BRITISH STANDARD

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Protective clothing for firefighters — Laboratory test methods and performance requirements for wildland clothing

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ICS 13.340.10

BSI
British Standards

National foreword

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A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Protective clothing for firefighters - Laboratory test methods and performance requirements for wildland clothing

Vêtements de protection pour sapeurs-pompiers - Méthodes d'essai de laboratoire et exigences de performance pour vêtements portés pendant la lutte contre les feux d'espaces naturels

Schutzkleidung für die Feuerwehr - Laborprüfverfahren und Leistungsanforderungen für Schutzkleidung für die Brandbekämpfung im freien Gelände

This European Standard was approved by CEN on 10 May 2007.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

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Foreword

This document (EN 15614:2007) has been prepared by Technical Committee CEN/TC 162 “Protective clothing including hand and arm protection and lifejackets”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2007, and conflicting national standards shall be withdrawn at the latest by December 2007.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 89/686/EEC.

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

The purpose of this European Standard is to provide minimum performance requirements for protective clothing designed for use for extended periods during wildland firefighting and associated activities.

Wildland firefighting involves work primarily in summer temperatures, for many hours during which the firefighter may develop high levels of metabolic heat. Consequently the protective clothing should be light, flexible and commensurate with the risks to which the firefighter may be exposed in order to be effective without introducing heat stress to the wearer.

Accordingly a risk assessment should be undertaken to determine if the clothing covered by this European Standard is suitable for its intended use and the expected exposure. This European Standard does not cover clothing for use in situations where clothing complying with EN 469 is more suitable, nor does this European Standard cover clothing to protect against chemical, biological or radiation hazards.

The risk assessment should include what additional personal protective equipment is necessary for head, hands and feet. In some situations respiratory protection may be required.

Firefighters should be trained in the selection, use, care and maintenance of the protective clothing covered by this European Standard, including an understanding of its limitation.

Nothing in this European Standard is intended to restrict any jurisdiction, purchaser or manufacturer from exceeding the minimum requirements in this standard.

A list of standards related to EN 15614 is given in the Bibliography.

1 Scope

This European Standard specifies methods of test and minimum performance requirements for protective clothing, designed to protect the wearer's body, except the head, hands and feet, to be worn in wildland firefighting and associated activities. This clothing is not intended to provide protection during fire entrapment. This European Standard covers the general design of the clothing, the minimum level of performance for the materials employed and the methods of test to determine these levels.

This European Standard is not applicable to clothing for use in situations encountered in structural firefighting (EN 469 and ISO 11613) or where a high level of infrared radiation is expected (EN 1486), nor does this European Standard cover clothing to protect against chemical, biological, electrical or radiation hazards.

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 340:2003, *Protective clothing — General requirements*

EN 471:2003, *High-visibility warning clothing for professional use — Test methods and requirements*

EN 25077, *Textiles — Determination of dimensional change in washing and drying (ISO 5077:1984)*

EN 31092, *Textiles — Determination of physiological properties — Measurement of thermal and water–vapour resistance under steady–state conditions (sweating guarded – hotplate test) (ISO 11092:1993)*

EN ISO 139, *Textiles — Standard atmospheres for conditioning and testing (ISO 139:2005)*

EN ISO 3146, *Plastics — Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers by capillary tube and polarizing-microscope methods (ISO 3146:2000)*

EN 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 6942:2002)*

EN ISO 13934-1, *Textiles — Tensile properties of fabrics — Part 1: Determination of maximum force and elongation at maximum force using the strip method (ISO 13934-1:1999)*

EN 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 13935-2:1999)*

EN ISO 13937-2, *Textiles — Tear properties of fabrics — Part 2: Determination of tear force of trouser-shaped test specimens (Single tear method) (ISO 13937-2-2000)*

EN ISO 15025:2002, *Protective clothing — Protection against heat and flame — Method of test for limited flame spread (ISO 15025:2000)*

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

CIE 54.2, *Retroreflection — Definition and measurement*

3 Terms and definitions

For the purpose of this document, the following terms and definitions apply.

3.1
ageing
change of the product performance over time during use or storage. Ageing is caused by a combination of several factors, such as:

- cleaning, maintenance or disinfecting processes;
- exposure to visible and/or ultra-violet radiation;
- exposure to high or low temperatures or to changing temperatures;
- exposure to chemicals including humidity;
- exposure to biological agents such as bacteria, fungi, insects or other pests;
- exposure to mechanical action such as abrasion, flexing, pressure and strain;
- exposure to contaminants such as dirt, oil, splashes of molten metal etc.;
- exposure to wear and tear

3.2
cleaning
process by which a PPE is made again serviceable and/or hygienically wearable by removing any dirt or contamination.

NOTE A cleaning cycle is typically a washing plus drying or a dry cleaning treatment followed, if required, by ironing or other finishing

3.3
cleaning cycle
wash and a drying cycle or dry cleaning cycle

3.4
closure system
method of fastening the 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 fastener

NOTE This term does not cover seams.

3.5
component assembly
combination of all materials of a multi-layer garment presented exactly as the finished garment construction

3.6
conditioning
keeping the samples under standard conditions of temperature and relative humidity for a minimum period of time

3.7
protective coverall
one piece garment that completely covers the wearer's torso, arms and legs.

Clothing which covers or replaces personal clothing and which is designed to provide protection for the firefighter's upper and lower torso, neck, arms and legs, but excluding the head, eyes, hands and feet

3.8
protective garment
individual item of protective clothing the wearing of which provides protection against specified hazards to the part of the body that it covers

EXAMPLE Coat or shirt, trouser, or coverall.

3.9
hardware
non-fabric items used in protective clothing including those made of metal or plastic

EXAMPLE Fasteners, rank marking, buttons etc.

3.10
innermost lining
lining of the innermost face of a component assembly closest to the wearer's skin

NOTE Where the innermost lining forms a part of a material combination, the material combination is to be regarded as the innermost lining.

3.11
interlining
layer between the outermost layer and the innermost lining in a multilayer garment

3.12
main seam
seam which is necessary to maintain the integrity of the garment

3.13
material combination
material produced from a series of separate layers, intimately combined prior to the garment manufacturing stage

EXAMPLE Quilted material.

3.14
outer material
outermost material of which the protective clothing is made

3.15
pre-treatment
standard way of preparing the samples before testing. 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

3.16
seam
method of permanent fastening between two or more pieces of material

3.17
protective suit
upper and lower garment worn together that completely covers the wearer's torso, arms and legs and their neck, ankles and wrists

3.18
wildland fire fighting
suppression action involving a fire in vegetative fuels such as forest, crops, plantations, grass or farmland

4 Clothing design

4.1 General

Protective clothing for firefighters capable of satisfying the levels of performance specified in this European Standard shall protect the wearer's body, except the head, hands and feet. It may be comprised of:

— a coverall,

— a suit provided with an interface area, or

— a number of inner and/or outer garments designed to be worn together.

Clothing shall not restrict the wearer in any of the movements expected to be made during wildland firefighting.

Closure systems, label accessories, touch and close fasteners, retroreflective and/or fluorescent materials etc. attached to the protective clothing shall be designed to not adversely affect the clothing’s performance.

All closure systems shall be designed to prevent the entry of burning debris.

Conformity shall be checked by visual inspection and practical testing, such as to check sizing and correct fit by donning and doffing of the garment.

4.2 Collar

The collar shall be able to remain in the vertical position when it is set upright. All protective clothing which encircles the neck shall have a closure system at the level of the line of the collar.

Conformity shall be checked by visual inspection.

4.3 Coverall or suit

The coverall or suit shall not have turn–ups or cuffs.

The end of the coverall or trousers shall have a closure system, which will allow the end of the coverall or trousers to provide a satisfactory interface with shoes or boots that may be used for wildland firefighting.

A suit shall be provided with an interface overlap area of at least 15 cm overlap between the jacket and the trousers. This interface overlap area shall be maintained for example whilst stooping, reaching or while making a turning movement. Conformity shall be checked by visual inspection and practical testing, such as physical measurement of the overlap and checking sizing and correct fit by donning and doffing of the garment.

4.4 Pockets

All pockets with external openings shall be constructed entirely from the outer material and the external opening shall be provided with a closure system covered with a protective flap.

Protective flaps shall not be able to be tucked into the pocket and shall overlap the pocket by a minimum of 20 mm wider than the opening.

Conformity shall be checked by visual inspection and physical measurement.

4.5 Hardware

Hardware penetrating the outer material shall not be exposed on the innermost surface of the component assembly.

Conformity shall be checked by visual inspection.

4.6 Sleeves

The end of the sleeves shall be designed to protect the wrist and shall have a closure system, all of which allow the end of the sleeve to provide a satisfactory interface with gloves that may be used for wildland firefighting.

Conformity shall be checked by visual inspection and practical testing, such as physical measurement. This interface will be maintained when stooping, reaching, stretching, elevating arms and hands directly above the wearers head and making a turning movement.

4.7 Trousers

Trousers shall have a closure system which will be designed to provide a satisfactory interface between the end of the trousers and any footwear that may be used for wildland firefighting. Interfaces shall be maintained during any movement associated with wildland firefighting. Conformity shall be checked by visual inspection and practical testing, such as physical measurement of the interfaces between the bottom of the trouser leg and footwear.

5 Sampling and pre-treatment

5.1 Sampling

Test samples shall be representative of the material or material assembly as used in the protective clothing to be tested. If possible, all samples shall be taken from the garment. The number and size of the test specimens required shall be in accordance with the relevant test methods.

The tests shall be carried out on the outer material of the garment unless it is mentioned in the appropriate test clause of this European Standard to use the complete material assembly.

5.2 Number and size of specimen

The number and the size of the test specimens for the different tests shall be in accordance with the respective European and International Standards.

5.3 Pre-treatment

5.3.1 General

Prior to testing, the protective clothing shall be pre-treated.

5.3.2 Cleaning

Before each test specified in Clauses 6 and 7 the cleaning of the protective clothing shall be in line with the manufacturer's instructions, on the basis of standardized processes. If the number of cleaning cycles is not specified 5 cleaning cycles shall be performed.

5.3.3 Ageing

Performance tests of 6.2 have also to be executed after the maximum number of cleaning procedures indicated by the manufacturer.

5.4 Conditioning

Prior to all tests and after having performed the pre-treatment specified in 5.3, precondition the specimens in accordance with EN ISO 139 with the following modification: relative humidity (65 ± 5) % and at a temperature of (20 ± 2) ºC. Test each specimen within 5 min of its removal from the conditioning atmosphere.

5.5 Exposure surface

In all surface tests, test the outer surface.

6 Thermal requirements

6.1 General

Each material in the garment assembly, including retroreflective and fluorescent materials but excluding hardware, shall be tested separately using clause 6.2.1 and 6.2.2, following the appropriate cleaning specified in 5.3.

In all tests, all samples shall conform to the requirements and the test result given shall be relative to the worst result obtained.

6.2 Flame spread

6.2.1 General

Testing shall take place in accordance with EN ISO 15025:2002, either Procedure A (Code letter A1) or Procedure B (Code letter A2) or both in accordance with the existent risk during the foreseen use.

This test shall be carried out both before and after the pre-treatment specified in Clause 5. This test shall also be carried out on seams.

6.2.2 Testing in accordance with EN ISO 15025:2002, Procedure A (Code letter A1)

6.2.2.1 When tested according to EN ISO 15025:2002, Procedure A, specimens from single layer garments including seams shall meet the following requirements:

a) no specimen shall give flaming to the top or either side edge;

b) no specimen shall melt or give flaming or molten debris;

c) the mean value of afterflame time shall be ≤ 2 s;

d) the mean value of afterglow time shall be ≤ 2 s;

e) no specimen shall give hole formation.

NOTE 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.

For seams, 3 specimens containing a structural seam shall be tested in accordance with EN ISO 15025:2002, Procedure A. Specimens shall be oriented with the seam running up the centreline of the test specimen so that the burner flame impinges directly upon it. Seams shall remain intact.

6.2.2.2 If the garment is multilayer, specimens of the component assembly shall be tested both by applying the flame to the surface of the outer material of the garment and to the innermost lining of the garment and shall meet the requirements of 6.2.2.1 including that no specimen shall give hole formation except for an interlining which is used for specific protection other than heat protection, for example liquid penetration.

For seams, 3 specimens containing a structural seam shall be tested in accordance with EN ISO 15025:2002, Procedure A. Specimens shall be oriented with the seam running up the centreline of the test specimen so that the burner flame impinges directly upon it. Seams shall remain intact.

6.2.3 Testing in accordance with EN ISO 15025:2002, Procedure B (Code letter A2)

6.2.3.1 When tested according to EN ISO 15025:2002, Procedure B, hemmed specimens from single layer garments shall meet the following requirements:

a) no specimen shall give flaming to the top or either side edge;

b) no specimen shall melt or give flaming or molten debris;

c) the mean value of afterflame time shall be ≤ 2 s;

d) the mean value of afterglow time shall be ≤ 2 s;

NOTE A glowing inside the charred area is defined in EN ISO 15025 as afterglow without combustion and for the purpose of this clause is not regarded as afterglow.

For seams, 3 hemmed specimens containing a structural seam shall be tested in accordance with EN ISO 15025:2002, Procedure B. Specimens shall be oriented with the seam running up the centreline of the test specimen so that the burner flame impinges directly upon it. Seams shall remain intact.

6.2.3.2 The hemmed fabric specimen shall be prepared in the same manner as used in the construction of the clothing.

6.2.3.3 If the garment is multilayer, hemmed specimens of the component assembly shall be tested by applying the flame to the edge of the multilayer assembly and shall meet the requirements of 6.2.3.1. including that no specimen shall give hole formation except for an interlining which is used for specific protection other than heat protection, for example liquid penetration.

For seams, 3 specimens containing a structural seam shall be tested in accordance with EN ISO 15025:2002, Procedure A. Specimens shall be oriented with the seam running up the centreline of the test specimen so that the burner flame impinges directly upon it. Seams shall remain intact.

6.3 Heat transfer (radiation)

Test the single layer, the component assembly or multilayer clothing assembly, excluding any retroreflective or fluorescent materials. Carry out the tests after pre-treatment specified in 5.3. When tested in accordance with Method B of EN ISO 6942:2002 with a heat flux density of 20 kW/m^2 the single layer, the component assembly or multilayer clothing assembly shall have the minimum level as following:

RHTI 24 ≥11 s RHTI 24 – RHTI 12 ≥ 4 s

6.4 Heat resistance

Test each material including badges, patches, embroideries, hardware and closure systems, including retroreflective and/or fluorescent materials, separately. If a specimen of sufficient size cannot be taken it may

be sewn on the carrying material as used in the garment. Carry out tests after pre-treatment as specified in 5.3. When tested in accordance with ISO 17493 at a temperature of (180 ± 5) °C for 5 min, no material shall melt, drip, ignite or shrink > 5 %. Closure systems shall remain functional after the test.

Hardware, that is not in contact with the skin and is protected on the outside, shall be tested in accordance with ISO 17493 at a temperature of (180 ± 5) °C, for 5 min and shall not melt, drip, ignite and shall remain functional.

6.5 Heat resistance of the sewing thread

Specimens of the sewing threads shall be tested as received in accordance with the hot plate test in EN ISO 3146 and shall not melt at a temperature less than (260 ± 5) °C.

7 Mechanical requirements

7.1 Tensile strength

When tested in accordance with EN ISO 13934-1 the mean breaking load of the outer material shall be in both machine and cross direction:

≥ 450 N.

7.2 Tear strength

When tested in accordance with EN ISO 13937-2, the mean tear strength of the outer material shall give a tear strength in both machine and cross direction:

≥ 20 N.

7.3 Main seam strength

When tested in accordance with EN ISO 13935-2, the mean strength of main seams in the outer garment shall give a seam strength:

≥ 225 N.

8 Ergonomic and comfort requirements

8.1 Thermal resistance

When tested in accordance with EN 31092 the mean thermal resistance of the material or material combination shall give a thermal resistance:

≤ 0,055 m^2 K/W.

8.2 Water vapour resistance

When tested in accordance with EN 31092 the mean water vapour resistance of material or material combination shall give a water vapour resistance:

≤ 10 m^2 Pa/W.

9 General requirements

9.1 Dimensional change after washing and/or dry cleaning

Dimensional changes shall be measured in accordance with EN 25077.

For garments labelled for washing only (or dry cleaning only), carry out five washes (or five dry cleaning cycles) in accordance with the manufacturers instructions.

The dimensional change shall not exceed 3 % in either the machine or cross direction.

9.2 Retroreflective and/or fluorescent performance

The minimum coefficient of retroreflection for retroreflective or combined performance material shall be in accordance with EN 471:2003, Table 5 or Table 7.

Colour requirements of fluorescent materials shall be in accordance with 5.1 of EN 471:2003.

When tested in accordance with 7.3 of EN 471:2003, using the CIE 54.2 measurement protocol, and following testing according to the conditions established in 6.4 of this European Standard, the retroreflective and/or combined-performance material shall have a coefficient of retroreflectivity in accordance with 6.2 of EN 471:2003 (Retroreflective performance requirements after exposure).

Retroreflective materials as defined in EN 471 shall be attached to the outermost surface of the protective clothing with a minimum area of not less than 0,13 m^2 and give all around visibility by encircling the arms, legs and torso regions of the garment(s).

Fluorescent and/or combined-performance material shall comprise an area of not less than 0,2 m^2 and give all around visibility by encircling the arms, legs and torso regions of the garment(s).

10 Marking

Wildland firefighter's protective clothing for which compliance with this European Standard is claimed shall be marked according to EN 340:2003. The marking shall be on the garment itself or on a label permanently fixed on the inside of the garment and shall remain legible following 50 cleaning cycles.

The marking shall provide the following information:

a) name, trade mark or other means of identifying the manufacturer or its authorised representative;

b) designation of product type, commercial name or code;

c) size designation according to Clause 6 of EN 340:2003;

d) the garment manufacturer shall provide washing instructions and confirmation that the clothing can be industrially washed if applicable;

e) conformity of the clothing with the requirements of EN 15614:2007;

f) lot or trace number;

g) the graphical symbol according to Figure 1 and below the symbol code letters A1 or A2 or both, as applicable.

Figure 1 – Graphical symbol ISO 7000 - 2418

11 Information supplied by the manufacturer

The protective clothing shall be supplied to the client accompanied by instructions written at least in the official languages of the country of destination. All this information shall be clear. The manufacturer shall give as much information as possible on known factors of durability, especially on durability to cleaning. See EN 340:2003, Clause 8 for further details:

In the case that applying a finish can restore the protective properties, the maximum number of cleaning cycles before re-application of the finish shall be clearly indicated in the information notice.

The following information shall be provided:-

a) the name and address of the manufacturer or its authorised representative;

b) the intended use of the product;

c) reference to this European Standard, i.e. EN 15614:2007;

d) the mode of use;

— test to be carried out by the user before use if necessary;

— instructions explaining how to put on and take of the garment if necessary;

— the limits of use (e.g. scale of temperatures);

— the storage and maintenance instructions;

— the instructions for cleaning and /or decontamination;

— the method of drying;

— a warning against problems which might arise, if necessary;

— any illustrations, if these might be useful;

— the type of packaging suitable for transport;

e) code letters A1 or A2 or both, as applicable and their meaning.

Annex A
(informative)

Uncertainty of measurement

The uncertainty associated with most of the test methods specified in this European Standard cannot be determined until laboratory trials have been completed and the test methods have been amended appropriately. In this transitional period the results obtained from all tests specified in this European Standard shall be interpreted without taking uncertainty into account.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 89/686/EEC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 89/686/EEC, on the approximation of the laws of the Member States relating to Personal Protective Equipment.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Directive 89/686/EEC

Clause(s)/subclause(s) of this European Standard	Essential Requirements (ERs) of Directive 89/686EEC, Annex II	Qualifying remarks/notes
4.1	1.2.1 Absence of risks and other inherent nuisance factors	
4.2	1.2.1 Absence of risks and other inherent nuisance factors	
4.3	1.2.1 Absence of risks and other inherent nuisance factors	
4.4	1.2.1 Absence of risks and other inherent nuisance factors	
4.5	1.2.1 Absence of risks and other inherent nuisance factors	
4.6	1.2.1 Absence of risks and other inherent nuisance factors	
4.7	1.2.1 Absence of risks and other inherent nuisance factors	
5.3	1.4 Information supplied by the manufacturer	
5.3.3	2.4 PPE subject to ageing	
6.2	Protection against heat and/or fire 3.6.1 PPE constituent materials and other components	
6.3	Protection against heat and/or fire 3.6.1 PPE constituent materials and other components	
6.3	Protection against heat and/or fire 3.6.2 Complete PPE ready for use	
6.4	1.2.1 Absence of risks and other inherent nuisance factors	
6.5	1.2.1 Absence of risks and other inherent nuisance factors	
7.1	1.3.2 Lightness and design strength	

Table ZA.1 *(continued)*

Clause(s)/sub-clause(s) of this Standard	Essential Requirements (ERs) of Directive 89/686EEC, Annex II	Qualifying remarks/notes
7.2	1.3.2 Lightness and design strength	
7.3	1.3.2 Lightness and design strength	
8.1	1.2.1 Absence of risks and other inherent nuisance factors	
8.2	2.2 PPE ‘enclosing' the parts of the body to be protected	
9.1	1.2.1 Absence of risks and other inherent nuisance factors	
9.2	2.13 PPE in the form of clothing capable of signalling the user’s presence visually	
10	1.4 Information supplied by the manufacturer	
10	2.12 PPE bearing identification marks relating to health and safety	
11	1.4 Information supplied by the manufacturer	

WARNING: Other requirements and other EU Directives may be applicable to the products falling within the scope of this standard.

Bibliography

[1] EN 469, *Protective clothing for firefighters — Performance requirements for protective clothing for firefighting*

[2] EN 1486, *Protective clothing for firefighters — Test methods and requirements for reflective clothing for specialized fire fighting*

[3] ISO 11613, *Protective clothing for firefighters — Laboratory test methods and performance requirements*

[4] ISO 15538, *Protective clothing for firefighters — Laboratory test methods and performance requirements for protective clothing with a reflective outer surface*

[5] EN ISO 15797, *Textiles — Industrial washing and finishing procedures for testing of workwear (ISO 15797:2002)*

[6] EN ISO 6330, *Textiles — Domestic washing and drying procedures for textile testing (ISO 6330:2000)*

[7] ISO 7000, *Graphical symbols for use on equipment — Index and synopsis*

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