SINGLE LAYER FIRE RETARDANT COVERALL

Governing Specifications

and Test details for

Single Layer Fire retardant

Coverall / Dangree

EN ISO 11612 & ISO 11611

Vinay Khanna

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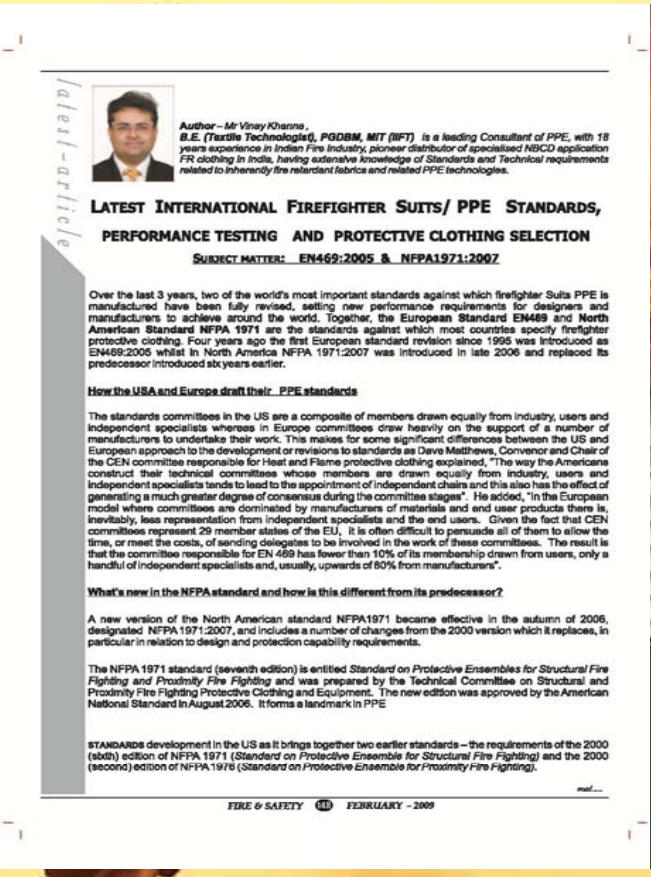
INHERENT FIRE RETARDANT COVERALL / SINGLE LAYER

Governing Specifications and Testing details

Introduction



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LATEST INTERNATIONAL FIREFIGHTER SUITS/ PPE STANDARDS, PERFORMANCE TESTING AND PROTECTIVE CLOTHING SELECTION

SUBJECT MATTER: EN469:2005 & NFPA1971:2007

Over the last 3 years, two of the world's most important standards against which firefighter Suits PPE is manufactured have been fully revised, setting new performance requirements for designers and manufacturers to achieve around the world. Together, the **European Standard EN469** and **North American Standard NFPA 1971** are the standards against which most countries specify firefighter protective clothing. Four years ago the first European standard revision since 1995 was introduced as EN469:2005 whilst in North America NFPA 1971:2007 was introduced in late 2006 and replaced its predecessor introduced six years earlier.

How the USA and Europe draft their PPE standards

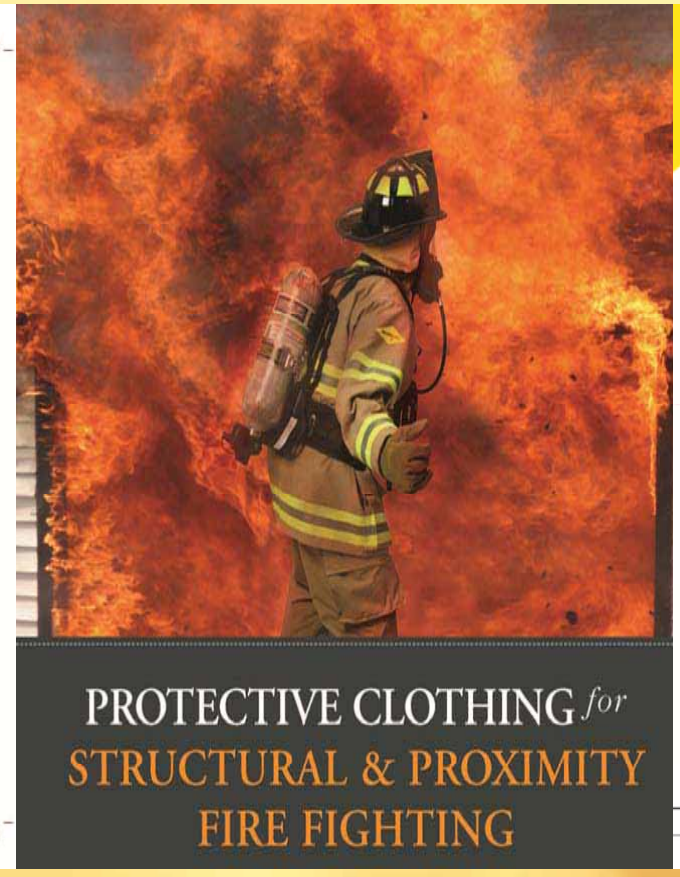
The standards committees in the US are a composite of members drawn equally from industry, users and independent specialists whereas in Europe committees draw heavily on the support of a number of manufacturers to undertake their work. This makes for some significant differences between the US and European approach to the development or revisions to standards as Dave Matthews, Convenor and Chair of the CEN committee responsible for Heat and Flame protective clothing explained, "The way the Americans construct their technical committees whose members are drawn equally from industry, users and independent specialists tends to lead to the appointment of independent chairs and this also has the effect of generating a much greater degree of consensus during the committee stages". He added, "In the European model where committees are dominated by manufacturers of materials and end user products there is, inevitably, less representation from independent specialists and the end users. Given the fact that CEN committees represent 29 member states of the EU, it is often difficult to persuade all of them to allow the time, or meet the costs, of sending delegates to be involved in the work of these committees. The result is that the committee responsible for EN 469 has fewer than 10% of its membership drawn from users, only a handful of independent specialists and, usually, upwards of 80% from manufacturers".

What's new in the NFPA standard and how is this different from its predecessor?

A new version of the North American standard NFPA1971 became effective in the autumn of 2006, designated NFPA 1971:2007, and includes a number of changes from the 2000 version which it replaces, in particular in relation to design and protection capability requirements.

The NFPA 1971 standard (seventh edition) is entitled *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting* and was prepared by the Technical Committee on Structural and Proximity Fire Fighting Protective Clothing and Equipment. The new edition was approved by the American National Standard in August 2006. It forms a landmark in PPE

STANDARDS development in the US as it brings together two earlier standards – the requirements of the 2000 (sixth) edition of NFPA 1971 (*Standard on Protective Ensemble for Structural Fire Fighting*) and the 2000 (second) edition of NFPA 1976 (*Standard on Protective Ensemble for Proximity Fire Fighting*).



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Press Release

New revision in Standards of Fire Fighter Suit

Mr Vinay Khanna , B.E. (Textile Technologist),

Mr Vinay Khanna , B.E. (Textile Technologist), PGDBM , MIT (IIFT – Topper & Medalist) is a leading Consultant of PPE, with 19 years experience in Indian Fire Industry, pioneer distributor of specialised Proximity / NBCD application FR clothing in India, having extensive knowledge of Standards and Technical requirements related to inherently fire retardant fabrics and related PPE technologies.

Improvement of PPE and Fire Clothing has been a continuous process since centuries and Fire Professionals are taking advantage of technology developments and innovations to ensure that life saving clothing like Fire Fighter Suits are deployed as per the latest VERSIONS of International Standards In lieu of older or outdated version of Standards with limited or redundant capability.

The prindpal standards setting bodies for Fire Fighter Structural-Proximity Suits cover Europe ("EN" Standards) , the USA ("NFPA" Standards) and a worldwide International Group which sets ISO Standards.

In India, advanced Structural Fire Fighter Proximity Suits were introduced in the period 1990-1992 and since then has become the preferred choice of Fire Departments in various Sectors including State Fire Brigades, Industrial Fire Services, Defence and new sectors like Aviation/ Thermal Power Plants / Marine Shipping / large scale Commercial establishment including Hotels, Offices besides Oil Sector (where these Suits are also refered to as "Bunker Gear")

Bureau Of Indian Standards(BIS) has also recently initiated a process of establishing the Indian Standards for Fire Suits. As observed globally, new Standards typically take years to develop and gain International agreement and acceptance. At present , more than 85% Users/ Fire Departments in India procure Fire Fighter Suits based on EN 469 Standards , which being lightweight in configuration and are considered as a preferred choice, suitable for deployment in hot Indian tropical climate conditions with minimal heat stress on the users

The aforesaid Standards are regularly revised in the span of 7-15 years and it has been observed that during introduction of new version/ upgrades , many global manufacturers are known to hold huge inventories and stocks of older version Fire apparel. Although it is legal to use the older version Fire Suits in many countries , end users in Europe and USA prefer to purchase the new version Fire Suits as better comfort, greater safety and improved fire fighting capabilities are always given preference in the west / developed countries.

One of the common practices employed by many OEMs is that the older version Fire Suits are sold to third world countries to ignorant end-users / fire departments at cheap discounted rates and it is not uncommon to see Vendors in India promoting older EN469 :1995 version Fire Suit instead of EN 469: 2005 Fire Suit. Similarly , old NFPA 1971, 2000 Edition has been superceded by NFPA 1971, 2007 Edition Standard.

This current – first part of Article focuses on EN 469 Standards - with latest version of 2005

What does the New version 2005 of EN 469 Standard cover?

The requirements of the new standard can be categorised under a number of headings relating to performance levels, sizing, practical performance testing, sampling and pre-treatment, visibility and whole garment testing. Some of these changes/ points are provided below for all professionals involved in the design, manufacture, supply and use of PPE . The main focus is to review the implications and highlight some of the more important differences between the old and new standards.

Performance Level - (Level or Level 2) clauses 6.2, 6.3, 6.11, and 6.12.

There are now two performance level which specify the minimum requirements for garments to be worn during firefighting operations- the First relates to clothing which does not provide protection against the hazards of entrapment (level 1) whilst the other covers the requirements for structural firefighting (level 2)

Level 1 is a lower specification and may be considered adequate for activities such as rescue work, disaster assistance, road traffic collisions, perimeter support for the Main Fire attack team and wildland firefighting, whilst Level 2 is the higher requirement for fire fighting

Altogether, there are four different requirements covering respectively heat transfer (flame), heat transfer (radiation), resistance to water penetration, and water vapour resistance.

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INHERENT FIRE RETARDANT COVERALL / SINGLE LAYER

Governing Specifications and Testing details

EN ISO 11612:2008

FOREMOST

EN ISO 11612

EUROPEAN STANDARDS

FOR FLAME RESISTANT

PERSONAL PROTECTIVE CLOTHING

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Governing Specifications and Testing details

EN ISO 11612:2008

EN ISO 11612

Fire Retardant Coverall

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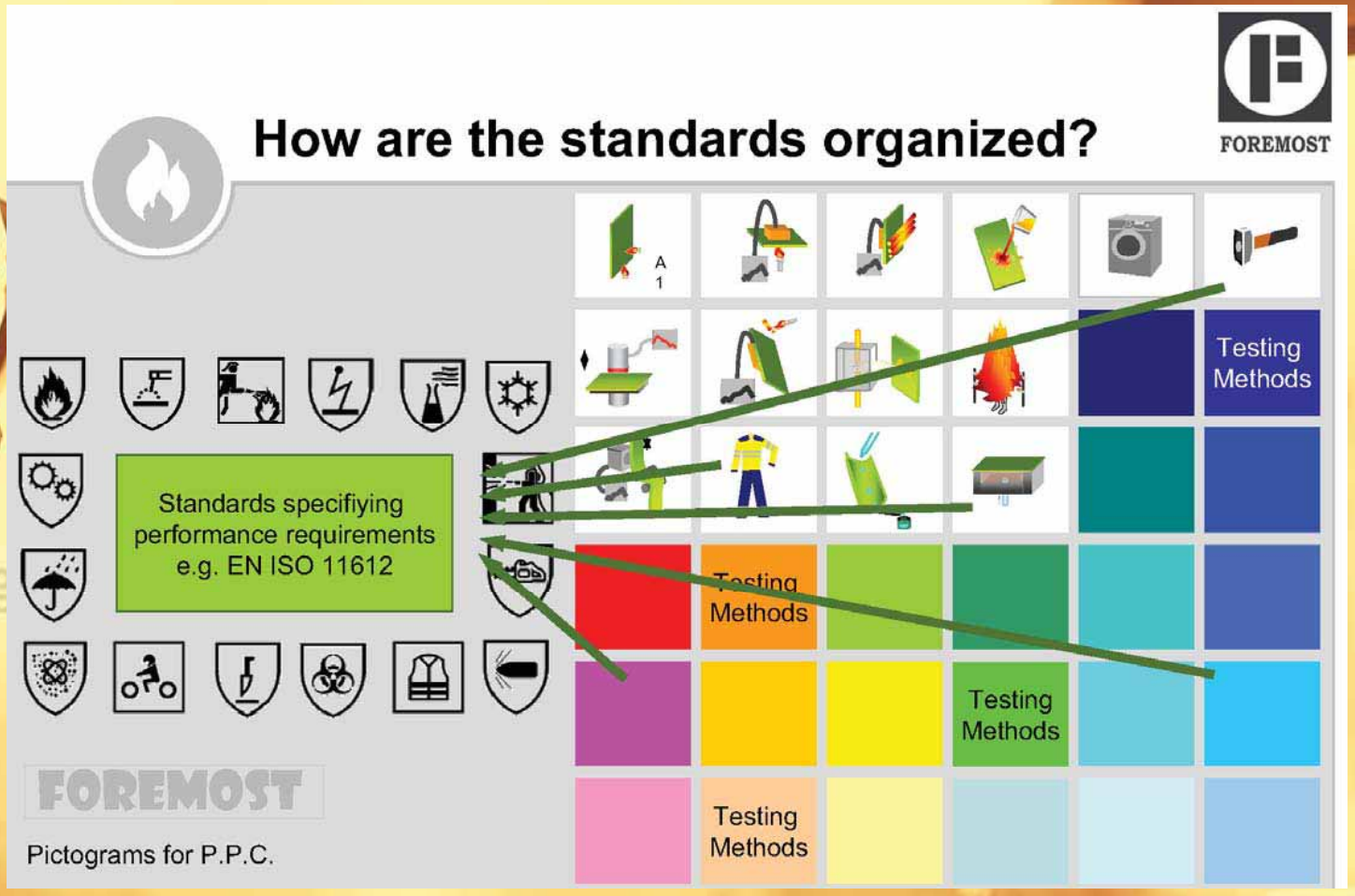

INHERENT FIRE RETARDANT COVERALL / SINGLE LAYER

Governing Specifications and Testing details

EN ISO 11612:2008

EN ISO 11612 : 2008

PROTECTION AGAINST BRIEF CONTACT WITH HEAT AND FLAME

- **EN 11612 was approved by CEN on 8TH October 2008 and was applied in November 2008**
- **This Standard superceedes EN 531**
- **This document stipulated the minimum requirements for Protective clothing-clothing to protect against heat and flame**
- **The new standard has eliminated a loophole. Now the whole garment is tested and not limited to only raw material fabric.**
- **Minimum requirement of clothing design, the minimum requirement of performance, and the minimum requirement of testing and certification**

  The heat can be convective, radiant, molten material, or a combination thereof.

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Governing Specifications and Testing details

EN ISO 11612:2008

EN ISO 11612

As per EN 11612 : 2008 ,

The Garment is Classified for the following parameters

(A1)	Limited flame spread	
(A2)	Limited flame spread, hemmed specimens	
(B)	Convective heat,	scale 1-3, where 3 is the best
(C)	Radiant heat,	scale 1-4, where 4 is best
(D)	Molten aluminium splash,	scale 1-3, where 3 is the best
(E)	Molten iron splash,	scale 1-3, where 3 is the best
(F)	Contact Heat,	scale 1-3, where 3 is the best

INHERENT FIRE RETARDANT COVERALL / SINGLE LAYER

Governing Specifications and Testing details

EN ISO 11612:2008

EN ISO 11612:2010 – ex EN 531:1995

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Protective Clothing – Protection against heat and flame

EN ISO 11612

CODE LETTERS

A	Limited Flame Spread
B	Convective Heat
C	Radiant Heat
D	Molten Aluminium Splash
E	Molten Iron Splash
F	Contact Heat
W	Optional – Resistance to water penetration

OTHER REQUIREMENTS

- Design requirements
- Washing stability
- Textile durability requirements
- Heat resistance 180°C, 260°C

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EN ISO 11612:2008

For example

EN ISO 11612 A1 B1 C1 D0 E1 F1 printed on garment label

Protective clothing for industrial workers exposed to heat according to European norm EN ISO 11612 ; The performance levels A1, B1, C1, D0, E1 and F1 are applicable.

A means that the garments fulfil the flame spread test;
B indicates the performance for convective heat, where 1 is the lowest level applicable for limited risks;
C means the performance for radiant heat, where 1 is the lowest level applicable for limited risk,
D means the performance for molten aluminium where 1 is the lowest level applicable for limited risk,
E means the performance for molten iron splash, where 1 is the lowest level applicable for limited risk and
F means the performance for contact heat, where 1 is the lowest level applicable for limited risk

This means that the wearer is protected against brief contacts with a flame as well (as to the level indicated) against convective and radiant heat and against a small amount of molten metal splashes.

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Governing Specifications and Testing details

EN ISO 11612:2008

ROADMAP FOR COMPLETE EN TESTING AS PER EEC GUIDELINES

- Test Certificate
- Test Report
- EC TYPE Examination Certificate

CE

Use of Logo permitted at this stage

INHERENT FIRE RETARDANT COVERALL / SINGLE LAYER

Governing Specifications and Testing details

EN ISO 11612:2008

EN ISO 11612

Why

EN 11612 : 2008 Standard

was introduced to replace the

EN 531 standard

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Governing Specifications and Testing details

EN ISO 11612:2008

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What makes the difference?

			EN 531:1995	EN ISO 11612:2010
6.2	Heat Resistance at a temperature of 180 ± 5°C	ISO 17493	-	≤ 5% no ignition or melt
6.2.1	Optional requirement – heat resistance at a temperature of 260 ± 5°C	ISO 17493	-	≤ 10% no ignition or melt
6.3 **6.3.2.1**	Limited Flame spread Code A1 Surface ignition Test carried out before and after pre-treatment. Specimen including seams	EN ISO 15025 Procedure A	-no specimen shall suffer flaming to the top or side edge -no specimen shall suffer hole formation -no specimen shall melt or suffer flaming or molten debris -the mean value of afterflame time shall be ≤ 2s -the mean value of afterglow time shall be ≤ 2s	-no specimen shall suffer flaming to the top or side edge -no specimen shall suffer hole formation -no specimen shall melt or suffer flaming or molten debris -the mean value of afterflame time shall be ≤ 2s -the mean value of afterglow time shall be ≤ 2s -seams shall remain intact
6.3.2.2	Multilayer garments: flame shall be applied on outer material and innermost lining of the garment	EN ISO 15025 Procedure A	-	Shall meet the requirements of 6.3.2.1 No specimen shall suffer hole formation except for an interlining that is used for specific protection other than heat protection
6.3 **6.3.3.1**	Limited Flame spread Code A2 Edge ignition Test carried out before and after pre-treatment	EN ISO 15025 Procedure B	-	-no specimen shall suffer flaming to the top or side edge -no specimen shall melt or suffer flaming or molten debris -the mean value of afterflame time shall be ≤ 2s -the mean value of afterglow time shall be ≤ 2s

INHERENT FIRE RETARDANT COVERALL / SINGLE LAYER

Governing Specifications and Testing details

EN ISO 11612:2008

What makes the difference?

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			EN 531:1995	EN ISO 11612:2010
6.4	Dimensional change due to cleaning	ISO 5077	Wovens: ≤ 3% Knits: -	Wovens: ≤ 3% Knits: ≤ 5%
6.5.1	Tensile Strength	EN ISO 13934-1 EN ISO 3376	-	Fabrics: ≥ 300N Leather: ≥ 60N
6.5.2	Tear Strength	EN ISO 13937-2 EN ISO 3377-1	-	Fabrics: ≥ 15N Leather: ≥ 20N
6.5.3	Burst strength for knitted materials	EN ISO 13938-1	-	≥ 200kPa
6.5.4	Seam strength	EN ISO 13935-2	-	Fabrics: ≥ 225N Leather: ≥ 110N
6.6	Resistance to water penetration	EN 343	-	Resistance to water penetration Water vapor resistance Classification according to EN 343
6.7	Ergonomic requirements	Annex D	-	Practical performance testing
6.9.2	pH value	ISO 3071 ISO 4045	-	pH-value shall be > 3,5 and < 9,5

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Governing Specifications and Testing details

EN ISO 11612:2008

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What makes the difference?

			EN 531:1995	EN ISO 11612:2010
6.9.3	Chromium content for leather	ISO 17075	-	Less than the detection limit
7.1	General		Code A plus one additional code letter	Code A1 and/or A2 plus 1 additional code letter
7.2	Convective heat code letter B	EN 367 ISO 9151	B1 3 until 6s B2 7 until 12s B3 13 until 20s B4 21 until 30s B5 ≥ 31s	B1 ≥ 4 < 10s B2 ≥ 10 < 20s B3 ≥ 20
7.3	Radiant heat code letter C	EN 366 EN ISO 6942, 20kW/m²	tested according to EN 366 C1 8 until 30s C2 31 until 90s C3 91 until 150s C4 ≥ 151s	tested according to EN ISO 6942 C1 ≥ 7 < 20s C2 ≥ 20 < 50s C3 ≥ 50 < 95s C4 ≥ 95s
7.4	Molten aluminium splash code letter D	EN 373 ISO 9185	D1 ≥ 100 < 200g D2 ≥ 200 < 350g D3 ≥ 350g	D1 ≥ 100 < 200g D2 ≥ 200 < 350g D3 ≥ 350g
7.5	Molten iron splash code letter E	EN 373 ISO 9185	E1 ≥ 60 < 120g E2 ≥ 121 < 200g E3 ≥ 201g	E1 ≥ 60 < 120g E2 ≥ 120 < 200g E3 ≥ 200g

INHERENT FIRE RETARDANT COVERALL / SINGLE LAYER

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EN ISO 11612:2008

FOREMOST

What makes the difference?

			EN 531:1995	EN ISO 11612:2010
7.6	Contact heat code letter F	ISO 12127 Tc=250°C	-	F1 ≥ 5 < 10s F2 ≥ 10 < 15s F3 ≥ 15s
7.7	Optional Protection against the thermal effects of an electric arc event	Annex F	-	Optional according to risk assessment
7.8	Optional Whole garment testing	ISO 13506	-	Optional testreport and comment of testing institute shall be submitted

INHERENT FIRE RETARDANT COVERALL / SINGLE LAYER

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EN ISO 11611:2007

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EN ISO 11611

EUROPEAN STANDARDS

FOR FLAME RESISTANT

PERSONAL PROTECTIVE CLOTHING

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EN ISO 11611:2007

EN ISO 11611 : 2007

PROTECTIVE CLOTHING USED IN WELDING & ALLIED PROCESSES

- EN 11611 was approved by CEN in the year 2007
- This Standard superceedes EN 471 : 1995
- The standard specifies minimum basic safety requirements and test methods for protective clothing that are designed to protect the wearer's body and that are to be worn during welding and allied processes with comparable risks
- This type of protective clothing is intended to protect the wearer against spatter (small splashes of molten metal), short contact time with flame as well as radiant heat from the Arc

  Also minimizes the possibility of electrical shock by short-term, accidental contact with live electrical conductors at voltages up to approximately 100 V d.c. in normal conditions of welding.

Sweat, soiling or other contaminants can affect the level of protection provided against short-term accidental contact with live electric conductors at these voltages.

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Governing Specifications and Testing details

EN ISO 11611:2007

EN ISO 11611

ISO 11611:2007 specifies two classes with specific performance requirements

Class 1 - lower level protection

Class 2 - Higher level protection

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Governing Specifications and Testing details

EN ISO 11611:2007

EN ISO 11611:2010 – ex EN 470-1

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Protective Clothing for use in welding and allied processes

- General Clothing requirements
- Textile durability requirements
- Washing stability
- FR performance requirements tested acc. EN ISO 15025
- Welding performance tested acc. ISO 9150 (2 classes)
- Radiant heat protection tested acc. EN ISO 6942 (2 classes)
- Electrostatic properties tested acc. EN 1149-2

INHERENT FIRE RETARDANT COVERALL / SINGLE LAYER

Governing Specifications and Testing details

EN ISO
11611 & 11612

EN ISO 11611

EN ISO 11612

Overview of Tests Covered under

EN 11612 : 2008 standards

and

EN 11611 : 2007 standards

INHERENT FIRE RETARDANT COVERALL / SINGLE LAYER

Governing Specifications and Testing details

EN ISO 11612 : 2008

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Vertical flame test EN ISO 15025

Protective Clothing – Protection against heat and flame – Method of test for limited flame spread

- EN ISO 15025 (ex EN 532)
- 6 specimen (3 warp 3 weft direction)
- 200 x 160 mm
- Vertical orientation
- Flame exposure = 10 sec.
- 2 Procedures: A Surface, B Edge

Observations shall be recorded:

- Flaming to the top or side edge of the specimen
- Time of afterburn
- Afterglow outside of the charred area
- Time of afterglow
- Molten or flaming debris
- Ignition of filterpaper (if used) by flaming or molten debris
- Hole formation and in which layer in case of multilayers

INHERENT FIRE RETARDANT COVERALL / SINGLE LAYER

Governing Specifications and Testing details

EN ISO 11612 : 2008

Convective heat test EN ISO 9151

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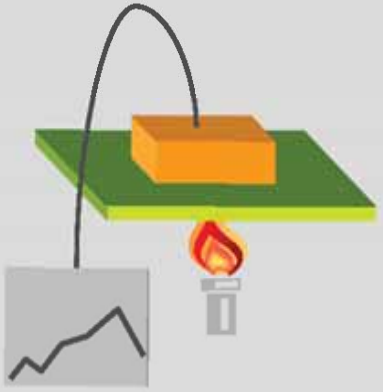
Protective Clothing against heat and flame – Determination of heat transmission on exposure to flame



- EN ISO 9151 (ex EN 367)
- 3 specimen
- 140 x 140 mm
- Horizontal orientation
- Heatflux = 80kW/m²
- Time until second degree burn
- Classification according to the relevant standard e.g. EN ISO 11612

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INHERENT FIRE RETARDANT COVERALL / SINGLE LAYER

Governing Specifications and Testing details

EN ISO 11612 : 2008

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Radiant heat test EN 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

- EN ISO 6942 (ex EN 366)
- 3 specimen
- 230 x 70 mm
- Vertical orientation
- Heatflux = 20kW/m²
- Time until second degree burn
- Classification according to the relevant standard e.g. EN ISO 11612

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Governing Specifications and Testing details

EN ISO 11612

Liquid metal splash test ISO 9185

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Protective Clothing – Assessment of resistance of materials to molten metal splash

- ISO 9185 (EN 373 harmonisation pending)
- 4 specimen
- 260 x 100 mm
- Pouring height 225 mm
- Aluminium 60° Iron 75° angel
- Damage of skin simulant
- Hole formation in the fabric
- Classification according to the relevant standard e.g. EN ISO 11612

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Governing Specifications and Testing details

EN ISO 11612

Contact heat test ISO 12127

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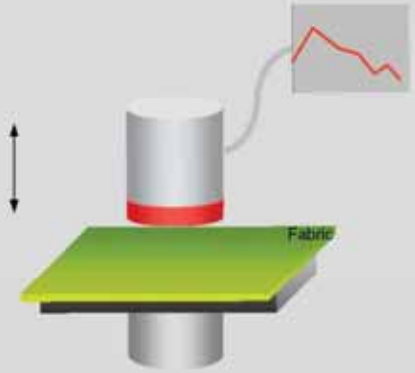
Clothing for protection against heat and flame – Determination of contact heat transmission through protective clothing or constituent materials



- ISO 12127:1996
- Horizontal orientation
- 3 specimen
- 80 mm diameter
- Hot cylinder 250°C
- Time until second degree burn
- Classification according to the relevant standard e.g. EN ISO 11612

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Governing Specifications and Testing details

EN ISO 11611:2007

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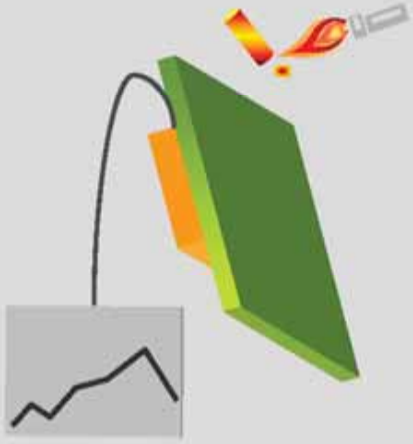
Welding Test ISO 9150:1988

Protective Clothing – Determination of behaviour of materials on impact of small splashes of molten metal



- ISO 9150:1988
- Min 10 specimens
- Size of specimen 120 x 20 mm
- Metal rod, specified frequency of droplets
- Measurement of temperature increase by calorimeter
- Classification according to the relevant standard e.g. EN ISO 11611

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EN ISO 11611:2007

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Protection agaist static electricity EN 1149

Protective Clothing – Electrostatic properties – Part 1-5

	EN 1149-1 Test method for measurement of surface resistivity	EN 1149-2 Test method for measurement of the electrical resistance through a material	EN 1149-3 Test methods for measurement of charge decay	EN 1149-5 Material performance and design requirements
Number of specimen	5	5	12	Material has to fulfill one of the following requirements
Specimen size	100 mm diameter	100 mm diameter	50 x 300 mm	T50 < 4 s or S > 0,2 tested according EN 1149-3 procedure 2
Voltage	100 ± 5V	100 ± 5V		Surface resistivity of ≤ 2,5 x 10^9 Ω tested according EN 1149-1
Duration time	15 ± 1 s	15 ± 1 s	60 s	Distance of anti static grid has to ≤10 mm in all directions
	Measurement of surface resistivity	Mmt. of electrical resistance through a material	Measurement of charge decay	

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EN ISO 11612:2008

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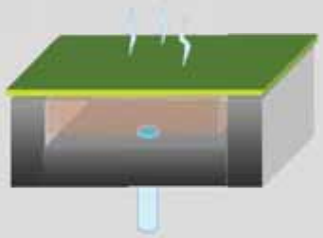
Physiological properties RET - EN 31092

Textiles - Determination of physiological properties - Measurement of thermal and water-vapour resistance under steady-state conditions (sweating guarded - hotplate test) (ISO 11092)



- Hotplate test
- Specimen size 270 x 270 mm
- 2 specimen
- Resistance of watervapour through the textile material
- Classification according to the relevant standard e.g. EN 469, EN 471

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EN ISO
11612:2008

Style 1

BASIC

CE

EN ISO 11611

EN ISO 11612

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EN ISO
11612:2008

Style 2

Customised/ DLF

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EN ISO
11612:2008

Style 3

Premium
Concept

EN ISO 11611

EN ISO 11612

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ISO 9001 : 2008

DRAWING LAYOUT - CUSTOMISED PREMIUM DESIGN FR COVERALL

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