

*Incorporating
Amendment No. 1 and
implementing
Amendment No. 2, (not
published separately) to
BS EN 344 : 1993
(renumbers BS as
BS EN 344-1 : 1993)*

Safety, protective and occupational footwear for professional use

Part 1. Requirements and test methods

The European Standard EN 344-1 : 1992 with the incorporation of its amendment A1 : 1997 has the status of a British Standard

ICS 13.340.10

Cooperating organizations

The European Committee for Standardization (CEN), under whose supervision this European Standard was prepared, comprises the national standards organizations of the following countries:

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United Kingdom	British Standards Institution

This British Standard, having been prepared under the direction of the Personal Safety Equipment Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 January 1993

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Amendments issued since publication

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National foreword

- This British Standard has been prepared under the direction of the Personal Safety Equipment Standards Policy Committee and is the English language version of EN 344-1 : 1992 *Safety, protective and occupational footwear for professional use* Part 1. *Requirements and test methods*, including its Amendment No.1, published by the European Committee for Standardization (CEN).
- EN 344-1 was produced as a result of international discussions in which the United Kingdom took an active part.
- A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.
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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 52, and inside back cover and a back cover.

Sidelining in this document indicates the most recent changes by amendment.

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English version

Safety, protective and occupational footwear for professional use —

Part 1: Requirements and test methods

(includes amendment A1 : 1997)

Chaussures de sécurité, chaussures de protection et
chaussures de travail à usage professionnel —
Partie 1: Exigences et méthodes d'essai
(inclut l'amendement A1 : 1997)

Sicherheits-, Schutz und Berufsschuhe für den
gewerblichen Gebrauch —
Teil 1: Anforderungen und Prüfverfahren
(enthält Änderung A1 : 1997)

This European Standard was approved by CEN on 1992-10-30. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
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Central Secretariat: rue de Stassart 36, B-1050 Brussels

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Foreword

This European Standard was prepared by Technical Committee CEN/TC 161 'Foot and leg protectors', the Secretariat of which is held by BSI.

This European Standard has been prepared under a mandate given to CEN by the Commission of the European Communities and the European Trade Association, and supports essential requirements of the EC Directive(s).

Work on this standard was initiated by Technical Committee CEN/TC 161 at its inaugural meeting in April 1989 and was subsequently undertaken by Technical Committee CEN/TC 161/WG 1. A draft proposal was prepared and circulated for the CEN Enquiry in 1990. Following consideration of all the comments received, a revised draft was prepared and agreement for its submission to the formal vote was given in October 1991. The result of the formal vote was positive.

This European Standard relates directly to EN 345-1 : 1992, EN 346-1 : 1992 and EN 347-1 : 1992, which specify requirements for footwear for different areas of work.

Further requirements and test methods for safety, protective and occupational footwear are currently being developed by Technical Committee CEN/TC 161. Initially, these will be published separately, but eventually it is intended that they should be incorporated in one standard.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 1993, and conflicting national standards shall be withdrawn at the latest by May 1993.

The Standard was approved and in accordance with the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

Foreword to amendment A1

This Amendment EN 344 : 1992/A1 : 1997 to the EN 344 : 1992 has been prepared by Technical Committee CEN/TC 161 'Foot and leg protectors', the secretariat of which is held by BSI.

This Amendment to the European Standard EN 344 : 1992 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 1997, and conflicting national standards shall be withdrawn at the latest by August 1997.

The amendment is based upon the work of CEN/TC161/WG1 and WG2 and is intended to provide urgently needed modifications to particular requirements and test methods specified in EN 344 : 1992 in order to rectify minor deficiencies which the practical implementation of the standard has brought to light.

Where still appropriate, this amendment incorporates the corrections of the corrigendum issued April 1993.

As a consequence of the publication of EN 344-2 the standard EN 344 has been renumbered as EN 344-1 with the following title, Safety, protective and occupational footwear for professional use — Part 1: Requirements and test methods.

This amendment will be incorporated in EN 344 : 1992 on the occasion of its first revision.

This Amendment to the European Standard EN 344 : 1992 has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this Amendment: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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1 Scope

This European Standard specifies requirements and, where appropriate, test methods to establish conformity with these requirements for footwear intended to protect the wearer's feet and legs against foreseeable hazards in a variety of working sectors.

This standard can be used only in conjunction with EN 345 : 1992, EN 346 : 1992 or EN 347 : 1992, which give requirements for footwear relating to specific levels of risk.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- | | |
|-----------------|--|
| EN 345-1 : 1992 | <i>Safety footwear for professional use — Part 1: Specification</i> |
| EN 346-1 : 1992 | <i>Protective footwear for professional use — Part 1: Specification</i> |
| EN 347-1 : 1992 | <i>Occupational footwear for professional use — Part 1: Specification</i> |
| ISO 34 : 1979 | <i>Rubber, vulcanized — Determination of tear strength (trouser, angle and crescent test pieces)</i> |
| ISO 868 : 1985 | <i>Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness)</i> |
| ISO 1817 : 1985 | <i>Rubber, vulcanized — Determination of the effect of liquids</i> |
| ISO 2023 : 1973 | <i>Lined industrial rubber footwear</i> |
| ISO 3290 : 1975 | <i>Rolling bearings — Bearing parts — Balls for rolling bearings</i> |
| ISO 3376 : 1976 | <i>Leather — Determination of tensile strength and elongation</i> |
| ISO 3377 : 1975 | <i>Leather — Determination of tearing load</i> |

- | | |
|-----------------|---|
| ISO 4045 : 1977 | <i>Leather — Determination of pH</i> |
| ISO 4643 : 1992 | <i>Moulded plastics footwear — Lined or unlined poly(vinyl chloride) boots for general industrial use — Specification</i> |
| ISO 4648 : 1991 | <i>Rubber, vulcanized or thermoplastic — Determination of dimensions of test pieces and products for test purposes</i> |
| ISO 4649 : 1985 | <i>Rubber — Determination of abrasion resistance using a rotating cylindrical drum device</i> |
| ISO 4674 : 1977 | <i>Fabrics coated with rubber or plastics — Determination of tear resistance</i> |
| ISO 5423 : 1992 | <i>Moulded plastics footwear — Lined or unlined polyurethane boots for general industrial use — Specification</i> |

3 Definitions

NOTE. The component parts of footwear are illustrated in figures 1 and 2.

For the purposes of this standard, the following definitions apply.

3.1 safety footwear for professional use

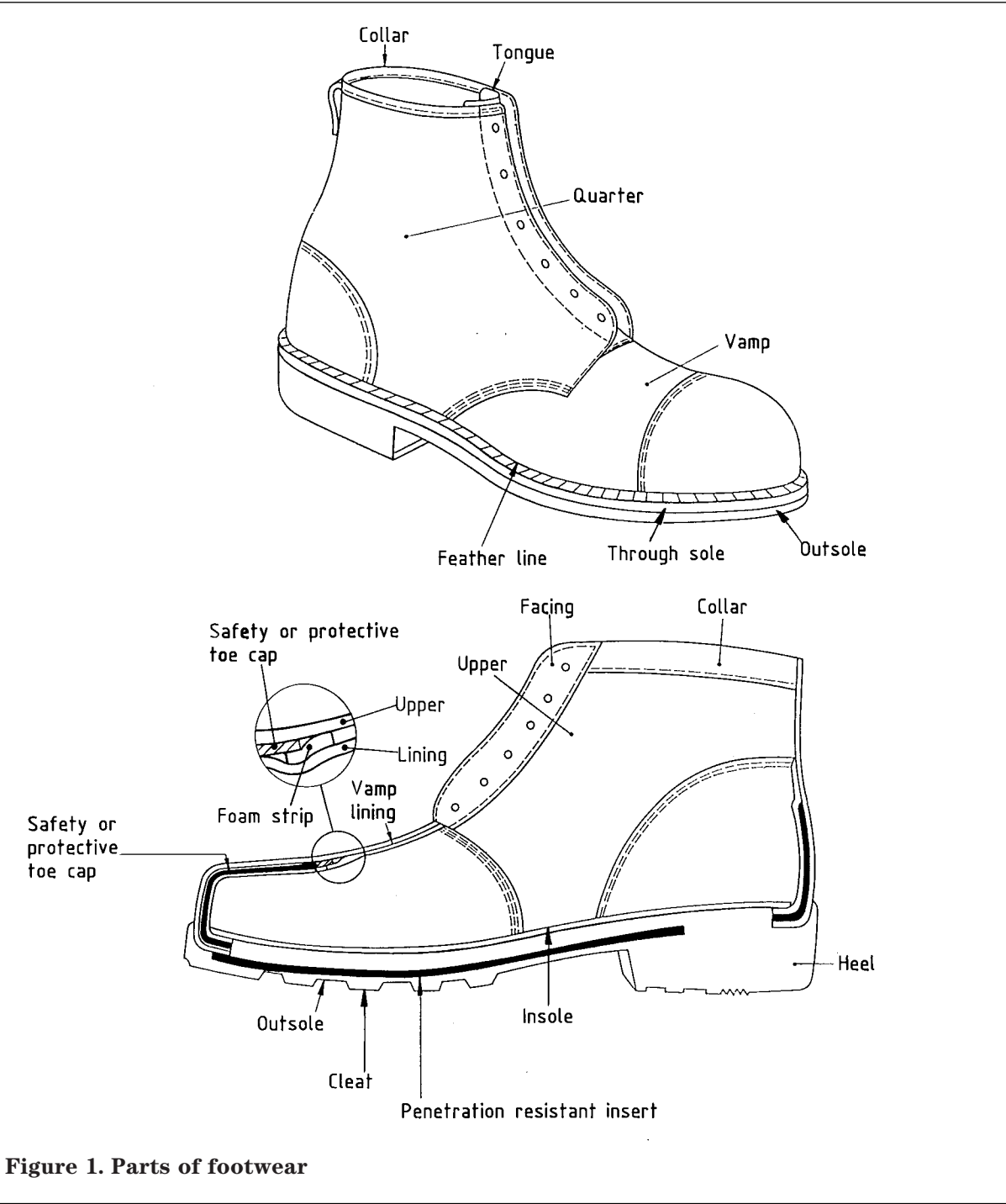
Footwear incorporating protective features to protect the wearer from injuries which could arise through accidents in the working sectors for which the footwear was designed, fitted with toecaps designed to give protection against impact when tested at an energy level of 200 J.

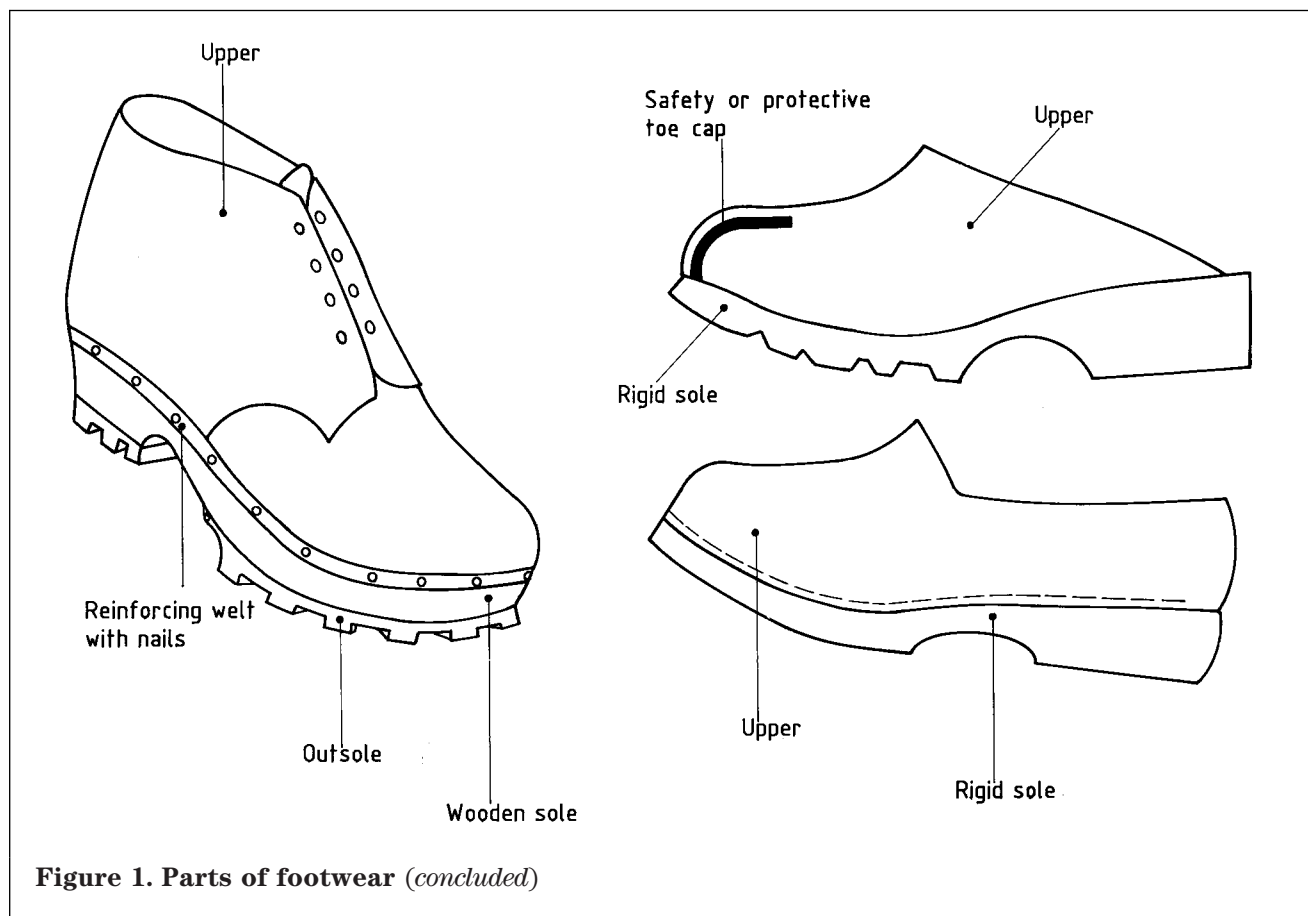
3.2 protective footwear for professional use

Footwear incorporating protective features to protect the wearer from injuries which could arise through accidents in the working sectors for which the footwear was designed, fitted with toecaps designed to give protection against impact when tested at an energy level of 100 J.

3.3 occupational footwear for professional use

Footwear incorporating protective features to protect the wearer from injuries which could arise through accidents in the working sectors for which the footwear was designed.





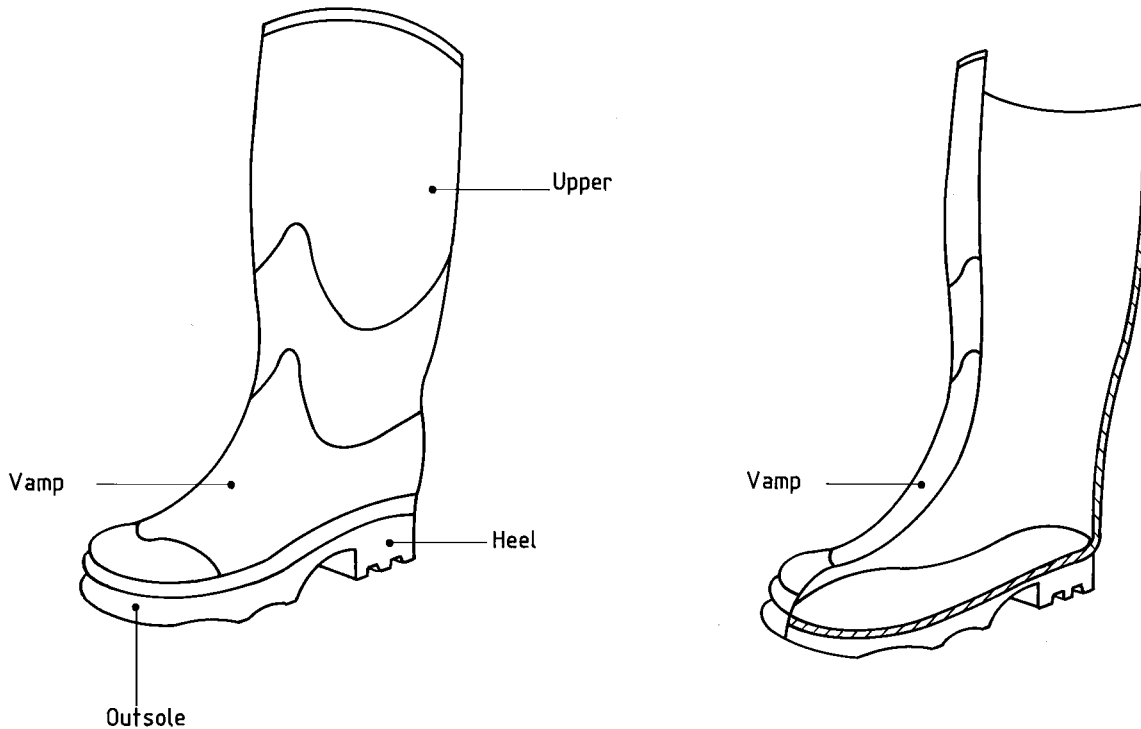


Figure 2. Parts of all-rubber (i.e. vulcanized) or all polymeric (i.e. entirely moulded) footwear

3.4 leather

This term covers

full grain leather

Hide or skin tanned to be imputrescible with its original fibrous structure more or less intact and still possessing the full grain layer.

corrected grain leather

Hide or skin tanned to be imputrescible with its original fibrous structure more or less intact, but which has been subjected to mechanical buffing to modify its grain structure.

leather split

Flesh or middle part of a skin or hide tanned to be imputrescible with its original fibrous structure more or less intact and split or shaved to eliminate completely the grain layer.

3.5 rubber

Vulcanized elastomers.

3.6 polymeric materials

Materials made of polyurethane, polyvinylchloride or thermoplastic rubber.

3.7 height of the upper

Vertical distance between the top surface of the extreme rear edge of the insole and the highest point of the back of the upper.

3.8 insole

Non-removable bottom inside component of the footwear adjacent to the foot.

3.9 lining

Inside layer of the upper which is adjacent to the foot.

3.10 fuel oil

Aliphatic hydrocarbon constituent of petroleum.

4 Requirements

4.1 Sampling and conditioning

The minimum number of samples, i.e separate items of footwear, to be tested in order to check compliance with the requirements specified in clause 4, together with the minimum number of test pieces taken from each sample, shall be as given in table 1.

Wherever possible, test pieces shall be taken from the whole footwear unless otherwise stated.

NOTE. If it is not possible to obtain a large enough test piece from the footwear, then a sample of the material from which the component has been manufactured may be used instead and this should be noted in the test report.

Where samples are required from each of three sizes, these shall comprise the largest, smallest and a middle size of the footwear under test.

All test pieces shall be conditioned in a standard atmosphere of $20\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and $65\% \pm 5\%$ r.h. for a minimum of 48 h before testing, unless otherwise stated in the test method.

The maximum time which shall elapse between removal from the conditioning atmosphere and the start of testing shall be not greater than 10 min, unless otherwise stated in the test method.

Each test piece shall individually satisfy the specified requirement, unless otherwise stated in the test method.

4.2 Design

NOTE. The designs of footwear covered by this standard are illustrated in figure 3.

4.2.1 Height of upper

The height of the upper (h) shall be as given in table 2.

4.2.2 Seat region

The seat region shall be closed.

4.3 Whole footwear

4.3.1 Sole performance

4.3.1.1 Construction

Unless the footwear has a rigid sole, an insole shall be present in such a way that it cannot be removed without damaging the footwear.

4.3.1.2 Upper/outsole bond strength

When footwear, other than that with a rigid sole, is tested in accordance with the method described in 5.1, the bond strength shall be not less than 4,0 N/mm, unless there is tearing of the sole, in which case the bond strength shall be not less than 3,0 N/mm.

4.3.2 Toe protection

4.3.2.1 General

Safety or protective toecaps shall be incorporated in the footwear in such a manner that they cannot be removed without damaging it.

With the exception of all-rubber and all-polymeric footwear, footwear fitted with internal toecaps shall have a vamp lining or an element of the upper that serves as a lining, and in addition the toecaps shall have an edge covering extending from the back edge of the toecap to at least 5 mm beneath it and at least 10 mm in the opposite direction.

Scuff resistant coverings for the toe region shall be not less than 1 mm in thickness.

NOTE. Recommendations for the assessment of toecaps to be used in safety or protective footwear are given in annex A.

Table 1. Minimum number of samples and test specimens or test pieces (concluded)			
Requirement	Clause reference	Number of samples	Number of test pieces from each sample
Upper/outsole and sole interlayer bond strength	4.3.1.2 4.8.7	1 from each of 3 sizes	1
Internal toecap length	4.3.2.2	1 pair from each of 3 sizes	1 pair
Impact resistance	4.3.2.3.1 4.3.2.3.2	1 pair from each of 3 sizes	1 pair
Compression resistance	4.3.2.4.1 4.3.2.4.2	1 pair from each of 3 sizes	1 pair
Corrosion resistance of metal toecaps or metal penetration resistant inserts	4.3.2.5 4.3.3.2.3	2	1
Penetration resistance	4.3.3.1	1 pair from each of 3 sizes	1 pair
Dimensions of penetration resistant inserts	4.3.3.2.2	1 pair from each of 3 sizes	1 pair
Electrical resistance	4.3.4	1 pair from each of 3 sizes	1 pair
Insulation against heat	4.3.5.1	2	1
Insulation against cold	4.3.5.2	2	1
Energy absorption of seat region	4.3.6	1 pair from each of 3 sizes	1 pair
Leakproofness	4.3.7	2	1
Thickness	4.4.1	1 from each of 3 sizes	3
Tear strength	4.4.2 4.5.2 4.6.1 4.8.3	1 from each of 3 sizes	3
Tensile properties	4.4.3	1 from each of 3 sizes	3
Flexing resistance	4.4.4	1 from each of 3 sizes	1
Water penetration and water absorption	4.4.5	1 from each of 3 sizes	1
Water vapour permeability and coefficient	4.4.6 4.5.4	1 from each of 3 sizes	1
pH value	4.4.7 4.5.5 4.6.2 4.7.2	1 from each of 3 sizes	1
Hydrolysis	4.4.8 4.8.6	1 from each of 3 sizes	1
Abrasion resistance of lining	4.5.3	1 from each of 3 sizes	4

Table 1. Minimum number of samples and test specimens or test pieces (concluded)			
Requirement	Clause reference	Number of samples	Number of test pieces from each sample
Thickness of insole	4.7.1	1 from each of 3 sizes	1
Water absorption and desorption of insole	4.7.3	1 from each of 3 sizes	1
Abrasion resistance of insole	4.7.4	1 from each of 3 sizes	1
Thickness of outsole	4.8.1 4.8.2	1 from each of 3 sizes	1
Abrasion resistance of outsole	4.8.4	1 from each of 3 sizes	1
Flexing resistance of outsole	4.8.5	1 from each of 3 sizes	1
Resistance to hot contact	4.8.8	1 from each of 3 sizes	1
Resistance to fuel oil	4.8.9	1 from each of 3 sizes	1

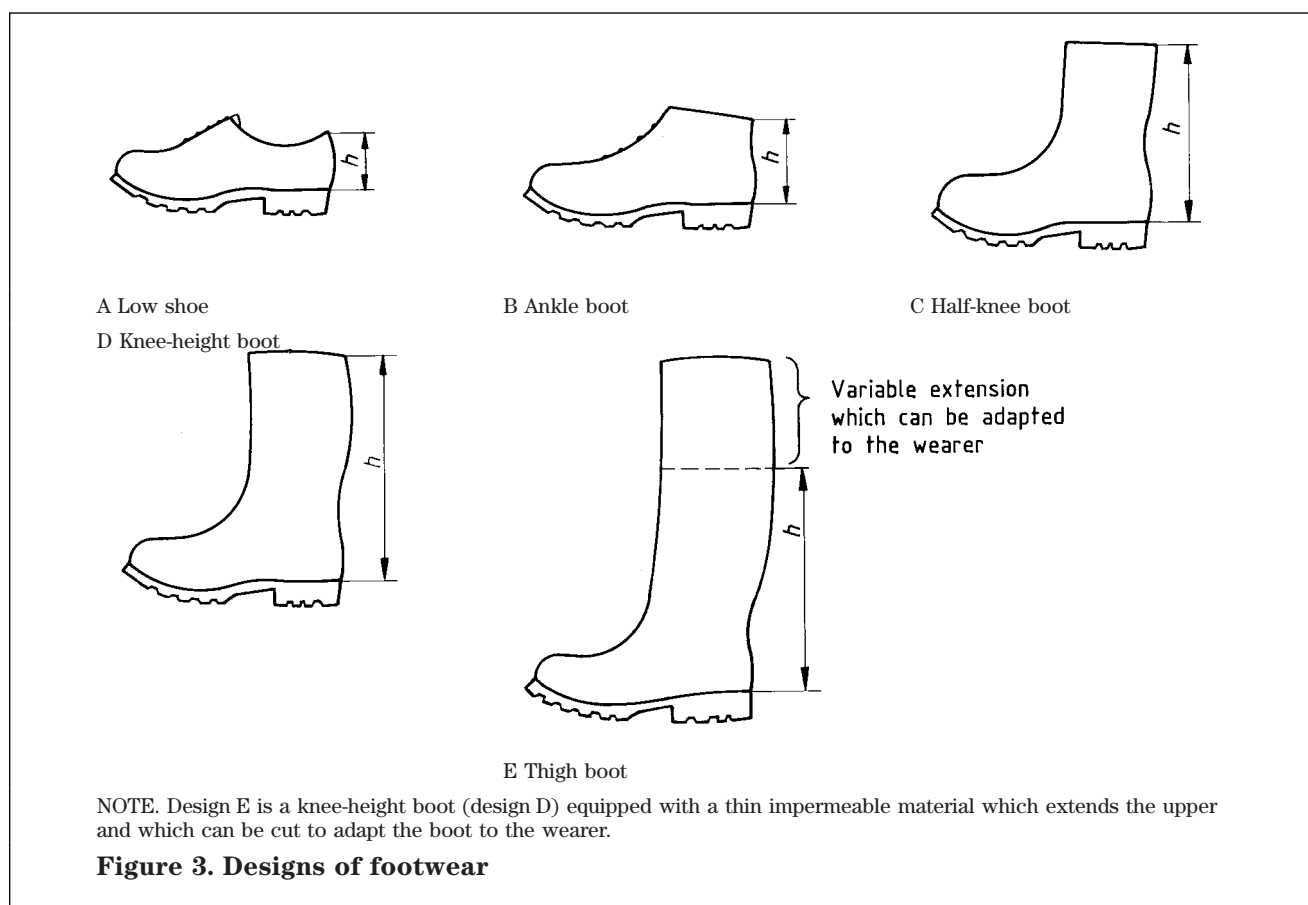


Table 2. Height of upper					
Footwear size		Height, <i>h</i>			
Paris points	English	Design A	Design B	Design C	Design D
		mm	mm min.	mm min.	mm min.
36 and below	3 and below	< 103	103	162	255
37 and 38	4 and 5	< 105	105	165	260
39 and 40	6	< 109	109	172	270
41 and 42	7 and 8	< 113	113	178	280
43 and 44	9 and 10	< 117	117	185	290
45 and above	11 and above	< 121	121	192	300

4.3.2.2 Internal length of toecaps

When measured in accordance with the method described in 5.2, the internal toecap length shall be not less than the appropriate value given in table 3.

Table 3. Minimum internal length of toecaps		
Size of footwear		Minimum internal length mm
Paris points	English	
36 and below	3 and below	34
37 and 38	4 and 5	36
39 and 40	6	38
41 and 42	7 and 8	39
43 and 44	9 and 10	40
45 and above	11 and above	42

4.3.2.3 Impact resistance

4.3.2.3.1 Impact resistance of safety footwear

When safety footwear is tested in accordance with the method described in 5.3 at an energy level of $200 \text{ J} \pm 4 \text{ J}$, the clearance under the toecap at the moment of impact shall be not less than the appropriate value given in table 4. In addition, the toecap shall not develop any cracks on the test axis which go through the material, i.e. through which light can be seen.

Table 4. Minimum clearance under toecaps at impact		
Size of footwear		Minimum clearance mm
Paris points	English	
36 and below	3 and below	12,5
37 and 38	4 and 5	13,0
39 and 40	6	13,5
41 and 42	7 and 8	14,0
43 and 44	9 and 10	14,5
45 and above	11 and above	15,0

4.3.2.3.2 Impact resistance of protective footwear

When protective footwear is tested in accordance with the method described in 5.3 at an energy level of $100 \text{ J} \pm 2 \text{ J}$, the clearance under the toecap at the moment of impact shall be not less than the appropriate value given in table 4. In addition the toecap shall not develop any cracks on the test axis which go through the material, i.e. through which light can be seen.

4.3.2.4 Compression resistance

4.3.2.4.1 Compression resistance of safety footwear

When safety footwear is tested in accordance with the method described in 5.4, the clearance under the toecap at a compression load of $15 \text{ kN} \pm 0,1 \text{ kN}$ shall be not less than the appropriate value given in table 4.

4.3.2.4.2 Compression resistance of protective footwear

When protective footwear is tested in accordance with the method described in 5.4, the clearance under the toecap at a compression load of $10 \text{ kN} \pm 0,1 \text{ kN}$ shall be not less than the appropriate value given in table 4.

4.3.2.5 Corrosion resistance of metal toecaps in all-rubber footwear

When all-rubber footwear is tested and assessed in accordance with the method described in 5.5.1, the metal toecap shall exhibit no more than five areas of corrosion, none of which shall exceed $2,5 \text{ mm}^2$ in area.

When metal toecaps to be used in all other types of footwear are tested and assessed in accordance with the method described in 5.5.2, they shall exhibit no more than five areas of corrosion, none of which shall exceed $2,5 \text{ mm}^2$ in area.

4.3.3 Penetration resistance

4.3.3.1 All penetration resistant footwear

When footwear is tested in accordance with the method described in 5.6 the force required to penetrate the sole unit shall be not less than 1100 N.

4.3.3.2 Additional requirements for footwear which incorporates penetration resistant inserts

NOTE. Recommendations for further tests which may be used to assess the suitability of penetration resistant inserts before they are incorporated in footwear are given in annex B.

4.3.3.2.1 Construction

The penetration resistant insert shall be built into the bottom of the shoe in such a manner that it cannot be removed without damaging the footwear.

The insert shall not lie above the flange of the safety or protective toecap and shall not be attached to it.

4.3.3.2.2 Dimensions

The penetration resistant insert shall be of such a size that with the exception of the heel region, the maximum distance between the line represented by the feather edge of the last and the edge of the insert is 6,5 mm. In the heel region the maximum distance between the line represented by the feather edge of the last and the insert shall be 17 mm. (See figure 4.)

The penetration resistant insert shall have no more than three holes of maximum diameter 3 mm to attach it to the bottom of the footwear. The holes shall not lie in the shaded area shown in figure 4.

4.3.3.2.3 Corrosion resistance of metal penetration resistant inserts in all-rubber footwear

When all rubber footwear is tested and assessed in accordance with the method described in 5.5.1, the metal penetration resistant insert shall exhibit no more than five areas of corrosion, none of which shall exceed 2,5 mm² in area. When metal penetration resistant inserts to be used in all other types of footwear are tested in accordance with the method described in 5.5.3, they shall exhibit no more than five areas of corrosion, none of which shall exceed 2,5 mm² in area.

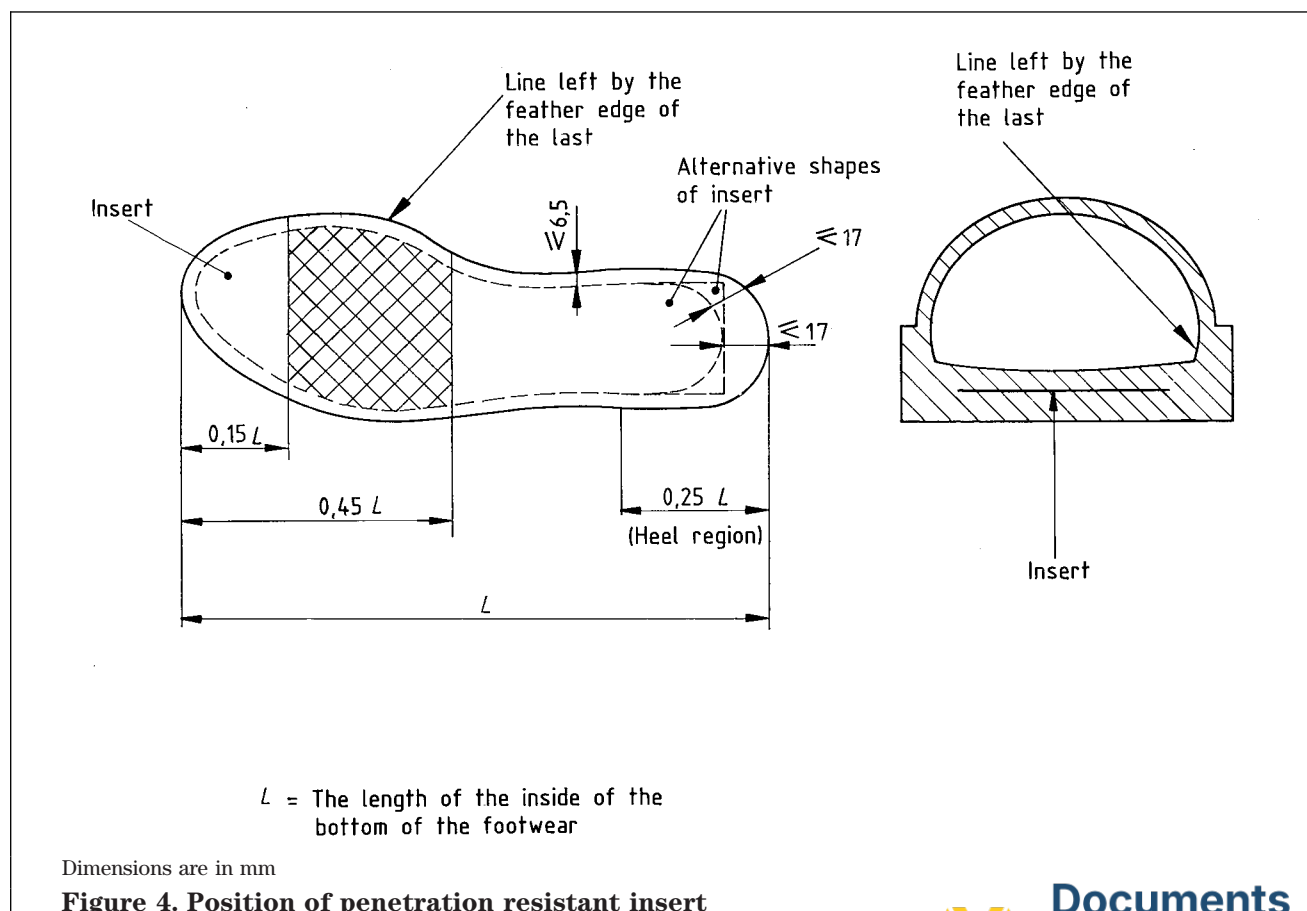
4.3.4 Electrical resistance

4.3.4.1 Conductive footwear

When measured in accordance with the method described in 5.7 after conditioning in a dry atmosphere (5.7.2.3 a)), the electrical resistance shall be not greater than 100 kΩ.

4.3.4.2 Antistatic footwear

When measured in accordance with the method described in 5.7, after conditioning in a dry and wet atmosphere (5.7.2.3 a) and b)), the electrical resistance shall be not less than 100 kΩ and not greater than 1 000 MΩ.



4.3.5 Resistance to inimical environments

4.3.5.1 Heat insulation of sole complex

When footwear is tested in accordance with the method described in 5.8 the temperature increase on the upper surface of the insole shall be not greater than 22 °C.
The insulation shall be incorporated in the footwear in such a manner that it cannot be removed without damaging the bottom of the footwear.

4.3.5.2 Cold insulation of sole complex

When footwear is tested in accordance with the method described in 5.9, the temperature decrease on the upper surface of the insole shall be not more than 10 °C.
The insulation shall be incorporated in the footwear in such a manner that it cannot be removed without damaging the bottom of the footwear.

4.3.6 Energy absorption of seat region

When footwear is tested in accordance with the method described in 5.10 the energy absorption of the seat region shall be not less than 20 J.

4.3.7 Leakproofness

When tested in accordance with the method described in 5.11 there shall be no leakage of air.

4.4 Upper

NOTE 1. The requirements specified for uppers do not apply to the extension of the upper indicated for design E (see figure 3).
NOTE 2. The textile layer in all-rubber and all-polymeric footwear is a part of the upper and should not be removed before testing, except where otherwise indicated in the relevant test method.

4.4.1 Thickness

When determined in accordance with the appropriate method, the thickness of the upper at any point shall be not less than the value given in table 5.
NOTE. The thickness of the upper should include the textile layer.

Table 5. Minimum thickness of upper		
Type of material	Test method	Minimum thickness mm
Rubber	ISO 4648 : 1991*	1,50
Polymeric	ISO 4648 : 1991*	1,00
*Using a thickness gauge with a flat presser foot of 10 mm diameter and a load of 1 N.		

4.4.2 Tear strength

When determined in accordance with the appropriate method, the tear strength of the upper shall be not less than the value given in table 6, with the exception of non-leather uppers required to have particular resistance to animal fats, when the minimum tear strength shall be 30 N.

Table 6. Minimum tear strength of upper		
Type of material	Test method	Minimum force N
Leather	ISO 3377 : 1975	120
Coated fabric and textile	A.2* of ISO 4674 : 1977	60
*Using a rectangular test piece 50 mm × 25 mm with a cut 20 mm long placed centrally and parallel with the longer sides to form a trouser tear test piece. Carry out the test at a constant rate of traverse of 100 mm/min. For knitted and non woven materials, use the largest possible test piece obtainable from the footwear.		

4.4.3 Tensile properties

When determined in accordance with the appropriate method, the tensile properties shall be as given in table 7.

Table 7. Tensile properties			
Type of material	Test method	Tensile property	Value
Leather split	ISO 3376 : 1976*	Tensile strength	15 N/mm ² minimum
Rubber	Annex A of ISO 2023 : 1973	Breaking force	180 N minimum
Polymeric**	ISO 4643 : 1992	Modulus at 100 % elongation	1,3 N/mm ² to 4,6 N/mm ²
		Elongation at break	250 % minimum
*Using the test piece $l = 90$ mm, $b_1 = 25$ mm. ** Remove the textile layer before testing.			