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Wildland firefighting personal protective equipment — Requirements and test methods —

Part 9: Firehoods

Équipement de protection individuelle pour la lutte contre les feux d'espaces naturels — Exigences et méthodes d'essai — Partie 9: Capuches anti-feu

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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).

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 equipment*, Subcommittee SC 14, *Firefighters personal equipment*.

A list of all parts in the ISO 16073 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.

Introduction

This document provides minimum performance requirements for wildland firefighters' personal protective equipment (PPE) firehoods, designed for use for extended periods during wildland firefighting.

Wildland firefighting involves work carried out mostly in summer temperatures and for many hours, during which the firefighter can develop high levels of metabolic heat. As a consequence, the PPE is required to be of low mass, flexible and commensurate with the risks to which the firefighter can be exposed in order to be effective without introducing excessive heat stress to the wearer.

Firefighters should be trained in the selection, use, care and maintenance of the PPE covered by this document, including an understanding of its limitations.

It is intended that a risk assessment be undertaken to determine if the PPE covered by this document is suitable for its intended use and the expected exposure.

Wildland firefighting personal protective equipment — Requirements and test methods —

Part 9: **Firehoods**

1 Scope

This document specifies the minimum performance requirements and methods of test for firehoods that cover the head and neck and are used for wildland firefighting. An optional requirement has been included to provide limited protection against particulate contaminants

This document covers the general design of the PPE, the minimum levels of performance for the materials employed and the methods of test used. This PPE is not intended to provide protection during fire entrapment.

This document does not cover firehoods for structural firefighting (see ISO 11999-9). This document only applies in situations when compatible protective clothing, helmet, and when necessary respiratory protection devices are also worn.

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 139, *Textiles — Standard atmospheres for conditioning and testing*

ISO 3146, *Plastics — Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers by capillary tube and polarizing-microscope methods*

ISO 3175-1, *Textiles — Professional care, drycleaning and wetcleaning of fabrics and garments — Part 1: Assessment of performance after cleaning and finishing*

ISO 5077, *Textiles — Determination of dimensional change in washing and drying*

ISO 6330, *Textiles — Domestic washing and drying procedures for textile testing*

ISO 6942, *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 9151, *Protective clothing against heat and flame — Determination of heat transmission on exposure to flame*

ISO 11092, *Textiles — Physiological effects — Measurement of thermal and water-vapour resistance under steady-state conditions (sweating guarded-hotplate test)*

ISO 13688, *Protective clothing — General requirements*

ISO 13938-1, *Textiles — Bursting properties of fabrics — Part 1: Hydraulic method for determination of bursting strength and bursting distension*

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

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

ISO/TR 19591, *Personal protective equipment for firefighters — Standard terms and definitions*

NFPA 1971:2018, *Standard on protective ensembles for structural firefighting and proximity firefighting*

3 Terms and definitions

For the purposes of this document, the terms and definitions in ISO/TR 19591 apply.

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/

4 General design requirements

4.1 General

Materials used in the construction of the firehood shall meet all requirements of ISO 13688, including specifically the requirements for innocuousness in 4.2.

4.2 Firehood flexibility and facial opening

The firehood shall have flexibility to take up the shape of the wearer's head without discomfort and shall not restrict head movement.

The firehood shall fit around, when possible, the respiratory protection devices for which compatibility is claimed by the manufacturer without reducing the field of view or interfering with the breathing function of the mask and give no discomfort to the wearer.

NOTE 1 Firehoods do not fit around P2 masks, check compatibility.

The design requirements specified shall be verified by visual inspection during the procedures in Annex A.

NOTE 2 For more information on compatibility, see ISO/TS 11999-2.

4.3 Yoke interface area

The firehood shall have a yoke creating an interface area with protective clothing (see ISO 15384), the integrity of which shall be maintained.

NOTE For more information on compatibility, see ISO/TS 11999-2.

4.4 Sizing

The firehood may be manufactured in various sizes. It shall be sufficiently elastic to be compatible with various head sizes and shapes. Assess by visual inspection.

NOTE 1 Overstretching will reduce the heat protective performance of the firehood and is to be avoided by design. Excess material in the construction of the firehood can hamper the wearer and compromise the wearing of other personal protective equipment.

NOTE 2 The yoke is not always symmetrical on the back, upper shoulders and front (upper chest).

4.5 Seam construction

Seams shall be constructed to give minimum loss of strength and protection and to maintain the temperature resistance and the integrity of the fire hood meeting the requirements of 6.2 and 6.7. Also assess by visual observation as detailed in Annex A.

4.6 Labels

The label(s) for the marking requirement shall be positioned in the area defined as the yoke of the firehood. Assess by visual inspection.

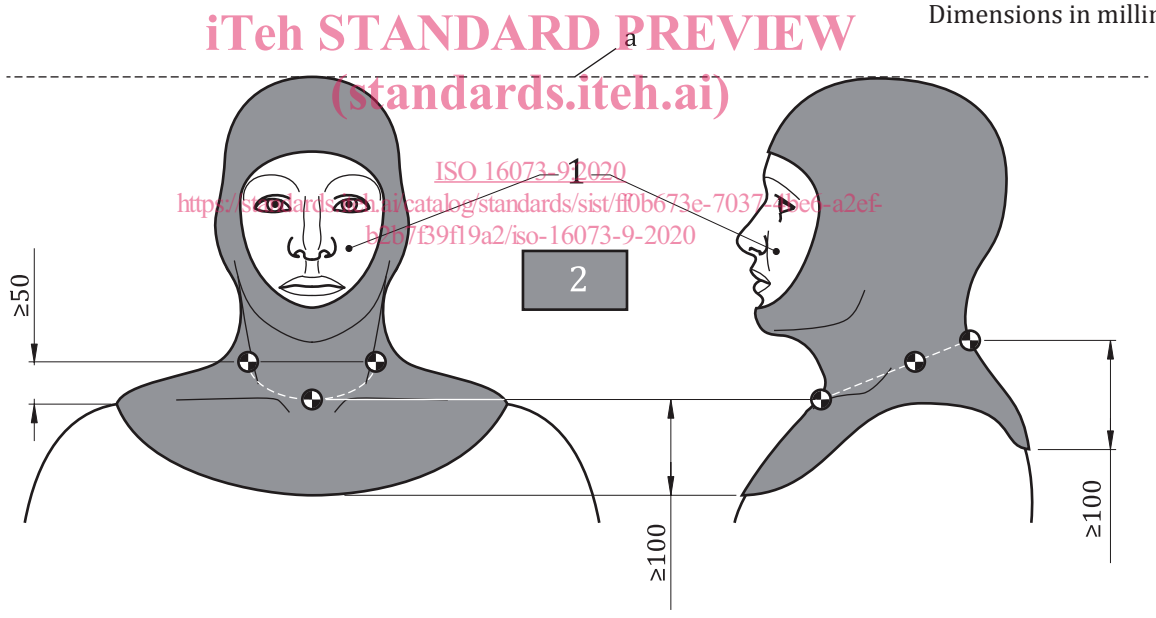
4.7 Particulate protection (Optional)

The firehood shall meet the requirements in 6.9 and the requirements in this sub-clause.

The particulate protection surface shall include from the top of the head to at least the areas from 50 mm below the side neck point, 100 mm below the front neck point and 100 mm below the back neck point (neck points as defined in ISO 8559-1) (see Figure 1).

The elastic and stitching around the facial opening shall be permitted to exclude particulate blocking material specifically for meeting the requirements of 4.2 for a distance of 20 mm from the leading edge of the firehood face opening to the innermost row of stitching. The distance shall be measured in at least six locations with the firehood lying on a flat surface with the face opening facing upwards.

Dimensions in millimetres



Key

1 face opening
2 particulate protected area
a Top head.

Figure 1 — Firehood with particulate protection area (shaded)

If the requirements of this subclause are met, add on the label wording equivalent to “This firehood provides limited particulate protection" [see also 7.3 h)].

5 Sampling and pre-treatment

5.1 Sampling

A sample shall be taken, which is representative of the materials used to construct the firehood taking into account whether 4.7 applies.

5.2 Pre-treatment by cleaning

Where required in this standard, tests shall be carried out after five cleaning cycles (a cleaning cycle is one wash and one dry cycle), cleaning shall be performed in accordance with ISO 6330 using the front-loading horizontal drum machine and reference detergent 3 (ECE reference detergent 98).

Washing shall be carried out in accordance with ISO 6330 procedure 6N (60 ± 3) °C and drying by procedure F (machine Type A1) exhaust temperature normal (minimum 40 °C, maximum 80 °C), unless otherwise specified in the care labelling.

Materials that are labelled as dry cleanable only shall be dry cleaned five times in accordance with ISO 3175-1.

A laundry bag shall not be used.

For single use firehoods, pre-treatment by cleaning is not required.

5.3 Conditioning

Unless otherwise specified in the specific test methods, prior to all tests and after having performed the pretreatment specified in 5.2 condition the specimens in accordance with ISO 139 with the following modification: conditioned for a minimum of 24 h by exposure to a temperature of (20 ± 2) °C and a relative humidity of (65 ± 5) %. Test the specimens within 5 min following their removal from the conditioning atmosphere.

6 Performance requirements

The performance requirements shall be met after preconditioning in accordance with all requirements of Clause 5 and its sub-clauses.

6.1 Flame resistance — Face ignition

Carry out the flame spread test in accordance with ISO 15025 procedure A (face ignition) using a flame application time of 10 s.

For seams, three specimens containing a structural seam shall be tested. Specimens shall be oriented with the seam running up the centreline of the outer surface of the test specimen so that the burner flame impinges directly upon the seam. Seams shall not separate.

The requirements in Table 1 shall be satisfied.

Table 1 — Limited flame spread performance requirements ISO 15025, procedure A

Properties	Requirement
Flame spread	No specimen shall permit any part of the lowest boundary of any flame to reach the upper or either vertical edge.
Flaming debris	No specimen shall give flaming or molten debris.
Hole formation	No specimen shall give hole formation of 5 mm or greater in any direction, except for an inner layer that is used for specific protection other than flame or heat protection.
NOTE This table is taken from ISO 14116:2015.	

Table 1 *(continued)*

Properties	Requirement
Afterglow	Afterglow time shall be ≤2 s. A glowing inside the charred area is defined in ISO 15025 as afterglow without combustion and for the purpose of this clause is not regarded as afterglow.
Afterflame	Afterflame time shall be ≤2 s.
NOTE This table is taken from ISO 14116:2015.	

6.2 Sewing thread thermal stability

All yarns and sewing threads utilized in the construction of the protective fabrics and firehood, when tested in accordance with ISO 3146 at a temperature of (260 ± 5) °C, shall not melt.

6.3 Heat resistance

When tested in accordance with ISO 17493 at a temperature of (260 ± 5) °C, no firehood material shall melt, drip, ignite or shrink by more than 10 % in length or width.

6.4 Heat transfer — Flame exposure

When tested in accordance with ISO 9151, the hood shall achieve the performance given in Table 2.

Table 2 — Heat transfer — Flame exposure

Heat transfer index	Result
HTI_{24}	≥8

6.5 Heat transfer — Radiant exposure

When tested in accordance with method B of ISO 6942 at a heat flux density of 20 kW/m^2, the hood shall achieve the result given in Table 3.

Table 3 — Heat transfer — Radiant exposure

Heat transfer	Result
$RHTI_{24}$	≥11
$RHTI_{24-12}$	≥4

6.6 Residual burst strength of material following radiant heat exposure

Three specimens taken from the firehood or from equivalent material or assembly shall have a burst strength ≥200 kPa, after pretreatment of the specimen by method A of ISO 6942 at a heat flux density of 10 kW/m^2, when tested in accordance with ISO 13938-1 using a test area of 7,3 cm^2.

6.7 Seam burst strength

The average of 3 specimens of each seam type used in the construction of the firehood shall have a burst strength ≥450 kPa when tested in accordance with ISO 13938-1 using a test area of 7,3 cm^2.

6.8 Dimensional change

The material or component assembly shall have a dimensional change ≤5 % when tested in accordance with ISO 5077.