BSI

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to BS 5145 : 1975

Lined industrial rubber boots

Revised text

AMD 3131
February 1980

CONTENTS

In the title of clause 4, delete 'Minimum heights' and substitute 'Heights'.

In the title of table 1, delete 'Minimum heights' and substitute 'Heights'.

AMD 3131
February 1980

CLAUSE 4. MINIMUM HEIGHTS AND TABLE 1 MINIMUM HEIGHTS

Delete both the existing clause 4 and table 1 and substitute the following:

'4. HEIGHTS

When measured on the inside, at the back of the boot, from the insole to the top, the height ranges for the various types of boots shall be in accordance with table 1.

TABLE 1. HEIGHTS

Type	Mens	Womens
	mm	mm
Ankle	115 to 179	115 to 152
Half knee	180 to 239	153 to 203
Short knee	240 to 329	204 to 279
Knee	330 to 429	280 to 380
Three quarter thigh	640 to 699	-
Full thigh	700 min.	-

The purchaser and supplier shall agree the actual height, with tolerances, of the various types of boots to be supplied.'

AMD 3131
February 1980

Clause 5.2.1 METHOD OF MEASUREMENT

At the end of the existing text, insert the following new paragraph:

'The heel thickness shall be measured on the cut section along a line drawn perpendicular to the bottom of the heel from a point on the bottom of the heel 10 mm from the back edge. In the case of heels with internal cavities, the measurement from the bottom of the heel to the start of the cavity shall be not less than 9 mm.

BSI

BS 5145 : January 1975

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Specification for

Lined industrial rubber boots

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FOREWORD

This British Standard has been prepared under the authority of the Rubber Industry Standards Committee and supersedes both BS 3299 'Industrial rubber boots' and BS 3995 'Lined moulded industrial rubber boots' which will both be withdrawn 6 months after the publication of this standard.

In appendix C and figure 1 guidance is given on the typical composition and location of the various parts of the boot.

This standard is generally in line with International Standard 2023 'Lined industrial rubber footwear'.

Points of difference are outlined below.

(a) ISO 2023 states that knitted fabrics may be used by agreement between purchaser and supplier, but BS 5145 includes specified requirements for knitted fabrics when used.

(b) ISO 2023 gives minimum heights for boots as recommendations only, but BS 5145 includes specified requirements.

(c) BS 5145 includes a compression set requirement for heels but this is not included in ISO 2023.

(d) BS 5145 tensile strength and elongation requirements for soling and heels are generally slightly lower than ISO 2023 requirements, this takes into account a considered improvement in durability due to increased use of synthetic polymers.

(e) In ISO 2023 the ageing treatment for the flexing test is 24 h at 100 °C whereas BS 5145 calls for 168 h at 70 °C.

(f) In ISO 2023 the minimum thicknesses between cleats are 4.0 mm mens and 3.5 mm womens whereas in BS 5145 these thicknesses are 3.0 mm and 2.5 mm respectively.

(g) In ISO 2023 the minimum weft strength of the fabric is 200 N whereas in BS 5145 it is 250 N.

The points of difference listed above are being brought to the attention of the International Organization for Standardization in the form of a proposal to make corresponding changes in ISO 2023. Particular importance is attached by the United Kingdom to points (a) and (d).

Attention is also drawn to BS 1870 'Safety footwear', which covers safety boots of similar construction.

Certification. Attention is drawn to the certification facilities described on the inside back cover of this standard.

BRITISH STANDARD SPECIFICATION FOR LINED INDUSTRIAL RUBBER BOOTS

1. SCOPE

This British Standard specifies requirements for rubber ankle boots and rubber boots of half knee, short knee and knee height for men and women, as well as rubber boots of three-quarter length and full thigh height for men for use in industry. All the boots are intended for heavy duty, but attention is particularly drawn to BS 1870 which deals with safety boots of similar construction.

This standard does not cover the style of boot.

2. REFERENCES

The titles of the British Standards referred to in this standard are listed on the inside back cover.

3. DEFINITIONS (see also figure 1)

For the purposes of this British Standard the following definitions apply:

(1) anklet. Additional rubber or fabric to reinforce the lower leg.

(2) backstrip. Internal or external strip of fabric or rubber covering the back centre line of the boot.

(3) boot counter. (a) Heel area of the upper
(b) Reinforcement for stiffening that area

(4) boot upper. That part of the boot above the outsole covering the foot and leg.

(5) boot vamp. Front area of the boot upper, forward of the instep.

(6) eyelet. Reinforcement of hole through which a lace is fitted.

(7) eyelet stay. Reinforcement of the upper in the area where eyelets are secured.

(8) filler. Material used to fill any cavity between insole and outsole.

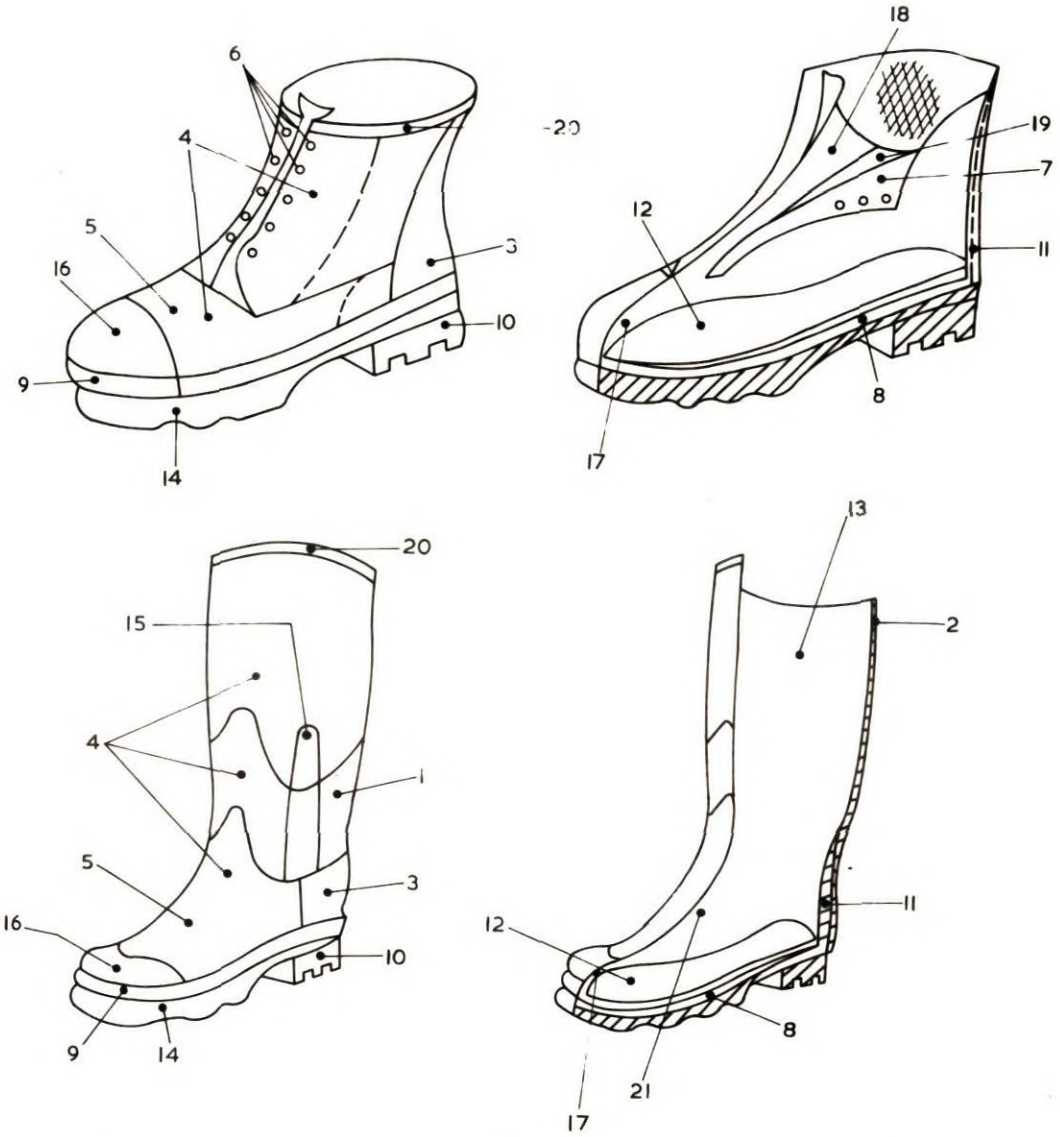
(9) foxing strip. Reinforcing strip to protect the bottom edge of the upper.

(10) heel. Bottom outside component providing the walking surface at the rear of the boot.

(11) heelpiece. Internal reinforcement for stiffening the heel counter area.

(12) insole. Bottom inside component of the boot adjacent to the bottom of the foot.

(13) leg lining. Material lining the whole leg and the back of the foot down to the insole.



1. Anklet	8. Filler	15. Sidestay
2. Backstrip	9. Foxing strip	16. Toecap
3. Boot counter	10. Heel	17. Toepiece
4. Boot upper	11. Heelpiece	18. Tongue
5. Boot vamp	12. Insole	19. Tongue gusset
6. Eyelet	13. Leg lining	20. Top binding
7. Eyelet stay	14. Outsole	21. Vamp lining

These illustrations show the general location of parts, all of which are not necessarily included in the construction, or implied in the specification and are intended to combine the features of different styles.

In the case of moulded boots, the terms indicate a particular area of the boot, rather than a separate part.

FIGURE 1. ILLUSTRATION FOR GUIDANCE : TYPICAL INDUSTRIAL RUBBER BOOTS, KNEE AND ANKLE TYPES

(14) outsole. Bottom outside component providing the walking surface in the forepart and the walking surface or the base at the rear.

(15) *sidestay*. *Additional fabric or rubber to reinforce the side of the leg.*

(16) toecap. External reinforcement of the boot upper in the toe area.

(17) toepiece. Internal reinforcement of the boot upper in the toe area.

(18) tongue. Shaped piece of material to protect the foot from chafing by the closure.

(19) tongue gusset or bellows tongue. Rubber or rubberized fabric joining the sides of the tongue to the upper of the boot to prevent entry of water.

(20) top binding. Narrow strip of rubber along the top edge of rubber boots to give a finished appearance and to reinforce the edge.

(21) vamp lining. Material lining the vamp.

4. MINIMUM HEIGHTS

The minimum height of the boot, when measured on the inside at the back of the boot from the insole to the top, shall be in accordance with table 1, unless otherwise agreed between the purchaser and the supplier.

TABLE 1. MINIMUM HEIGHTS

Type	Mens	Womens
	mm	mm
Ankle	135	135
Half knee	190	190
Short knee	275	260
Knee	350	300
Three quarter thigh	660	-
Full thigh	720	-

5. MINIMUM THICKNESSES

5.1 Boot upper and foxing strip. The combined thickness of the rubber and fabric shall be not less than 1.5 mm at any point round the top circumference of the boot upper, ignoring any of the top binding, and not less than 2.5 mm at any point round the foxing strip except that within 6 mm of the centre line at the back of the heel it shall be not less than 4.0 mm and at the toecap region not less than 3.5 mm, in each case not including any pattern on the foxing strip.

5.2 Soling and heel. The minimum thickness of soling and heel shall be in accordance with table 2 when measured in accordance with 5.2.1.

TABLE 2. MINIMUM THICKNESSES OF SOLING AND HEEL

	Over cleats	Between cleats	Non-cleated
	mm	mm	mm
Cleated soling (Mens)	9.0	3.0	-
Cleated soling (Womens)	7.0	2.5	-
Non-cleated soling	-	-	5.0
Cleated heel	25.0	-	-
Non-cleated heel	-	-	20.0

5.2.1 *Method of measurement.* The boot shall be cut through the centre of the sole longitudinally and perpendicular to the surface. The thickness of the sole over and between the cleats and over any pattern shall be measured from the lower surface of the filler at three widely separated points along the cut, using a steel rule graduated in millimetres.

5.3 Insole and filler. The minimum thickness of the insole and filler shall be 4 mm. If the insole is of sponge rubber the minimum combined thickness of insole and filler shall be 5 mm.

6. FABRICS

The lining of a boot shall consist of one or more plies of fabric(s) forming the leg and vamp lining. The fabric(s) shall be free from such defects as would detract from the serviceability of the finished product. When tested as described in appendix A the strength of the one ply, or the composite strength, if more than one ply, shall be in accordance with table 3.

TABLE 3. MINIMUM FABRIC STRENGTHS (of a 25 mm wide test piece)

	Length direction of the material	Breadth direction of the material
	N	N
Woven fabric	250	250
Knitted fabric	180	180

7. REINFORCEMENTS

7.1 Top binding. The top of the boot shall be finished off by a top binding or other suitable means.

7.2 Eyelets. Eyelets, if fitted, shall be resistant to corrosion and shall be securely fixed.

8. PHYSICAL PROPERTIES OF SOLING AND HEEL

8.1 Tensile strength and elongation at break requirements before ageing. Three test pieces shall be cut from both outsoles and heels, then reduced to the required thickness by buffing or any other suitable method. Undue heating of the rubber shall be avoided. The tensile strength and elongation at break of outsoles and heels shall then be determined according to the method described in BS 903, Part A2, using Type 1 dumb-bell test pieces. A smaller dumb-bell test piece may be used for the heels if size makes this necessary. The size of this test piece should be stated when quoting results. All test pieces shall be free from visible defects.

The median value of the three test results shall be in accordance with table 4. If the median of the results is below, and the highest value is above, the appropriate values given in table 4, two further test pieces shall be tested. The material shall not be deemed to comply unless the median of all five results is not below the appropriate value.

TABLE 4. TENSILE STRENGTH AND ELONGATION AT BREAK REQUIREMENTS OF OUTSOLE AND HEEL

	Tensile strength, min.	Elongation at break, min.
Outsole, thickness mm	MPa	%
Up to and including 9.0	8.5	250
Over 9.0 up to and including 10.0	8.0	225
Over 10.0 up to and including 11.0	7.5	200
Over 11.0	7.0	200
All heels	7.0	200

8.2 Tensile strength and elongation at break requirements after ageing. After submission to the ageing treatment detailed in table 5, the median values for tensile strength and elongation at break of outsole and heel determined as in 8.1 shall not show changes from the corresponding unaged median values greater than the amounts given in table 5.

TABLE 5. TENSILE STRENGTH AND ELONGATION AT BREAK REQUIREMENTS AFTER AGEING FOR OUTSOLE AND HEEL

Ageing treatment	Max. change after ageing	
	Tensile strength	Elongation at break
168 h at 70 ± 1 °C in accordance with Method A or B described in BS 903, Part A19	± 20 % of unaged value	-30 % to + 10 % of unaged value

8.3 Compression set. When tested according to Method A of BS 903, Part A6 at 70 °C using lubricated Type 1 test pieces, samples taken from the heel shall have a maximum compression set of 50 %.

9. PERFORMANCE REQUIREMENTS

9.1 Freedom from leakage

9.1.1 When finished boots are tested by the manufacturer, there shall be no leakage of air when subjected to the following treatment (see 9.1.2 for further procedure in the case of ankle boots):

Air shall be forced into the boots to a pressure of 100 mbar*, the top of the boot having been sealed.

The boot shall then be examined for escape of air when immersed in water to within 75 mm of the top.

9.1.2 After testing as indicated in 9.1.1, ankle boots which show any sign of leakage in the vicinity of either the eyelets or the gusset, shall be submitted to an immersion test. The boots shall be weighted and immersed in water to within 75 mm of the top for a period of 16 h and then examined to see if water has penetrated to the inside of the boot. Ankle boots which show water penetration shall be deemed as not complying with the requirements of this specification.

9.2 Resistance to dry heat ageing. All rubber components shall be capable of withstanding exposure to air at 100 ± 1 °C for a period of 24 h without developing any signs of brittleness or tackiness. For the purpose of this test the test pieces may be entire articles or pieces cut from them. The test shall be carried out in accordance with Method A or Method B described in BS 903, Part A19.

9.3 Resistance to flexing. When tested as described in appendix B after having been submitted to the ageing treatment detailed in 8.2 (i.e. 168 h at 70 °C), test pieces taken from the uppers shall withstand the number of continuous flexes detailed in table 6 without the rubber face showing pinholes or any sign of cracking, and without separation of the plies being apparent when viewed with the unaided eye. For this purpose, only those parts of the test piece should be observed which are under tension during the test, i.e., the folds which form a diamond shape. Pinholes or cracking associated with machine damage shall be ignored.

The test pieces shall receive a minimum of two days rest after having been subjected to the ageing treatment detailed in 8.2.

The testing equipment shall be kept away from any ozone source.

TABLE 6. FLEXING TEST LIMITS

Thickness of upper	Number of flexes	
	Handbuilt type	Moulded type
mm		
Up to and including 2.00	125 000	75 000
Over 2.00 up to and including 2.25	110 000	50 000
Over 2.25	90 000	40 000

* 100 mbar = 10 kPa.

10. MARKING

Each article of footwear shall be indelibly and legibly marked with the following particulars:

(a) Size stamped on the inside or moulded or impressed on the waist of the outsole.

(b) Manufacturer's identification, on the outside.

(c) The number of this British Standard, i.e. BS 5145, stamped on the inside of the boot.

11. SAMPLING

The frequency of testing for demonstrating compliance with this standard shall be as agreed between the purchaser and the supplier.

APPENDIX A

METHOD OF PREPARATION AND TEST FOR FABRICS

Cut strip test pieces of rectangular shape, 25 mm wide, from the upper part of the boot to be tested and through the full thickness of the upper i.e. including the rubber covering. These test pieces should cover both length and breadth directions, and be of sufficient length to permit a free length of 75 mm between the jaws of the fabric strength testing machine.

Where the height of the product does not permit a test piece to be cut giving a free length of 75 mm between the jaws, a free length of 25 mm shall be used.

Determine the breaking strength of the fabric portion of the rubber/fabric laminate in both length and breadth directions in accordance with the requirements of Method 6A or 6B of BS 3424 using the appropriate preload selected from the following:

1.0 N for a coated fabric of mass per unit area up to and including 200 g/m^2

2.5 N for a coated fabric of mass per unit area over 200 g/m^2 and up to and including 500 g/m^2

5.0 N for a coated fabric of mass per unit area over 500 g/m^2

Set the test jaws at 75 mm or 25 mm apart as appropriate.

Express the breaking strength of the fabric in newtons (N) in the length and breadth directions for a test piece 25 mm in width.

APPENDIX B

METHOD OF TESTING RESISTANCE TO FLEXING

B.1 Apparatus. The essential features of the apparatus shall be as follows.

The machine shall have an adjustable stationary part provided with grips 25 mm across, for holding one end of each of the test pieces in a fixed position, and a similar reciprocating part for holding the other end of each of the test pieces.

The reciprocating part shall be arranged so that its motion is in the direction of, and in the same plane as, the centre line between the grips, and its travel is adjusted so that the two sets of grips approach each other to a distance of 13 mm and separate to a distance of 57 mm.

The eccentric which actuates the reciprocating part should be driven by a constant speed motor to give 340–400 flexing cycles per minute, with sufficient power to flex at least six and preferably twelve test pieces at one time.

The test pieces shall be arranged in two equal groups, so that one group is being flexed while the other group is being straightened, thus reducing the vibration in the machine. The grips shall hold the test pieces firmly, and shall enable individual adjustment to be made to each test piece.

B.2 Test piece. The test piece shall have the dimensions shown in figure 2. Four test pieces shall be cut from the thinnest portion of the leg part of the upper containing the fewest plies of fabric. Care should be taken to ensure that the test pieces are cut cleanly from the sample material.

B.3 Fitting. Fold the test piece symmetrically about its major axis so that the rubber surface is outwards. In the folded condition insert one tapered end into the fixed central grip and push in until the test piece touches the grip pins.

Then tighten this fixed grip. Take out the corresponding movable grip to its fullest extent, insert the test piece, pull flat and tighten the grip. It is recommended that clips be used to keep the edges together during the insertion of the test piece in the grips, but their removal is essential before flexing commences.

NOTE. The test piece should not be under tension.

B.4 Procedure. A complete to-and-fro movement of the grip shall be counted as one flex cycle. The length of test shall be calculated in flex cycles and not in time units.

The flex cycle may be determined by using a trip counter operated by one of the movable grips. The ambient temperature during testing shall be not more than 24 °C.

APPENDIX C
LIST OF SUITABLE MATERIALS

This list and figure 1 are included for guidance only

(1) Anklet	Rubber or rubberized fabric
(2) Backstrip (where applicable)	Rubber
(3) Boot counter	Rubber
(4) Boot upper	Inside fabric Outside rubber
(5) Boot vamp	Inside fabric Outside rubber
(6) Eyelet (where applicable)	Corrosion resistant steel or suitable alternative
(7) Eyelet stay	Rubberized fabric
(8) Filler	Rubber or rubber/fabric composition
(9) Foxing strip	Rubber
(10) Heel	Rubber
(11) Heelpiece	Rubber or rubber/fabric composition
(12) Insole	Fabric of either sponge or rubber/fabric composition
(13) Leg lining	Fabric or rubberized fabric
(14) Outsole	Rubber
(15) Sidestay	Rubber or rubberized fabric
(16) Toecap	Rubber
(17) Toepiece	Rubber or fabric or rubberized fabric
(18) Tongue	Rubber or fabric or rubberized fabric
(19) Tongue gusset	Rubber or rubberized fabric
(20) Top binding (where applicable)	Rubber
(21) Vamp lining	Fabric or rubberized fabric

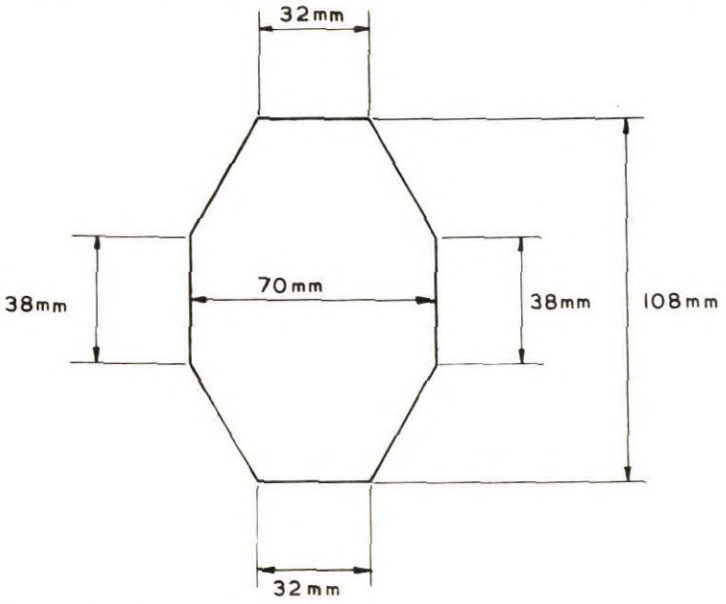


FIGURE 2. TEST PIECE FOR FLEXING TEST