side wall).

8 Test result

8.1 Record number of new cracks and maximum length of new crack; the unbonding length of upper/outsole area (including the foxing and side wall).

8.2 Record and describe the changes of upper (e.g. crazing, crack grain, thread breakage, fabric broken, drawn work), sole (e.g. unbonding, coating cracking, peel off, air/liquid cushion leakage or shrunken etc.), feather line includes foxing and side wall (e.g. unbonding).

8.3 For method B, if there is a puncture, measure the extended crack length, in mm, to the nearest 0,1 mm.

8.4 Record the results separately for each shoe.

9 Test report

The test report shall include the following information:

a) reference to this document, i.e. ISO 24266:2020;

b) a full identification of the samples tested, including sample references, name, size, code, etc.;

c) flexing angle and complete cycles;

d) the results, expressed in accordance with Clause 8;

e) the treatment of test area and surface;

f) date of test;

g) any deviations from this test method.

h) the method which is used (method A or method B).

Bibliography

[1] ISO 17707:2005, *Footwear — Test methods for outsoles — Flex resistance*

(*Continued form second cover*)

(Part 17)	Abrasion resistance for accessories shoe laces (*under preparation*)
(Part 18)	Peel strength before and after repeated closing for accessories Touch and close fasteners (*under preparation*)

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions and terminologies are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words `International Standard' appear referring to this standard, they should be read as `Indian Standard'; and
b) Comma (,) has been used as a decimal marker in the International Standard, while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

The technical committee has reviewed the provisions of the following International Standards referred in this standard and has decided that they are acceptable for use in conjugation with this standard:

International Standard	*Title*
ISO 18454	Footwear — Standard atmospheres for conditioning and testing of footwear and components for footwear

Conditioning and test atmospheres stipulated in this standard may not be applicable to tropical/subtropical countries like India. The applicable Standard Atmospheric Conditions (SAC) for Indian Conditions are (27 ± 2)º C and (65 ± 5) percent relative humidity and may be observed while using this standard.

In reporting the result of a test or analysis 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 : 2022 'Rules for rounding off numerical values (*second revision*)'.

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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