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Protective clothing for firefighter's who are engaged in support activities associated with structural fire fighting — Laboratory test methods and performance

Vêtements de protection pour sapeurs-pompiers engagés dans des activités de support associées à la lutte structurelle contre les incendies — Méthodes d'essai et exigences de performance

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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. www.iso.org/directives

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

This second edition cancels and replaces the first edition (ISO 11613:1999), which has been technically revised.

This edition has been completely rewritten as the Scope and tittle of this document have changed.

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Introduction

The purpose of this document is to provide minimum performance requirements for protective clothing designed to protect firefighters who are engaged in support activities associated with interior attack firefighting.

This document is intended for firefighters who are engaged in support activities associated with interior attack firefighting. It is not intended for firefighters who are engaged in interior attack firefighting. Interior attack firefighting and support activities of firefighting are defined in 3.8.1 and 3.8.2.

It provides guidance on the considerations for conducting a risk assessment of firefighting risks (see Annex A).

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Protective clothing for firefighter's who are engaged in support activities associated with structural fire fighting — Laboratory test methods and performance

1 Scope

This document specifies test methods and minimum performance requirements for protective clothing used by firefighters who are engaged in support activities of firefighting. This clothing is not intended for interior attack firefighting. These support activities of firefighting are defined (see 3.8.2) as activities such as:

— water and material supply;

— extinguishing fires from the outside of the structure;

— prevention of exterior spreading to adjacencies, preventing enviromental damage and limiting effect of smoke;

— securing traffic and environment;

— first aid base activities;

— preparing the fire ground for subsequent activities;

— RPD replenishment tasks;

— assessment zone;

— BA communication;

— forward command post;

— evacuation;

— assist planning;

— assist logistics;

— assist communication;

— transportation.

This document covers the general clothing design, the minimum performance levels of the materials used, and the methods of test for determining these performance levels.

This document is not equivalent to ISO 11999-3, clothing worn by firefighters who are at risk of exposure to high levels of heat and/or flame while fighting fires occurring in structures. This document provides lower minimum level of protection.

Selection of the appropriate system of clothing is dependent on carrying out an effective risk assessment which identifies the hazards to be faced, evaluates the likelihood of those hazards, and provides the means to reduce or eliminate these hazards. Details of one example of a recommended risk assessment approach and some factors for consideration are included in Annex A

This document does not cover special clothing for use in other high risk situations such as specialized firefighting, or clothing for use in long term firefighting operations in high ambient temperature, for example bush, wildland, or forest firefighting where clothing according to ISO 15384 could be more

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appropriate. It does not cover clothing for use in high-risk fire exposures, for example reflective protective clothing according to ISO 15538 could be more appropriate.

It does not cover protection for the head, hands and feet or protection against other hazards, for example chemical, biological, radiation and electrical hazards. These aspects can be dealt with in other standards.

NOTE Additional "fit for purpose" personal protective equipment to protect the head, hands, respiratory system and feet should be worn with clothing specified in this document and in majority of situations appropriate protection is also required to be worn. Firefighters need to be trained in the use and care of protective clothing covered by this document including an understanding of its limitations and of the other items of personal protective equipment that can be required depending on the risks encountered

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 811, *Textile fabrics — Determination of resistance to water penetration — Hydrostatic pressure test*

ISO 1421, *Rubber- or plastics-coated fabrics — Determination of tensile strength and elongation at break*

ISO 3175-1, *Textiles — Professional care, drycleaning and wetcleaning of fabrics and garments — Part 2: Procedure for testing performance when cleaning and finishing using tetrachloroethene*

ISO 4920, *Textile fabrics — Determination of resistance to surface wetting (spray test)*

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

ISO 6530, *Protective clothing — Protection against liquid chemicals — Test method for resistance of materials to penetration by liquids*

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 13688:2013, *Protective clothing — General requirements*

ISO 13934-1, *Textiles — Tensile properties of fabrics — Part 1: Determination of maximum force and elongation at maximum force using the strip method*

ISO 13935-2, *Textiles — Seam tensile properties of fabrics and made-up textile articles — Part 2: Determination of maximum force to seam rupture using the grab method*

ISO 13937-2, *Textiles — Tear properties of fabrics — Part 2: Determination of tear force of trouser-shaped test specimens (Single tear method)*

ISO 14116:2015, *Protective clothing — Protection against flame — Limited flame spread materials, material assemblies and clothing*

ISO 15025:2016, *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*

ISO 20471:2013, *High visibility clothing — Test methods and requirements*

CIE 054.2, *Retroreflection — Definition and measurement*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TR 19591 and the following 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/

3.1
char
formation of a brittle residue when material is exposed to thermal energy

3.2
collar lining
that part of the collar fabric component assembly that is next to the skin when the collar is closed in the raised position

3.3
closure system
method of fastening openings in the garment including combinations of more than one method of achieving a secure closure, for example a slide fastener covered by an overlap fastened down with a touch and close fasteners

Note 1 to entry: This term does not cover seams.

3.4
component assembly
combination of all materials and hardware of a multilayer garments presented exactly as in the finished garment construction

Note 1 to entry: This term does not cover reinforced materials.

3.5
coverall
one-piece garment that is designed and configured to provide protection to the torso, neck, arms, and legs, excluding head, hands, and feet

3.6
drip
to run or fall in drops or blobs

3.7
firefighters' protective clothing
garments configured as a *jacket* (3.17), trousers or *coverall* (3.5) for the protection for the firefighters upper and lower torso, neck, arms, and legs, but excluding the head, hands, and feet

3.8
firefighting activities

3.8.1
interior attack firefighting
activities of rescue, fire suppression and property conservation generally performed in the interior or in the immediate vicinity of the fire of the involved structure

3.8.2
support activities of firefighting
activities executed by firefighters, who are not involved in interior attack but support through activities such as

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— water and material supply

— extinguishing fires from the outside of the structure

— prevention of exterior spreading to adjacencies, preventing enviromental damage and limiting effect of smoke

— securing traffic and environment

— first aid base activities

— preparing the fire ground for subsequent activities

— RPD replenmishiment tasks

— assessment zone

— BA communication

— forward command post

— evacuation

— assist planning

— assist logistics

— assist communication

— transportation

3.9
garment
single item of clothing which may consist of single or multiple layers

3.10
hardware
non-fabric components of protective clothing including those made of metal or plastic

Note 1 to entry: Examples include fasteners, *closure systems* (3.3), rank markings, buttons, zippers, embroideries, braces, etc.

3.11
HTI_{12}
heat transfer index to one decimal place calculated from the mean time (measured in seconds, to one decimal place) to achieve a temperature rise of (12 ± 0,1) °C in the calorimeter

Note 1 to entry: When tested according to ISO 9151 with an incident heat flux of (80 ± 2) kW/m^2.

3.12
HTI_{24}
heat transfer index to one decimal place calculated from the mean time (measured in seconds, to one decimal place) to achieve a temperature rise of (24 ± 0,2) °C in the calorimeter

Note 1 to entry: When tested according to ISO 9151 with an incident heat flux of (80 ± 2) kW/m^2.

3.13
impregnation
procedure to maintain or regain the repellent properties of the outer fabric and/or chemical penetration resistance of the clothing

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3.14
innermost lining
lining on the innermost face of a *component assembly* (3.4) which is intended to be nearest to the wearers skin

Note 1 to entry: Where the *innermost lining* (3.14) forms part of a material combination, the material combination is regarded as the innermost lining.

3.15
interface area
area where openings interrupt the continuity of material(s) or *garments* (3.9)

3.16
interlining
layer between the outermost layer and the *innermost lining* (3.14) in a multilayer *garment* (3.9)

3.17
jacket
long sleeved *garment* (3.9) incorporating materials meeting the requirements covering the areas of the neck, shoulders, and torso, upper and lower back extending to the waist or the hips

3.18
main seam
outer-shell seam assemblies where rupture could reduce the protection of the *garment* (3.9) by exposing the moisture management component, *thermal barrier* (3.32), the wearer's station/work uniform, other clothing, or skin

3.19
manufacturer
entity that assumes the liability and provides the warranty for the compliant product

3.20
materials
substances, excluding *hardware* (3.10) and labels, of which an item of clothing is made

3.21
material combination
material produced from a series of separate layers, intimately combined prior to the item's manufacturing stage

3.22
melt
to liquefy a material, usually by heat resulting in an non-reversible change

Note 1 to entry: For the purpose of this document, melting is observed as the response to heat as evidenced by flowing or dripping.

3.23
moisture management component
fabric or membrane used in a *component assembly* (3.4) to achieve the properties of hydrostatic pressure and water vapour permeability

Note 1 to entry: Moisture management component may not prevent the passage of some chemical (except incidentally), biological or radiological agents. Appropriate PPE should be provided to protect the wearer in such incidents.

3.24
multilayer clothing assembly
series of layers of protective clothing arranged in the order as worn

Note 1 to entry: It may contain multilayer materials, material combinations or separate layers of clothing material in single layers.

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3.25
non-woven
sheet of fibres, continuous filaments, or chopped yarns of any nature or origin, that have been formed into a web by any means, and bonded together by any means, with the exception of weaving or knitting.

Note 1 to entry: Felts obtained by wet milling are not non-wovens.

3.26
outer material
outermost material of which the protective clothing is made

3.27
outer shell
outside facing portion of the *component assembly* (3.4) with the exception of *trim* (3.33), *hardware* (3.10), reinforcing material, and *wristlet* (3.35) material

3.28
protective garment
single item of clothing which can consist of single or multiple layers of material

EXAMPLE Protective *jacket* (3.17), protective trouser, or protective *coverall* (3.5).

3.29
pre-treatment
standard way of preparing the samples before testing

Note 1 to entry: This might include e.g. a number of cleaning cycles, submitting the sample to heat, mechanical action or any other relevant exposure and is finished by conditioning.

3.30
$RHTI_{12}$
radiant heat transfer index to one decimal place calculated from the mean time (measured in seconds, to one decimal place) to achieve a temperature rise of (12 ± 0,1) °C in the calorimeter

Note 1 to entry: When tested according to ISO 6942 with an incident heat flux of 40 kW/m^2.

3.31
$RHTI_{24}$
radiant heat transfer index to one decimal place calculated from the mean time (measured in seconds, to one decimal place) to achieve a temperature rise of (24 ± 0,2) °C in the calorimeter

Note 1 to entry: When tested according to ISO 6942 with an incident heat flux of 40 kW/m^2.

3.32
thermal barrier
that portion of the *component assembly* (3.4) designed to provide thermal protection

3.33
trim
retroreflective and fluorescent material attached to the *outer shell* (3.27) for visibility enhancement

Note 1 to entry: retroreflective materials enhance night-time visibility, and fluorescent materials enhance daytime visibility.

3.34
undergarment
garment (3.9) designed to be worn separately under an outer garment in order to provide thermal insulation

3.35
wristlet
circular, close-fitting part of a garment that encircles the wrist or ankles tightly

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