
**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 —**

**iTeh STANDARD PREVIEW
Part 5:
(standards.iteh.ai)
Helmets**

ISO 11999-5:2015
*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 5: Casques



iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 11999-5:2015

<https://standards.iteh.ai/catalog/standards/sist/29f986f9-babd-47ab-b495-e5f8c9f4e03d/iso-11999-5-2015>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, 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
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

	Page
Foreword	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Helmet requirements	2
4.1 General.....	2
4.1.1 Fit.....	2
4.1.2 Protrusions and sharp edges.....	2
4.1.3 Reinforcement.....	3
4.1.4 Replacement components and accessories.....	3
4.1.5 Neck protector and ear covers.....	3
4.1.6 Shikoro.....	3
4.1.7 Optional components.....	3
4.1.8 Material selection.....	4
4.1.9 Resistance to cleaning agent.....	4
4.1.10 Protected area.....	4
4.1.11 Field of vision.....	5
4.1.12 Helmet mass.....	6
4.2 Samples and helmet adjustment.....	6
4.2.1 Samples.....	6
4.2.2 Helmet adjustment.....	6
4.3 Pre-conditioning.....	10
4.3.1 Pre-conditioning for Type 1 helmets.....	10
4.3.2 Pre-conditioning for Type 2 helmets.....	11
4.4 Performance requirements.....	12
4.4.1 Requirement table for Type 1 and Type 2 helmets.....	12
4.4.2 Radiant heat requirements for Type 1 helmets.....	14
4.4.3 Protection against molten metals for Type 1 helmets (optional).....	14
4.4.4 Heat resistance.....	14
4.4.5 Flame resistance.....	15
4.4.6 Flame engulfment for Type 1 helmets (optional).....	15
4.4.7 Thermal protective performance (TPP) for Type 2 helmets.....	15
4.4.8 Force impact resistance.....	16
4.4.9 Ballistic resistance for Type 1 helmets (optional).....	16
4.4.10 Impact energy attenuation for Type 2 helmets.....	16
4.4.11 Penetration resistance.....	16
4.4.12 Lateral crushing for Type 1 helmets.....	16
4.4.13 Retention system effectiveness for Type 1 helmet (optional).....	16
4.4.14 Retention system strength.....	17
4.4.15 Suspension system retention for Type 2 helmets.....	17
4.4.16 Shell retention for Type 2 helmets.....	17
4.4.17 Electrical properties.....	17
4.4.18 Hardware corrosion resistance for Type 2 helmets.....	18
4.5 Test methods.....	18
4.5.1 Radiant heat.....	18
4.5.2 Protection against molten metals for Type 1 helmets (optional).....	18
4.5.3 Heat resistance.....	18
4.5.4 Flame resistance.....	19
4.5.5 Flame engulfment for Type 1 helmets (optional).....	19
4.5.6 Thermal protective performance for Type 2 helmets ear covers.....	20
4.5.7 Force impact resistance.....	20
4.5.8 Ballistic resistance for Type 1 helmets (optional).....	20
4.5.9 Impact energy attenuation for Type 2 helmets.....	21

4.5.10	Penetration resistance	21
4.5.11	Lateral crushing for Type 1 helmets	21
4.5.12	Retention system effectiveness for Type 1 helmets (optional)	21
4.5.13	Retention system strength	21
4.5.14	Suspension system retention for Type 2 helmets	22
4.5.15	Shell retention for Type 2 helmets	22
4.5.16	Electrical properties	22
4.5.17	Hardware corrosion resistance for Type 2 helmets	23
5	Marking	23
5.1	Marking for Type 1 helmets	23
5.2	Marking for Type 2 helmets	24

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 11999-5:2015](https://standards.iteh.ai/catalog/standards/sist/29f986f9-babd-47ab-b495-e5f8c9f4e03d/iso-11999-5-2015)

<https://standards.iteh.ai/catalog/standards/sist/29f986f9-babd-47ab-b495-e5f8c9f4e03d/iso-11999-5-2015>

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).

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

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 14, *Fire-fighters' personal equipment*.

ISO 11999 consists of the following parts, under the general title *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*
- *Part 2: Compatibility* [Technical Specification]
- *Part 3: Clothing*
- *Part 4: Gloves*
- *Part 5: Helmets*

The following parts are under preparation:

- *Part 6: Footwear*
- *Part 9: Fire hoods*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 11999-5:2015](https://standards.iteh.ai/catalog/standards/sist/29f986f9-babd-47ab-b495-e5f8c9f4e03d/iso-11999-5-2015)

<https://standards.iteh.ai/catalog/standards/sist/29f986f9-babd-47ab-b495-e5f8c9f4e03d/iso-11999-5-2015>

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 5: Helmets

1 Scope

This part of ISO 11999 specifies the minimum design and performance requirements for helmets as part of personal protective equipment (PPE) to be used by firefighters, primarily but not solely to protect against exposure to flame and high thermal loads.

NOTE A Type 1 helmet is similar to helmets for fighting fires in structures according to EN 443:2008. A Type 2 helmet is similar to helmets used for fighting fires in structures according to NFPA 1971:2013. However, following ISO 11999-1, all parts of heat and flame resistance requirements are consistent with each other, therefore heat and flame tests consistent with requirements for clothing given in ISO 11999-3.

2 Normative references (standards.iteh.ai)

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 9185:2007, *Protective clothing — Assessment of resistance of materials to molten metal splash*

ISO 11612:2008, *Protective clothing — Clothing to protect against heat and flame*

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/TS 11999-2, *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 2: Compatibility*

ISO 16073:2011, *Wildland firefighting personal protective equipment — Requirements and test methods*

ISO 17493:2000, *Clothing and equipment for protection against heat — Test method for convective heat resistance using a hot air circulating oven*

EN 136:1998, *Respiratory protective devices — Full face masks. Requirements, testing, marking*

EN 137:2006, *Respiratory protective devices — Self-contained open-circuit compressed air breathing apparatus with full face mask. Requirements, testing, marking*

EN 166:2001, *Personal eye protection — Specifications*

EN 168:2001, *Personal eye-protection — Non-optical test methods*

EN 443:2008, *Helmets for fire fighting in buildings and other structures*

EN 960:2006, *Headforms for use in the testing of protective helmets*

ISO 11999-5:2015(E)

EN 13087-1:2000, *Protective helmets — Test methods — Part 1: Conditions and conditioning*

EN 13087-2:2012, *Protective helmets — Test methods — Part 2: Shock absorption*

EN 13087-4:2012, *Protective helmets — Test methods — Part 4: Retention system effectiveness*

EN 13087-5:2012, *Protective helmets — Test methods — Part 5: Retention system strength*

EN 13087-6:2012, *Protective helmets — Test methods — Part 6: Field of vision*

EN 13087-8:2000, *Protective helmets — Test methods — Part 8: Electrical properties*

EN 13087-10:2012, *Protective helmet — Test methods — Part 10: Resistance to radiant heat*

NFPA 1971:2013, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*

3 Terms and definitions

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

4 Helmet requirements

4.1 General

Helmets shall consist of at least the following assembled components:

- a) Shell (area 1a according to EN 443:2008).
- b) Energy absorbing system.
 - Retention system. The retention system shall include a chinstrap having a minimum width of 19 mm.
- c) Neck protector (Optional for Type 1 helmets, area 3a according to EN 443:2008).
- d) Ear covers (Optional for Type 1 helmets, area 1b according to EN 443:2008).
- e) Faceshield or goggles or both (Optional for Type 1 helmets, area 3b or area 2 according to EN 443:2008).
 - Where a faceshield is selected, the faceshield shall be attached to and tested with the helmet.
 - Where goggles are selected, the goggles shall be permitted to be unattached, not assembled, to the helmet. Where they are attached to the helmet, they shall be tested with the helmet. Where they are not attached, they shall be removed from the helmet before it is tested.

4.1.1 Fit

The fit of the helmet shall be adjustable laterally, in order to improve the wearing comfort and the helmet efficiency. This adjustment shall be easily feasible by the wearer without the use of tools. It should be possible for the wearer to remove the helmet by releasing the chinstraps, using one hand wearing a structural firefighting glove.

When this adjustment covers several size of head circumference, the relevant instructions shall be given in the information supplied by the manufacturer.

4.1.2 Protrusions and sharp edges

There shall be no sharp edges, roughness or projection on any part of the helmet. Projections intruding more than 5 mm from the shell interior surface and above the test line, shall not be acceptable unless covered by protective padding. Projections above the test line shall be impacted directly over the

position of the internal projection in accordance with [4.4.7](#), and the laboratory shall assess that the projection did not make contact with the headform.

Rigid internal projections below the test line and above the reference plane shall not be able to touch the head of the wearer when the helmet is normally affixed to the head.

The profile at the front of the helmet shall not prevent the wearing of spectacles or goggles as specified by the helmet manufacturer.

4.1.3 Reinforcement

The shell construction shall be uniformly reinforced. This does not exclude a gradual increase of the shell's thickness or of the grooves or fixation devices of the harness or of the accessories, but it does exclude every other localized reinforcement.

4.1.4 Replacement components and accessories

The fitting and/or replacement of any interchangeable parts or accessories shall not impair the function and/or safety of the helmet. All accessories and their respective replacement procedures shall be given in the information supplied by the manufacturer. No openings shall penetrate the helmet shell other than those provided by the manufacturer for mounting energy absorbing systems, retention systems or accessories.

Faceshields shall not be considered as accessories and along with neck protectors (where fitted) shall be considered as fixed sub-components of the helmet assembly.

4.1.5 Neck protector and ear covers

Type 2 helmets shall cover the wearer's neck and ears, or shall have neck protector and ear covers that cover the wearer's neck and ears. The helmet or the helmet with neck protectors and ear covers shall provide at least the following coverage.

The helmet, or the helmet with neck protector and ear covers, shall be donned in the proper wearing position as specified by the manufacturer on an EN 960:2006 headform 575 according to its positioning index. The helmet positioning index shall be the vertical distance, as specified by the manufacturer, from the lowest point of the brow at the lateral midpoint of the helmet to the basic plane of the EN 960:2006 headform 575 with the helmet firmly positioned on the headform. In this position, the neck coverage shall be measured downward from the reference plane to the lower edge of the neck coverage.

- a) 95 mm measured 50 mm forward of the coronal plane;
- b) 120 mm measured 25 mm forward of the coronal plane;
- c) 130 mm measured at the coronal plane;
- d) 130 mm measured at the midsagittal plane at the rear of the headform.

4.1.6 Shikoro

Where Shikoro is fitted, it is made of fire resistance fabric that surrounds entire wear's head, neck part below helmet brim level except eye portion covered by the face shield. Its purpose is to prevent direct flame contact to wear's head, face or neck and also to reduce heat stress. The helmet fitted with Shikoro shall continue to meet the relevant requirements of [4.4.2](#) to [4.4.6](#).

4.1.7 Optional components

Type 1 helmets shall have the facility for the fitting of any optional neck, ear and eye and face protection, unless these form integral parts of the helmet. Helmets incorporating these optional components shall continue to meet the relevant requirements of [4.4](#).

Neck protectors intended for use and supplied with Type 1 helmets shall conform to the requirements for neck protectors as indicated in [Table 3](#).

4.1.8 Material selection

Materials used in helmets that may come into contact with the wearer's skin shall not be known to be likely to cause irritation or any other adverse effect to health.

4.1.9 Resistance to cleaning agent

All materials shall be unimpaired after cleaning and disinfection by the agents and procedures specified in the information provided by the manufacturer. Such agents shall not be known to be likely to cause irritation or any other adverse effect to the health of the wearer.

4.1.10 Protected area

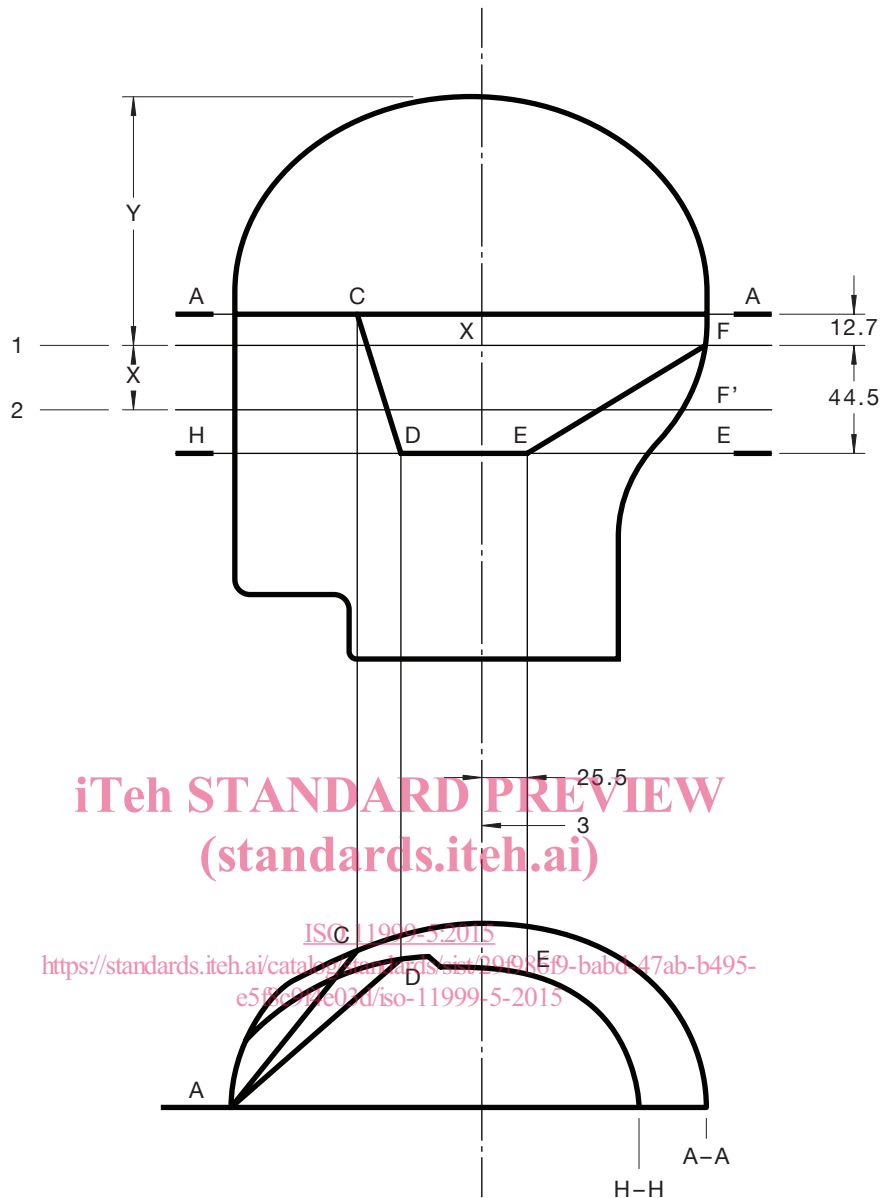
When adjusted on the headform as in [4.2.2](#), the helmet shall at least cover all the area 12,7 mm above the reference plane (see line AA in [Figure 1](#)).

NOTE This is area 1a according to EN 443:2008.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO 11999-5:2015](#)

<https://standards.iteh.ai/catalog/standards/sist/29f986f9-babd-47ab-b495-e5f8c9f4e03d/iso-11999-5-2015>



Key

- 1 reference plane
- 2 basic plane
- 3 central vertical axis

Figure 1 — Protected areas

4.1.11 Field of vision

4.1.11.1 When a Type 1 helmet is tested in accordance with EN 13087-6:2012, with any attached faceshield or goggle in both the stowed and deployed positions, the wearer's field of vision shall correspond to the following angles:

- a) A dihedral angle of at least 105 degrees measured horizontally between L and K on each side of the sagittal plane which passes through the point L (see [Figure 2](#) and [Figure 3](#)). Remove the neck protector or Shikoro if necessary.

- b) An upper dihedral angle greater than 7 degrees above the reference plane and which is defined by the straight line passing through L1, L2 (see [Figure 2](#) and [Figure 3](#));
- c) A lower dihedral angle greater than 45 degrees under the basic plane and which is defined by the straight line passing through K1 K2 situated on the surface of the headform as 31 mm on each side of the point K (see [Figure 2](#) and [Figure 3](#)).

4.1.11.2 When a Type 2 helmet is tested in accordance with NFPA 1971:2013, Section 6.4.5, with faceshield or faceshield/goggle component deployed, the wearer's field of vision shall correspond to the following angles:

- a) A dihedral angle of at least 85 degrees measured horizontally between L and K on each side of the sagittal plane which passes through the point L (refer to [Figure 2](#) and [Figure 3](#)).
- b) An upper dihedral angle greater than 10 degrees above the reference plane and which is defined by the straight line passing through L1 L2 (refer to [Figure 2](#) and [Figure 3](#)).
- c) A lower dihedral angle greater than 40 degrees under the basic plane and which is defined by the straight line passing through K1 K2 situated on the surface of the headform as 31 mm on each side of the point K (refer to [Figure 2](#) and [Figure 3](#)).
- d) With faceshield or faceshield/goggle component in the stowed position, the helmet shall provide peripheral vision clearance of at least 94 degrees to each side.

NOTE "Stowed position" means to be placed in "out of use" position, when it is not providing the designed protection. "Deployed position" means to be placed "in use" position, when it is providing the designed protection.

4.1.12 Helmet mass

(standards.iteh.ai)

If helmet mass, excluding non-permanently fitted accessory parts, exceed 1 500 g it shall then be marked on the helmet visible to users.

4.2 Samples and helmet adjustment

Helmet samples shall be submitted for testing in the condition in which they are offered for sale, including any means of attachment for energy absorbing systems, retention systems or accessories specified by the manufacturer.

4.2.1 Samples

Unless otherwise specified in the test methods, the number of specimens needed for pre-conditioning and testing shall be in accordance with [Table 1](#) or [Table 2](#) as appropriate.

4.2.2 Helmet adjustment

Before any testing on a headform, the helmet shall be adjusted in accordance with the manufacturer's instructions. If the wearing adjustment covers several sizes of headform then the size of headform representing the most unfavourable case shall be used.

Type 1 helmets shall be tested on headforms, where required, that conform to EN 960:2006 sizes 495, 535, 605, and 625 or EN 168:2001 medium size, as appropriate to the test performed.

Type 2 helmets shall be tested on headforms, where required, that conform to NFPA 1971:2013, Figure 8.15.4.1 (a), (b), and (c). (Acceleration and penetration tests are done on ISO size J headform, and only force impact is on an aluminium ISEA size 7 headform).