**BUREAU OF INDIAN STANDARDS**

**(New Delhi)**

**AGENDA**

**Textiles Protective Clothing Sectional Committee, TXD 32 19th Meeting**

|  |  |  |
| --- | --- | --- |
| **Date/Day** | **Time** | **Venue** |
| 21 May 2024 | 1100 h | Through Video Conferencing |

**CHAIRMAN:** Dr. Arindam Basu, NITRA, Ghaziabad

**MEMBER SECRETARY:** Shri Mayur Katiyar

**Item 0 WELCOME AND INTRODUCTORY REMARKS BY THE CHAIRMAN**

**Item 1 CONFIRMATION OF THE MINUTES OF THE PREVIOUS MEETING**

**1.1** The minutes of the 18th meeting of the TXD 32 held on 19 December 2023 were circulated vide BIS DG letter No. TXD32/A2.18 dated 11 January 2024. No comments have been received.

## 1.1.1 The Committee may NOTE.

**Item 2 COMPOSITION OF TXD 32**

**2.1** The present composition and scope of TXD 32 is given in **Annex 1 (P-5 to 7).**

**2.1.1** The committee may **DECIDE**.

**2.2** Co-option requests received from M/s BisonLife India Pvt. Ltd, Bengaluru is given in **Annex 2 (P-8 to 12).**

**2.2.1** The committee may **DECIDE**.

**Item 3 ISSUES ARISING OUT OF THE PREVIOUS MEETINGS**

**3.1** Summary of actions taken on the various decisions of the previous meetings are given in **Annex 3 (Page 13 to 14).**

**3.1.1** The committee may **NOTE.**

**Item 4 DRAFT STANDARD FOR FINALIZATION**

**4.1** In the last meeting, the committee decided that the following draft Indian standards shall be issued under wide circulation for a period of 2 months for eliciting technical comments. The wide circulation draft is given in **Annex 4 (P-15 to 29).** No comments were received.

1. **[Doc: TXD/32/24728]** ISO 16073-3:2019 Wildland firefighting personal protective equipment Requirements and test methods part 3: Clothing
2. **[Doc: TXD/32/24727]** ISO 16073-4 : 2019 Wildland firefighting personal protective equipment Requirements and test methods Part 4: Gloves
3. **[Doc: TXD/32/24726]** ISO 23616 : 2022 Cleaning Inspection and Repair of Firefighters Personal Protective Equipment PPE

**4.1.1** The committee may **DECIDE.**

**Item 5 DRAFT FOR WIDE CIRCULATION**

**5.1** In the last meeting, the committee constituted a working group under the convenorship of Dr M S Parmar for preparing the draft revision of IS 16890 for protective clothing for firefighters. The working group convened a meeting on 18 March 2024. BIS has prepared a draft revision after incorporating the decisions of the working group. The draft revision of IS 16890 is given in **Annex 5 (P-30 to 48).**

**5.1.1** The committee may **DECIDE.**

**Item 6 COMMENTS ON PUBLISHED STANDARDS**

**6.1** The comments received from Shri Amit Jain through portal on IS 15741 : 2007 on Curtain and drapes is given in **Annex 6 (P-49).**

**6.1.1** The committee may **DECIDE.**

**6.2** The comments received from M/s NITRA, Ghaziabad on IS 15748 : 2008 on Clothing to protect against heat and flameare given in **Annex 7 (P-50).**

**6.2.1** The committee may **DECIDE.**

**6.3** The comments received from the following organizations on IS 15809 : 2017 on High Visibility Warning Clothing are given in **Annex 8 (P- 51 to 53).**

1. M/s Star safety Hub, Faridabad.
2. M/s 3M Scotchlite Reflective Materials Business.
3. M/s NITRA Ghaziabad.

**6.3.1** The committee may **DECIDE.**

**6.4** The comments received from Office of the Principal Commissioner of Customs Air Cargo Complex (Import) on IS 15768 : 2008 on Upholstered fabric for non-domestic furniture is given in **Annex 9 (P- 54).**

**6.4.1** The committee may **DECIDE**.

**Item 7 NEW WORK ITEM PROPOSAL**

**7.1** The proposal of formulation of new Indian standards on the following subject has been received from M/s CFEES:

1. ISO 15538:2001 Protective clothing for firefighters Laboratory test methods and performance requirements for protective clothing with a reflective outer surface

**7.1.1** The committee may **DECIDE.**

# **7.2** ISO 15384 : 2018 Protective clothing for firefighters: Laboratory test methods and performance requirements for wildland firefighting clothing have been published by ISO under ISO/TC 94/SC 14. The scope of the standard is relevant to the scope of TXD 32 sectional committee. The relevant extract of above ISO Standard is given at **Annex 10 (Pages 55-58)**. It is proposed that the standard may be adopted as Indian standard.

**7.2.1** The committee may **DECIDE**.

**7.3** The proposal for formulation of new Indian standard for Fire resistant fabric was received from M/s Arvind Ltd. Ahmedabad. The draft as received is given in **Annex 11 (Pages 59-78)** to the agenda.

**7.3.1** The committee may **DECIDE**.

**Item 8 REVIEW OF INDIAN STANDARDS**

**8.1** As per procedure of BIS, standards which were published/reaffirmed five years ago or before are required to be reviewed to assess adequacy of the requirements specified. Review is carried out keeping in view the changes in technology, current industrial practices and the needs/ expectations of the consumers/users so as to decide regarding further reaffirmation/revision/ withdrawal/amendment of the standards under review. The following standards were allocated to member secretary for review. The review was done and was circulated to members. The review performa is given in **Annex 12 (P- 79 to 90).**

|  |  |  |
| --- | --- | --- |
| **Sl No.** | **IS Number** | **IS Title** |
|  | IS 17286 : 2019 | Textiles – Water-proof multipurpose rain poncho with convertibility as bivouac – Specification |
|  | IS 17291 : 2019 | Textiles – Flame retardant jute based decorative and cover fabric for temporary structure – Specification |

**8.1.1** The committee may **DECIDE.**

**Item 9 STANDARD RECOMMENDED FOR WITHDRAWL**

**9.1** In the 17th meeting, the committee decided that the Indian Standard IS 1097 : 1979 for handloom cotton mosquito netting shall be circulated to the committee members for their inputs for a period of 15 days for comments. The comments received from M/s NSG, New Delhi and Shri B R MohanRaj from Central Manufacturing Technology Institute are given in **Annex 13 (P- 91)**

**9.1.1** The committee may **DECIDE**.

**Item 10 ANY OTHER BUSINESS**

**ANNEX 1**

**(Item 2.1)**

**COMPOSITION OF TEXTILE PROTECTIVE CLOTHING SECTIONAL COMMITTEE, TXD 32**

**SCOPE -** To formulate Indian Standards for testing and specification for textile protective clothing for protection from fire and other health/life hazards

|  |  |  |
| --- | --- | --- |
| **Sl No.** | **NAME OF THE ORGANIZATION** | **REPRESENTED BY** |
|  | Northern India Textile Research Association, (NITRA)Ghaziabad | Dr. Arindam Basu CHAIRMAN |
|  | Aeronav Industrial Safety Appliances, Noida | Shri Sandeep Hora |
|  | Arvind Limited, Ahmedabad | Shri Narinder Thapa  Shri Pabitra Sahoo  Smt Palak Kakkar (Alternate) |
|  | Border Security Force, New Delhi | Shri Satish Chandra  Shri Tarun Ravi (Alternate) |
|  | Avient Protective Materials Limited, Pune | Shri Harsh Wardhan Sharma  Shri Rakesh Gaikwad (Alternate) |
|  | Central Industrial Security Force, New Delhi | Shri Anand Saxena  Shri Ravindra Kumar Meel (Alternate) |
|  | Central Reserve Police Force, New Delhi | Shri D.N Lal  Shri Sanjeev Kumar Singh (Alternate) |
|  | Centre for Fire and Explosive Environment Safety, Defence Institute of Fire Research, Delhi | Shri Mahipal Meena  Ms Anjlina Kerketta (Alternate) |
|  | Confederation of Indian Industry, New Delhi | Shri Saunak Banerjee |
|  | Defence Bio-Engineering and Electromedical Laboratory, Ministry of Defence, Bengaluru | Dr T M Kotresh  Shri Vinoth. P (Alternate) |
|  | Defence Institute of Physiology and Allied Science (DRDO), New Delhi | Dr. Madhusudan Pal  Shri Sunil Kumar Hota (Alternate) |
|  | Defence Materials and Stores Research and Development Establishment, Kanpur | Shri Mukesh Sinha  Shri Ajitendra Singh Parihar (Alternate) |
|  | Defence Research and Development Organisation, Terminal Ballistics Research Laboratory, Chandigarh | Dr. Preeti Jain  Shri Sandeep Bagga (Alternate) |
|  | Department of Delhi Fire Services, Govt of NCT of Delhi, Delhi | Atul Garg  Shri Vipin Kental (Alternate) |
|  | Department of Jute and Fibre Technology, University of Kolkata, Kolkata | Prof A. K. Samanta  Prof D Das (Alternate) |
|  | Directorate General Fire Services, Civil Defence and Home Guards, Ministry of Home Affairs, New Delhi | Shri D. K. Shami |
|  | Directorate General of Quality Assurance, Ministry of Defence, New Delhi | Shri Mahendra Singh  Shri P De (Alternate) |
|  | E.I. DuPont India Private Limited, Gurugram | Shri Manoj Jhaver  Smt. Mithali Chenggapa (Alternate) |
|  | Fire Retardant Association of India, Mumbai | Shri P V Murali Mohan |
|  | Foremost Technico Private Limited, New Delhi | Shri Vinay Khanna  Shri Anoop Khanna (Alternate) |
|  | Indian Institute of Technology Delhi, New Delhi | Prof. Abhijit Majumdar  Dr Bipin Kumar (Alternate) |
|  | Indian Technical Textiles Association, Mumbai | Dr Anup Rakshit  Shri Sanjay Sathe (Alternate) |
|  | Indo Tibetan Border Police, New Delhi | Shri M Kumar  Shri Uttam Kumar (Alternate) |
|  | JCT Limited, Hoshiarpur | Shri K S Dhillon  Shri Arwinder Singh (Alternate) |
|  | Kusumgar Corporates Private Limited, Vapi | Shri Sidhartha Kusumgar  Dr M K Talukdar (Alternate) |
|  | Ministry of Textiles, New Delhi | Dr Mukesh Kumar Sinha |
|  | Mishra Dhatu Nigam Limited, Hyderabad | Col Ashwani Kumar |
|  | MKU Limited, Kanpur | Shri Vaibhav Gupta  Shri Rajib Pal (Alternate) |
|  | NBC Equipment Wing, Ministry of Defence (DGQA), Pune | Shri BG Shinde  Lt. Col RS Jhinkwan (Alternate) |
|  | National Forensic Sciences University, Gandhinagar | Shri S K Khandelwal  Shri Saurabh Kumar (Alternate) |
|  | Northern India Textile Research Association, Ghaziabad | Dr M S Parmar  Smt Shweta Saxena (Alternate) |
|  | National Security Guard, New Delhi | Shri Manu Lochab |
|  | Office of the Textile Commissioner, Mumbai | Shri N. K. Singh  Shri Sanjay Charak (Alternate) |
|  | Oil Industry Safety Directorate, Noida | Shri Devendra M. Mahajan  Shri Harendra Yadav (Alternate) |
|  | Ordnance Clothing Factory, Shahjahanpur | Shri V Mathivanan  Shri Shanmugam B (Alternate) |
|  | Reliance Industries Limited, Mumbai | Shri Rahul Srivastava  Shri Vijay Garg (Alternate) |
|  | SGS India Private Limited, Mumbai | Dr. Anitha Jeyaraj  Dr. Karthikeyan K (Alternate) |
|  | SMPP Private Limited, New Dehi | Shri Ashish Kansal  Dr. S. C. Kansal (Alternate) |
|  | Star Safety Hub, Faridabad | Shri Pawan Kumar Gupta  Shri Naveen Gupta (Alternate) |
|  | System 5S Private Limited, Chennai | Shri Sudhir Takkar  Smt. Bhavna Sr. Takkar (Alternate) |
|  | Teijin India Private Limited, Gurugram | Shri Ravi Kumar  Shri Sahil Aneja (Alternate) |
|  | Tex Corporation Limited, Gurugram | Shri Vijay Toley  Shri Sanjay Aggarwal (Alternate) |
|  | Textiles Committee, Mumbai | Shri Kartikay Dhanda  Smt Shilpi Chauhan (Alternate) |
|  | The Synthetic and Art Silk Mills Research Association, Mumbai | Shri Premnath Surwase  Ravi Prakash Singh (Alternate) |
|  | TUV Rhineland (India) Private Limited, Mumbai | Dr. P. S. Sundaram  Shri Shivendra Parmar (Alternate) |

**ANNEX 2**

**(Item 2.2)**

**Letter of Authorization**

Bisonlife India Private Limited

#137/34, HMG Ambassador Building, 10th Floor,   
Residency Road, Bengaluru-560025   
GST: 29AALCB7282M1ZV   
CI N: 1132902KA2023PTC175443

Date: 26/02/2024

Dear Ma’am/ Sir.

Subject: Letter of Authorization

We hereby authorize Mr. Abhijit Mondal, Chief Technical Officer of Bisonlife India Pvt. Ltd. to submit the application to become a member of the BIS Technical Committee on behalf of our entity Bisonlife India Pvt. Ltd. having registered office at #137/34, HMG Ambassador Building, 10th Floor, Residency Road, Bengaluru-560025. India.

We also authorize Mr. Abhijit Mondal to make declarations and to submit documents, wherever required, on our behalf.

The Specimen signature of Mr. Abhijit Mondal Authorized representative is attested below:

(Specimen Signature of authorized representative)

Yours faithfully,

For Bison Life India Pvt. Ltd. Authorised signatory

Name: Anirban Pal

Designation: Business Head — South East Asia

Date: 26/02/2024

Seal of the signing authority

**CV**

**Abhijit Mondal**

+91 99000 64403 🞟 [abhijitmondal2006@gmail.com](mailto:abhijitmondal2006@gmail.com)

**PRODUCT DEVELOPMENT / RESEARCH AND DEVELOPMENT – Product Commercialization and Regulatory Certification**

**Innovative and results-driven professional with 18+ years of a robust background in Technical Textile, Safety Product Development and Research and Development (R&D), specializing in Product Commercialization and Regulatory Certification.**

* Proven track record of successfully bringing new products from concept to commercialization while ensuring compliance with regulatory requirements.
* Skilled in identifying product opportunities, and developing strategic plans to meet customer needs.
* Proficient in managing cross-functional teams, coordinating lab setup, regulatory audit and compliance, and ensuring smooth product commercialization processes.
* Strong analytical and problem-solving abilities combined with effective communication skills to collaborate with stakeholders at all levels.

**CORE COMPETENCIES**

* Product Development Lifecycle
* Product Regulations and Standards
* Product Testing and Validation
* Quality Assurance Principles and Processes
* Stakeholder Management
* Product Commercialization Strategies
* Technical Textile Knowhow
* Various Polymer and Material Science Knowledge
* Product Development
* Commercialization and Project Management
* Regulatory Standards Knowledge
* Documentation and Reporting
* Cross-functional Team Management

**SOFTWARE SKILLS**

MS Office | Datacolor CCM | Textile CAD | Systat10 | Data color Autolab | Logic-art | Arel APC controller | SAP & CRM |

**CAREER**

**Bisonlife India Pvt. Ltd. Oct 2023 – Present**

**Chief Technical Officer (Global role)**

* Successfully commercialized various occupational health and safety products and secured various regulatory approvals.
* Conceptualizing and commercializing the product, manufacturing setup, trial and product qualification, lab setup and securing regulatory approval.
* Lead the product development, regulatory and commercialization process to develop hardhat, hearing, respiratory, fall protection etc.
* Business development and participation in various forum

**3M India Ltd. Jun 2011 – Sept 2023**

**Sr Technical Manager (Personal Safety Division)**

* Sustained USD 6Mn business and created new opportunities through arranging lab setup and testing as per regulatory amendment, and altering product design to qualify.
* Developed a disposable respirator and commercialized BIS P2 level respirator to gain momentum to save lives during the pandemic in 2020.
* Execute new lab setup, product certification and regularity compliance.
* Deliver technical support to the sales team to augment market share, business development, troubleshoot, handle customer complaints, and organize seminars and awareness programs.

**MKU Pvt. Ltd. (100% EOU unit) Jul 2009 – Jun 2011**

**Technical Manager**

* Drove personal protection product design and development, R&D on bullet, stab and blast resistance products, Armor product testing and test results analysis, testing facility development, troubleshooting, product certification, international customer care and business development.

**MAHLE Filter Systems India Dec 2007 – Jun 2009**

**Assistant Manager (Research & Development)**

* Handled industrial projects including, application of electrospun nanofibre as Automotive Air, Fuel & Oil filter media, Commercial nanofibre production setup development, Filter for Bio-Diesel, Double layer high efficiency & DHC air filter media development, four-layer high efficiency & DHC fuel filter media development, Validation of offline & online particle counters, and Development of melt blown nonwoven pilot line.
* Testing exposure: Media testing (Tensile, Air permeability, Max. pore & Mean pore, Burst strength), Polymer characterization (DSC, FTIR, MFI, XRD, Viscosity, AFM, SEM), Filter testing (Particulate efficiency, DHC)

**Vardhman Textile Ltd. Jul 2006 – Nov 2007**

**Process & Product Development**

* Piloted process and product development, Q.C in textile processing, customer complaint analysis and support.
* Core team member for ISO 14001 & OHSAS 18001 certification.
* Steered industrial projects like:
* Process development of natural antimicrobial bamboo fiber processing.
* Mercerization process optimization.
* Water consumption reduction in Fong’s package dyeing machine.

**PATENTS**

* “Fragment resistance structure” Application No. 44\DEL\2011
* “Ballistic resistance flexible structure” Application No. 376\DEL\2011
* “Development of multi-layered media setup having nanofiber for mass production and the process of generating thereof”; Application No. 1141\DEL\2009
* “Application of Polyacrylonitrile (PAN) polymeric nanofibers deposited on filtration media in automotive filters and the process of preparing thereof”; Patent No.: 289594
* “Formation of droplet free PAN nanofibers on filtration media using different spinnerets and the process of generating thereof”; Patent No.: 293625

**PAPERS/PUBLICATIONS**

* Electrospun Self-assembled Nanofiber Yarns, Abhijit Mondal, Ritutapan Borha, Avishek Mukherjee, Sandip Basu Manjeet Jassal, Ashwini K. Agrawal, Journal of Applied Polymer Science, Vol. 110, 603-607 (2008).
* Electrospun Self-assembled Nanofiber Yarns, Manjeet Jassal, Ashwini K. Agrawal, Abhijit Mondal, Ritutapan Borha, Avishek Mukherjee, Sandip Basu, Nano for 3rd Millenium- nano for life,17-18th Oct.2007, Prague
* Poster presentation and Paper “Continuous yarn from polymeric nanofibres by electrospinning” published in the book of papers of “International conference nanoscience and technology” March 2006 Delhi, which has been appreciated among 375 papers by honorable president Dr. A.P.J. Kalam. (http://presidentofindia.nic.in/scripts/sllatest1.jsp?id=745)
* Poster presentation and paper “Nonwoven nanostructure formation using electrospinning” published in the book of papers of the seminar on “Nonwovens technology, products &amp; market potential” Oct. 2005 IIT Delhi.
* Paper “Electrospun nanofibres” published in the book of papers of the seminar on “Nanotechnology opportunity in textile” Sept. 2005, IIT Delhi.

**EDUCATION**

M.Tech. – Fibre Science &amp; Technology │ Indian Institute of Technology Delhi | 2006

B.Tech. – Textile │ University of Calcutta | 2004

**ANNEX 3**

**(Item 3.1)**

**SUMMARY OF ACTIONS TAKEN ON THE MINUTES OF THE**

**LAST MEETINGS OF TXD 32**

|  |  |  |
| --- | --- | --- |
| **ITEM NO.** | **DESCRIPTION OF ACTION REQUIRED** | **ACTION TAKEN** |
| **2.1** | **SCOPE AND COMPOSITION OF TXD 32** | Updated composition is given in **Annex 1** |
| **4.1** | The committee decided to finalize the draft ‘Textiles — Workwear for Cement Workwear — Specification’ | Under Publication |
| **5.1** | The committee decided to wide circulate the following standards:   1. IS 11871 : 1986 Methods for determination of flammability and flame resistance of textile fabrics 2. IS 12722 : 1989 Textile floor coverings – Determination of flame resistance by tablet test 3. IS 13501 : 1992 Textiles - Determination of flammability by oxygen index 4. IS 10054 : 1996 Textiles – High density polyethylene (HDPE) monofilament mosquito netting, round mesh – Specification (first revision) | Draft under preparation  Issued under Wide Circulation |
| **6.1** | The committee decided to finalize the following amendments:   1. IS 16725 : 2018 Textiles – Tactical 3 points sling universal – Specification 2. IS 16874 : 2018 Textiles – Protective gloves for firefighters – Specification | Under publication |
| **6.2** | The committee finalized the amendment to IS 15768 : 2008 Textiles – Resistance to ignition of upholstered composites used for non-domestic furniture – Specification | Final draft under preparation |
| **6.3** | The committee decided that the panel under the convener ship of Dr. M S Parmar shall prepare a draft revision of IS 16890 for Protective clothing for firefighter | The draft revision is prepared and coming up for discussion under item **5.1** |
| **7.2 and 7.3** | The committee decided to wide circulate the following drafts   1. **[Doc: TXD/32/24728]** ISO 16073-3:2019 Wildland firefighting personal protective equipment Requirements and test methods part 3: Clothing 2. **[Doc: TXD/32/24727]** ISO 16073-4 : 2019 Wildland firefighting personal protective equipment Requirements and test methods Part 4: Gloves 3. **[Doc: TXD/32/24726]** ISO 23616 : 2022 Cleaning Inspection and Repair of Firefighters Personal Protective Equipment PPE | Wide circulation period is completed and coming up for discussion under agenda item **4.1** |
| **8** | The committee allocated the following standards to member secretary for review  IS 17286 : 2019 Textiles – Water-proof multipurpose rain poncho with convertibility as bivouac – Specification  IS 17291 : 2019 Textiles – Flame retardant jute based decorative and cover fabric for temporary structure – Specification | Review completed and coming up for discussion under item **7.1** |
| **9** | The committee finalized the ToR for R&D project on firehood for firefighters. | R&D project allocated to NITRA, Ghaziabad |
| **10** | **Proposal for P Membership**  The committee decided that TXD 32 shall represent in ISO/TC94/SC14 | The proposal is under process for approval |
| **11.1** | The committee decided to finalize the amendment for IS 15748 : 2022 | Draft under preparation |

**ANNEX 4**

**(Item 4.1)**

**a) Wide Circulation Draft of ISO 16073-3:2019**

**भारतीय मानक ब्यूरो**

**BUREAU OF INDIAN STANDARDS**

*Draft For Comments Only*  Doc: TXD 32 (24728) WC

Jan 2024

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भारतीय मानक मसौदा

**वाइल्डलैंड अग्निशमन निजी सुरक्षा उपकरण** — **अपेक्षाएं और परीक्षण पद्धति** — **भाग 3: परिधान**

Draft *Indian Standard*

**Wildland firefighting personal protective equipment** — **Requirements and test methods** — **part 3: Clothing**

ICS 13.340.10, 13.220.10

**Textiles Protective Clothing** Last date for receipt of comments is

**Sectional Committee, TXD 32** 30 March 2024

NATIONAL FOREWORD

(*Formal clauses will be added later*)

This Indian Standard intended to be adopted is identical with ISO 16073-3:2019 ‘Wildland firefighting personal protective equipment — Requirements and test methods — Part 3: Clothing’ issued by the International Organization for Standardization (ISO).

This standard has been undertaken to harmonize it with the latest version of ISO 16073-3:2019.

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

1. Wherever the words ‘International Standard’ appear referring to this standard, they should be read as ‘Indian Standard’.
2. Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

The technical committee has reviewed the provisions of the following International Standards referred in this standard intended to be adopted and has decided that these are acceptable for use in conjunction with this standard:

|  |  |
| --- | --- |
| *International Standard* | *Title* |
| ISO 15384 | Protective clothing for firefighters — Laboratory test methods and performance requirements for wildland firefighting clothing |
| ISO 16073-2 | Wildland firefighting personal protective equipment — Requirements and test methods — Part 2: Compatibility |
| ISO/TR 19591 | Personal protective equipment for firefighters — Standard terms and definitions |

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

**Extract of ISO 16073-3:2019 ‘Wildland firefighting personal protective equipment Requirements and test methods part 3: Clothing’**

**Introduction**

Wildland firefighting involves work primarily in summer temperatures, for many hours in which the firefighter may develop high levels of metabolic heat. Loose-fitting clothing is as important as the fire resistance of materials in preventing serious burn injury. Clothing that is tight-fitting poses a danger to the wildland firefighter from radiant heat and heat stress, while, at the same time, diminishing the firefighter's ability to perform. 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 (see ISO 21808) should be undertaken to determine if the clothing covered by this document is suitable for its intended use and the expected exposure. This document does not cover clothing for use in higher risk situations, where clothing complying with ISO 11999-3 (structural firefighting) or even ISO 15538 (firefighting with reflective outer surface), is more suitable, nor does this document cover clothing to protect against chemical, biological, electrical or radiation hazards. This document does not cover risk related to rescue operations that are covered in ISO 18639-3.

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

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

The purpose of this document is to provide minimum performance requirements for protective clothing designed for use for extended periods during wildland firefighting activities. The minimum performance requirements and methods of test for personal protective equipment (PPE) covering the head, hands, feet, eyes and ears for wildland firefighting are covered in other parts of ISO 16073.

**1 Scope**

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

This document is not applicable to clothing for use in situations encountered in structural firefighting (ISO 11999-3), rescue (ISO 18639-3) or where a high level of infrared radiation is expected (ISO 15538), nor does this document cover clothing to protect against chemical, biological, electrical or radiation hazards. This document does not provide protection against high mechanical risks such as for protection when using chain saws.

NOTE For information on test methods, minimum performance requirements and general design refer to ISO 15384.

**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 15384, Protective clothing for firefighters — Laboratory test methods and performance requirements for wildland firefighting clothing

ISO 16073-2, Wildland firefighting personal protective equipment — Requirements and test methods — Part 2: Compatibility

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

**3 Terms and definitions**

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

**FORMAT FOR SENDING COMMENTS ON BIS DOCUMENTS**

(Please use A4 size sheet of paper only and type within fields indicated. Comments on each clause/sub clause/table/fig etc. be started on a fresh box. Information in column 3 should include reasons for the comments and suggestions for modified working of the clauses when the existing text is found not acceptable. Adherence to this format facilitates Secretariat’s work)

***Please e-mail your comments to*** [txd@bis.gov.in](mailto:txd@bis.gov.in)

NAME OF THE COMMENTATOR/ORGANIZATION:

**DOCUMENT NO:** TXD 32 (24728) WC

**BIS LETTER REFERENCE NO. :** TXD 32 (24728)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item, Clause Sub-Clause No. Commented upon (Use Separate Box afresh)** | **Comments** | **Specific Proposal (Draft clause to be add/amended)** | **Remarks** | **Technical References and justification on which (2), (3), (4) are based** |
| **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
|  |  |  |  |  |

**b)** **Wide Circulation Draft of ISO 16073-4 : 2019**

**भारतीय मानक ब्यूरो**

**BUREAU OF INDIAN STANDARDS**

*Draft For Comments Only*  Doc: TXD 32 (24727) WC

Jan 2024

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**वाइल्डलैंड अग्निशमन निजी सुरक्षा उपकरण** — **अपेक्षाएं और परीक्षण पद्धति** — **भाग 4: दस्ताने­­­­­**

Draft *Indian Standard*

**Wildland firefighting personal protective equipment** — **Requirements and test methods** — **Part 4: Gloves**

ICS 13.340.40, 13.220.10

**Textiles Protective Clothing** Last date for receipt of comments is

**Sectional Committee, TXD 32** 30 March 2024

NATIONAL FOREWORD

(*Formal clauses will be added later*)

This Indian Standard intended to be adopted is identical with ISO 16073-4 : 2019 ‘Wildland firefighting personal protective equipment — Requirements and test methods — Part 4: Gloves’ issued by the International Organization for Standardization (ISO).

This standard has been undertaken to harmonize it with the latest version of ISO 16073-4 : 2019.

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

1. Wherever the words ‘International Standard’ appear referring to this standard, they should be read as ‘Indian Standard’.
2. Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In the standard intended to be adopted,reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their respective places are listed below along with their degree of equivalence for the editions indicated:

|  |  |  |
| --- | --- | --- |
| *International Standard* | *Corresponding Indian Standard* | *Degree of Equivalence* |
| ISO 139 : 2005 Textiles —Standard atmospheres for conditioning and testing | IS 6359 : 2023 Method for conditioning of textiles (first revision) | Technically Equivalent |
| ISO 3146 : 2000 Plastics — Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers by capillary tube and polarizing-microscope methods | IS 13360 (Part 6/Sec 10) : 2023  Plastics — Methods of Test  Part 6 Thermal Properties  Section 10 Determination of Melting Behaviour  (Melting Temperature or Melting Range) of  Semi-crystalline Polymers by Capillary Tube  and Polarizing-Microscope Methods  (*second revision*) | Identical with  ISO 3146 : 2022 |
| ISO 6330 : 2019 Textiles — Domestic washing and drying procedures for textile testing | IS 15370 : 2023 Textiles — Domestic Washing and  Drying Procedures for Textile  Testing  ( *second revision* ) | Identical with ISO 6330 : 2021 |
| ISO 6942 : 2002,1 Protective clothing — Protection against heat and fire — Method of test: Evaluation of materials and material assemblies when exposed to a source of radiant heat | IS 15758 (Part 2) :2007  Textiles — protective clothing  part 2 assessment of material assemblies when exposed  to source of radiant heat | Identical |
| ISO 9151, Protective clothing against heat and flame — Determination of heat transmission on exposure to flame | IS 15758 (Part 1) : 2020 Textiles — Protective Clothing  Part 1 Determination of Heat Transmission  on Exposure to Flame  ( *first revision* ) | Identical with ISO 9151 : 2016 |
| 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 | IS 17462 (Part 1) : 2020  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 | Identical with ISO 12127-1 : 2015 |
| ISO 12947-4, Textiles — Determination of the abrasion resistance of fabrics by the Martindale method — Part 4: Assessment of appearance change | IS 12673 (Part 4) : 2014 Textiles - Determination of the abrasion resistance of fabrics by the martindale method Part 4 Assessment of appearance change (first revision) | Identical with ISO 12947-4 : 1998 |
| ISO 15025, Protective clothing — Protection against flame — Method of test for limited flame spread | IS 15758 (Part 4) : 2020  Textiles – Protective clothing Part 4 Method of test for limited flame spread (*first revision*) | Identical with ISO 15025 : 2016 |
| ISO 17493, Clothing and equipment for protection against heat — Test method for convective heat resistance using a hot air circulating oven | IS 17468 : 2020 Clothing and Equipment for  Protection against Heat — Test  Method for Convective Heat  Resistance using a Hot Air  Circulating Oven | Identical with ISO 17493 : 2016 |
| ISO 21420 : 2019 Protective gloves — General requirements and test methods | IS 6994 (Part 7) : 2021  Protection of Arms and Hands  Part 7 Protective Gloves — General Requirements and Test Methods | Identical with ISO 21420 : 2020 |
| ISO 23388 : 2018, Protective gloves against mechanical risks | IS 6994 (Part 6) : 2021 Protection of Arms and Hands Part 6 Protective gloves against mechanical risks | Identical |
| 1 The standard has been revised as ISO 6942 : 2022 | | |

The technical committee has reviewed the provisions of the following International Standards referred in this standard intended to be adopted and has decided that these are acceptable for use in conjunction with this standard:

|  |  |
| --- | --- |
| *International Standard* | *Title* |
| ISO 3175-1 | Textiles — Professional care, drycleaning and wetcleaning of fabrics and garments — Part 1: Assessment of performance after cleaning and finishing |
| ISO 14116: 2015 | Protective clothing — Protection against flame — Limited flame spread materials, material assemblies and clothing |
| ISO/TR 19591 | Personal protective equipment for firefighters — Standard terms and definitions |
| EN 13087-1:2000 | Protective helmets — Test methods — Part 1: Conditions and conditioning |

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

**Extract of ISO 16073-4:2019 ‘Wildland firefighting personal protective equipment Requirements and test methods Part 4: Gloves’**

# **Introduction**

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. Therefore, the personal protective equipment (PPE) is required to be light, 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.

It is important to train firefighters 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.

This document provides minimum performance requirements for wildland firefighters' PPE designed for use for extended periods during wildland firefighting.

# **1   Scope**

This document specifies the minimum performance requirements and methods of test for personal protective equipment (PPE), gloves, that cover the hands whilst wildland firefighting.

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. A risk assessment (see ISO/TR 21808) can be undertaken to determine if the gloves covered by this document are suitable for their intended use and the expected exposure.

This document does not cover PPE for structural firefighting (see ISO 11999-4), for use against chemical, biological, radiological and nuclear hazards, or for use where a reflective outer surface is required (see ISO 15538).

Activities in support of wildland firefighting, such as the cutting of trees and the use of a chainsaw can require additional protection to that provided in this document. Users can refer to the relevant standards for the requirements associated with such protection.

# **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 3146:2000, 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 6330:2019, 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 14116:2015, Protective clothing — Protection against flame — Limited flame spread materials, material assemblies and clothing
* 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
* ISO 21420:2019, Protective gloves — General requirements and test methods
* ISO 23388:2018, Protective gloves against mechanical risks
* EN 13087-1:2000, Protective helmets — Test methods — Part 1: Conditions and conditioning

# **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/>

**FORMAT FOR SENDING COMMENTS ON BIS DOCUMENTS**

(Please use A4 size sheet of paper only and type within fields indicated. Comments on each clause/sub clause/table/fig etc. be started on a fresh box. Information in column 3 should include reasons for the comments and suggestions for modified working of the clauses when the existing text is found not acceptable. Adherence to this format facilitates Secretariat’s work)

***Please e-mail your comments to*** [txd@bis.gov.in](mailto:txd@bis.gov.in)

NAME OF THE COMMENTATOR/ORGANIZATION:

**DOCUMENT NO:** TXD 32 (24727) WC

**BIS LETTER REFERENCE NO. :** TXD 32 (24727)

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| **Item, Clause Sub-Clause No. Commented upon (Use Separate Box afresh)** | **Comments** | **Specific Proposal (Draft clause to be add/amended)** | **Remarks** | **Technical References and justification on which (2), (3), (4) are based** |
| **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
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**c) Wide Circulation of ISO 23616 : 2022**

**भारतीय मानक ब्यूरो**

**BUREAU OF INDIAN STANDARDS**

*Draft For Comments Only*  Doc: TXD 32 (24726) WC

Jan 2024

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भारतीय मानक मसौदा

**अग्निशामकों के निजी सुरक्षा उपकरण की सफाई, निरीक्षण और मरम्मत**

Draft *Indian Standard*

**Cleaning, Inspection and Repair of Firefighters’ Personal Protective Equipment (PPE)**

ICS 13.340.10

**Textiles Protective Clothing** Last date for receipt of comments is

**Sectional Committee, TXD 32** 29 March 2024

NATIONAL FOREWORD

(*Formal clauses will be added later*)

This Indian Standard intended to be adopted is identical with ISO 23616 : 2022 ‘Cleaning, inspection and repair of firefighters’ personal protective equipment (PPE)’ issued by the International Organization for Standardization (ISO).

This standard has been undertaken to harmonize it with the latest version of ISO 23616 : 2022.

The text of ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

1. Wherever the words ‘International Standard’ appear referring to this standard, they should be read as ‘Indian Standard’.
2. Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

The technical committee has reviewed the provisions of the following International Standards referred in this standard intended to be adopted and has decided that these are acceptable for use in conjunction with this standard:

|  |  |
| --- | --- |
| *International Standard* | *Title* |
| ISO/TR 19591:2018 | Personal protective equipment for firefighters  Standard terms and definitions |
| ISO/TR 21808:2024 | Best practices on the selection and use of personal protective equipment (PPE) designed to provide protection for firefighters |

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

**Extract of ISO 23616:2022 ‘Cleaning, inspection and repair of firefighters’ personal protective equipment (PPE)’**

**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)](https://www.iso.org/directives-and-policies.html).

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)](https://www.iso.org/iso-standards-and-patents.html).

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.](https://www.iso.org/foreword-supplementary-information.html)

This document was prepared by Technical Committee ISO/TC 94, *Personal safety — Personal protective equipment*, Subcommittee SC 14, *Firefighters' personal equipment*.

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.](https://www.iso.org/members.html)

**Introduction**

The purpose of this document is to provide the requirements, guidance and recommendations regarding the cleaning, inspection and repair of firefighters' personal protective equipment (PPE) and establish criteria for its cleaning, inspection and repair. This document has been developed in response to growing concerns about contaminated PPE and potential health hazards for firefighters. Fire and rescue services, and the manufacturers of PPE, want to provide instructions and guidance to effectively minimize and manage this risk.

It is the responsibility of the firefighter (initially and ongoing) to undertake regular inspections of their PPE, and there shall also be a reliable system / mechanism (including training) to ensure that this can effectively be achieved.

This document also provides instruction and guidance to fire and rescue services regarding more advanced cleaning, inspection and repair.

**1   Scope**

This document gives requirements, guidance and recommendations for the cleaning, inspection, and repair of PPE for use by firefighters.

This document is intended to be used by those responsible for the cleaning, inspections, and repair of firefighters PPE, however, it will also provide vital guidance to those who are responsible for establishing such a programme including fire and rescue services.

This document does not cover the following at this time:

a) chemical protective clothing;

b) garments required for protection against chemical, biological, radiological and nuclear (CBRN) materials.

**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/TR 19591](https://www.iso.org/obp/ui/en/#iso:std:iso:tr:19591:en), Personal protective equipment for firefighters — Standard terms and definitions
* [ISO/TR 21808](https://www.iso.org/obp/ui/en/#iso:std:iso:tr:21808:en), Guidance on the selection, use, care and maintenance of personal protective equipment (PPE) designed to provide protection for firefighters.

**3   Terms and definitions**

For the purposes of this document, the following terms and definitions given in [ISO/TR 19591](https://www.iso.org/obp/ui/en/#iso:std:iso:tr:19591:en), [ISO/TR 21808](https://www.iso.org/obp/ui/en/#iso:std:iso:tr:21808:en) and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <http://www.iso.org/obp>

— IEC Electropedia: available at <http://www.electropedia.org/>

**3.1 Advanced cleaning**

Cleaning by the product manufacturer, the manufacturers approved organisation, or mutually agreed organisation when a PPE item has been, or is potentially exposed to a hazardous or dangerous contaminant

Note 1 to entry: CBRN [contaminated PPE (3.4)](https://www.iso.org/obp/ui/en/#iso:std:iso:23616:ed-1:v1:en:term:3.4) are to be disposed of not cleaned. PPE should be disposed of following local laws and regulations.

Note 2 to entry: Some known chemicals are commercially available for industrial use. PPE that have been exposed to known chemicals may not have to be disposed of. Specialist advice shall be sought on the contamination, however, the PPE shall be treated in the first instance as if the contamination is unknown.

Note 3 to entry: The decision shall be made following a detailed risk assessment.

**3.2 Competent organization**

Organization that is experienced and certified to inspect, clean, maintain or repair PPE for firefighters

**3.3 Contaminant**

Undesirable solid, liquid, gaseous or particulate hazardous substance such as

a) products of combustion (e.g. soot),

b) body fluids,

c) infectious micro-organisms, and

d) chemicals (e.g. asbestos or respirable fibres, flammable, corrosive, carcinogenic, mutagenic, toxic or sensitizing substances)

**3.4 Contaminated PPE**

Any items of PPE that has been exposed to a [contaminant (3.3)](https://www.iso.org/obp/ui/en/#iso:std:iso:23616:ed-1:v1:en:term:3.3)

**3.5 Routine cleaning**

Cleaning as per manufacturers or suppliers’ instructions

**3.6 Routine inspection**

Superficial inspections by user of their PPE upon issue, or after return from cleaning or repair, and after each use

**3.7 Advanced inspection**

Inspection to ensure PPE is fit for purpose before return to use looking at all aspects of the PPE (e.g. inside, outside, defects, wear and tear, need for repairs or disposal)

**3.8 Repair**

Rectification of defects identified in PPE so that the required level of protection is re-established

**FORMAT FOR SENDING COMMENTS ON BIS DOCUMENTS**

(Please use A4 size sheet of paper only and type within fields indicated. Comments on each clause/sub clause/table/fig etc. be started on a fresh box. Information in column 3 should include reasons for the comments and suggestions for modified working of the clauses when the existing text is found not acceptable. Adherence to this format facilitates Secretariat’s work)

***Please e-mail your comments to*** [txd@bis.gov.in](mailto:txd@bis.gov.in)

NAME OF THE COMMENTATOR/ORGANIZATION:

**DOCUMENT NO:** TXD 32 (24726) WC

**BIS LETTER REFERENCE NO. :** TXD 32 (24726)

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| **Item, Clause Sub-Clause No. Commented upon (Use Separate Box afresh)** | **Comments** | **Specific Proposal (Draft clause to be add/amended)** | **Remarks** | **Technical References and justification on which (2), (3), (4) are based** |
| **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
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**ANNEX 5**

**(Item 5.1)**

**DRAFT REVISION FOR IS 16890 FOR PROTECTIVE CLOTHING FOR FIREFIGHTERS**

*DRAFT* FOR COMMENTS ONLY Doc: No: TXD 32 (XXXX) WC

भारतीय मानक ब्युरो

*भारतीय मानक मसौदा*

**वस्त्रादि – अग्निशामकों के लिए सुरक्षात्मक कपड़े – विशिष्ट**

**(आई एस 16890 का पहला पुनरीक्षण)**

**BUREAU OF INDIAN STANDARDS**

Draft *Indian Standard*

**‘Textiles — Protective Clothing for Firefighters — Specification’**

(*First revision of* IS 16890)

**ICS 13.340.10**

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BIS or used as Standard April, 2024

FOREWORD

(*Formal clause will be added later*)

The role of firefighters is very extensive in our society. Firefighters not only play a pivotal role to rescue human lives during fire accident but also save properties from extensive damage by extinguishing hazardous fires. It is one of the most life threatening occupations that require intensive physical work in hazardous environment. For fighting fire accident more effectively and saving their precious life, it is needed to provide suitable personal protective equipment (PPE). The fire fighting suit is one of the important parts of PPE.

Fire fighter suit mostly comprises following three components:

1. *Outer shell* – The outer shell resists ignition upon being exposed to thermal radiation or very short periods of direct flame contact. It also provides safety to the wearer from chemical hazards.
2. *Inner shell* – The inner shell is generally composed of moisture barrier and a thermal barrier.
3. *Moisture barrier* – Moisture barriers may totally prevent the passage of moisture, whether liquid or vapour.
4. *Thermal barrier* – The thermal barrier is a layer of insulating material which retards heat flow through the garment.

c) *Inner liner* – It is light weight flame retardant fabric.

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

In the formulation of this standard, considerable assistance has been derived from ISO 11613 : 2017 ‘Protective clothing for firefighters — Laboratory test methods and performance requirements’ and EN 469:2020 ‘Protective clothing for firefighters — Performance requirements for protective clothing for firefighting activities’ on the subject.

The Committee has reviewed the provisions of the following International Standards referred in this standard and has decided that it is acceptable for use in conjunction with this standard:

*IS Title*

ISO 811 : 1981 Textile fabrics — Determination of resistance to water penetration —

Hydrostatic pressure test

ISO 3175-1 : 2010 Textiles — Professional care, drycleaning and wetcleaning of fabrics and

Garments : Part 2 Procedure for testing performance when cleaning and

finishing using tetrachloroethene

ISO 4920 : 2012 Textile fabrics — Determination of resistance to surface wetting (spray

test)

ISO 5077 : 2007 Textiles — Determination of dimensional change in washing and drying

ISO 11092 : 2014 Textiles — Physiological effects — Measurement of thermal and water-

vapour resistance under steady-state conditions (sweating guarded-

hotplate test)

ISO 17493 : 2016 Clothing and equipment for protection against heat — Test method for

convective heat resistance using a hot air circulating oven

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

**1 SCOPE**

This standard specifies test methods and minimum requirements for protective clothing to be worn during firefighting and associated activities where there is a risk of heat and/or flame and covers the general clothing design, the minimum performance levels of the materials used, and the methods of test for determining these performance levels.

This standard does not cover special clothing for use in other high risk situations such as specialized firefighting (fire entry application), or clothing for use in long term firefighting operations in high ambient temperature, for example brush, wildland, or forest firefighting. It does not cover protection for the head, hands and feet or protection against other hazards, for example biological, radiation and electrical hazards. These aspects may be dealt with in other standards.

NOTE – Additional personal protective equipment to protect the head, hands, and feet should be worn with clothing specified in this standard and in majority of situations breathing apparatus is also required to be worn. Firefighters should be trained in the use and care of protective clothing covered by this standard including an understanding of its limitations and of the other items of personal protective equipment that may be required depending on the risks encountered.

**2 REFERENCES**

The standards listed in Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subjected to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

**3 TERMINOLOGY**

For the purposes of this standard, the following terms, definitions and symbols shall apply:

**3.1 Terms and Definitions**

**3.1.1** *Cargo Pockets* – Pockets located on the protective garment exterior.

**3.1.2** *Char*– Formation of a brittle residue when material is exposed to thermal energy.

**3.1.3** *Collar Lining* – That part of the collar fabric composite that is next to the skin when the collar is closed in the raised position.

**3.1.4** *Composite* – Layer or layers that provide protection required of outer shell, moisture barrier, and thermal barrier.

**3.1.5** *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 fastener.

NOTE – This term does not cover seams.

**3.1.6** *Component Assembly* – Material combination found in a multilayer garment arranged in the order of the finished garment construction and including any inner liner.

**3.1.7** *Drip* – To run or fall in drops or blobs.

**3.1.8** *Firefighter's Protective Clothing* – Specific garments providing protection for the firefighter's upper and lower torso, neck, arms, and legs, but excluding the head, hands, and feet.

**3.1.9** *Garment*– Single item of clothing which may consist of single or multiple layers.

**3.1.10** *Hardware* – Non-fabric components of protective clothing including those made of metal or plastic material.

NOTE – Examples include fasteners, rank markings, buttons, etc.

**3.1.11** *Innermost Lining* – Lining found on the innermost face of a component assembly.

**3.1.12** *Integral Melting* – Liquefaction of a material when exposed to heat to the extent of causing a hole in its structure, either by shrinking and/or dripping away under specified test conditions.

**3.1.13** *Interface Area* – Area of the body not protected by a protective garment, helmet, gloves, footwear, or self-contained breathing apparatus (SCBA) facepiece; the area where the protective garments and the helmet, gloves, footwear, or SCBA facepiece meet, that is the protective coat/helmet/SCBA facepiece area, the protective coat/glove area, and the protective trouser/footwear area.

**3.1.14** *Interface Component* – Item(s) designed to provide limited protection to interface areas.

**3.1.15** *Interlining* – Layer found between the outermost layer and the innermost lining in a multilayer garment, not next to the wearer's skin.

**3.1.16** *Manufacturer* – Entity that assumes the liability and provides the warranty for the compliant product.

**3.1.17** *Material Combination* – Material produced from a series of separate layers, intimately combined prior to the garment manufacturing stage.

Example – A quilted fabric.

**3.1.18** *Melt* – To change from solid to liquid form, or become consumed by action of heat.

**3.1.19** *Moisture Barrier* – That portion of the protective garment designed to prevent the transfer of liquid water from the environment to the thermal barrier.

**3.1.20** *Multilayer Clothing Assembly* – Series of layers of garments arranged in the order as worn.

NOTE – It may contain multilayer materials, material combinations or separate layers of clothing material in single layers.

**3.1.21** *Outer Material* – Outermost material of which the protective clothing is made.

**3.1.22** *Outer Shell* – Outside facing portion of the composite with the exception of trim, hardware, reinforcing material, and wristlet material.

**3.1.23** *Protective Clothing* – Protective garments, configured as a coat and trousers or as a coverall, and interface components that are designed to provide protection to the firefighter’s body.

**3.1.24** *Protective Coat* – Protective garment designed and configured to protection to upper torso and arms, excluding the hands and head.

**3.1.25** *Protective Coverall* – Protective garment designed and configured to provide protection to the torso, arms, and legs, excluding the head, hands, and feet.

**3.1.26** *Protective Garment* – Single item of clothing which may consist of single or multiple layers, for example protective coat, protective trouser, or protective coverall.

**3.1.27** *Protective Hood* – Interface component that provides limited protection to the protective coat/helmet/SCBA facepiece interface area.

**3.1.28** *Protective Trouser* – Provides protection to lower torso and legs excluding the feet.

**3.1.29** *Protective Uniform Garment* – Garment designed and configured to be both the thermal barrier or portion of the thermal barrier of a protective garment, and a station/work uniform.

**3.1.30** *Protective Wristlet* – Interface component that provides limited protection to the protective garment/glove interface area.

**3.1.31** *Removable Inner Liner* – Inner garment designed to be attached or to be worn separately under an outer garment in order to provide thermal insulation.

**3.1.32** *Seam* – Junction of two edges of material which are permanently attached in the garment by sewing or any other method.

**3.1.32.1** *Major A Seams*– Outer-shell seam assemblies where rupture could reduce the protection of the garment by exposing the moisture barrier, thermal barrier, the wearer's station/work uniform, other clothing, or skin.

**3.1.32.2** *Major B Seams* – Moisture barrier or thermal barrier seam assemblies where rupture could reduce the protection of the garment by exposing the next layer of the garment, the wearer's station/work uniform, other clothing, or skin.

**3.1.32.3** *Minor Seams* – Remaining seam assemblies that are not classified as major A or major B seams.

**3.1.33** *Thermal Barrier* – That portion of the composite designed to provide thermal protection.

**3.1.34** *Trim* – Retroreflective and fluorescent material attached to the outer shell for visibility enhancement; retroreflective materials enhance night-time visibility, and fluorescent materials improve daytime visibility.

**3.1.35** *Inner Garment*– Garment which is worn under an outer garment.

**3.1.36** *Winter Liner* – Optional composite layer designed to provide added insulation against cold.

**4 CLASSIFICATIONS**

This Standard specifies two categories of protective clothing i.e. Category 1 and Category 2. Both the categories have differing performance characteristics. Selection of category of protective clothing should be determined considering the operational practices, environmental conditions, and local building standards.

**5 DESIGN REQUIREMENTS**

**5.1 General**

This clause specifies test methods and minimum requirements for protective clothing to be worn during firefighting and associated activities where there is a risk of heat and/or flame for both category 1 and category 2 of protective clothing.

It covers the general clothing design, the minimum performance requirements of the materials used, and the methods of test for determining these performance requirements for both category 1 and category 2 of protective clothing.

**5.2 Design Requirements**

**5.2.1** *Configuration*

The firefighter’s protective clothing shall provide protection for the firefighter’s upper and lower torso, neck, arms, and legs, but excluding the head, hands, and feet. It shall consist of:

a) a single outer garment; or

b) an outer two-piece suit consisting of a jacket and a pair of trousers with a minimum

overlap of 30 cm; or

c) a series of outer and inner garments designed to be worn together.

**5.2.2** *Restriction of Movement*

The clothing shall be designed to minimize restrictions of movement. It shall be compatible with other protective equipment which may be necessary, for example boots, helmet, gloves and breathing apparatus. Details for checking the basic ergonomic features of protective clothing by doing practical performance tests are given in Annex B.

**5.2.3** *Multilayer Clothing Assemblies*

Where multilayer clothing assemblies are used to achieve the specified requirements, the layers shall be either permanently attached or the various garments shall be clearly labelled that they must always be used in combination. Multilayer assembly for Category 1 and Category 2 shall consists of the following three layers;

**5.2.3.1** *Multilayer clothing assemblies for Category 1*

a) *Outer layer* – Mass shall not be more than 270 g/m2

b) *Moisture barrier* – Mass shall not be more than 150 g/m2

c) *Thermal layer* – Thermal layer may be a single layer or two layers and the mass (including lining) shall not be more than 380 g/m2

**5.2.3.2** *Multilayer clothing assembly for Category 2*

a) *Outer layer- Mass* shall not be more than 240 g/m2

b) *Moisture barrier-* Mass shall not be more than 140 g/m2

c) *Thermal layer -* Thermal layer may be a single layer or two layers and the mass (including lining) shall not be more than 300 g/m2.

**5.2.4** *Seams*

Seams on the outer layer of the garment shall be constructed to give the minimum loss in strength and protection and to maintain the integrity of the garment. Seam breaking strength, when tested in accordance with IS/ISO 13935-2, shall have minimum seam breaking force of 300 N.

**5.2.5** *Hardware*

Hardware penetrating the outer material shall not be exposed on the innermost surface of the component assembly. The hardware when tested in accordance with the method given in ISO 17493 at a test temperature of 180 ± 5°C, shall not melt, drip, separate, or ignite, and shall not shrink more than 5 percent.

**5.2.6** *Closure Systems*

Closure systems shall be constructed so as to fulfil the performance requirements of the garment. Closure system when tested in accordance with the method given in ISO 17493 at a test temperature of 180 ± 5°C, shall not melt, drip, separate, or ignite, and shall not shrink more than 5 percent. The closure system shall be of positive fastener type. Closure systems shall be protected by means of the component assembly, for example by overlapping or underlining storm flap that provides secure and complete moisture and thermal protection. Where buttonholes are used, the maximum interval distance shall be 150 mm and if zippers are used, the slide fastener shall be designed to lock when completely closed.

**5.2.7** *Retroreflective Elements*

The clothing shall have retroreflective elements/combined performance materials to the user's requirements provided that they do not affect the performance of the clothing. Visibility requirements shall conform to the requirements specified in Annex C.

**5.2.8** *Sleeve Ends*

The ends of the sleeves shall be designed to protect the wrist and to prevent the entry of burning debris. They shall not hinder the donning of the garment and shall be compatible with the wearing of protective gloves.

**5.2.9** *Clothing Mass*

The clothing shall be as light as possible while still maintaining the required performance levels.

**5.2.10** *Ease of Cleaning*

The clothing shall be designed to promote ease of cleaning.

**5.2.11** *Labels*

Any labels or trim shall not adversely affect the performance of the garment.

**5.2.12** *Size Designations*

The size of each protective clothing shall be designated by height and chest or bust girth as two control dimensions, in cm. The height and the girth ranges for different size designations shall be as given in Table 1.

**Table 1 Height and Girth Ranges of Body Measurements**

(*Clause* 5.2.12)

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl No.** | **Size Designations** | **Chest or Bust Girth**  cm | **Height**  cm |
| (1) | (2) | (3) | (4) |
| i) | S | 80-88 | 152-158 |
| ii) | M | 88-96 | 158-164 |
| iii) | L | 96-104 | 164-176 |
| iv) | XL | 104-112 | 176-182 |
| v) | XXL | 112-120 | 182-188 |
| vi) | XXXL | 120-124 | 188-194 |

**6 SAMPLING AND PRE-TREATMENT**

**6.1 Samples**

Samples shall be taken so as to be representative of the materials and garment construction employed. Sampling and criteria for conformity shall be as given in Annex D. The sampling procedure is applicable for both category 1 and category 2 of protective clothing.

**6.2 Number and Size of Specimens**

The number and size of specimens for the different tests shall be in accordance with the respective standards. All tests shall be carried out on materials as received unless otherwise specified (*see* **6.4**).

**6.3 Exposure Surface**

In all surface tests, the outermost surface shall be exposed, except for flame spread testing of the innermost lining (*see* 7**.2.2**) and testing of water vapour resistance (*see* **7.13**) when the innermost surface is exposed.

**6.4 Pre-treatment**

The test materials shall be washed five times in a front loading horizontal drum machine with 1 g/l IEC reference detergent (Annex B of IS 15370) in hard water (hardness of water 160 ± 20 mg/l expressed as calcium carbonate) and dried in accordance with the procedures of IS 15370. Washing shall be carried out by procedure 2A at (60 ± 3) °C and drying by procedure E (tumble drying) unless otherwise specified in the care labelling. Drying shall be in accordance with the procedures specified in IS 15370. A total of five washing and drying cycles shall be used. Materials which are labelled as dry cleanable only shall be dry cleaned five times in accordance with ISO 3175-2. The pretreatment is applicable for both categories (Category 1 and category 2) of protective clothing. All the requirements specified in clause **7.2, 7.3, 7.4, 7.5, 7.10, 7.12, and 7.13** shall be testes in as received condition and after pretreatment.

**7 PERFORMANCE REQUIREMENTS**

**7.1** The performance requirements specified in this clause are applicable for both category 1 and category 2 of the protective clothing.

**7.2 Flame Resistance**

**7.2.1** Flame spread shall be tested in accordance with IS 15758 (Part 4), using the procedures for face ignition and bottom ignition and the following requirements shall be satisfied:

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

b) No specimen shall give hole formation in any layer;

c) No specimen shall give flaming or molten debris;

d) The mean value of after flame time shall be ≤ 2 s; and

e) The mean value of the afterglow time shall be ≤ 2 s.

**7.2.2** The component assembly of the outer garment shall be tested by applying the flame to the outer surface of the garment. If the outer garment has a lining material, the component assembly of the outer garment shall also be tested with the flame applied to the innermost lining of the outer garment. If the clothing assembly consists of several separate garments and the inner garment may be exposed to flame, the component assembly of this inner garment shall also be tested applying the flame to the outer surface of this inner garment. If the clothing assembly incorporates wristlet material, this shall be tested separately applying the flame to the outer surface of the wristlet material.

**7.2.3** For seams, 3 specimens containing a structural seam shall be tested separately by applying the flame to the seam portion of the component assembly with the seam oriented verticallyin accordance with IS 15758 (Part 4), using the procedures for face ignition and shall pass the requirement specified in **7.2.1** and the seam shall not open.

**7.2.4** Sewing thread when tested as per IS 13360 (Part 6/sec 10) at a temperature of 260 **°**C (± 5 **°**C) shall not melt.

**7.3 Heat Transfer (Flame Exposure)**

**7.3.1** *Heat Transfer (Flame Exposure) for Category 1*

The component assembly or multilayer clothing assembly when tested in accordance with IS 15758 (Part 1) shall give a mean HTI24 ≥ 13 seconds and a mean HTI24 – HTI12 ≥ 4 seconds.

**7.3.2** *Heat Transfer (Flame Exposure) for Category 2*

The component assembly or multilayer clothing assembly when tested in accordance with IS 15758 (Part 1) shall give a mean heat transmission index HTI24 ≥ 17 seconds and a mean HTI24 – HTI12 ≥ 6 seconds.

**7.4 Heat Transfer (Radiant Exposure)**

**7.4.1** *Heat Transfer (Radiant Exposure) for Category 1*

The component assembly or multilayer clothing assembly when tested in accordance with method B of IS 15758 (Part 2) at a heat flux density of 40 kW/m2, shall give a mean RHTI24 ≥ 18 seconds, a mean RHTI24 – RHTI12 ≥ 4 seconds, and a mean transmission factor ≤ 60 percent.

**7.4.2** *Heat Transfer (Radiant Exposure) for Category 2*

The component assembly or multilayer clothing assembly when tested in accordance with method B of IS 15758 (Part 2) at a heat flux density of 40 kW/m2 shall give a mean RHTI24 ≥ 26 seconds, a mean RHTI24 – RHTI12 ≥ 8 seconds, and a mean transmission factor ≤ 60 percent.

**7.5 Contact Heat**

The component assembly or multilayer clothing assembly when tested in accordance with method specified in IS 17462 (Part 1) at a temperature of 250 °C shall have a maximum threshold of 10 seconds.

**7.6 Residual Strength of Material when Exposed to Radiant Heat**

One machine and one cross machine specimen of the outer material shall be tested in accordance with IS 1969 (Part 1) before and after pre-treatment of the complete assembly by method A of IS 15758 (Part 2) at a heat flux density of 10 kW/m2. Each specimen shall have a tensile strength ≥ 450 N.

**7.7 Heat Resistance**

Each material used in the clothing assembly when tested in accordance with the method given in ISO 17493 at a test temperature of 180 ± 5 °C shall not melt, drip, separate, or ignite, and shall not shrink more than 5 percent.

**7.8 Tensile Strength**

**7.8.1** *Tensile Strength for Category 1*

The outer material when tested in accordance with IS 1969 (Part 1) shall give a breaking load in both machine and cross direction ≥ 450 N.

**7.8.2** *Tensile Strength for Category 2*

The outer material when tested in accordance with IS 1969 (Part 1) shall give a breaking load in both machine and cross direction of ≥ 600 N.

**7.9 Tear Strength**

**7.9.1** *Tear Strength for Category 1*

The outer material when tested in accordance with method specified in IS 6489 (Part 2), shall give a tear strength in both machine and cross direction ≥ 30 N.

**7.9.2** *Tear Strength for Category 2*

The outer material when tested in accordance with method specified in IS 6489 (Part 2) shall give a tear strength in both machine and cross direction of ≥ 100 N.

**7.10 Cleaning-Shrinkage Resistance**

The materials of the outer garment assembly when tested in accordance with ISO 5077 using the cleansing pre-treatment specified in **6.4** shall give a dimensional change of ≤ 3% (for woven fabric ) and ≤ 5% (for knitted fabric) in both the machine and cross machine directions.

**7.11 Liquid-Chemical Penetration Resistance**

The component assembly or multilayer clothing assembly when tested in accordance with IS 15758 (Part 3) shall give more than 80 percent run-off and no penetration to the innermost surface using the following liquids.

a) 40 percent sodium hydroxide (NaOH) at 20 °C;

b) 36 percent hydrochloric acid (HCI) at 20 °C;

c) 30 percent sulfuric acid (H2SO4) at 20 °C; and

d) O-xylene, 100 percent

NOTE – 1. Fabrics shall be conditioned for 24 h at (20 ± 2) °C and (65 ± 5) percent RH before testing. All tests shall be carried out with a pouring time of 10 s and at a temperature of 20°C.

**7.12 Water-penetration Resistance**

Specimens of clothing assembly and its seams, when tested in accordance with ISO 811 at 20 kPa for a period of 5 min, shall not show appearance of water drops.

**7.13 Water-vapour Resistance**

Specimens of clothing assembly and its seams, when tested in accordance with ISO 11092 shall have maximum water vapour resistance of 30 m2 Pa/W..

NOTE – High water vapour resistance can lead to a higher risk of steam burns.

**8 MARKING**

**8.1 Label**

Each separable layer of each protective garment shall have a label permanently and conspicuously attached to each layer upon which at least the information given in Fig. 1 is printed in letters at least 1.5 mm high. At least one label shall be conspicuously located inside the garment in all possible configurations of garment utilization.

|  |
| --- |
| **THIS FIRE FIGHTING PROTECTIVE GARMENT MEETS THE**  **REQUIREMENTS OF THIS INDIAN STANDARD** |
| Manufacturer's Name and address  Country of Manufacture  Manufacturer's garment identification number  Article Number  Model No. (along with information about outer layer)  Moisture layer  Thermal layer with Inner Liner  Size  Date of Manufacture  Batch/Lot No.  Care labelling symbols as specified in IS 14452  Garment Material(s)  Pictogram as given in Fig. 2  These protective clothing are not designed for use as fire entry suit  **"DO NOT REMOVE THIS LABEL"** |

FIG. 1 LABEL

**8.2 Label Legibility**

All garment labels shall be clearly legible to the eye both before and after being subjected to the pre-treatment specified in **6.4**. Garment labels not meeting specimen size requirements for the procedure specified in **6.4** shall be sewn to a support fabric of required size.

**8.3 Manufacturer's Information**

**8.3.1** *The Manufacturer’s Information shall contain the following:*

a) Name, address and contact details of the manufacturer;

b) Model name and article number of the protective clothing which has been certified to this standard;

c) Indian Standard to which certified along with pictogram as given in Fig. 2;

A black and white sign with a person putting out a fire

Description automatically generated

FIG. 2 PICTOGRAM ISO 7000-2418

d) Size information of the manufacturer for this protective clothing, that is, S – XXXL;

e) Care labeling symbols as specified in IS 14452; and

f) Declaration:

1) The manufacturer shall include a note in the information that in order to comply with the requirements of this standard, the upper and lower body including the neck, arms to the wrists and legs to the ankles, are protected and covered by the clothing described in this standard, but other parts of the body are not and need essential means in order to be fully protected.

2) These protective clothing has been designed to give a specified level of protection for use in firefighting operations and associated activities, in conjunction with other accessories like protective helmet, protective fire fighting boot, protective hood and fire fighting protective gloves.

         3) These protective clothing is not designed for use as fire entry suit.

**8.3.2** *Instructions and Information*

Protective clothing manufacturers shall also provide the following instructions and information with each garment:

a) Cleaning and instructions;

b) Maintenance criteria;

c) Methods of repair; and

d) Warranty information.

**8.3.3** *Training Materials*

Protective clothing manufacturers shall furnish training materials that address, but are not limited to:

a) Safety considerations;

b) Storage conditions;

c) De-contamination procedures; and

d) Retirement considerations.

**8.4 BIS Certification Marking**

The protective clothing may also be marked with the Standard Mark.

**8.4.1** The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of the conditions under which a license for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

**ANNEX A**

(*Clause* 2)

**LIST OF REFERRED INDIAN STANDARDS**

|  |  |
| --- | --- |
| *IS No.* | *Title* |
| 1969  (Part 1) : 2009 | Textiles —Tensile properties of fabrics — Determination of maximum force and elongation at maximum force: Part 1 Strip method (*third revision*) |
| 6489  (Part 2) : 2011 | Textiles — Tear properties of fabrics: Part 2 Determination of tear force of trouser shaped test specimens (single tear method) (*second revision*) |
| 14452 : 2014 | Textiles — Care labelling code using symbols |
| 15370 : 2005 | Textiles — Domestic washing and drying procedures for textile testing |
| 15758 | Textiles — Protective clothing: |
| (Part 1) : 2020 | Method of determining of heat transmission on exposure to flame |
| (Part 2) : 2007 | Assessment of material assemblies when exposed to source of radiant heat |
| (Part 3) : 2007 | Test method for resistance of material to penetration by liquids |
| (Part 4) : 2007 | Test method for limited flame spread |
| 15809 : 2008 | High visibility warning clothes — Specification |
| IS/ISO 13935-2 : 1999 | Textiles — Seam tensile properties of fabrics and made-up textile articles: Part 2 Determination of maximum force to seam rupture using the grab method |
| IS/ISO 17462  (Part 1) : 2020 | 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 |
| IS/ISO 13360  (Part6/sec10) : 2013 | Plastics – Methods of testing: Part 6 thermal properties section 10 determination of melting behaviour (Melting Temperature Or Melting Range) of semi – Crystalline polymers by capillary tube and polarizing - Microscope methods (First Revision) |
| ISO 5077 : 2007 | Textiles – Determination of dimensional change in washing and drying |

**ANNEX B**

(*Clause* 5.2.2)

**CHECKING OF BASIC ERGONOMIC FEATURES OF PROTECTIVE CLOTHING** —

**PRACTICAL PERFORMANCE TESTS**

**B-1** This Annex informs how some basic ergonomic features can be checked for many types of protective clothing in a pragmatic way. This Annex is not intended to replace ergonomic testing required by the user for the individual assessment of protective clothing at a specific workplace. In general carrying out ergonomic assessments can help to improve protective clothing and detect major deficiencies.

**B-2** In principle, one or more experienced assessors should examine the protective clothing after reading the information supplied from the manufacturer. The test clothing of a suitable size should be put on together with such normal clothing as is intended to be worn, and some ergonomic features relating to the practical performance of the protective clothing should be checked (for example if no movement restrictions are caused). Some of the relevant questions that might be asked are set out below and it is desirable that responses given should be positive.

NOTE — An assessor may have difficulties deciding whether the product is acceptable or unacceptable. It is recommended that the product should be compared with similar items on the market. If it is significantly worse ergonomically, without redeeming features such as enhanced protection, it can be regarded as unnecessarily uncomfortable. Care will need to be taken if there are no directly comparable products. Care will also have to be taken when protection against mortal danger is intended and ‘the state of the art’ does not allow comfortable conditions for users, nor perhaps conditions free of harm caused by the protective clothing. Carrying out (subjective) ergonomic assessments will more often result in recommendations for changes to improve protective clothing, than in finding the clothing does not comply with the standard.

**Question 1**: Is the protective clothing free from any sharp or hard edges, rough surfaces or other items on the inner or outer surface of the clothing that are likely to cause harm to the user?

Protective clothing should be inspected manually and visually to ensure that no harmful points exist; for example, no protruding wire ends or other items that could seriously harm a person.

**Question 2**: Is it possible to put on and take off the protective clothing without difficulty?

The following points should be considered:

The ease of putting on and removing the clothing with or without assistance as is appropriate for the type of clothing;

The clothing is not too tight for comfort and deep breathing is not restricted and there is nowhere any blood flow restriction; and

Clothing design features at, for example, armholes and crotch are appropriately proportioned and positioned.

**Question 3**: Can the closures, adjusters and restraint systems be operated without difficulty?

The following points should be considered:

The adequacy of the range of adjustments available;

The ease and security of closures and adjusters; and

The closures, adjusters and restraint systems should withstand the forces they are likely to be exposed to during body movements.

**Question 4:** Can the following movements be carried out without difficulty?

Standing, sitting, walking, kneeling, crawling and stair climbing;

Raising both hands above the head; and

Bending over and picking up a small object, for example, a pencil.

The following points should be considered:

The arms and legs of the clothing are not so long that they interfere with hand and foot movements;

The clothing is not so loose it flaps about or moves independently and inconveniently;

Any point at which unexpected and unintended gaps open up between or within components of the clothing; and

Any unreasonable restriction of movements.

**Question 5:** Does the protective clothing cover the body area to be protected during movements?

The following points should be considered:

Coverage of specific protection zones of the intended body area by protective material or special constructions; and

The coverage is maintained during movements as extreme as it is anticipated a user would make.

**Question 6:** Is the protective clothing compatible with other items of PPE?

The following points should be considered:

Protective clothing normally worn as part of an ensemble should be compatible with representative examples of the rest of the ensemble;

Putting on and removing other items of PPE, for example, gloves, boots should be possible without difficulty.

**B-3** Grounds for concluding that a product is unacceptable:

The following are obvious reasons for concluding that a protective clothing product is unacceptable and not fit for use:

a) Subject it should fit can not wear it.

b) It does not stay closed or it will not stay in place.

c) It compromises a vital function, such as breathing.

d) Simple tasks to be performed wearing it are impossible.

e) The subject refuses to continue this assessment due to pain.

f) It prevents the wearing of other essential PPE.

**ANNEX C**

(*Clause* 5.2.7)

**REQUIREMENTS FOR VISIBILITY**

**C-1** **MINIMUM AREA OF VISIBLE MATERIALS**

**C-1.1** Separate performance retroreflective material shall be attached to the outermost surface of the protective clothing with a minimum area of not less than 0.13 m2 and give all round visibility by encircling the arms, legs and torso regions of garment (s).

**C-1.2** If non-reflective fluorescent or combined performance material is used, the minimum area of fluorescent material shall be not less than 0.2 m2.

**C-2 PHOTOMETRIC REQUIREMENTS**

**C-2.1** The minimum coefficient of retroreflection for new retroreflective material or combined performance material shall conform to the requirements specified in **5.4.1** of IS 15809.

**C-3** The retroreflective/combined performance materials, in order not to affect the performance of the protective clothing, shall comply with the following test requirements:

**C-3.1** **Heat Resistance**

The retroreflective/combined performance materials when tested in accordance with the method given in IS 17468 at a test temperature of 180 ± 5°C, shall not melt, drip, separate, or ignite, and shall not shrink more than 5 percent.

**C-3.2** **Flame Spread**

All materials used for visibility when tested in accordance with IS 15758 (Part 4), in combination with outer layer to make it possible to take samples of the specified dimensions, using the procedures for face ignition, shall not allow hole formation in the material.

**ANNEX D**

(*Clause* 6.1)

**SAMPLING AND CRITERIA FOR CONFORMITY**

**D-1 LOT**

For the purpose of conformance inspection and test sampling, a lot is defined as all the completed protective clothingof the same type, with same assemblies, produced in one facility, using the same production processes and materials, and being offered for delivery at one time to buyer against a dispatch note.

NOTE — Protective clothingof different sizes may be grouped in one lot.

**D-2** For assessing the conformity of the lot to the requirements of this standard, the samples as given in col 3 of Table 2 shall be drawn at random from the lot.

**Table 2 Sample Size**

(*Clause* D-2)

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl No.**  (1) | **Number of Protective Clothing**  **in the Lot**  (2) | **Sample Size**  **(No. of Protective Clothing)**  (3) | **Permissible No. of Defectives**  (4) |
| i) | Up to 90 | 3 | 0 |
| ii) | 91-150 | 3 | 0 |
| iii) | 151-280 | 5 | 0 |
| iv) | 281-500 | 5 | 0 |
| v) | 501 and above | 5 | 0 |

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**D-2.1** A protective clothing shall be considered defective, if it does not meet any of the requirements specified in this standard.

**D-3** The lot shall be declared as conforming to the requirements of this standard, if no defective protective clothing is found.

**ANNEX 6**

**(Item 6.1)**

**COMMENTS ON IS 15741 RECEIVED FROM SHRI AMIT JAIN**

As per Ministry of Textile order DT. 10/04/2023 Curtain and Drapes should be as per IS 15741 : 2007, but in current situation blinds are imported in India in very big quantity , around 99% . Blinds is also type of window covering curtains. Customs allow clearance of blinds without IS 15741 : 2007. So, it requested to you please check and amend said standard and insert blinds along with Curtain and drapes in IS 15741 : 2007.

**ANNEX 7**

**(Item 6.2)**

**COMMENT RECEIVED ON IS 15748 FROM NITRA, GHAZIABAD**

**Subject** : IS 15748: Protective clothing - Clothing to protect against heat and flame - Minimum performance requirements

Sir,

There is a need to correct Clause 6.4 Dimensional Change. Instead of Dimensional change before and after 5 cycles of treatment, **we should correct it after 5 cycles of treatment**.

Regards,

Dr. M.S. Parmar

Director

Northern India Textile Research Association

**Annex 8**

**(Item 6.3)**

**COMMENTS RECEIVED ON IS 15809 : 2017**

1. **Comment received from Star Safety Hub Pvt Ltd**

**Subject: Comments and Suggestions on IS 15809:2017**

Respected Sir,

We are the manufacturer and licensee of High Visibility Warning Clothing as per Indian Standard IS 15809:2017 ‘High Visibility Warning Clothing’ brought out by your esteem organization. Below are our comments and suggestions on the same.

1) **Washable and Non Washable Garment:** As per the clause C.4.4.1, it is mentioned that when the marking on the garment indicates that it is suitable for washing the retroreflective material shall be washed for a minimum of 50 washing cycles.

This is interpreted as an optional clause. However, no such option is available in the SIT. We believe that being a textile product, washing should be mandatory. We request to kindly amend it accordingly.

2) **Tensile and Bursting Strength**: As per the clause 5.5, physical requirements of the background material are mentioned. We suggest that it should be clearly stated that the only tensile strength is required for woven fabric and bursting strength for knitted fabric.

3) **Chromaticity Coordinates**: As per the clause 5.3.1.1, chromaticity coordinates and luminous factor are mentioned for the background material. It is observed that, many end users prefer cotton based safety vests due to its better feel and finish. However, the requirements mentioned in the standard are not possible for a cotton dyed fabric. So, it is suggested that suitable coordinates should be provided for such fabrics. This type of high visibility warning clothing is covered under Australian standard.

4) **Logo**: Currently, the Indian standard is silent about the logo which is used for branding and identification of the departments. As a result, few garment manufacturers use EN 13356 as a base standard. It is important to note that this standard is withdrawn in August 2020 and replaced by EN 17353:2020. Also, very few retro reflective manufacturing companies are having this certified product which is basically a micro prismatic based film with retro reflective properties. As a result, it becomes a monopolistic market. We suggest to kindly address this issue and give options to the end users. The branding options may be heat transfers label, sublimation, screen printing on background material may be incorporated in the standard.

We request that appropriate actions should be taken on the above mentioned points.

Kindly do the needful.

Warm Regards

For STAR SAFETY HUB

(Partner)

Pawan Kumar Gupta

1. **Comment received from 3M Scotchlite Reflective Materials Business**

Dear Mr. Katiyar,

Thank you for getting in touch with me and informing me about the BIS enrolment process. I wanted to let you know that the 3M Scotchlite Regional Representative worldwide is collaborating with local authorities to develop and enhance safety standards in different countries, and I would like to offer my services to BIS for the same purpose. Reflective tape is a critical element in any garment as it ensures visibility in low-light conditions. The placement of reflective tape on the garment is equally important to ensure that the wearer can be seen from all angles. Reflective tape is used in various safety apparel such as Hi-vis, Coveralls, Overalls, Work wear, Turn-out-Gear, Uniform, Footwear, etc. and the reflective solutions vary from garment to garment depending on the safety apparel operation area.

Let me give you an example of our recent collaboration with a State Fire Service to provide reflective solutions for first responders and firefighters. 3M Scotchlite recommended a reflective solution that reduced the weight of the garment, improved mobility, and eliminated stitches on the garment that were developed during the process of stitching reflective tape on the fabric, further eliminating the risk of fire penetration through the stitching area and improved service and maintenance of the reflective tape without hampering visibility.

Recently, I came across an ISI-marked Hi-vis that was tagged as non-washable. A non-washable Hi-vis garment needs to be quantified to determine the life of the garment. Suppose a wearer is working on a construction site and has been provided with an ISI marked and labeled non-washable. In this case, as days pass, foreign deposits in the form of dust accumulate on the background fabric and reflective layer of reflective tape. These deposits then hamper visibility during both daytime and nighttime, as the wearer didn't wash the safety vest as it was marked as non-washable. This further creates a hygiene issue. If the Safety Vest is non-washable, then when it needs to be discarded from the service, how it must be maintained, how it must be cleaned, and many other details must be studied and incorporated on the labels.

I have been informed that one of the NABL-accredited testing facilities didn’t test the reflectivity of reflective tape as per the 330 table, but tested only for 2 entrance angles and 2 observation angles. This was the general practice until the customer specified that the reflective tape must be tested as per the 330 table. 3M Scotchlite contacted the testing facility to educate them on the correct testing procedure. However, when the same product was re-tested, it did not meet the requirement.

Several other examples can be shared with you. 3M Scotchlite is committed to continuing its work through customer engagement, industrial best practices, and leveraging its global presence.

I hope enrolling 3M Scotchlite in the committee will be of help to you.

Thank you.

Best regards,

Sachin

Sachin Vilas Karande

Senior Sales Specialist

1. **Comments received from M/s NITRA**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SNo.** | **Clause / Subclause No.** | **Paragraph No./Figure No./Table No.** | **Type of Comment** | **Attachment** |
| 1 | C 4.4.1 | 1 | Editorial | N/A |
| **Comments/Suggestions along with Justification for the Proposed Change** | | | Washing treatment shall be mandatory criteria for all types of all types of garments. | |
| **Proposed Change/Modified Wordings** | | | All garments with retroreflective material shall be washed for a minimum of 50 cycles per the procedure defined in C-4.4.2. | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SNo.** | **Clause / Subclause No.** | **Paragraph No./Figure No./Table No.** | **Type of Comment** | **Attachment** |
| 1 | 5.5.3 | 1 | Editorial | N/A |
| **Comments/Suggestions along with Justification for the Proposed Change** | | | The bursting strength should be for knitted fabric only. There shall not be tensile and tear strength tests for knitted fabric. | |
| **Proposed Change/Modified Wordings** | | | For knitted fabric, only Bursting strength shall be carried out. | |

**ANNEX 9**

**(Item 6.4)**

**COMMENTS ON IS 15768 : 2008 AS RECEIVED FROM OFFICE OF THE PRINCIPAL COMMISSIONER OF CUTOMS**

**AIR CARGO COMPLEX (IMPORT**)

सेवा में,

The Deputy Director,

Office of The Director General,

BIS Headquarters,

9, Bahadur Shah Zafar Marg, New Delhi-110002

महोदय,

विषय :- **Seeking clarification on IS 15768 : 2008 for Upholstered composites used for non-domestic furniture — reg.**

With reference to the aforementioned subject, your kind attention is invited to the Protective Textiles (Quality Control) Order, 2022 dated 10.04.2023, wherein IS 15768 : 2008 has been imposed on "Upholstered Composites used for non-domestic furniture".

It is hereby requested to clarify the definition of the term "non-domestic furniture" in this regard, whether it means furniture not to be used in homes, i.e. in offices, malls etc. or whether non-domestic means for export out of India and non consumption in India.

भवदीय

उपायुक्त (तकनीकी)

Signed by Sakshi Garg. सी. सी . (आयात )

Date :22-03-2024 20:16:36

Reason Approved

**ANNEX 10**

**(Item 7.2)**

**EXTRACT FROM ISO 15384 : 2018**

# **Introduction**

The purpose of this document is to provide minimum performance requirements for protective clothing designed for use for extended periods during wildland firefighting activities. The minimum performance requirements and methods of test for personal protective equipment (PPE) covering the head, hands, feet, eyes and ears for wildland firefighting are covered in [ISO 16073](https://www.iso.org/obp/ui/en/#iso:std:iso:16073:en).

Wildland firefighting involves work primarily in summer temperatures, for many hours in which the firefighter can develop high levels of metabolic heat. Loose-fitting clothing is as important as the fire resistance of materials in preventing serious burn injury. Clothing that is tight-fitting poses a danger to the wildland firefighter from radiant heat and heat stress, while, at the same time, diminishing the firefighter's ability to perform. Consequently, the protective clothing needs to be light, flexible and commensurate with the risks to which the firefighter can be exposed in order to be effective without introducing heat stress to the wearer.

Accordingly, a risk assessment ([ISO/TR 21808](https://www.iso.org/obp/ui/en/#iso:std:iso:tr:21808:en)) needs to be undertaken to determine if the clothing covered by this document is suitable for its intended use and the expected exposure. This document does not cover clothing for use in higher risk situations, where clothing complying with [ISO 11999-3](https://www.iso.org/obp/ui/en/#iso:std:iso:11999:-3:en) or EN 469 (structural firefighting) or even [ISO 15538](https://www.iso.org/obp/ui/en/#iso:std:iso:15538:en) or EN 1486 (firefighting with reflective outer surface), is more suitable, nor does this document cover clothing to protect against chemical, biological, electrical or radiation hazards. This document does not cover risk related to rescue operations that are covered in [ISO 18639](https://www.iso.org/obp/ui/en/#iso:std:iso:18639:en) or EN 16689.

The risk assessment needs to include what additional personal protective equipment is necessary for the head, hand and feet. In some situations, respiratory protection may also be required.

Firefighters need to be trained in the use, care and maintenance of the protective clothing covered by this document, including an understanding of its limitation.

# **Scope**

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

This document is not applicable to clothing for use in situations encountered in structural firefighting (EN 469 or [ISO 11999-3](https://www.iso.org/obp/ui/en/#iso:std:iso:11999:-3:en)), rescue ([ISO 18639](https://www.iso.org/obp/ui/en/#iso:std:iso:18639:en)) or where a high level of infrared radiation is expected ([ISO 15538](https://www.iso.org/obp/ui/en/#iso:std:iso:15538:en) or EN 1486), nor does this document cover clothing to protect against chemical, biological, electrical or radiation hazards. This document does not provide protection against high mechanical risks such as for protection when using chain saws.

# **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](https://www.iso.org/obp/ui/en/#iso:std:iso:139:en), *Textiles — Standard atmospheres for conditioning and testing*
* [ISO 3146](https://www.iso.org/obp/ui/en/#iso:std:iso:3146:en), *Plastics — Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers by capillary tube and polarizing-microscope methods*
* [ISO 4674-1](https://www.iso.org/obp/ui/en/#iso:std:iso:4674:-1:en), *Rubber- or plastics-coated fabrics — Determination of tear resistance — Part 1: Constant rate of tear methods*
* [ISO 5077](https://www.iso.org/obp/ui/en/#iso:std:iso:5077:en), *Textiles — Determination of dimensional change in washing and drying*
* [ISO 6942:2002](https://www.iso.org/obp/ui/en/#iso:std:iso:6942:ed-3:en), *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 11092](https://www.iso.org/obp/ui/en/#iso:std:iso:11092:en), *Textiles — Physiological effects — Measurement of thermal and water-vapour resistance under steady-state conditions (sweating guarded-hotplate test)*
* [ISO 12947-2](https://www.iso.org/obp/ui/en/#iso:std:iso:12947:-2:en), *Textiles — Determination of the abrasion resistance of fabrics by the Martindale method — Part 2: Determination of specimen breakdown*
* [ISO 13688](https://www.iso.org/obp/ui/en/#iso:std:iso:13688:en), *Protective clothing — General requirements*
* [ISO 13934-1](https://www.iso.org/obp/ui/en/#iso:std:iso:13934:-1:en), *Textiles — Tensile properties of fabrics — Part 1: Determination of maximum force and elongation at maximum force using the strip method*
* [ISO 13935-2](https://www.iso.org/obp/ui/en/#iso:std:iso:13935:-2:en), *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](https://www.iso.org/obp/ui/en/#iso:std:iso:13937:-2:en), *Textiles — Tear properties of fabrics — Part 2: Determination of tear force of trouser-shaped test specimens (Single tear method)*
* [ISO 15025:2016](https://www.iso.org/obp/ui/en/#iso:std:iso:15025:ed-2:en), *Protective clothing — Protection against flame — Method of test for limited flame spread*
* [ISO 17493](https://www.iso.org/obp/ui/en/#iso:std:iso:17493:en), *Clothing and equipment for protection against heat — Test method for convective heat resistance using a hot air circulating oven*
* [ISO 20471:2013](https://www.iso.org/obp/ui/en/#iso:std:iso:20471:ed-1:en), *High visibility clothing — Test methods and requirements*

# 3   Terms and definitions

For the purposes of this document, the following terms and definitions 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](https://www.iso.org/obp/ui)
* — IEC Electropedia: available at <http://www.electropedia.org/>

**3.1**

**ageing**

changing of the product performance over time during use or storage

Note 1 to entry: Ageing is caused by a combination of several factors, such as:

* — cleaning, maintenance, or disinfecting processes;
* — exposure to visible and/or ultraviolet 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 Personal Protective Equipment, (PPE), is made again serviceable and/or hygienically wearable by removing any dirt or contamination

**3.3**

**cleaning cycle**

washing and a drying cycle or dry-cleaning cycle

Note 1 to entry: A cleaning cycle is typically a washing and drying cycle or a dry-cleaning cycle followed, if required, by ironing or other finishing.

**3.4**

**closure system**

method of fastening/unfastening the openings in the garment, including combinations of more than one method of achieving a secure closure

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

**3.5**

**component assembly**

combination of all materials and hardware 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**

**hardware**

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

**3.8**

**main seam**

seam which is essential to the integrity of the garment

**3.9**

**material combination**

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

EXAMPLE:

A quilted fabric.

**3.10**

**outer material**

outermost material of which the protective clothing is made

**3.11**

**pre-treatment**

standard way of preparing the samples before testing

Note 1 to entry: This can include subjecting the sample to a specific number of cleaning cycles; to heat, mechanical action or other relevant exposure followed by conditioning of the sample.

**3.12**

**personal protective equipment**

**PPE**

device or appliance designed to be worn or held by an individual for protection against one or more health and safety hazards

**3.13**

**personal protective clothing**

**PPC**

garment designed and configured to provide protection to the torso, neck, arms, and legs, excluding the head, hands, and feet

**3.14**

**protective coverall**

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

**3.15**

**protective garment**

clothing which consists of either single or multi-layers

**3.16**

**protective suit**

two-piece garment consisting of an upper and lower garment worn together, designed and configured to provide protection to the torso, neck, arms and legs

EXAMPLE:

Protective coat, protective trouser, or protective coverall.

**3.17**

**rank markings**

means of identifying the firefighter

EXAMPLE:

Badges, patches or embroideries.

**3.18**

**seam**

permanent junction between two or more pieces of textile material created by sewing, welding, or other methods

**3.19**

**wildland firefighting**

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

Note 1 to entry: Suppression actions can include back-burning involving a fire in vegetative fuels such as forest, crops, plantations, grass or farmland.

**ANNEX 11**

**(Item 7.3)**

**P-DRAFT ON FIRE RESISTANT FABRIC**

Foreword

(*Formal foreword to be added later*)

Within industries such as oil and gas, firefighting, welding, aviation, automotives etc, the threat of fire is a constant concern. In such environments, ensuring the safety of workers and infrastructure against fire hazards is of utmost importance. Flame retardant fabrics play a crucial role in reducing the threat posed by fire hazards in various industries. Although, there are several technologies and methods employed to impart fire resistance in textile fabrics, but these methods can broadly be divided into two categories:

1. **By chemical treatments,**

Chemical treatments like Proban coating, Pyrovatex treatment, and FR chemical finishes are employed to impart flame retardant properties to fabrics. Proban forms a polymer network on the fabric surface, Pyrovatex chemically bonds with cellulose fibers, and FR chemical finishes utilize compounds like brominated, phosphorus, and nitrogen compounds. These treatments enhance fabric safety in fire-prone environments.

1. **By selection of inherently fire resistant fibres,**

Fibres such as Meta-aramid, Para-aramid, and Modacrylic are inherently flame resistant due to their chemical structure. Fabrics made from these fibres exhibit high resistance to ignition and do not require additional chemical treatments.

**Textiles — Fire resistant fabric made of Cotton, Man-made fibres/filaments and their blends — General and Performance Requirements**

**1 SCOPE**

**1.1** This standard specifies the general and performance requirements for fire resistant fabric made of cotton, man-made fibres/filaments and their blends.

**2 REFERENCES**

The standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

**3 REQUIREMENTS**

**3.1 Requirements for fire-resistant fabric utilized in the manufacture of clothing for use in the oil and gas sector, foundries, automotive industries, aviation sectors, and allied industries.**

**3.1.1** *Pre-treatment by cleaning*

Before each test specified in Clauses **3.1.4** the fabric shall pre-treated by cleaning. If the manufacturer’s instructions indicate that cleaning is not allowed, i.e. single-use fabric, then testing shall be carried out on new fabric. In addition, **3.1.4.3** requires that the limited flame spread tests shall be carried out both before the pre-treatment and after the pre-treatment, if cleaning is allowed.

The cleaning shall be in line with the manufacturer’s instructions, on the basis of standardized processes. If the number of cleaning cycles is not specified, the tests shall be carried out after five cleaning cycles (a cleaning cycle is one wash and one dry cycle). This shall be reflected in the information supplied by the manufacturer. If the fabric can be washed and dry-cleaned, it shall only be washed. If only dry-cleaning is allowed, the fabric shall be dry-cleaned in accordance with the manufacturer’s instructions.

NOTE — Manufacturer’s instructions typically indicate one or several of the various methods and processes of ISO 6330,[2] ISO 15797,[3] ISO 3175-2,[5] or equivalent as standardized processes for cleaning.

**3.1.2** *Ageing*

In the case that the fabric should be submitted to some treatment to maintain its limited flame spread property as specified in **3.1.4.3**, the manufacturer shall indicate the maximum number of cleaning cycles that can be carried out before applying the treatment indicated to maintain the fabric protective performance. Limited flame spread test according to **3.1.4.3** shall be carried out after the last cleaning cycles before any treatment as indicated by the manufacturer; in both cases the fabric shall comply with the requirement.

**3.1.3** *Conditioning*

Fabric shall be conditioned for at least 24 h in an atmosphere having a temperature of (27 ± 2) °C and a relative humidity of (65 ± 4) %. Testing shall be carried out within 5 min of removal from this atmosphere.

**3.1.4** *Performance requirement*

**3.1.4.1** *General*

The fabric shall meet the requirements of Clause **3.1.4.2**, **3.1.4.3** and shall meet at least one of the heat transmission requirements for letter codes B, C, ~~D, E(~~Optional~~)~~ or F of **3.1.4.4** based on their intended use. The fabric shall also meet the requirements of clause **3.1.4.5** to **3.1.4.8.**

The fabric can optional meet the requirement for letter codes D and E of 3.1.4.4.

**3.1.4.2** *Heat resistance*

**3.1.4.2.1** *Heat resistance at a temperature of (180 ± 5) °C*

The fabric shall be tested according to ISO 17493 at a temperature of (180 ± 5) °C for an exposure time of 5 min. Test samples shall not ignite, melt or drip, and fabrics shall also not shrink by more than 5 %.

**3.1.4.2.2** *Optional requirement — Heat resistance at a temperature of (260 ± 5) °C*

The fabric can be optionally tested according to ISO 17493 at a temperature of (260 ± 5) °C for an exposure time of 5 min. The fabric shall not ignite, melt, or drip and shall not shrink by more than 10 % in addition to meeting the requirements of **3.1.4.2.1**.

NOTE — Heat shrinkage has the potential to reduce the thermal protection level of the fabric as it reduces the insulating air pocket between the fabric and the body. Therefore, heat shrinkage in heat and flame protective fabric has to be limited, especially in cases where a heat or flame hazard exists that could hit a large percentage area of the fabric.

**3.1.4.3** *Limited flame spread*

Testing of fabric shall take place in accordance with ISO 15025, to Procedure A (code letter A1). This test shall be carried out both before and after the pre-treatment specified in **3.1.1**. Code letter A2 is optional.

**3.1.4.3.1** *Testing in accordance with ISO 15025, Procedure A (code letter A1)*

When tested in accordance with ISO 15025, Procedure A, specimens from fabric shall meet the following requirements (*see* Table 1):

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

**(code letter A1)**

(*Clause* 3.1.4.3.1)

|  |  |
| --- | --- |
| **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 interlining that is used for specific protection other than heat and flame protection. |
| 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 |
| After flame | After flame time shall be ≤ 2 s. |

**3.1.4.4** *Heat transmission performance requirements*

**3.1.4.4.1** *Convective heat (code letter B)*

When tested in accordance with ~~IS 15758 (Part 1~~ (Comment: Claims B1 to B5 with different performance specification) (ISO 9151:2016) , fabrics that are claimed to offer protection against convective heat shall meet at least performance level B1 in Table 2.

**Table 2 Performance levels: Convective Heat Test**

(*Clause* 3.1.4.4.1)

|  |  |  |
| --- | --- | --- |
| **Performance levels** | **Heat transfer factor HTI24 values**  S | |
| Min | Max |
| B1 | 4.0 | <10.0 |
| B2 | 10.0 | <20.0 |
| B3 | 20.0 |  |
| NOTE —Heat transfer index, as defined in ISO 9151. | | |

**3.1.4.4.2** *Radiant heat (code letter C)*

When tested in accordance with ~~IS 15758 (Part 2)~~ (Comment: Claims C1 to C4 with different performance specification) (ISO 9151:2016)(ISO 6942: 2002), Method B, at a heat flux density of 20 kW/m2, fabrics that are claimed to offer protection against radiant heat shall meet at least performance level C1 in Table 3.

**Table 3 Performance levels: Radiant Heat Test**

(*Clause* 3.1.4.4.2)

|  |  |  |
| --- | --- | --- |
| **Performance levels** | **Heat transfer factor RHTI24**  S | |
| Min | Max |
| C1 | 7.0 | <20.0 |
| C2 | 20.0 | <50.0 |
| C3 | 50.0 | <95.0 |
| C4 | 95.0 |  |
| NOTE — Radiant heat transfer index, as defined in ISO 6942. | | |

**3.1.4.4.3** *Molten aluminium splash (code letter D)*

When tested in accordance with ~~IS 15758 (Part 5)~~ (ISO 9185) using molten aluminium, fabrics that are claimed to offer protection against molten aluminium splash shall meet at least performance level D1 in Table 4. This is optional requirement. Fabrics which ignite during the test do not meet this requirement.

**Table 4 Performance levels: Molten Aluminium Splash**

(*Clause* 3.1.4.4.3)

|  |  |  |
| --- | --- | --- |
| **Performance levels** | **Molten aluminium splash**  G | |
| Min | Max |
| D1 | 100 | <200 |
| D2 | 200 | <350 |
| D3 | 350 |  |

**3.1.4.4.4** *Molten iron splash (code letter E)*

When tested in accordance with ~~IS 15758 (Part 5)~~ (ISO 9185) using molten iron, fabrics that are claimed to offer protection against molten iron splash shall meet at least performance level E1 in Table 5. This is optional requirement. Fabrics which ignite during the test do not meet this test.

**Table 5 Performance levels: Molten Iron Splash**

(*Clause* 3.1.4.4.4)

|  |  |  |
| --- | --- | --- |
| **Performance levels** | **Molten iron splash**  G | |
| Min | Max |
| E1 | 60 | <120 |
| E2 | 120 | <200 |
| E3 | 200 |  |

**3.1.4.4.5** *Contact heat (code letter F)*

When tested in accordance with IS 17462 (Part 1)/ISO 12127-1:2015 at a temperature of 250 °C, fabrics that are claimed to offer protection against contact heat shall meet at least performance level F1 in Table 6.

**Table 6 Performance levels: Contact Heat**

(*Clause* 3.1.4.4.5)

|  |  |  |
| --- | --- | --- |
| **Performance levels** | **Threshold time**  S | |
| Min | Max |
| F1 | 5.0 | <10.0 |
| F2 | 10.0 | <15.0 |
| F3 | 15.0 |  |

**3.1.4.5***Tensile strength*

When tested in accordance with ISO 13934-1, woven fabric shall have a minimum tensile strength of 300 N in both the machine and cross directions.

**3.1.4.6** *Tear strength*

When tested in accordance with ISO 13937-2, woven fabric shall have a minimum tear strength of 10 N in both the machine and cross directions.

**3.1.4.7** *Burst strength for knitted materials*

When tested in accordance with ISO 13938-1 or ISO 13938-2, knitted fabric shall have a minimum burst strength of 100 kPa, when using 50 cm2 test area, or of 200 kPa, when using a 7.3 cm2 test area.

**3.1.4.8** *Dimensional Change*

Dimensional change shall be measured before and after the samples have undergone five cleaning cycles according to 3.1.1. The change in dimensions of woven fabric shall not exceed ± 3 % in either length or width direction when measured in accordance with ISO 5077. The change of dimensions of knitted materials shall not exceed ± 5 % when measured in accordance with ISO 5077. Dimensional change shall be measured after the fabric has been uncreased and flattened on a plane surface. Dimensional change does not apply to single use fabric.

**3.2 Requirements for fire-resistant fabric used in the manufacture of clothing for use during welding, and allied activities.**

**3.2.1** *Pre-treatment of material*

Before each test specified in **3.2.5 to 3.2.12**, the test materials and test specimens shall be pre-treated by cleaning. If the manufacturer’s instructions indicate that cleaning is not allowed, i.e. single use fabric, then testing will be carried out on new material. In addition, **3.2.9** requires that the limited flame spread tests shall be carried out both before the pre-treatment and after the pre-treatment. The cleaning shall be in line with the manufacturer’s instructions, on the basis of standardized processes. If the number of cleaning cycles is not specified, the tests shall be carried out after five cleaning cycles (a cleaning cycle is one wash and one dry cycle). This shall be reflected in the information supplied by the manufacturer. If the fabric can be washed and dry-cleaned, it shall only be washed. If only dry-cleaning is allowed, the fabric shall be dry-cleaned in accordance with the manufacturer’s instructions.

NOTE — The manufacturer’s instructions typically indicate one or several of the various methods and processes of ISO 6330, ISO 15797, ISO 3175-2 or equivalent as standardized processes for cleaning.

**3.2.2** *Ageing*

In the case that the fabric should be submitted to some treatment to maintain its limited flame spread property as specified in **3.2.9**, the manufacturer shall indicate the maximum number of cleaning cycles that can be carried out before applying the treatment indicated to maintain the fabric protective performance. Limited flame spread test according to **3.2.9** shall be carried out after the last cleaning cycles before any treatment as indicated by the manufacturer, in both cases, the fabric shall comply with the requirement.

**3.2.3** *Conditioning*

Fabric shall be conditioned for at least 24 h in an atmosphere having a temperature of (20 ± 2) °C and a relative humidity of (65 ± 5) %. Leather specimens shall be conditioned for at least 48 h in an atmosphere having a temperature of (20 ± 2) °C and a relative humidity of (65 ± 5) %. Testing shall be carried out within 5 min of removal from this atmosphere. Samples for electrical resistance testing specified in **3.2.12** shall be conditioned and tested in an atmosphere having a relative humidity of (85 ± 5 %) and a temperature of (20 ± 2) °C.

**3.2.4** *Classification*

This Indian Standard specifies the performance requirements of two types of fabrics used in the manufacture of clothing for use during welding, and allied activities as given below:

1. Class 1 is protection against less hazardous welding techniques and situations, causing lower levels of spatter and radiant heat. (*see* Annex B).
2. Class 2 is protection against more hazardous welding techniques and situations, causing higher levels of spatter and radiant heat. (*see* Annex B).

**3.2.5** *Tensile strength*

When tested in accordance with ISO 13934-1, woven outer fabric shall have a minimum tensile strength of 400 N in both the machine and cross directions.

**3.2.6** *Tear strength*

When tested in accordance with ISO 13937-2, woven outer fabric shall have a minimum tear strength of 15 N in both the machine and cross directions for Class 1 welders clothing and 20 N in both the machine and cross directions for Class 2 welders clothing.

**3.2.7** *Burst strength of knitted materials*

When tested in accordance with ISO 13938-1 or ISO 13938-2, knitted outer fabric shall have a minimum burst strength of 100 kPa, when using 50 cm2 test area, or 200 kPa, when using a 7.3 cm2 test area.

**3.2.8** *Dimensional change of textile materials*

Dimensional change shall be measured before and after the samples have undergone five cleaning cycles according to **3.2.1**. The change in dimensions of woven fabric shall not exceed ± 3 % in either length or width direction when measured in accordance with ISO 5077. The change of dimensions of knitted materials shall not exceed ± 5 % when measured in accordance with ISO 5077. Dimensional change shall be measured after the fabric has been uncreased and flattened on a plane surface. Dimensional change does not apply to single use fabric.

**3.2.9** *Limited flame spread*

When tested in accordance with ISO 15025, Procedure A (code letter A1)., fabric shall meet the following requirements (*see* Table 7). This test shall be carried out both before and after the pre-treatment specified in **3.2.1**. Code letter A2 is optional.

**Table 7 — Limited flame spread performance requirements ISO 15025, Procedure A**

**(code letter A1)**

(*Clause* 3.2.9)

|  |  |
| --- | --- |
| **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 interlining that is used for specific protection other than heat and flame protection. |
| 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 |
| After flame | After flame time shall be ≤ 2 s. |

**3.2.10** *Impact of spatter (small splashes of molten metal)*

When tested according to ISO 9150, the fabric shall require:

— at least 15 drops of molten metal to raise the temperature behind the test specimen by 40 ºC (In place of k) for Class 1, and

— at least 25 drops of molten metal to raise the temperature behind the test specimen by 40 ºC for Class 2.

Fabric samples which ignite during the test do not meet this requirement.

**3.2.11** *Heat transfer (radiation)*

When tested in accordance with ISO 6942, Method B, at a heat flux density of 20 kW/m2, fabrics shall meet a radiant heat transfer index (RHTI for 24 °C) of

— for Class 1: RHTI 24 ≥ 7.0, and

— for Class 2: RHTI 24 ≥ 16.0.

**3.2.12** *Electrical resistance*

Conditioning and testing of the samples shall be carried out at a temperature of (27 ± 2) °C and relative humidity of (65 ± 4) %. When the fabric is tested in accordance with the test method specified in EN 1149-2 and under an applied potential of (100 ± 5) V, the electrical resistance shall be greater than 105 Ω (corresponds to less than 1 mA leakage current).

**3.3 Requirements for fire-resistant fabric utilized in the manufacture of clothing for use during firefighting, and allied activities.**

**3.3.1 Requirements for outer fabric**

**3.3.1.1** *Pre-treatment*

Before testing to the basic safety requirements as specified in **3.3.1.2.1** to **3.3.1.2.3**, the fabric shall be washed five times in a front loading horizontal drum machine with 1 g/l IEC reference detergent (Annex B of IS 15370) in hard water (hardness of water 160 ± 20 mg/l expressed as calcium carbonate) and dried in accordance with the procedures of IS 15370. Washing shall be carried out by procedure 2A at (60 ± 3) °C and drying by procedure E (tumble drying) unless otherwise specified in the care labelling. Drying shall be in accordance with the procedures specified in IS 15370. A total of five washing and drying cycles shall be used. Fabrics which are labelled as dry cleanable only shall be dry cleaned five times in accordance with ISO 3175-2.

**3.3.1.2** *Performance requirements*

**3.3.1.2.1** *Flame resistance*

**3.3.1.2.1.1** Flame spread shall be tested in accordance with IS 15758 (Part 4)/ISO 15025, using the procedures for face ignition and bottom ignition, after the pre-treatment specified in **3.3.1.1** and the following requirements shall be satisfied:

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

b) No specimen shall give hole formation in any layer;

c) No specimen shall give flaming or molten debris;

d) The mean value of after flame time shall be ≤ 2 s; and

e) The mean value of the afterglow time shall be ≤ 2 s.

**3.3.1.2.2** *Heat transfer (flame exposure)*

The fabric when tested in accordance with ~~IS 15758 (Part 1)~~ (ISO 9151:2016) after the pre-treatment specified in **3.3.1.1** shall give a mean heat transmission index HTI24 ≥ 9 and a mean HTI (24-12) ≥ 3 for Level 1 and HTI24 ≥13 and a mean HTI (24-12) ≥ 4 for Level 2. If more than a single layer is used in the combination, all layers are to be tested together.

**3.3.1.2.3** *Heat transfer (radiant exposure)*

The fabric when tested in accordance with method B of ~~IS 15758 (Part 2)~~ ISO 6942:2002 at a heat flux density of 40 kW/m2, after the pre-treatment specified in **3.3.1.1**, shall give a *RHTI*  ≥ 10 s, a RHTI (24-12) ≥ 3 s for Level 1,and *RHTI*  ≥ 18 s, a RHTI (24-12) ≥ 4 s for Level 2, and a mean transmission factor ≤ 60 percent. If more than a single layer is used in the combination, all layers are to be tested together.

**3.3.1.2.4** *Residual strength of fabric when exposed to radiant heat*

One machine and one cross machine specimen of the outer fabric shall be tested in accordance with ~~IS 1969 (Part 1)~~ (ISO 13934-1:2013) before and after pre-treatment by method A of ~~IS 15758 (Part 2)~~ (ISO 6942: 2002 Method A) at a heat flux density of 10 kW/m2. Each specimen shall have a tensile strength ≥ 450 N.

**3.3.1.2.5** *Heat resistance*

The fabric when tested in accordance with the method given in ISO 17493 at a test temperature of 180 ± 5°C, shall not melt, drip, separate, or ignite, and shall not shrink more than 5 percent.

**3.3.1.2.6** *Contact heat*

When tested in accordance with ISO 12127-1 at a temperature of 250 °C, fabrics shall have a threshold time of at least 10 s. The fabrics shall be tested before and after pre-treatment as specified in **3.3.1.1**. If more than a single layer is used in the combination, all layers are to be tested together.

**3.3.1.2.7** *Tensile strength*

The fabric when tested in accordance with ~~IS 1969 (Part 1)~~ (ISO 13934-1) shall give a breaking load in both machine and cross direction ≥ 450 N.

**3.3.1.2.8** *Tear strength*

The fabric when tested in accordance with method specified in ~~IS 6489 (Part 2)~~ (ISO 13937-2:2000) shall give a tear strength in both machine and cross direction ≥ 30 N.

**3.3.1.2.9** *Surface wetting*

~~The fabric when tested in accordance with ISO 4920 shall give a spray rating of ≥ 4. (~~This standard is no longer tested as per EN ISO 469:2020)

**3.3.1.2.10** *Cleaning-shrinkage resistance*

The fabric when tested in accordance with ISO 5077 using the cleansing pre-treatment specified in **3.3.1.1** shall give a dimensional change ≤ 3 percent in both the machine and cross machine directions for woven fabric and a dimensional change ≤ 5 percent for knitted fabric.

**3.3.1.2.11** *Liquid-chemical penetration resistance*

The fabric when tested in accordance with ~~IS 15758 (Part 3) (EN ISO 6530:2005)~~ shall give more than 80 percent runoff and no penetration to the innermost surface using the following liquids:

a) ~~40 percent sodium hydroxide (NaOH) at 20°C;~~ (Not tested now as per EN ISO 469:2020)

b) ~~36 percent hydrochloric acid (HCI) at 20°C;~~ (Not tested now as per EN ISO 469:2020)

c) 30 percent sulfuric acid (H2SO4) at 20°C; and

d) O-xylene, 100 percent.

NOTE — Fabrics shall be conditioned for 24 h at (20 ± 2) °C and (65 ± 5) percent RH before testing. All tests shall be carried out with a pouring time of 10 s and at a temperature of 20°C.

**3.3.1.2.12** *Water-penetration resistance*

The fabric when tested in accordance with ISO 811 at 20 kPa for a period of 5 min after the pre-treatment specified in **3.3.1.1**, shall not show appearance of water drops. When used along with moisture barrier must >= 20 kPa, and without moisture barrier < 20 kPa.

**3.3.1.2.13** *Water-vapour resistance*

The fabric when tested in accordance with ISO 11092 after the pretreatment specified in **3.3.1.1**, shall have maximum water vapour resistance of 30 m2 Pa/W (Level 2). If more than a single layer is used in the combination, all layers are to be tested together.

NOTE — High water vapour resistance can lead to a higher risk of steam burns.

**3.3.2 Requirements for inner liner fabric**

**3.3.2.1** *Pre-treatment*

Before testing to the basic safety requirements specified in **3.3.2.2,** the fabric shall be washed five times in a front loading horizontal drum machine with 1 g/l IEC reference detergent (Annex B of IS 15370) in hard water (hardness of water 160 ± 20 mg/l expressed as calcium carbonate) and dried in accordance with the procedures of IS 15370. Washing shall be carried out by procedure 2A at (60 ± 3) °C and drying by procedure E (tumble drying) unless otherwise specified in the care labelling. Drying shall be in accordance with the procedures specified in IS 15370. A total of five washing and drying cycles shall be used. Fabrics which are labelled as dry cleanable only shall be dry cleaned five times in accordance with ISO 3175-2.

**3.3.2.2** *Flame resistance*

Flame spread shall be tested in accordance with IS 15758 (Part 4)/ISO 15025, using the procedures for face ignition and bottom ignition, after the pre-treatment specified in **3.3.2.1** and the following requirements shall be satisfied:

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

b) No specimen shall give hole formation in any layer;

c) No specimen shall give flaming or molten debris;

d) The mean value of after flame time shall be ≤2 s; and

e) The mean value of the afterglow time shall be ≤2 s.

**3.3.2.3** *Water-penetration resistance*

The fabric when tested in accordance with ISO 811 at 20 kPa for a period of 5 min after the pre-treatment specified in **3.3.2.1**, shall not show appearance of water drops.

**3.3.2.4** *Water-vapour resistance*

The fabric when tested in accordance with ISO 11092 after the pretreatment specified in **3.3.2.1**, shall have maximum water vapour resistance of 30 m2 Pa/W (Level 2). If more than a single layer is used in the combination, all layers are to be tested together.

NOTE — High water vapour resistance can lead to a higher risk of steam burns.

**3.3.2.5** *Cleaning-shrinkage resistance*

The fabric when tested in accordance with ISO 5077 using the cleansing pre-treatment specified in **3.3.2.1** shall give a dimensional change ≤ 3 percent in both the machine and cross machine directions for woven fabric and a dimensional change ≤ 5 percent for knitted fabric.

**3.4 Requirements for fire-resistant fabric utilized in the manufacture of clothing for use in the construction sites, and allied activities.**

**3.4.1** *Pre-treatment by cleaning*

Before each test specified in Clauses **3.4.4,** the fabric shall pre-treated by cleaning. If the manufacturer’s instructions indicate that cleaning is not allowed, i.e. single-use fabric, then testing shall be carried out on new fabric. In addition, **3.4.4.3** requires that the limited flame spread tests shall be carried out both before the pre-treatment and after the pre-treatment, if cleaning is allowed.

The cleaning shall be in line with the manufacturer’s instructions, on the basis of standardized processes. If the number of cleaning cycles is not specified, the tests shall be carried out after five cleaning cycles (a cleaning cycle is one wash and one dry cycle). This shall be reflected in the information supplied by the manufacturer. If the fabric can be washed and dry-cleaned, it shall only be washed. If only dry-cleaning is allowed, the fabric shall be dry-cleaned in accordance with the manufacturer’s instructions.

NOTE — Manufacturer’s instructions typically indicate one or several of the various methods and processes of ISO 6330,[2] ISO 15797,[3] ISO 3175-2,[5] or equivalent as standardized processes for cleaning.

**3.4.2** *Ageing*

In the case that the fabric should be submitted to some treatment to maintain its limited flame spread property as specified in **3.4.4.3**, the manufacturer shall indicate the maximum number of cleaning cycles that can be carried out before applying the treatment indicated to maintain the fabric protective performance. Limited flame spread test according to **3.4.4.3** shall be carried out after the last cleaning cycles before any treatment as indicated by the manufacturer; in both cases the fabric shall comply with the requirement.

**3.4.3** *Conditioning*

Fabric shall be conditioned for at least 24 h in an atmosphere having a temperature of (27 ± 2) °C and a relative humidity of (65 ± 4) %. Testing shall be carried out within 5 min of removal from this atmosphere.

**3.4.4** *Performance requirement*

**3.4.4.1** *General*

The fabric shall meet the requirements as given in clause **3.4.4.2** to **3.4.4.6**.

**3.4.4.2** *Heat resistance*

**3.4.4.2.1** *Heat resistance at a temperature of (180 ± 5) °C*

The fabric shall be tested according to ISO 17493 at a temperature of (180 ± 5) °C for an exposure time of 5 min. Test samples shall not ignite or melt, drip and fabrics shall also not shrink by more than 5 %.

**3.4.4.2.2** *Optional requirement — Heat resistance at a temperature of (260 ± 5) °C*

The fabric can be optionally tested according to ISO 17493 at a temperature of (260 ± 5) °C for an exposure time of 5 min. The fabric shall not ignite or melt and shall not shrink by more than 10 % in addition to meeting the requirements of **3.4.4.2.1**.

NOTE — Heat shrinkage has the potential to reduce the thermal protection level of the fabric as it reduces the insulating air pocket between the fabric and the body. Therefore, heat shrinkage in heat and flame protective fabric has to be limited, especially in cases where a heat or flame hazard exists that could hit a large percentage area of the fabric.

**3.4.4.3** *Limited flame spread*

Testing of fabric shall take place in accordance with ISO 15025, to Procedure A (code letter A1). This test shall be carried out both before and after the pre-treatment specified in **3.4.1**. Code letter is optional.

**3.4.4.3.1** *Testing in accordance with ISO 15025, Procedure A (code letter A1)*

When tested in accordance with ISO 15025, Procedure A, specimens from single layer fabric shall meet the following requirements (*see* Table 8):

**Table 8 — Limited flame spread performance requirements, ISO 15025, Procedure A**

**(code letter A1)**

(*Clause* 3.4.4.3.1)

|  |  |
| --- | --- |
| **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 interlining that is used for specific protection other than heat and flame protection. |
| 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 |
| After flame | After flame time shall be ≤ 2 s. |

**3.4.4.4** *Tensile strength*

When tested in accordance with ISO 13934-1, woven fabric shall have a minimum tensile strength of 300 N in both the machine and cross directions.

Note — The requirement of tensile strength is not applicable for knitted fabric.

**3.4.4.5** *Tear strength*

When tested in accordance with ISO 13937-2, woven fabric shall have a minimum tear strength of 10 N in both the machine and cross directions.

**3.4.4.6** *Burst strength for knitted materials*

When tested in accordance with ISO 13938-1 or ISO 13938-2, knitted fabric shall have a minimum burst strength of 100 kPa, when using 50 cm2 test area, or of 200 kPa, when using a 7.3 cm2 test area.

Note — The requirement of bursting strength is not applicable for woven fabric.

**4 MARKING**

**4.1** Each fabric shall be marked with the following information:

a) Name of the material, for example, FR treated/FR proban treated fabric or in case of blended/mixed FR treated/FR proban treated fabric, the full name of fibres in the mixture and their composition;

b) Length and width;

c) Mass in g/m2;

d) Batch/ Lot No.;

e) Manufacturer's name, initials or trade-mark;

f) Month and year of manufacture; and

g) Any other information required by the law in force.

**4.2 BIS Certification Marking**

The product conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product may be marked with the Standard Mark.

**5 PACKING**

The fabrics shall be packed in bales or cases in accordance with the procedure laid down either in IS 2194 or in IS 2195 or as agreed upon between the buyer and the seller.

**6 SAMPLING**

**6.1 Lot**

The rolls of fabrics for same type of application, produced in one facility, using the same production processes and materials and being offered for delivery at one time to buyer against a dispatch noteshall constitute a lot.

**6.2** Unless otherwise agreed between the buyer and the seller, the number of rolls selected at random for inspection shall be as per col (3) of Table 9.

**6.4** The lot shall be declared as conforming to the requirements of this standard, if no defective protective clothing is found.

**Table 9 Sample size**

(*Clause* 6.2)

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl No.** | **Number of rolls of fabric in the Lot** | **Sample Size (No. of rolls)** | **Permissible No. of Defectives** |
| (1) | (2) | (3) | (4) |
| i) | Up to 90 | 3 | 0 |
| ii) | 91 – 150 | 3 | 0 |
| iii) | 151 – 280 | 5 | 0 |
| iv) | 281 – 500 | 5 | 0 |
| v) | 501 and above | 5 | 0 |

**ANNEX A**

(Clause 2)

**LIST OF REFERRED STANDARDS**

|  |  |
| --- | --- |
| IS No. | Title |
| IS 667: 1981 | Methods for identification of textile fibres (first revision) |
| IS 1954: 1990 | Determination of length and width of woven fabrics — Methods (second revision) |
| IS 1964 : 2001 | Textiles — Methods for determination of mass per unit length and mass per unit area of fabrics (second revision) |
| IS 1966 (Part 1) : 2022 | Textiles — Bursting properties of fabrics Part 1: Hydraulic method for determination of bursting strength and bursting distension (third revision) |
| IS 1966 (Part 2) : 2022 | Textiles — Bursting properties of fabrics Part 2: Pneumatic method for determination of bursting strength and bursting distension (third revision) |
| IS 1969 (Part 1) : 2018 | Textiles — Tensile properties of fabrics — Part 1: Determination of maximum force and elongation at maximum force using the strip method (fourth revision) |
| IS 2194 : 1963 | Code for seaworthy packaging of man-made fibre fabrics |
| IS 2195 : 1964 | Code for inland packaging of man-made fibre fabrics and man-made fibre yarns |
| IS 6489 (Part 2) : 2011 | Textiles — Tear properties of fabrics Part 2: Determination of tear force of trouser shaped test specimens (Single tear method) (second revision) |
| IS 15370 : 2020 | Textiles — Domestic washing and drying procedures for textiles testing (first revision) |
| IS 15758 (Part 1) : 2020 | Textiles — Protective clothing Part 1: Determination of heat transmission on exposure to flame (first revision) |
| IS 15758 (Part 2) : 2007 | Textiles — Protective clothing Part 2: Assessment of material assemblies when exposed to source of radiant heat |
| IS 15758 (Part 4) : 2020 | Textiles — Protective clothing Part 4: Method of test for limited flame spread (first revision) |
| IS 15758 (Part 5) : 2020 | Textiles — Protective clothing Part 5: Assessment of resistance of materials to molten metal splash (first revision) |
| IS 17468 : 2020 | Clothing and Equipment for Protection against Heat — Test Method for Convective Heat Resistance using a Hot Air Circulating Oven |
| IS 17462 (Part 1): 2020 | 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 3175-2 : 2017 | Textiles — Professional care, drycleaning and wetcleaning of fabrics and Garments: Part 2 Procedure for testing performance when cleaning and finishing using tetrachloroethene |
| ISO 5077 : 2007 | Textiles — Determination of dimensional change in washing and drying |
|  |  |
| ISO 9150 : 1988 | Protective clothing — Determination of behaviour of materials on impact of small splashes of molten metal |

**Annex B**

(*Clause* 3.3.4)

**GUIDANCE FOR THE SELECTION OF THE TYPE OF FABRIC FOR WELDERS’ CLOTHING (CLASS 1/ CLASS 2)**

**Table C.1 — Selection criteria for fabric for clothing for use in welding or allied processes (reference points)**

|  |  |  |
| --- | --- | --- |
| **Type of welders’**  **clothing** | **Selection criteria relating to the process:** | **Selection criteria relating to the environmental conditions:** |
| Class 1 | Manual welding techniques with light formation of spatters and drops, e.g.:  — gas welding;  — TIG welding;  — MIG welding (with low current);  — micro plasma welding;  — brazing;  — spot welding;  — MMA welding (with rutile-covered electrode). | Operation of machines, e.g.:  — oxygen cutting machines;  — plasma cutting machines;  — resistance welding machines;  — machines for thermal spraying;  — bench welding. |
| Class 2 | Manual welding techniques with heavy formation of spatters and drops, e.g.:  — MMA welding (with basic or cellulose-covered electrode);  — MAG welding (with CO2 or mixed gases);  — MIG welding (with high current);  — self-shielded flux cored arc welding;  — plasma cutting;  — gouging;  — oxygen cutting;  — thermal spraying. | Operation of machines, e.g.:  — in confined spaces;  — at overhead welding/cutting or in comparable constrained positions. |

**Annex 12**

**(Item 8.1)**

**REVIEW ANALYSIS OF INDIAN STANDARDS**

1. **Review analysis of IS 17286 : 2019**

**(To be submitted to the Sectional Committee)**

1. **Sectional Committee No. &Title:** TXD 32 (Textiles Protective Clothing Sectional Committee)
2. **IS No:** IS 17286
3. **Title:** Textiles — Water Proof Multipurpose Rain Poncho with Convertibility as Bivouac — Specification
4. **Date of review:** 23 April 2024
5. **Review Analysis**
6. **Status of standard(s), if any from which assistance had been drawn in the formulation of this IS.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Standard**  **(No. & Title)** | **Whether the standard has since been revised** | **Major changes** | **Action proposed** |
| NA | NA | NA | NA |

1. **Status of standards referred in the IS**

|  |  |  |  |
| --- | --- | --- | --- |
| **Referred standards**  **(No. & Title)** | **IS No. of these standards since revised** | **Changes that are of affecting the standard under review** | **Action proposed** |
| IS 105-B02 : 2014  Textiles — Tests for colour fastness: Part B02 Colour fastness to artificial light: Xenon arc fading lamp test | Same Version | NA | NA |
| IS 105-C10 : 2006  Textiles — Tests for colour fastness: Part C10 Colour fastness to washing with soap or soap and soda | Same Version | NA | NA |
| IS/ISO 13935-1 : 2014  Textiles — Seam tensile properties of fabrics and made-up textile articles: Part 1 Determination of maximum force to seam rupture using the strip method (first revision) | Same Version | NA | NA |
| IS 390 : 1975  Method for determining the water repellency of fabrics by water spray test (first revision) | IS 390 : 2024  /ISO 4920 : 2012  Textile Fabrics — Determination of  Resistance to Surface Wetting  (Spray Test)  ( Second Revision ) | This standard is superseded to IS 390 : 2024/ISO 4920 : 2012 | Latest version of the standard i.e. IS 390: 2024/ISO 4920: 2012 shall be referred. |
| IS 392 : 1989  Textiles — Determination of water absorption and penetration of fabrics using bundesmann type apparatus (third revision) | Same Version | NA | NA |
| IS 667 : 1981  Methods for identification of textile (first revision) | Same Version | NA | NA |
| IS 766 : 1988  Method for determination of colour fastness of textile materials to rubbing (first revision) | IS/ISO 105-X12 : 2016  Textiles — Tests for Colour Fastness  Part X12 Colour Fastness to Rubbing  ( First Revision ) | This standard is superseded to IS/ISO 105-X12: 2016. | Latest version of the standard i.e. IS/ISO 105-X12: 2016 shall be referred. |
| IS 1390 : 1983  Methods for determination of pH value of aqueous extracts of textile materials (first revision) | IS 1390 : 2022  ISO 3071 : 2020  Textiles — Determination of pH of  Aqueous Extract  ( Third Revision ) | This standard is superseded to IS 1390 : 2022 | Latest version of the standard i.e. IS 1390: 2022 shall be referred. |
| IS 1912 : 1984  Specification for country jute twine (second revision) | IS 1912 : 2023  Textiles — Country Jute Twine —  Specification  ( Third Revision ) | This standard is superseded to IS 1912 : 2023 | Latest version of the standard i.e. IS 1912: 2023shall be referred. |
| IS 1954 : 1990  Determination of length and width of woven fabrics — Methods ( second revision) | IS 1954 : 2024  ISO 22198 : 2006  Textiles — Fabrics — Determination  of Width and Length  ( Third Revision ) | This standard is superseded to IS 1954 : 2024 | Latest version of the standard i.e. IS 1954: 2024 shall be referred. |
| IS 1963 : 1981  Methods for determination of threads per unit length in woven fabrics (second revision) | Same Version | NA | NA |
| IS 1964 : 2001  Textiles — Methods for determination of mass per unit length and mass per area of fabrics (second revision) | Same Version | NA | NA |
| IS 1969 (Part 1) : 2018  Textiles — Tensile properties of fabrics: Part 1 Determination of maximum force and elongation at maximum force using the strip method (fourth revision) | Same Version | NA | NA |
| IS 2977 : 1989  Fabrics (other than wool) — Method for determination of dimensional changes on soaking in water (first revision) | Same Version | NA | NA |
| IS 4084 : 1978  Specification for eyelets and washers (sail) (first revision) | Same Version | NA | NA |
| IS 4229 : 1992  Textiles — Nylon sewing threads for aerospace purposes — Specification (second revision) | Same Version | NA | NA |
| IS 4741 : 1968  Specification for snap fasteners (four pieces) | Same Version | NA | NA |
| IS 6490 : 1971  Method for determination of stiffness of fabrics — Cantilever test | Same Version | NA | NA |
| IS 7016 (Part 2) : 2015  Methods of test for coated and treated fabrics Determination of tensile strength and elongation at break (second revision) | Withdraw | NA | NA |
| IS 7016 (Part 3) : 1981  Methods of test for coated and treated fabrics Determination of tear strength (first revision) | IS 7016 (Part 3/Sec 2) : 2023 / ISO 4674-2 : 2021 Methods of Test for Rubber or Plastics Coated Fabrics Part 3 Determination of Tear Resistance  Section 2 Ballistic Pendulum Method  ( Third Revision ) | This standard is superseded to IS 7016 (Part 3/Sec 2): 2023 / ISO 4674-2: 2021. | Latest version of the standard i.e. IS 7016 (Part 3/Sec 2): 2023 / ISO 4674-2: 2021 shall be referred. |
| IS 7016 (Part 4) : 2003  Methods of test for coated and treated fabrics Rubber-or plastics-coated fabrics — Determination of resistance to damage by flexing (second revision) | Same Version | NA | NA |
| IS 7016 (Part 7) : 2009  Methods of test for coated and treated fabrics Rubber-or plastics-coated fabrics — Determination of resistance to penetration by water (second revision) | IS 7016 (Part 7) : 2023  /ISO 1420 : 2016  Methods of Test for Rubber or  Plastics Coated Fabrics  Part 7 Determination of Resistance to  Penetration by Water  ( Third Revision ) | This standard is superseded to IS 7016 (Part 7) : 2023/ISO 1420 : 2016 | Latest version of the standard i.e. IS 7016 (Part 7): 2023/ISO 1420: 2016 shall be referred. |
| IS 7016 (Part 8) : 1975  Methods of test for coated and treated fabrics Accelerated ageing | IS 7016 (Part 8) : 2023  /ISO 1419 : 2019  Methods of Test for Rubber or  Plastics Coated Fabrics  Part 8 Accelerated Ageing  ( First Revision ) | This standard is superseded to IS 7016 (Part 8) : 2023/ISO 1419 : 2019 | Latest version of the standard i.e. IS 7016 (Part 8): 2023 /ISO 1419: 2019 shall be referred. |
| IS 7016 (Part 9) : 2003  Methods of test for coated and treated fabrics Rubber-or plastics-coated fabrics — Determination of blocking resistance (second revision) | Same Version | NA | NA |
| IS 7016 (Part 10) : 1997  Methods of test for coated and treated fabrics Rubber- or plastics-coated fabrics — Low-temperature bend test (first revision) | IS 7016 (Part 10) : 2022/ISO 4675 : 2017  Methods of Test for Rubber or Plastics Coated Fabrics Part 10 Low Temperature Bend test ( Second Revision ) | This standard is superseded to IS 7016 (Part 10) : 2022 /ISO 4675 : 2017 | Latest version of the standard i.e. IS 7016 (Part 10) : 2022  /ISO 4675: 2017 shall be referred. |
| IS 8156 : 2014  Fasteners for consumer goods — Synthetic hook and loop tape — Specification (third revision) | Same Version | NA | NA |
| IS 14181 (Part 1) : 2002  Synthetic (plastic) slide fasteners — Special purpose: Part 1 Specification, selection and ordering guideline of the product (first revision) | Same Version | NA | NA |
| IS 16390 : 2015  Agro textiles — Nylon knitted seamless gloves for tobacco harvesters — Specification | Same Version | NA | NA |

1. **Any other standards available related to the subject& scope of the standard being reviewed(International/regional/other national/association/consortia, etc or of new or revision of existing Indian Standard)**

|  |  |  |
| --- | --- | --- |
| **Standard**  **(No. & Title)** | **Provisions that could be relevant while reviewing the IS** | **Action proposed** |
| NA | NA | NA |

1. **Technical comments on the standard received, if any**

|  |  |  |  |
| --- | --- | --- | --- |
| **Source** | **Clause of IS** | **Comment** | **Action proposed** |
| NA | NA | NA | NA |

1. **Information available on technical developments that have taken place (on product/processes/practices/use or application/testing/input materials, etc)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Source** | **Development** | **Relevant clause of the IS under review that is likely to be impacted**  **(Clause & IS No.)** | **Action proposed** |
| NA | NA | NA | NA |

1. **Issues arising out of changes in any related IS or due to formulation of new Indian Standard**

|  |  |  |  |
| --- | --- | --- | --- |
| **Related IS and its Title**  **(revised or new)** | **Provision in the IS under review that would be impacted & the clause no. or addition of new clause/provision** | **Changes that may be necessary in the Standards under review** | **Action proposed** |
| NA | NA | NA | NA |

1. **Any consequential changes to be considered in other IS**

|  |  |
| --- | --- |
| **Related IS to get impacted** | **Requirements to be impacted** |
| NA | NA |

1. **Recommendations:**

Based on the above observations, this standard may be reaffirmed for a further period of 5 years without any changes, the committee shall decide.

1. **Review analysis of IS 17291 : 2019**

**(To be submitted to the Sectional Committee)**

1. **Sectional Committee No. & Title:** TXD 32 (Textiles Protective Clothing Sectional Committee)
2. **IS No:** IS 17291 : 2019
3. **Title:** Textiles – Flame retardant jute based decorative and cover fabric for temporary structure – Specification
4. **Date of review:** 23 April 2024
5. **Review Analysis**
6. **Status of standard(s), if any from which assistance had been drawn in the formulation of this IS.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Standard**  **(No. & Title)** | **Whether the standard has since been revised** | **Major changes** | **Action proposed** |
| NA | NA | NA | NA |

1. **Status of standards referred in the IS**

|  |  |  |  |
| --- | --- | --- | --- |
| **Referred standards**  **(No. & Title)** | **IS No. of this standards since revised** | **Changes that are of affecting the standard under review** | **Action proposed** |
| IS 1390 : 1983  Methods for determination of  pH value of aqueous extracts of  textile materials (first revision) | IS 1390 : 2022  ISO 3071 : 2020  Textiles Determination of pH of aqueous extract (third revision) | This standard is superseded to IS 1390 : 2022 | Latest version of the standard i.e. IS 1390 : 2022 shall be referred. |
| IS 1969 (Part 1) : 2018  Textiles — Tensile properties of fabrics: Part 1 Determination of maximum force and elongation at maximum force using the strip method (fourth revision) | Same Version | NA | NA |
| IS 2818 : 2015 Textiles — Hessian — Specification (third revision) | Same Version | NA | NA |
| IS 2977 : 1989 Fabrics (other than wool) — Method for determination of dimensional changes on soaking in water (first revision) | Same Version | NA | NA |
| IS 4905 : 2015 Random sampling and randomization procedures (first revision) | Same Version | NA | NA |
| IS 6489 : (Part 1 ) : 2011  Textiles — Tear properties of fabrics: Part 1 Determination of tear force using ballistic pendulum method (Elmendorf) (second revision) | Same Version | NA | NA |
| IS 10036 (Part 1 and 2) : 1982 Specification for jute canvas | Same Version | NA | NA |
| IS 11871 : 1986 Methods for determination of flammability and flame resistance of textile fabrics | Same Version | NA | NA |
| IS 13501 : 1992 Textiles — Determination of flammability by oxygen index | Same Version | NA | NA |
| IS 14563 (Part 1 ) : 1998  Textiles — Determination of formaldehyde: Part 1 Free formaldehyde | IS 14563 : 2021  ISO 14184 -1 : 2011  Textiles Determination of formaldehyde Part 1: Free and hydrolysed formaldehyde water extraction method (first revision) | This standard is superseded to IS 14563 : 2021 | Latest version of the standard i.e. IS 14563 : 2021 shall be referred. |
| IS 15370 : 2005 Textiles — Domestic washing and drying procedures for textile testing | IS 15370 : 2023  ISO 6330 : 2021  Textiles — Domestic Washing and Drying Procedures for Textile Testing (second revision) | This standard is superseded to IS 15370 : 2023 | Latest version of the standard i.e. IS 15370 : 2023 shall be referred. |
| IS 15612 (Part 2) : 2006  Textiles — Burning behaviour of curtains and drapes: Part 2 Measurement of flame spread of vertically oriented specimens with large ignition source | Same Version | NA | NA |
| IS 15741 : 2007 Textiles — Resistance to ignition of curtains and drapes — Specification | Same Version | NA | NA |
| IS 15782 : 2008 Textiles — Method for determining deterioration of visibility due to smoke released on combustion of materials | Same Version | NA | NA |

1. **Any other standards available related to the subject & scope of the standard being reviewed (International/regional/other national/association/consortia, etc or of new or revision of existing Indian Standard)**

|  |  |  |
| --- | --- | --- |
| **Standard**  **(No. & Title)** | **Provisions that could be relevant while reviewing the IS** | **Action proposed** |
| NA | NA | NA |

1. **Technical comments on the standard received, if any**

|  |  |  |  |
| --- | --- | --- | --- |
| **Source** | **Clause of IS** | **Comment** | **Action proposed** |
| NA | NA | NA | NA |

1. **Information available on technical developments that have taken place (on product/processes/practices/use or application/testing/input materials, etc)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Source** | **Development** | **Relevant clause of the IS under review that is likely to be impacted**  **(Clause & IS No.)** | **Action proposed** |
| NA | NA | NA | NA |

1. **Issues arising out of changes in any related IS or due to formulation of new Indian Standard**

|  |  |  |  |
| --- | --- | --- | --- |
| **Related IS and its Title**  **(revised or new)** | **Provision in the IS under review that would be impacted & the clause no. or addition of new clause/provision** | **Changes that may be necessary in the Standards under review** | **Action proposed** |
| NA | NA | NA | NA |

1. **Any consequential changes to be considered in other IS**

|  |  |
| --- | --- |
| **Related IS to get impacted** | **Requirements to be impacted** |
| NA | NA |

**Recommendations:**

Based on the above observations, this standard may be reaffirmed for a further period of 5 years without any changes, the committee shall decide.

**ANNEX 13**

**(Item 9.1)**

**COMMENTS RECEIVED ON IS 1097**

* + - 1. **Comments received from M/s NSG**

Sub:- Regardinq specification for handloom cotton mosquito netting.

Kindly refer to your office email dated 0411212023 on the subject cited above.

**2.** ln this regard, it is intimated that MHA has authorized Mosquito Net Polyester

white/grey, flame retardant in place of Cotton Mosquito Nets.

**3.** For info please.

**SQN Commander (Prov)**

**HQ NSG, New Delhi**

* + - 1. **Comments received from M/s Central Manufacturing Technology Institute**

Not related to my domain knowledge