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Personal protective equipment — Safety footwear

Équipement de protection individuelle — Chaussures de sécurité

ICS: 13.340.50

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

ISO 20345 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 161, *Foot and leg protectors*, in collaboration with Technical Committee ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 3, *Foot protection*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 20345:2011), which has been technically revised.

Changes between this edition and the 2011 version are as follows:

— revision of terms (3.);

— Figure 1 to Figure 4 revised;

— Table 1, Table 2 and Table 3 revised;

— heel area defined (5.2.3);

— toe protection, depending on ISO 22568-1 and ISO 22568-2, exchanging EN 12568:2010;

— requirement on slip resistance revised (5.3.5 and 6.2.10); marking “SR” introduced;

— requirement for seam strength of hybrid footwear added (5.3.7);

— requirement for upper materials not fulfilling WVP explained (5.4.6);

— abrasion of insoles revised (5.7.5);

— outsole requirements revised (5.8);

— outsole thickness revised (5.8.1.1);

— flexing resistance of outsole clarified (5.8.4);

— perforation resistant insert, depending on ISO 22568-3 and ISO 22568-4, exchanging EN 12568:2010;

— tolerance added (6.2.3.1);

— former Annex A Hybrid Footwear included in the general text (Table 2, 6.2.5.2, Table 16);

— optional requirement of metatarsal protection revised (6.2.6);

— optional requirement on ankle protection clarified (6.2.7);

— optional requirement for “SC” scuff caps added (6.2.9);

— optional requirement for “LG” Ladder grip of outsoles added (6.4.3);

— marking revised (Table 16 and Table 21);

— information on obsolescence date added (8.5);

— normative Annex A with requirements for customized safety footwear added;

— informative Annex B assessment of the footwear by the wearer added;

— informative Annex C Slip resistance added;

— requirement for electrically insulating footwear (EN 50321) deleted;

— Annex ZA revised.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Personal protective equipment — Safety footwear

1 Scope

This International Standard specifies basic and additional (optional) requirements for safety footwear used for general purpose. It includes, for example, mechanical risks, slip resistance, thermal risks, ergonomic behaviour. It also specifies requirements for orthopaedic customized or individual manufactured orthopaedic safety footwear. This standard does not cover the property of high visibility because of interaction with the clothing (e.g. trousers cover the footwear) and work area conditions (e.g. dirt, mud).

Special risks are covered by complementary job-related standards (e.g. footwear for firefighters, electrical insulating footwear, protection against chain saw injuries, protection against chemicals and molten metal splash, protection for motorcycle riders).

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 20344:2021, *Personal protective equipment — Test methods for footwear*

ISO 22568-1:2019, *Foot and leg protectors — Requirements and test methods for footwear components — Part 1: Metallic toecaps*

ISO 22568-2:2019, *Foot and leg protectors — Requirements and test methods for footwear component — Part 2: Non-metallic toecaps*

ISO 22568-3:2019, *Foot and leg protectors — Requirements and test methods for footwear components — Part 3: Metallic perforation resistant inserts*

ISO 22568-4:2019, *Foot and leg protectors — Requirements and test methods for footwear components — Part 4: Non-metallic perforation resistant inserts*

ISO 21064:2017, *Prosthetics and orthotics — Foot orthotics — Uses, functions classification and description*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

Note 1 to entry The component parts of footwear are illustrated in Figure 1, Figure 2 and Figure 3.

Note 2 to entry Further terms and definitions can be found in ISO 19952:2005.

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/

3.1
safety footwear
footwear incorporating safety features to protect the wearer from injuries that could arise through accidents

Note 1 to entry: Items of safety footwear are fitted with toecaps designed to give protection against impact of at least 200 J and against compression at least 15 kN.

3.2
upper
part or parts of a footwear that cover the toes, the top of the foot, the sides of the foot, and optionally the back of the heel; it is attached to the outsole of a footwear

3.3
leather
hide or skin tanned to be imperishable

3.3.1
leather split
flesh or middle part of a hide or skin, obtained by splitting a thick leather, which is tanned to be imperishable

3.4
rubber
vulcanized elastomers

3.5
polymeric materials
large molecules composed of repeating structural units (monomers) typically connected by chemical bond

EXAMPLE Polyurethane (PU) or polyvinylchloride (PVC).

3.6
insole
non-removable component used to form the base of the shoe to which the upper is usually attached during lasting

3.7
insock
removable or non-removable footwear component used to cover completely the insole

3.7.1
seat sock
removable or non-removable footwear component used to cover the insole in the heel area footbed

3.7.2
footbed
removable or non-removable footwear component used to cover completely the insole; shaped according to the sole of the foot

Note 1 to entry: “Non-removable” means that the component cannot be removed without any damage.

Note 2 to entry: “Removable” means, that the component can be removed, but it must be placed in the footwear while wearing to maintain all safety features.

3.8
lining
material covering the inner surface of the upper

Note 1 to entry: The wearer’s foot is in direct contact with the lining.

Note 2 to entry: Where an upper is split at the forepart to house the toecap, or if an external piece of material is stitched to the upper to form a pocket to house the toecap, the material under the toecap acts as a lining.

3.9
cleat
protruding part of the outer surface of the outsole

3.10
rigid outsole
outsole, which cannot be bent through an angle of 45° under a load of 30 N

3.11
perforation-resistant insert
Component, placed in the outsole complex or used as an insole simultaneously in order to provide protection against perforation

3.12
safety toecap
component, placed in the footwear to protect the toes of the wearer from impacts and compression

3.13
scuff caps
abrasion resistant material or component to protect against scuff of the upper external toe region

3.14
heel area
counter (stiffener) area, rear part of the footwear

3.15
dissipative footwear
footwear with low resistance between the wearer and the ground, able to dissipate some static electricity

3.16
antistatic footwear
Footwear maintaining some resistance between the wearer and the ground, able to dissipate some static electricity

3.17
fuel oil
aliphatic hydrocarbon constituent of petroleum

3.18
specific job-related footwear
safety footwear relating to a specific profession

EXAMPLE Footwear for firefighters; footwear with resistance to chain saw cutting.

3.19
customized safety footwear
(adapted to fit an individual user or a single unit to fit an individual user)
covering all individual orthotic footwear according to ISO 21064:2017, 3.2 and other specific conditions of a foot. They integrate in their design the recipient's own physiognomy and the specific arrangements aimed at modifying, correcting, compensating, curing, preventing, relieving a pathology, e.g. overweight, diabetes, hyperhidrosis …

Several types of customized safety footwear and footwear adaptions exist:

Type 1 – equipped with customized insocks

Safety footwear (complying ISO 20345:2021) incorporating a customized insocks adapted to the wearers needs.

Type 2 – modified safety footwear

Safety footwear (complying ISO 20345: 2021) modified from its original construction to fit to an individual user.

See examples in ISO 21064:2017, 6.4.

Type 3 – Bespoke safety footwear

Safety footwear (complying ISO 20345: 2021) constructed as a single unit to fit an individual user.

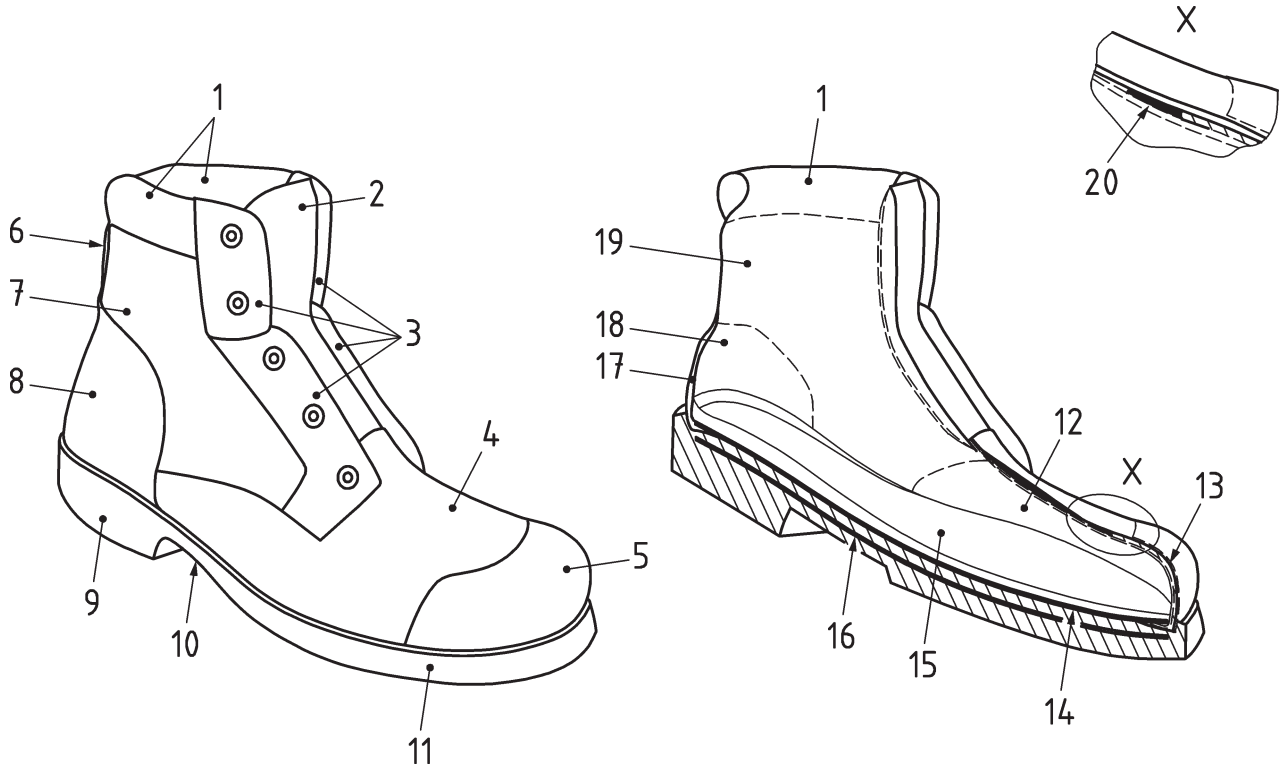
See examples in ISO 21064:2017, 6.3.2 and 6.3.3.

3.20
Hybrid footwear
a product with a vulcanized rubber or moulded polymeric lower foot section to the upper with a leather and/or fabric leg shaft. Hybrid footwear does not fully meet the classifications I or II as described in Clause 4.

Two Hybrid footwear product types exist:

Hybrid "moulded" footwear – with a vulcanized rubber or all moulded polymeric foot section integrally moulded around the toecap and often including the outsole. The foot area of this product type is unlined and usually does not incorporate an insole.

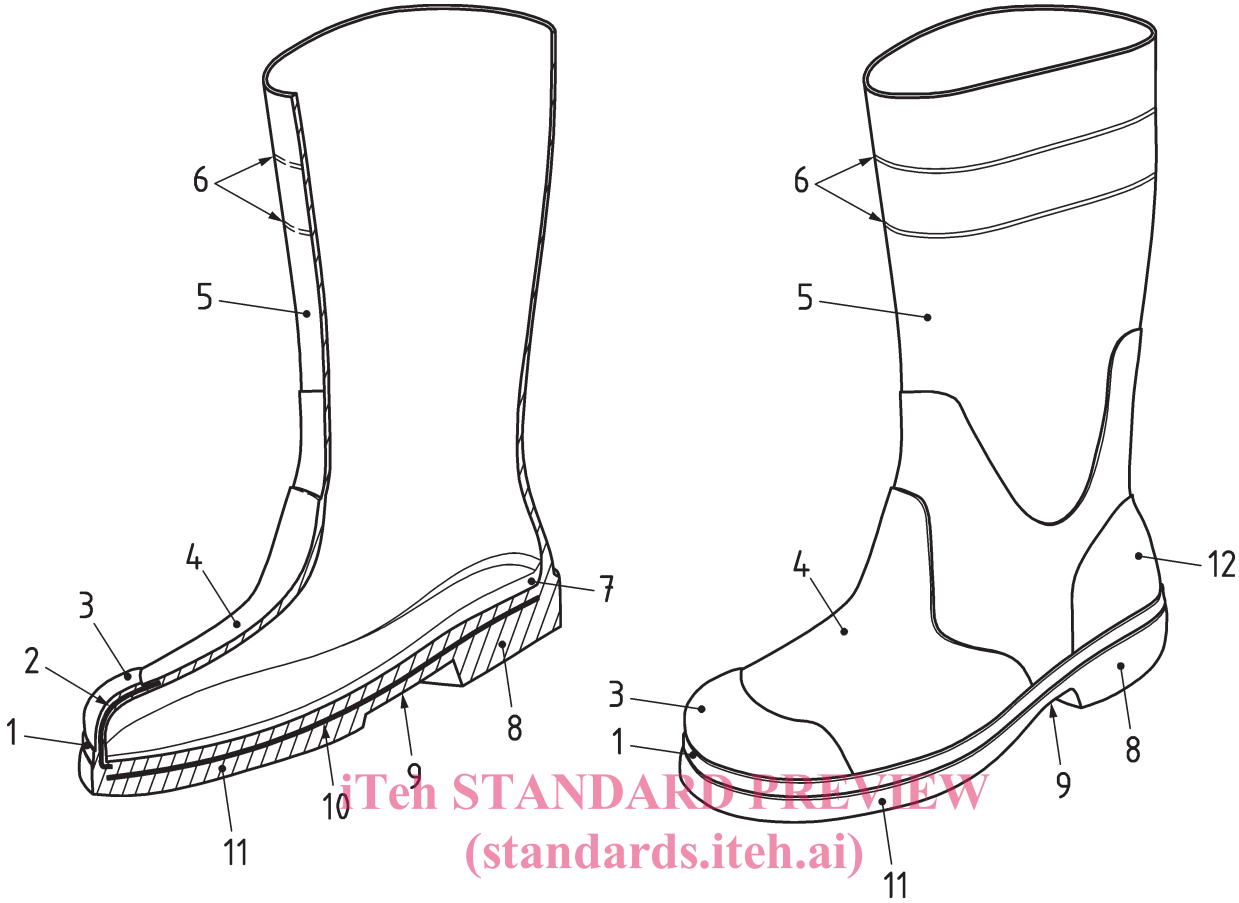
Hybrid "constructed" footwear – with a foot section of vulcanized rubber or all moulded polymeric that is manufactured separately and then constructed around a conventionally lasted lining/insole construction and often with a separately attached outsole.



Key

1	collar	11	outsole – forepart
2	tongue	12	vamp lining
3	facing	13	safety toecap
4	upper – vamp	14	insole board
5	scuff cap	15	insock/seat sock/footbed
6	back strap	16	perforation-resistant insert
7	upper – quarter	17	counter stiffener
8	upper – counter	18	counter lining
9	outsole – heel	19	quarter lining
10	outsole – waist	20	toecap back edge covering

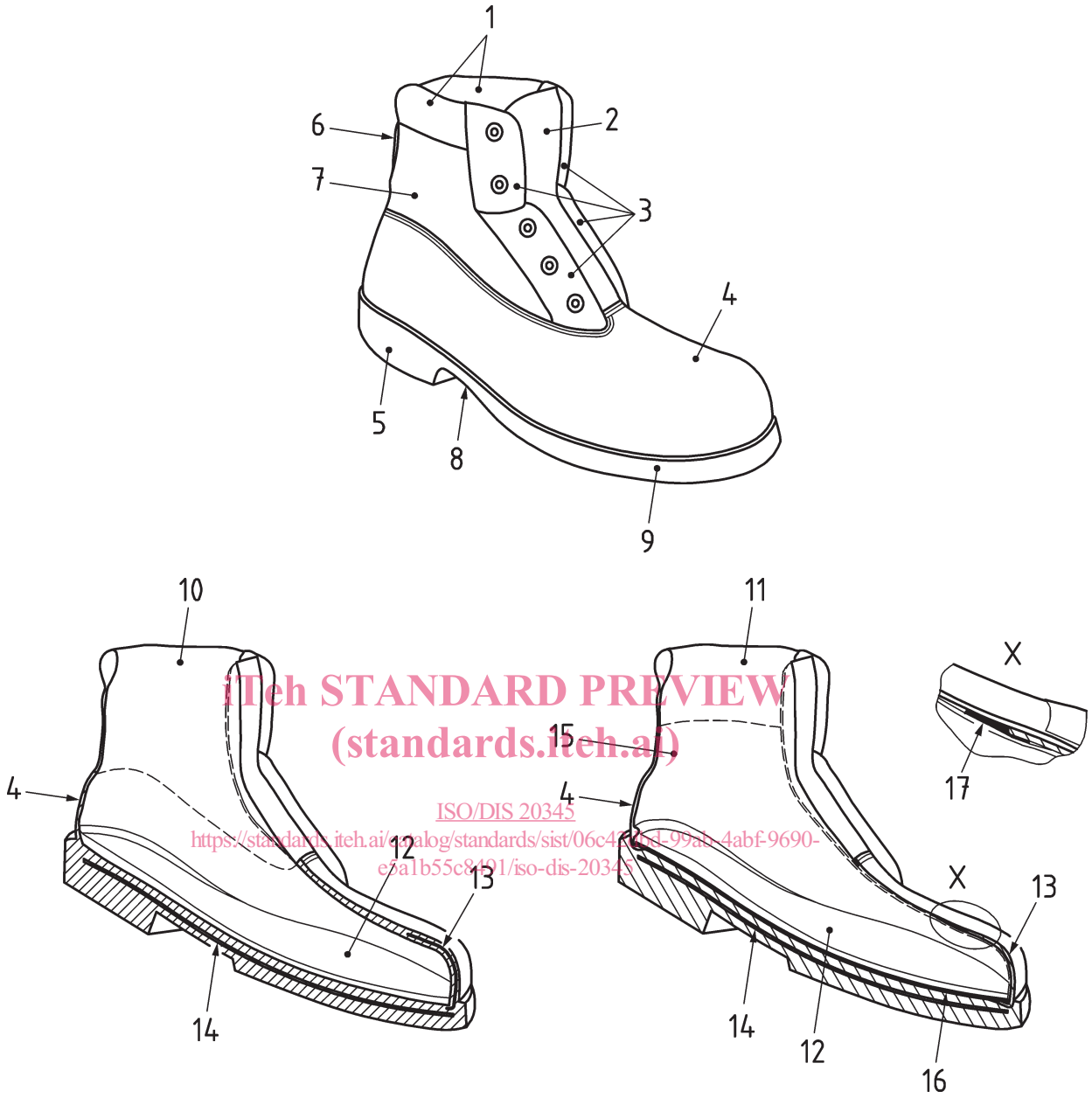
Figure 1 — Example parts of class I safety footwear



Key

1	Foxing strip	7	Insock/seat sock/Footbed
2	Safety toecap	8	Outsole – Heel
3	Scuff cap	9	Outsole – Waste
4	Upper – vamp	10	Perforation resistant insert
5	Upper – Shaft	11	Outsole – Forepart
6	Trim marks	12	Upper – counter

Figure 2 — Example parts of class II safety footwear



Hybrid moulded (Entirely moulded lower section)Hybrid constructed (seperately attached sole unit)

Key

1	Collar	10	lining
2	Tongue	11	Collar lining
3	Facings	12	insock/seat sock/footbed
4	Moulded rubber or polymeric upper part	13	safety toecap
5	Outsole – Heel	14	Perforation resistant insert
6	backstrap	15	Foot section lining
7	Upper leather or fabric section	16	insole board
8	Outsole – Waist	17	Toecap back edge covering
9	Outsole – forepart		

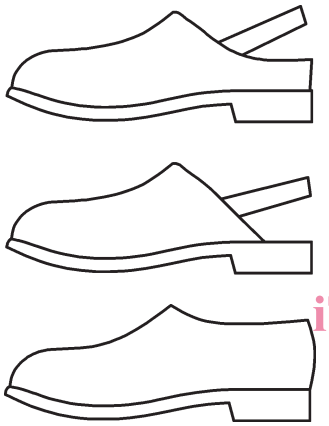
Figure 3 — Example parts of hybrid safety footwear

4 Classification and designs

Safety footwear shall be classified in accordance with Table 1. Designs of footwear illustrated in Figure 4.

Table 1 — Classification of safety footwear

Classification	Description
Class I	made from leather and other materials, excluding all-rubber or all-polymeric footwear (see Figure 1)
Class II	All-rubber (i.e. entirely vulcanized) or all-polymeric (i.e. entirely moulded) footwear (see Figure 2)
Hybrid footwear	See 3.20 (see Figure 3)

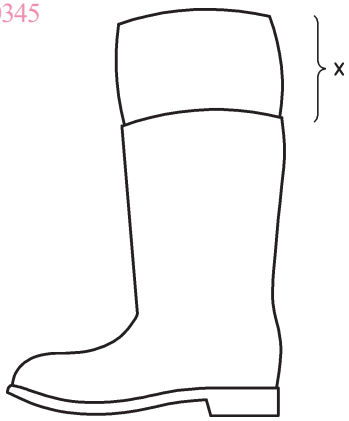


Design A – LOW SHOE

Design B – ANKLE BOOT

Design C – HALF KNEE BOOT

Design D – KNEE BOOT



Design E – THIGH BOOT

Key

× Variable extension which can be adapted to the wearer.

NOTE Design E of class I and II safety footwear can be a knee-height boot (design D) equipped with a thin impermeable material which extends the upper which can be cut to adapt the boot height to the wearer. This design does not constitute hybrid footwear.

Figure 4 — Example designs of safety footwear

5 Basic requirements for safety footwear

5.1 General

Safety footwear class I, class II and hybrid footwear (depending on production method) shall conform to the basic requirements given in table 2. Customized safety footwear (3.19) shall conform the requirements given in Table 2 Annex A depending on the type of customization.

NOTE Footwear sizes are defined in ISO 20344:2021, Annex B.

Table 2 — Basic requirements for safety footwear

Requirement		Clause of this standard	Classification			
			Class I	Class II	Hybrid	
					constructed	moulded
Design	Height of upper	5.2.2	X	X	X	X
	Heel area (design A)	5.2.3	o	o		
	Heel area (design B, C, D, E)	5.2.3	X	X	X	X
Whole footwear	Manufacturing performance:	5.3.1				
	— Construction	5.3.1.1	X		X	
	— Upper/outsole bond strength	5.3.1.2	X		X	
	Toe protection:	5.3.2				
	— General	5.3.2.1	X	X	X	X
	— Internal length	5.3.2.2	X	X	X	X
	— Width of flange	5.3.2.3	X	X	X	X
	— corrosion resistance	5.3.2.4	X	X	X	X
	— Behaviour of toecaps	5.3.2.5	X	X	X	X
	— Impact resistance	5.3.2.6	X	X	X	X
	— Compression resistance	5.3.2.7	X	X	X	X
	Leakproofness	5.3.3		X		
	Specific ergonomic features	5.3.4	X	X	X	X
	Slip resistance	5.3.5.2	X	X	X	X
	Innocuousness	5.3.6	X	X	X	X
	Seam Strength	5.3.7			X	X
	Water resistance	6.2.5.			X	X

NOTE 1 The applicability of a requirement to a particular property is indicated by X or o.

X means the requirement shall be met. In some cases, the requirement relates only to single materials within the classification, e.g. pH value of leather components. This does not mean that other materials are precluded from use.

o means, that if the component part exists, the requirement shall be met.

The absence of X or o indicates that there is no requirement.

NOTE 2 For class II and hybrid moulded footwear, usually no insole is present. However, if a removable insock is used, Table 3 is applicable.

NOTE 3 For class II footwear and hybrid moulded footwear stockings, covering the last before the moulding process, are not considered a lining.

[a] footbeds are treated like insocks