

# INTERNATIONAL STANDARD

**ISO**  
**8782-1**

First edition  
1998-12-15

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## **Safety, protective and occupational footwear for professional use —**

### **Part 1: Requirements and test methods**

**iTeh STANDARD PREVIEW**

*Chaussures de sécurité, de protection et de travail à usage  
professionnel —*

*Partie 1: Exigences et méthodes d'essais*

ISO 8782-1:1998

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ISO 8782-1:1998(E)

Contents	Page
1 Scope .....	1
2 Normative references .....	1
3 Definitions .....	2
4 Requirements .....	3
4.1 Sampling and conditioning.....	3
4.2 Design .....	8
4.3 Whole footwear .....	9
4.4 Upper.....	13
4.5 Lining .....	15
4.6 Tongue.....	15
4.7 Insole.....	16
4.8 Outsole.....	16
5 Test methods.....	19
5.1 Upper/outsole and sole interlayer bond strength.....	19
5.2 Internal toecap length .....	22
5.3 Impact resistance.....	23
5.4 Compression resistance .....	26
5.5 Corrosion resistance .....	28
5.6 Penetration resistance .....	29
5.7 Electrical resistance .....	30
5.8 Insulation against heat.....	31
5.9 Insulation against cold.....	32
5.10 Energy absorption of seat region .....	34

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5.11 Leakproof test .....	35
5.12 Water penetration and water absorption.....	36
5.13 Water vapour permeability and water vapour coefficient.....	38
5.14 Abrasion resistance of lining .....	42
5.15 Water absorption and water desorption of insole.....	45
5.16 Abrasion resistance of insole.....	46
5.17 Flexing resistance of outsole .....	47
5.18 Resistance to hot contact .....	49
5.19 Resistance to fuel oil.....	51
Annex A (normative) Flexing procedure.....	52
Annex B (informative) Recommended methods for the assessment of toecaps to be used in safety or protective footwear .....	54
Annex C (informative) Recommended methods for the assessment of penetration-resistant inserts .....	59
Annex D (informative) Bibliography .....	63

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ISO 8782-1:1998

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 8782-1 was prepared by Technical Committee ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 3, *Foot protection*.

ISO 8782 consists of the following parts, under the general title *Safety, protective and occupational footwear for professional use*:

- Part 1: Requirements and test methods
- Part 2: Specification for safety footwear
- Part 3: Specification for protective footwear
- Part 4: Specification for occupational footwear
- Part 5: Additional requirements and test methods
- Part 6: Additional specifications for safety footwear
- Part 7: Additional specifications for protective footwear
- Part 8: Additional specifications for occupational footwear

Annex A forms an integral part of this part of ISO 8782. Annexes B, C and D are for information only.

# Safety, protective and occupational footwear for professional use —

## Part 1: Requirements and test methods

### 1 Scope

This part of ISO 8782 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 part of ISO 8782 can be used only in conjunction with ISO 8782-2, ISO 8782-3 or ISO 8782-4, which give requirements for footwear relating to specific levels of risk.

### 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 8782. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 8782 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 34-1:1994, *Rubber, vulcanized or thermoplastic — Determination of tear strength — Part 1: Trouser, angle and crescent test pieces.*

ISO 868:1985, *Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness).*

ISO 1817:—<sup>1)</sup>, *Rubber, vulcanized — Determination of the effect of liquids.*

ISO 2023:1994, *Rubber footwear — Lined industrial vulcanized-rubber boots — Specification.*

ISO 3376:1976, *Leather — Determination of tensile strength and elongation.*

ISO 3377:1975, *Leather — Determination of tearing load.*

ISO 4045:1977, *Leather — Determination of pH.*

ISO 4643:1992, *Moulded plastics footwear — Lined or unlined poly(vinyl chloride) boots for general industrial use — Specification.*

ISO 4648:1991, *Rubber, vulcanized or thermoplastic — Determination of dimensions of test pieces and products for test purposes.*

ISO 4649:1985, *Rubber — Determination of abrasion resistance using a rotating cylindrical drum device.*

<sup>1)</sup> To be published. (Revision of ISO 1817:1985)

ISO 4674-1:—<sup>2)</sup>, *Rubber- or plastics-coated fabrics — Determination of tear resistance — Part 1: Constant rate of tear methods.*

ISO 5423:1992, *Moulded plastics footwear — Lined or unlined polyurethane boots for general industrial use — Specification.*

ISO 8782-2:1998, *Safety, protective and occupational footwear for professional use — Part 2: Specification for safety footwear.*

ISO 8782-3:1998, *Safety, protective and occupational footwear for professional use — Part 3: Specification for protective footwear.*

ISO 8782-4:1998, *Safety, protective and occupational footwear for professional use — Part 4: Specification for occupational footwear.*

### 3 Definitions

For the purposes of this part of ISO 8782, the following definitions apply.

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

#### 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

#### 3.4 Leather

NOTE This term covers full-grain leather, corrected-grain leather and leather split.

##### 3.4.1

##### **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

##### 3.4.2

##### **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

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<sup>2)</sup> To be published. (Revision of ISO 4674:1977)

**3.4.3****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, poly(vinyl chloride) 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

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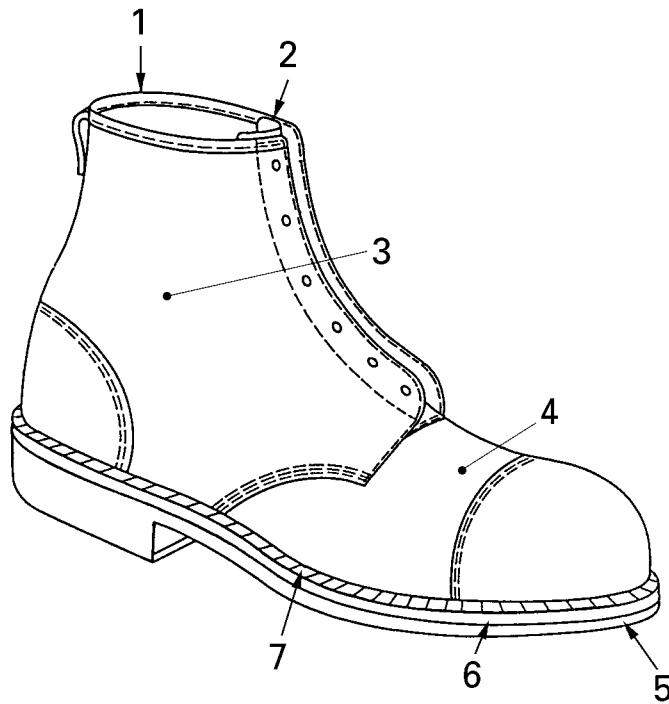
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**4 Requirements****4.1 Sampling and conditioning**

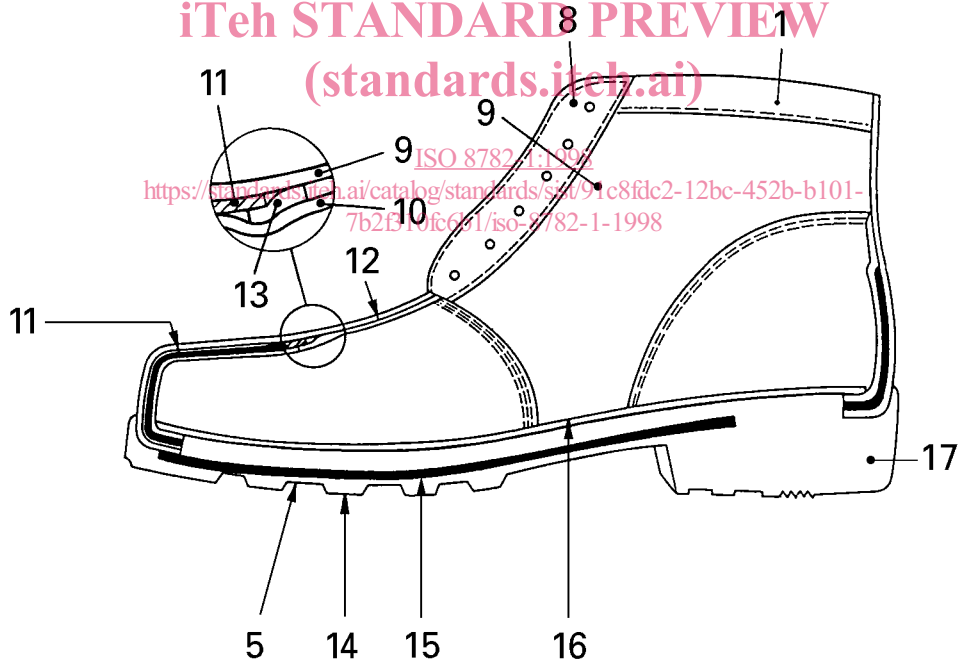
The minimum number of samples (i.e. separate items of footwear) to be tested in order to check compliance with the requirements specified in this clause, together with the minimum number of test pieces taken from each sample, shall be as given in table 1.

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

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



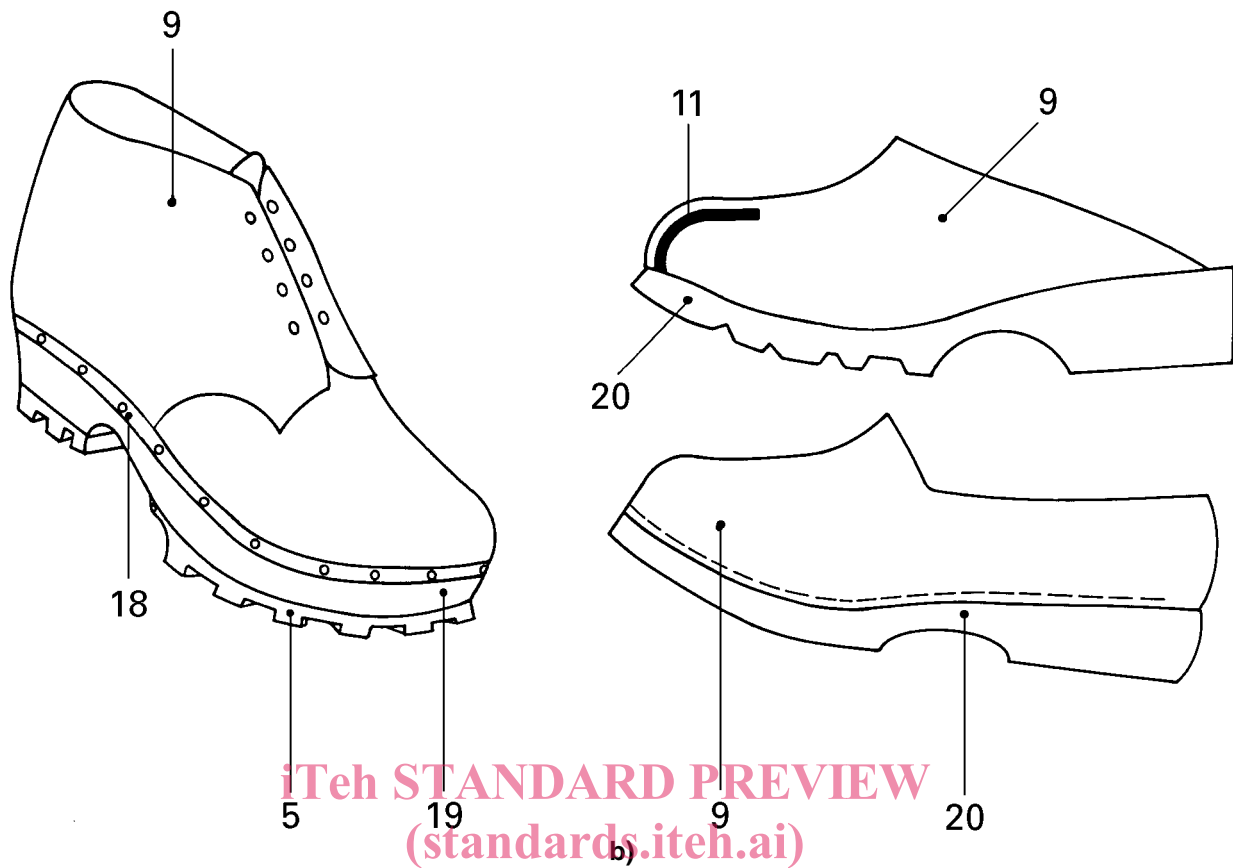
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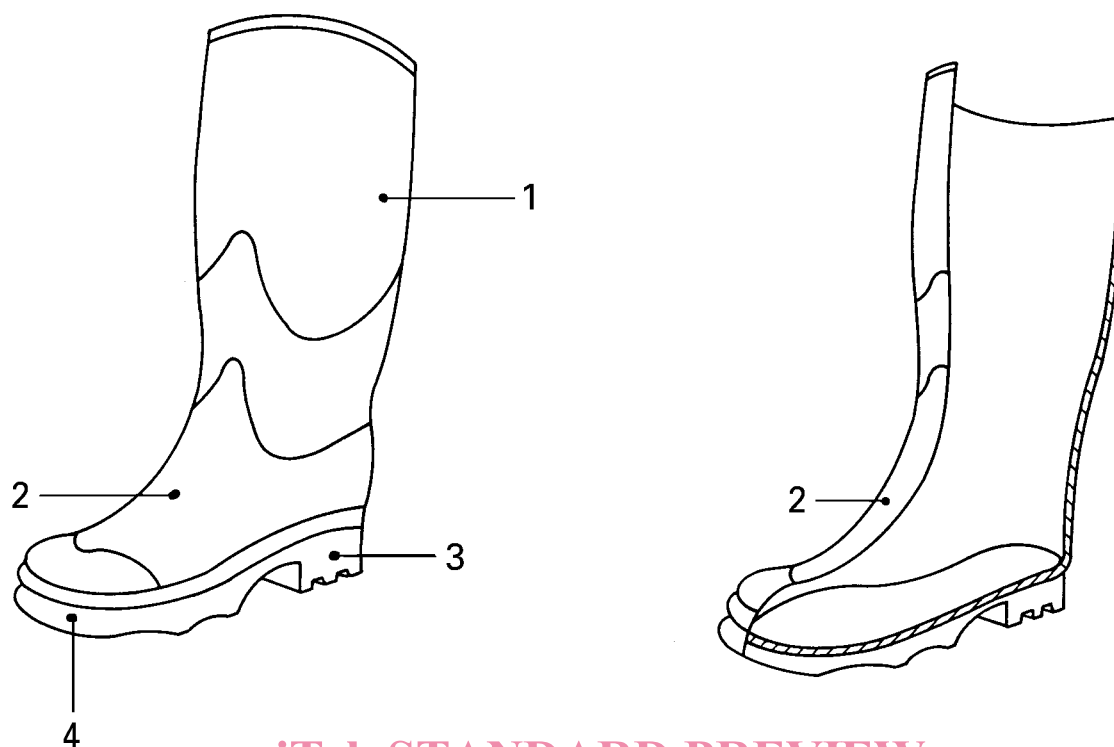




**Key**

- |                |                                 |                                 |
|----------------|---------------------------------|---------------------------------|
| 1 Collar       | 8 Facing                        | 15 Penetration-resistant insert |
| 2 Tongue       | 9 Upper                         | 16 Insole                       |
| 3 Quarter      | 10 Lining                       | 17 Heel                         |
| 4 Vamp         | 11 Safety or protective toe cap | 18 Reinforcing welt with nails  |
| 5 Outsole      | 12 Vamp lining                  | 19 Wooden sole                  |
| 6 Through sole | 13 Foam strip                   | 20 Rigid sole                   |
| 7 Feather line | 14 Cleat                        |                                 |

**Figure 1 — Parts of footwear**



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**Key**

- 1 Upper
- 2 Vamp
- 3 Heel
- 4 Outsole

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

Table 1 — Minimum number of samples and test pieces

Requirement	Subclause	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
Leakproof footwear	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 water vapour 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

Table 1 (concluded)

Requirement	Subclause	Number of samples	Number of test pieces from each sample
Abrasion resistance of lining	4.5.3	1 from each of 3 sizes	4
Thickness of insole	4.7.1	1 from each of 3 sizes	1
Water absorption and water 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

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## 4.2 Design

NOTE The designs of footwear covered by this part of ISO 8742 are illustrated in figure 3.

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### 4.2.1 Height of upper

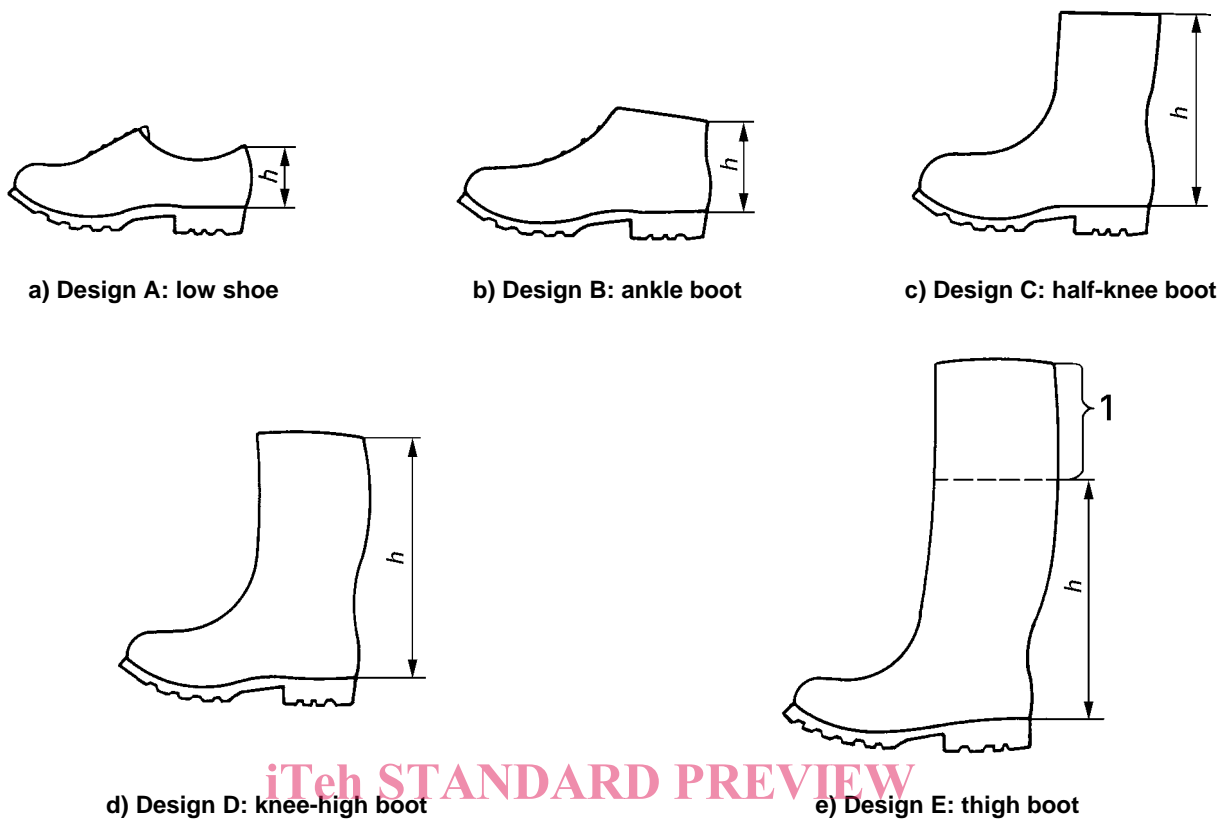
The height of the upper ( $h$ ) shall be as given in table 2.

Table 2 — Height of upper

Size of footwear			Height $h$			
Mondopoint	Paris points	English	Design A mm	Design B min. mm	Design C min. mm	Design D min. mm
225 and below	36 and below	3 and below	< 103	103	162	255
230 to 240	37 and 38	4 and 5	< 105	105	165	260
245 to 250	39 and 40	6	< 109	109	172	270
255 to 265	41 and 42	7 and 8	< 113	113	178	280
270 to 280	43 and 44	9 and 10	< 117	117	185	290
285 and above	45 and above	11 and above	< 121	121	192	300

### 4.2.2 Seat region

The seat region shall be closed.



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#### Key

1 Variable extension which can be adapted to the wearer

NOTE Design E is a knee-height boot (design D) equipped with a thin, impermeable material which extends the upper and which can be cut to adapt the boot to the wearer.

Figure 3 — Designs of footwear

### 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 given in 5.1, the bond strength shall be no less than 4,0 N/mm, unless there is tearing of the sole, in which case the bond strength shall be no 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 no less than 1 mm in thickness.

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

#### 4.3.2.2 Internal length of toecaps

When measured in accordance with the method given in 5.2, the internal toecap length shall be no less than the appropriate value given in table 3.

Table 3 — Minimum internal length of toecaps

Size of footwear			Minimum internal length mm
Mondopoint	Paris points	English	
225 and below	36 and below	3 and below	34
230 to 240	37 and 38	4 and 5	36
245 to 250	39 and 40	6	38
255 to 265	41 and 42	7 and 8	39
270 to 280	43 and 44	9 and 10	40
285 and above	45 and above	11 and above	42

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#### 4.3.2.3 Impact resistance

##### 4.3.2.3.1 Impact resistance of safety footwear [ISO 8782-1:1998](#)

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When safety footwear is tested in accordance with the method given in 5.3 at an energy level of  $(200 \pm 4)$  J, the clearance under the toecap at the moment of impact shall be no 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.

##### 4.3.2.3.2 Impact resistance of protective footwear

When protective footwear is tested in accordance with the method given in 5.3 at an energy level of  $(100 \pm 2)$  J, the clearance under the toecap at the moment of impact shall be no 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
Mondopoint	Paris points	English	
225 and below	36 and below	3 and below	12,5
230 to 240	37 and 38	4 and 5	13,0
245 to 250	39 and 40	6	13,5
255 to 265	41 and 42	7 and 8	14,0
270 to 280	43 and 44	9 and 10	14,5
285 and above	45 and above	11 and above	15,0

#### 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 given in 5.4, the clearance under the toecap at a compression load of  $(15 \pm 0,1)$  kN shall be no 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 given in 5.4, the clearance under the toecap at a compression load of  $(10 \pm 0,1)$  kN shall be no less than the appropriate value given in table 4.

#### 4.3.2.5 Corrosion resistance of metal toecaps

When all-rubber footwear is tested and assessed in accordance with the method given 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 given 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 given in 5.6, the force required to penetrate the sole unit shall be no less than 1 100 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 for information only in annex C.

##### 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

With the exception of the heel region, the penetration-resistant insert shall be of such a size that 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

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

In all other types of footwear, when metal penetration-resistant inserts are to be used, they shall be tested in accordance with the method given in 5.5.3. They shall exhibit no more than five areas of corrosion, none of which shall exceed  $2,5 \text{ mm}^2$  in area.