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PPE ensembles for firefighters undertaking specific rescue activities —

Part 4: Gloves

Équipements de protection personnelle pour pompiers entreprenant des activités de sauvetage particulières —
Partie 4: Gants

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **2**
4 Design and general requirements **2**
4.1 General 2
4.2 Glove sizing 3
4.2.1 Hand dimensions 3
4.2.2 Minimum sizing 4
4.2.3 Labelling 4
4.3 Glove body length 4
4.4 Wristlet or cuff 4
4.5 Other design requirements 4
5 Pre-treatment, conditioning and sampling **4**
5.1 Inspection 4
5.2 Testing 4
5.2.1 Specimens 4
5.2.2 Exposure surface 4
5.2.3 Interpretation criteria 5
5.3 Pre-treatments 5
5.3.1 Laundering 5
5.3.2 Conditioning 5
5.3.3 Wetting 5
6 Performance requirements **5**
6.1 General 5
6.2 Summary of requirements and classification 6
6.3 Road traffic crash (RTC) 6
6.4 Flame resistance 6
6.5 Heat transfer (flame exposure) 7
6.6 Heat transfer (radiant exposure) 7
6.7 Heat transfer (conductive exposure) 8
6.8 Heat resistance 8
6.9 Liquid penetration resistance (optional) 8
6.10 Whole glove integrity test 9
6.11 Urban search and rescue (USAR) 9
7 Mechanical and other requirements **9**
7.1 Abrasion resistance 9
7.2 Cut resistance 10
7.3 Tear resistance 10
7.4 Puncture resistance 10
7.5 Label legibility 11
7.6 Ergonomic requirements 11
7.6.1 Dexterity 11
7.6.2 Grip 11
7.6.3 Donning 11
8 Leather chromium(VI) content **11**
9 Marking **11**
10 Manufacturer/supplier information **12**
Annex A (normative) **Grip test** **13**

Annex B (normative) **Donning test** **15**
Annex C (normative) **Whole glove integrity test** **16**
Annex D (informative) **Marking** **17**
Bibliography **20**

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 — Personal protective equipment*, Subcommittee SC 14, *Firefighters' personal equipment*.

A list of all parts in the ISO 18639 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

ISO 18639 is a series of standards for personal protective equipment (PPE) for firefighters when engaged in specific rescue activities. It is not possible to provide a standard for PPE to cover all of the diverse range of rescue scenarios that firefighters are likely to encounter so it is important that risk assessments be undertaken to determine if the PPE covered by the ISO 18639 series is suitable for its intended use and the expected exposure to hazards. For complete protection against exposures, the risk assessment should allow protection of the whole body including the torso, arms and legs, head, face, hands and feet.

For certain rescue activities, safety ropes and harnesses can be required. For certain rescue situations, special PPE for use in and on water can be required. In some cases, appropriate respiratory protection can also be identified as being necessary.

The performance requirements specified in this document take account of accidental exposure to heat and flame, but do not cover PPE for firefighting. While this document takes account of accidental exposure to some common chemicals, it is not intended that PPE conforming to this document should be considered as providing chemical protection as a primary function. It does not cover PPE to protect against biological, electrical or radiation hazards. The risk assessment should determine whether PPE complying with this document or to the requirements of any other relevant standard is more suitable.

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

PPE ensembles for firefighters undertaking specific rescue activities —

Part 4: Gloves

1 Scope

This document provides the principles that govern the development of incident type and/or hazard specific test methods and minimum performance requirements for protective gloves for firefighters while engaged in specific rescue activities.

Gloves related to specific specialist rescue activities, such as road traffic crash (RTC) and urban search and rescue (USAR), are documented in individual subclauses of this document.

NOTE Further guidance can be found in ISO 18639-1.

The purpose of this document is to ensure that minimum performance requirements for incident type and/or hazard specific protective gloves are designated.

This document deals with "rescue from emergencies involving modes of transportation" in particular performance requirements for personal protective equipment (PPE) intended to be used by firefighters, primarily but not solely to protect against hazard exposure at non fire rescue activities involving road traffic crash (RTC) or motor vehicle accidents (MVA).

This document covers general glove design, the minimum performance level of the materials used and the methods of test for determining this performance level.

This document does not cover special gloves for use in other high risk situations such as firefighting.

This document does not cover protection for the head, torso, arms, legs and feet. These are covered in other parts of the ISO 18639 series. It does not cover protection of the hands against other hazards, e.g. chemical, biological, radiation and electrical hazards, except for limited, accidental exposure to fire ground chemicals and blood or body fluids.

Selection of the appropriate system of personal protective equipment (PPE), including gloves, is dependent on carrying out an effective risk assessment which identifies the hazard to be faced, evaluates the likelihood of those hazards and provides the means of reducing or eliminating these hazards.

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

ISO 6330:2012, *Textiles — Domestic washing and drying procedures for textile testing*

ISO 6942:2002, *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 12127-1, *Clothing for protection against heat and flame — Determination of contact heat transmission through protective clothing or constituent materials — Part 1: Contact heat produced by heating cylinder*

ISO 12947-4, *Textiles — Determination of the abrasion resistance of fabrics by the Martindale method — Part 4: Assessment of appearance change*

ISO 13994:2005, *Clothing for protection against liquid chemicals — Determination of the resistance of protective clothing materials to penetration by liquids under pressure*

ISO 13995, *Protective clothing — Mechanical properties — Test method for the determination of the resistance to puncture and dynamic tearing of materials*

ISO 13996, *Protective clothing — Mechanical properties — Determination of resistance to puncture*

ISO 13997, *Protective clothing — Mechanical properties — Determination of resistance to cutting by sharp objects*

ISO 15025:2016, *Protective clothing — Protection against flame — Method of test for limited flame spread*

ISO 17075 (all parts), *Leather — Chemical determination of chromium(VI) content in leather*

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

ISO 18639-1, *PPE ensembles for firefighters undertaking specific rescue activities — Part 1: General*

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

EN 420:2003+A1:2009, *General requirements for gloves*

3 Terms and definitions

For the purposes of this document, the terms and definitions given 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 Design and general requirements

4.1 General

The protective glove shall be designed and manufactured so that in the foreseeable conditions of use for which it is intended, the user can perform the hazard related activity normally while achieving appropriate protection at the highest possible level.

If required, the glove shall be designed to minimize the time needed for putting on and taking off.

When the glove construction includes seams, the material and strength of the seams shall be such that the overall performance of the glove is not significantly decreased. Where relevant, test methods and requirements can be found in the specific standards listed in the Bibliography.

Gloves shall consist of a component assembly meeting the performance requirements of this document. This component assembly shall be permitted to be configured as a continuous or joined single layer or as continuous or joined multiple layers.

4.2 Glove sizing

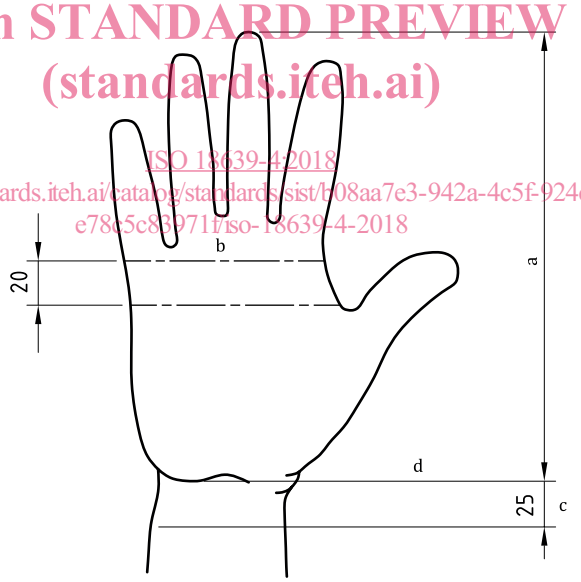
4.2.1 Hand dimensions

Hand dimensions for selection of proper glove size shall consist of measuring two dimensions, hand circumference and hand length, as shown in Figure 1.

Hand length shall be measured by placing the subject's hand, palm down, on a piece of paper with the fingers together and the hand and arm in a straight line. The thumb shall be fully abducted, extended away from the palm as far as possible. The paper shall be marked at the tip of the third, or middle finger. A mark shall be placed in the notch at the base of the thumb where the thumb joins the wrist. The straight-line distance between the two points shall be measured to the nearest millimetre, as shown in Figure 1.

Hand circumference shall be measured by placing a flexible measuring tape on a table or other flat surface with the numerals facing downward. The subject shall place the right hand, palm down and fingers together, in the middle of the tape so that the tape can pass over the back of the hand (metacarpals). The circumference shall be measured to the nearest millimetre, 20 mm from the crotch between thumb and index finger as shown in Figure 1.

Dimensions in millimetres



Key

a Hand length.

b Position where circumference is measured.

c Minimum glove body length from wrist crease.

d Wrist cease.

Figure 1 — Method of measuring hand dimensions for selection of proper glove

4.2.2 Minimum sizing

Gloves shall be provided in a minimum of 6 unique and distinct sizes. The manufacturer shall indicate the range in hand circumference and hand length for wearers of each glove size as specified in 4.2.1.

NOTE This requirement is intended to allow manufacturers to report information to the user that assists in their selection of the appropriate size. Standard sizes are not defined in this document.

4.2.3 Labelling

Glove size shall be indicated on the label. Manufacturers should provide information to the end user or purchaser on how they have defined their sizes in terms of hand length and circumference as specified in 4.2.1.

4.3 Glove body length

The glove body shall extend circumferentially beyond the wrist crease ≥ 25 mm. See "c" in Figure 1.

4.4 Wristlet or cuff

The sample glove body and the cuff or wristlet shall extend circumferentially at least 50 mm beyond the wrist crease shown in Figure 1.

4.5 Other design requirements

Gloves shall be designed to restrict the entry of foreign particles through the glove openings.

Gloves shall be compatible with the sleeves of the firefighters' protective clothing used.

Any labels or accessories shall not adversely affect the performance of the gloves or present a hazard to the wearer.

5 Pre-treatment, conditioning and sampling

5.1 Inspection

Inspection for determining conformity with the design requirements specified in Clause 4 shall be performed on whole gloves.

5.2 Testing

5.2.1 Specimens

Testing for determining material and component conformity with the requirements specified in Clause 6 shall be performed on samples representative of all the materials and components used in the actual construction of the protective glove. If suitably sized representative materials and components for the respective test method cannot be obtained, then samples from the glove shall be used as specified in the performance requirement. The appropriate testing laboratory shall be permitted to also use sample materials cut from representative protective gloves.

All specimens shall be taken from the palm of the different gloves for classification purposes. If relevant, additional areas of the protective glove shall be tested, e.g. for specific protection or for areas which provide lower protection.

5.2.2 Exposure surface

In all surface tests, the outermost surface shall be exposed.

5.2.3 Interpretation criteria

All the individual results of the specimens of a test shall meet the performance requirements. The average result shall be given. If a material exhibits differing behaviour for a property in the length and cross directions of the material, the resultant property value shall be the value obtained in the lesser performing direction. In the event that only one specimen fails, another set of specimens shall be tested and all the individual results of this second set of specimens shall meet the requirements. Otherwise, the sample is considered to have failed meting the requirement.

5.3 Pre-treatments

5.3.1 Laundering

Unless otherwise specified in the care labelling, test samples shall be subjected to five washing/drying cycles in a front-loading horizontal drum machine using 1 g/l no. 2 (IEC) detergent in soft water in accordance with the procedures specified in ISO 6330:2012. Washing shall be carried out using the procedure 6N at 60 °C + 3 °C and drying using procedure E (tumble drying). 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.

After five cycles of washing/drying or dry cleaning, sample gloves shall be donned by a test subject and shall be flexed by making a tight fist 10 times during a 30 s period.

5.3.2 Conditioning

After washing, sample gloves and/or specimens shall be conditioned at a temperature of 20 °C ± 2 °C and at a relative humidity of 65 % ± 5 % for at least 24 h in accordance with ISO 139.

Testing of sample gloves and/or specimens shall commence within 5 min after removal from conditioning.

5.3.3 Wetting

Sample gloves and/or specimens shall be conditioned by completely immersing the glove and/or specimen in water at a temperature of 20 °C ± 2 °C for 2 min. If gloves are used, the glove specimen shall be first filled with water prior to immersion.

Sample gloves and/or specimens shall be removed from the water, hung in a vertical position for 5 min with the fingers uppermost, laid horizontal with textile blotting paper both under and over the specimen, under a pressure of 3,5 kPa ± 0,5 kPa for a period of 20 min.

Testing of sample gloves and/or specimens shall commence within 5 min of wetting.

6 Performance requirements

6.1 General

Gloves shall be classified as RTC or USAR by meeting the performance requirements in Table 1.