



FINAL DRAFT International Standard

ISO/FDIS 11999-6

PPE for firefighters — Test methods and requirements for PPE used by firefighters who are at risk of exposure to high levels of heat and/or flame while fighting fires occurring in structures —

Part 6: Footwear

*Équipement de protection personnelle pour pompiers —
Méthodes d'essai et exigences pour les équipements de protection
personnelle utilisés par les pompiers qui sont à risque d'une
exposition à des niveaux élevés de chaleur et/ou de flamme quand
la lutte contre les incendies survient dans les structures —*

Partie 6: Chaussures

ISO/TC 94/SC 14

Secretariat: SA

Voting begins on:
2024-05-21

Voting terminates on:
2024-07-16

[ISO/FDIS 11999-6](#)

[https://standards.iteh.ai/standards/128b4-a548-4d53-9c8e-acb38f36cc22/iso-fdis-11999-6](#)

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[ISO/FDIS 11999-6](https://standards.iteh.ai/catalog/standards/iso/736428b4-a548-4d53-9c8e-acb38f36cc22/iso-fdis-11999-6)

<https://standards.iteh.ai/catalog/standards/iso/736428b4-a548-4d53-9c8e-acb38f36cc22/iso-fdis-11999-6>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2024

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Classification, design and performance level	2
4.1 Classification.....	2
4.2 Design.....	2
4.3 Innocuousness.....	3
4.4 Sizing.....	3
5 Sampling and conditioning	3
5.1 Sampling.....	3
5.2 Conditioning.....	3
6 Requirements	4
6.1 General requirement.....	4
6.2 Thermal behaviour.....	7
6.2.1 Insulation against heat.....	7
6.2.2 Radiant heat.....	7
6.2.3 Flame resistance.....	8
6.3 Resistance to chemicals.....	8
6.3.1 Degradation resistance.....	8
6.3.2 Permeation resistance.....	8
6.3.3 Resistance to limited contact with chemicals.....	8
6.4 Electrical properties.....	8
6.4.1 General.....	8
6.4.2 Electrically insulating footwear.....	8
6.4.3 Antistatic footwear.....	9
6.5 Water resistance.....	9
6.6 Outsole.....	9
6.6.1 Cleat design.....	9
6.6.2 Cleat height.....	9
6.6.3 Cleat height in the waist area.....	9
6.6.4 Heel breast.....	9
6.7 Zipper (slide fastener).....	10
6.7.1 Zipper construction.....	10
6.7.2 Zipper puller attachment strength.....	10
6.7.3 Zipper lateral strength.....	10
7 Test methods	10
7.1 Insulation against heat.....	10
7.2 Radiant heat.....	10
7.3 Flame resistance test.....	11
7.3.1 Conditioning and sampling.....	11
7.3.2 Procedure.....	11
7.4 Zipper.....	12
7.4.1 Puller attachment strength.....	12
7.4.2 Lateral strength.....	12
8 Marking	13
9 Information to be supplied	14
9.1 General.....	14
9.2 Antistatic footwear.....	15
9.3 Electrically insulating footwear.....	16
9.4 Insocks.....	16
9.5 Information regarding perforation resistant insert.....	16

ISO/FDIS 11999-6:2024(en)

Annex A (normative) Assessment of the footwear by the laboratory during testing for resistance to heat and flame	18
Annex B (informative) Assessment of the footwear by the wearer	20
Annex C (Normative) Assessment of the performance of the footwear	22
Annex D (informative) Slip resistance	23
Bibliography	26

iTeh Standards (<https://standards.iteh.ai>) Document Preview

[ISO/FDIS 11999-6](https://standards.iteh.ai/catalog/standards/iso/736428b4-a548-4d53-9c8e-acb38f36cc22/iso-fdis-11999-6)

<https://standards.iteh.ai/catalog/standards/iso/736428b4-a548-4d53-9c8e-acb38f36cc22/iso-fdis-11999-6>

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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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.

This document was prepared by Technical Committee ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 14, *Firefighters' personal equipment*.

This second edition of ISO 11999-6 cancels and replaces the first edition (ISO 11999-6:2016), which has been technically revised.

The main changes are as follows:

- Level A1 and A2 deleted to provide a single level of performance;
- insertion of updated ISO 20345:2021/Amd 1:2024 references;
- references to ISO 20344:2011 and ISO 20345:2011 have been deleted;
- chemical resistant footwear requirements and method updated.
- flame resistance requirements and method updated.
- insulation against Heat requirements updated.
- [Tables 2](#) and [3](#) have been updated.

A list of all parts in the ISO 11999 series can be found on the ISO website. 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.

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.

PPE for firefighters — Test methods and requirements for PPE used by firefighters who are at risk of exposure to high levels of heat and/or flame while fighting fires occurring in structures —

Part 6: Footwear

1 Scope

This document specifies the minimum design and performance requirements for footwear as part of personal protective equipment [PPE] to be used by firefighters, primarily but not solely to protect against flame and high thermal loads while fighting fires occurring in structures.

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

ISO 6942:2022, *Protective clothing — Protection against heat and fire — Method of test: Evaluation of materials and material assemblies when exposed to a source of radiant heat*

ISO 15025, *Protective clothing — Protection against flame — Method of test for limited flame spread*

ISO 11999-1, *PPE for firefighters — Test methods and requirements for PPE used by firefighters who are at risk of exposure to high levels of heat and/or flame while fighting fires occurring in structures — Part 1: General*

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

ISO 20344:2021/Amd 1:2024, *Personal protective equipment — Test methods for footwear — Amendment 1*

ISO 20345:2021, *Personal protective equipment — Safety footwear*

ISO 20345:2021/Amd 1:2024, *Personal protective equipment — Safety footwear — Amendment 1*

EN 13832-1:2018, *Footwear protecting against chemicals — Part 1: Terminology and test methods*

EN 13832-3:2018, *Footwear protecting against chemicals — Part 3: Requirements for footwear highly resistant to chemicals under laboratory conditions*

ISO 13994, *Clothing for protection against liquid chemicals — Determination of the resistance of protective clothing materials to penetration by liquids under pressure*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20344, ISO 11999-1 and EN 13832-1 apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

4 Classification, design and performance level

4.1 Classification

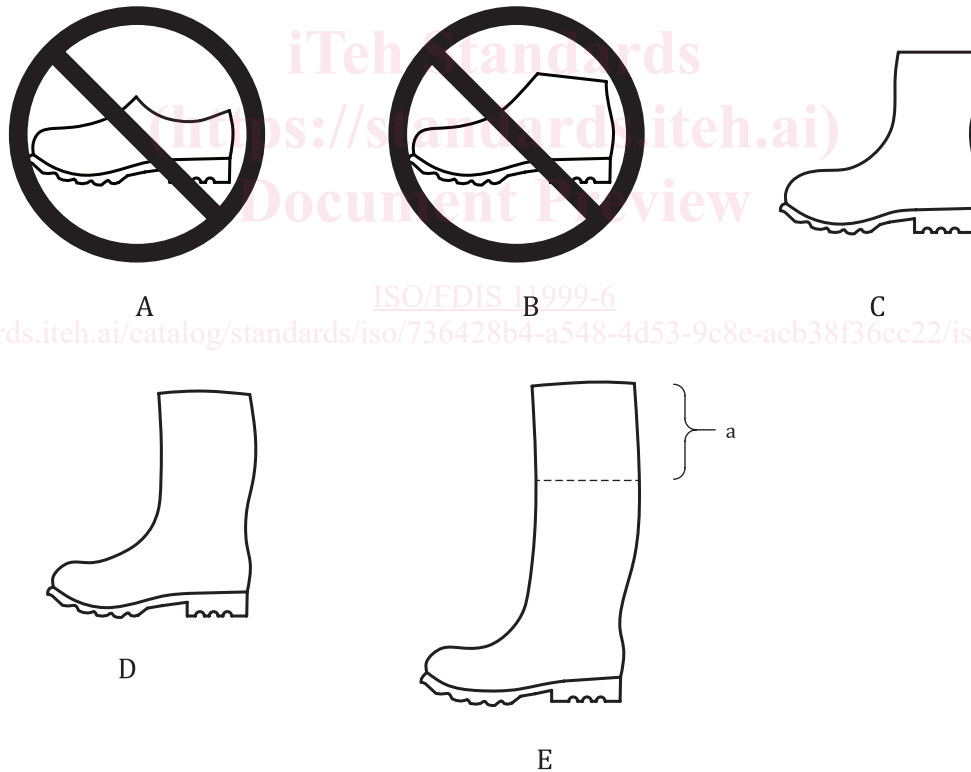
Footwear shall be classified in accordance with [Table 1](#).

Table 1 — Classification of footwear

Classification	Description
Class I	Footwear made from leather and other materials, excluding all-rubber or all-polymeric footwear
Class II	All-polymeric (i.e. entirely moulded) including all-rubber (i.e. entirely vulcanized) foot-wear

4.2 Design

Footwear shall conform to one of the designs C to E given in [Figure 1](#).



Key

- A low shoe
- B ankle boot
- C half-knee boot

- D knee-height boot
- E thigh boot
- ^a Variable extension which can be adapted to the wearer.

NOTE Design E can be 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 1 — Design of footwear

4.3 Innocuousness

Refer to ISO 20345:2021 + ISO 20345:2021/Amd 1:2024, 5.3.6.

4.4 Sizing

Manufacturers shall develop a sizing range of footwear based on anthropometric data.

5 Sampling and conditioning

5.1 Sampling

The minimum number of samples shall be that specified in ISO 20344:2021 + ISO 20344:2021/Amd 1:2024, Clause 4, together with the minimum number of test pieces taken from each sample, as given in [Table 1](#), unless otherwise stated within this standard.

Wherever possible, test pieces shall be taken from the whole footwear unless otherwise stated in this document or in ISO 20344.

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

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

5.2 Conditioning

All test pieces shall be conditioned in a standard atmosphere of (23 ± 2) °C and (50 ± 5) % relative humidity for a minimum of 24 hours 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 specific requirement, unless otherwise stated in the test method.

The uncertainty of measurement for each test method described in the present standard can be assessed. One of the following approaches should be used:

- a statistical method, e.g. as given in ISO 5725-2;
- a mathematical method, e.g. as given in ISO/IEC Guide 98-1;
- Uncertainty and conformity assessments given in ISO/IEC Guide 98-4;
- JCGM 100:2008.

Table 2 — Minimum number of samples and test pieces

Property to be determined ^a	Reference	Number of samples	Number of test pieces from each sample	Test only on the final footwear
Insulation against heat	6.2.1	one pair	See 7.1	Yes
Radiant heat	6.2.2	one pair	See 7.2	Yes
Flame resistance	6.2.3	one pair	See 7.3	Yes
Scuff cap abrasion	ISO 20345:2021, 6.2.9	one scuff cap	Two test pieces	No
Zipper puller attachment strength	6.7.2	three zippers		No
Zipper lateral strength	6.7.3	three zippers		No

^a ISO 20344:2021 + ISO 20344:2021/Amd 1:2024, Table 1 applies.

6 Requirements

6.1 General requirement

Footwear for firefighters shall conform to the requirements specified in [Table 3](#).

Customized safety footwear shall conform to the requirements given in ISO 20345:2021, Table 3 and Annex A.

Table 3 — General requirement

Requirement			Reference		Classification and performance level		Marking symbol
			ISO 20345:2021 + ISO 20345:2021/Amd 1:2024	This document	Class I	Class II	
General	Footwear construction	Type and classification		4.1	a	a	
		Height of upper	5.2.2		a	a	
		Specific ergonomic feature	5.3.4		a	a	
		Leakproofness	5.3.3		N/A	a	
		Water resistance		6.5	a	N/A	WR
	Heel Area	Design C, D and E	5.2.3		a	a	
Whole footwear	Constructional performance	Construction	5.3.1.1		a	N/A	
		Upper/outsole bond strength	5.3.1.2		a	N/A	
		Insulation against heat		6.2.1	a	a	
		Slip resistance	5.3.5.2 6.2.10		a	a	See Annex D
		Energy absorption of seat region	6.2.4		a	a	E
		Flame resistance		6.2.3	a	a	

The applicability of requirement to a particular classification is indicated in this table by the following:

^a Means that the requirement has to be met. In some cases, the requirement relates only to particular materials within the classification. This does not mean that other materials are precluded from use.

^b Means that if the component parts exists, the requirement shall be met.

^c Means that if the property is claimed, the requirement given in the appropriate clause shall be met.

^d One of the Two shall be chosen

N/A means the requirement is not applicable.

Table 3 (continued)

Requirement			Reference		Classification and performance level		Marking symbol
			ISO 20345:2021 + ISO 20345:2021/Amd 1:2024	This document	Class I	Class II	
		Perforation resistance	6.2.1		a	a	P PL PS
Toe protection	General	Internal length of toe caps	5.3.2.1		a	a	
		Width of Toecap Flange	5.3.2.2		a	a	
		Impact resistance	5.3.2.3		a	a	
		Compression resistance	5.3.2.6		a	a	
		Corrosion resistance of metal toe caps	5.3.2.7		a	a	
		Behaviour of Toe-caps (Thermal and Chemical)	5.3.2.4		a	a	
		Electrical property	Electrically insulating footwear ^d		6.4.2	N/A	a
	Antistatic footwear ^d		6.4.3	a	N/A	A	
Resistance to inimical environment	Cold insulation of sole complex		6.2.3.2		c	c	CI
		Resistance to chemicals		6.3.1/6.3.2	N/A	c	CH
				6.3.3	c	N/A	CH
Accessories	Zipper		6.7		b	b	
	Metatarsal protection	6.2.6			c	c	M
	Ankle protection	6.2.7			c	c	AN
	Innocuousness	5.3.6			a	a	
Requirement							
Upper	Thickness	5.4.2			N/A	a	
	Tear strength	5.4.3			a	N/A	
	Tensile properties	5.4.4			a	a	
	Flexing resistance	5.4.5			N/A	a	
	Water vapour permeability & coefficient	5.4.6			a	N/A	
	Hydrolysis	5.4.7			N/A	a	
	Water penetration Water absorption	6.3.1			a	N/A	WPA
<p>The applicability of requirement to a particular classification is indicated in this table by the following:</p> <p>a Means that the requirement has to be met. In some cases, the requirement relates only to particular materials within the classification,. This does not mean that other materials are precluded from use.</p> <p>b Means that if the component parts exists, the requirement shall be met.</p> <p>c Means that if the property is claimed, the requirement given in the appropriate clause shall be met.</p> <p>d One of the Two shall be chosen</p> <p>N/A means the requirement is not applicable.</p>							