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उत्पाद मैनुअल

Textiles — Protective Clothing for Firefighters — Specification
IS 16890: 2024 के अनुसार

PRODUCT MANUAL
FOR Textiles — Protective Clothing for Firefighters — Specification
ACCORDING TO IS 16890: 2024

विभिन्न उत्पादों के लिए भारतीय मानक ब्यूरो (अनुरूपता मूल्यांकन) विनियम, 2018 की योजना - I के तहत प्रमाणन के संचालन में एकरूपता और पारदर्शिता के लिए इस उत्पाद मैनुअल का उपयोग सभी क्षेत्रीय/शाखा कार्यालयों और लाइसेंसधारियों द्वारा संदर्भ सामग्री के रूप में किया जाएगा। दस्तावेज़ का उपयोग बीआईएस प्रमाणन प्राप्त करने के इच्छुक संभावित आवेदकों द्वारा भी किया जा सकता है।

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure uniformity of practice and transparency in operation of certification under Scheme-I of Bureau of Indian Standards (Conformity Assessment) Regulations, 2018 for various products. The document may also be used by prospective applicants desirous of obtaining BIS certification.

1.	मानक संख्या IS No.	:	IS 16890: 2024
	शीर्षक Title	:	Textiles — Protective Clothing for Firefighters — Specification
	संशोधनों की संख्या No. of amendments	:	01
2.	नमूना दिशानिर्देश Sampling Guidelines		
a)	कच्चा माल Raw material	:	Outer layer, Moisture barrier and Thermal layer in Multilayer Clothing Assemblies shall be conforming to clause 5.2.3 of IS 16890:2024 Note: This section indicates the requirements for raw material(if specified in the IS)for which compliance is to be established during Grant of Licence/Change in Scope of Licence/Factory Surveillance.
b)	समूहीकरण दिशानिर्देश Grouping Guidelines	:	Please refer to Annex-A

c)	नमूने का परिमाण Sample Quantity	:	i) 1.5 meters of fabric/ material used in each layer ii) Hardware: 4 pieces each iii) Slide Fasteners: 5 pieces each iv) Hook & Loop fasteners: 10 meters each v) Retro reflective material or tape: 10 meter each type vi) 02 complete fire-fighter suits Note: This section indicates the quantity of the sample of the product and/or the raw material (if applicable), required to be sent to the laboratory for testing, for the purpose of Grant of Licence/Change in Scope of Licence/ Factory Surveillance (in case of market surveillance, effort may be made to procure the required quantity of product sample, as far as possible since raw material sample may not be available in market)
d)	परीक्षण अनुरोध में घोषित किए जाने वाले पैरामीटर Parameters to be Declared in Test Request	:	i. Category ii. Fabric iii. Type iv. Sizes v. Optional requirements: • Dry Cleanable/Not Dry Cleanable Note: Apart from the above, any other requirements/parameters may also be declared as per the standard, as applicable.
3.	परीक्षण उपकरणों की सूची List of Test Equipment	:	Please refer to Annex-B
4.	निरीक्षण और परीक्षण की स्कीम Scheme of Inspection and Testing	:	Please refer to Annex-C
5.	एक दिन में संभावित परीक्षण Possible tests in a day All tests are possible in a day except for water vapour resistance, provided pre-conditioned samples are available. Note: This section is for the guidance of BIS Certification Officers/Technical Auditors of BIS Authorized Outside Surveillance Agencies(OSAs) during factory inspection to provide ready reference regarding the tests which can be witnessed during the inspection in the factory by the officer/auditor.		
6.	लाइसेंस का दायरा/Scope of the Licence: "Licence is granted to use Standard Mark as per IS 16890: 2024 with the following scope:		
	Name of the product	Textiles — Protective Clothing for Firefighters	
	Category	Category 1/Category 2	
	Fabric	Woven/Knitted/Non-woven Fabric	
	Type	Single outer garment/Outer Two-piece suit consisting of a pair of jacket/Series of outer and inner garments designed to be worn together	
	Sizes	S/M/L/XL/XXL/XXXL	
	Optional Requirements	Dry Cleanable/Not Dry Cleanable	

ANNEX-A
GROUPING GUIDELINES

- i. Based on the risk of convective and radiant heat and/or flame exposures, there are two categories of protective clothing defined in the ISS:
 - a) Category 1
 - b) Category 2
- ii. There are 3 fabrics specified in the Standard:
 - a) Woven Fabric
 - b) Knitted Fabric
 - c) Non-woven Fabric
- iii. Based on the configuration, following types of protective clothing have been defined in the Standard:
 - a) Single outer garment
 - b) Outer Two-piece suit consisting of a pair of jacket
 - c) Series of outer and inner garments designed to be worn together
- iv. Considering the above, following grouping guidelines for GoL/CSoL have been developed:
 - a) Each Category of protective clothing (Category 1/Category 2) made from particular fabric and configuration shall be tested separately to cover that particular variety in the scope of licence.
 - b) Protective clothing of any size may be tested to cover all the other sizes in the scope of licence.
 - c) Dry cleanable Protective clothing shall be tested separately to cover in the scope of licence.
 - d) Scope of licence shall be restricted based on the manufacturing and testing facilities available.
 - e) During operation of licence, samples of each variety covered in the scope of licence, shall be tested in rotation, to the extent possible.

ANNEX-B

LIST OF TEST EQUIPMENTS

(INDICATIVE LIST, FOR GUIDANCE ONLY)

Sl. No.	Tests used in with Clause Reference	Test Equipment/Chemical
1.	Multilayer Clothing Assemblies, clause 5.2.3; Clothing Mass, clause 5.2.9; and Size, clause 5.2.12	- GSM Circular Cutter - Electronic weighing balance - Ruler - Measuring Tape - Measuring Table
2.	Seams, clause 5.2.4	- Universal Testing Machine (CRE Type) as per IS/ISO 13595-2 - Sewing machine, sewing threads, needle, scissors etc. if preparation of seams is required before testing
3.	Retroreflective elements, clause 5.2.7	Suitable retroreflectometer designed for the measurement of coefficient of retroreflection
4.	Pre-treatment, clause 6.4	- Front Loading Horizontal Drum Washing Machine (15 kgs) as per IS 15370 - Washing Detergent (non phosphate ECE and IEC) - Liquid Detergent (SAC 700) - Dryer (15 kgs) (Tumble Dryer) as per IS 15370 Humidity Chamber - Stop Watch - Water hardness Testing Kit Hardness Reagent-H - Hardness Reagent-B - Hardness Reagent-I
5.	Flame resistance, clause 7.2	- Flammability Tester-Vertical Type as per IS 15758 part 4 Commercial grade propane of at least 95 % purity - Fine control valve and flow meter Mounting frame and templates - Timing Devices - Filter Paper - For Sewing Thread: - Melting Apparatus as per clause 4.2.1 of IS 13360 (Part 6/Sec 10) - Capillary tube, of heat-resistant glass, closed at one end - Calibrated thermometer, graduated in divisions of 0.1 °C

6.	Heat Transfer (Flame exposure), clause 7.3	Heat Transfer Index Tester as per IS 15758 part 1 - consisting of • a Meker gas burner; • a copper disc calorimeter; • a specimen support frame; • a calorimeter location plate; • a support stand; • suitable measuring and recording equipment; • a template.
7.	Heat Transfer (Radiant Exposure), clause 7.4	Radiant Heat Tester as per IS 15758 part 2 consisting of • -source of radiation • -test frame • -specimen holder • -calorimeter • -temp measuring and recording device
8.	Contact Heat, Clause 7.5	• Heating cylinder (constructed from a suitable metal which can withstand temperatures of over 500°C (e.g. Silver Alloy, 925 Sterling Silver), with a polished contact surface of diameter- $25,2 \pm 0,05$ mm & a central boring which ends 2 mm above the lower surface of the heating cylinder) enclosed by heat-resistant insulation, leaving free the bottom contact surface • Calorimeter as per specifications mentioned in clause 4.2 of IS 17462 (Part 1) • Assembly as per Figure 5 & clause 4.3 of IS 17462 (Part 1) • Electronic devices: - to raise the temperature of the heating cylinder to the chosen testing temperature and to maintain that temperature to $\pm 2^{\circ}\text{C}$, - to control the rate of contact, - to measure and register the calorimeter temperature to an accuracy of $\pm 0,1^{\circ}\text{C}$, - to measure the threshold time
9.	Residual strength of material when exposed to radiant heat, Clause 7.6	• Universal Testing Machine (CRE Type) plus test equipment as per 6.3
10.	Heat Resistance, clause 7.7; Hardware, clause 5.2.5; and Closure Systems, clause 5.2.6	• Forced Air Circulating Oven as per ISO 17493 • Templates for sizing specimens • Stretching frame for measuring shrinkage of knit materials • Specimen mounting hardware • Stop Watch • Humidity Chamber
11.	Tensile Strength, Clause 7.8	• Universal Testing Machine (CRE Type)
12.	Tear strength, Clause 7.9	• Universal Testing Machine (CRE Type) , • Clamping device • Equipment for cutting out test specimens,

		preferably a hollow punch or template as per IS 6489 (Part 2)
13.	Cleaning shrinkage resistance, Clause 7.10	• Front Loading Horizontal Drum Washing Machine(15 kgs) as per IS 15370 • Washing Detergent(non phosphate ECE and IEC) - Liquid Detergent(SAC 700) • Dryer (15 kgs) (Tumble Dryer) as per IS 15370 Humidity Chamber • Stop Watch • Water hardness Testing Kit Hardness Reagent-H Hardness Reagent-B Hardness Reagent-I • Ruler, measuring tape, table etc to measure length and width
14.	Liquid- chemical penetration resistance, Clause 7.11	• Testing Apparatus as per IS 15758 (Part 3) Liquid penetration testing - Static pump Chemical-NAOH • Chemical- HCL • Chemical- H₂SO₄ • Chemical- White spirit • Conical flask • Humidity Chamber • Electronic weighing balance
15.	Water – penetration resistance, Clause 7.12	• Pressure head tester with manometer and fabric clamp as per ISO 811 • General Lab apparatus and reagents
16.	Water Vapour Resistance, Clause 7.13	• Measuring unit, with temperature and water supply control, Thermal guard with temperature control, Test enclosure, into which is built the measuring unit and thermal guard, and in which the ambient air temperature and humidity are controlled, as per ISO 11092
17.	Conditioning and/or testing atmospheres required for different tests	• Conditioning or test chambers

ANNEX C

SCHEME OF INSPECTION AND TESTING

1. QUALITY ASSURANCE PLAN

1.1 It is expected that during operation of BIS licence, manufacturers will implement a Quality Assurance Plan (QAP) i.e. a plan of regular testing and in-process controls, designed to ensure that the product bearing the Standard Mark conforms to all requirements of the Indian Standard.

1.2 The manufacturers shall define a Quality Assurance Plan (QAP) defining the control unit (i.e. lot/batch etc.), the levels of control (i.e. the frequency and number of samples for conducting the different tests as per the Indian Standard) and declare the arrangement for testing i.e. whether in-house or subcontracting/sharing for each applicable test and submit the same to BIS Branch Office for information. The manufacturer shall comply with the QAP and maintain test records in accordance with para 2.1.

1.3 RECOMMENDED LEVELS OF CONTROL/CONTROL UNIT:

1.3.1 For the guidance of manufacturers, the recommended definition of control unit is: entire quantity of Firefighter Suits of manufactured from the same consignment of material and produced under similar conditions of manufacture in a day.

1.3.2 For the guidance of manufacturers in preparing the Quality Assurance Plan, recommended levels of control are given in **Table 1**. Manufacturer has the discretion of declaring their own levels of control or accept the levels of control given in this document.

1.3.3 The manufacturer shall ensure inspection and testing as per the Quality Assurance Plan submitted by them on the whole production of the factory which is covered by this plan.

2. ENSURING COMPLIANCE THROUGH TESTING- manufacturers shall ensure compliance of their products to all the requirements of the Indian Standard for which they may have in-house test facilities. However, there is no obligation to maintain in-house laboratory. Licensee may use alternative arrangements for tests of the production as per the declared QAP. Various alternatives are available for operation of BIS certification as given below and the relevant guidelines for availing such relaxations by the manufacturers, as amended from time to time, are to be referred:

- i) Shared testing resources like common facility,
- ii) Cluster based testing facility,
- iii) Sub-contracting to outside laboratories which may either be:
 - a) BIS recognised/empanelled laboratories, or
 - b) Any accredited laboratory as per ISO/IEC 17025

2.1 TEST RECORDS- The manufacturers shall maintain test records for the tests carried out (either in-house or at a sub-contracted or at shared test facility) to establish conformity of the product to the Standard for operation of licence. For the tests being subcontracted or conducted at a shared test facility, test results issued by the laboratories or test facilities, shall be made available for inspection by BIS.

3. PACKING AND MARKING - The Standard Mark as given in the Schedule of the licence shall be incorporated legibly and indelibly on each protective clothing, provided always that the material so marked conforms to each requirement of the specification.

3.1 Packing and Marking shall be done as per the Indian Standard.

3.2 **Additional Marking requirements:** Additionally, the following shall also be marked on product or package or both on each protective clothing:

a) "For BIS certification details please visit www.bis.gov.in"

4. REJECTION - The production which conforms to the Indian Standard and covered under the scope of this licence shall be marked with the Standard Mark. Disposal of non-conforming product shall be done in such a way so as to ensure that there is no violation of provisions of BIS Act, 2016.

TABLE 1
(Recommended Levels of Control by BIS- For Guidance Only)

(1)				(2)		
Test Details				Levels of Control		
Cl.	Requirement	Test Method		No. of Sample	Frequency	Remarks
		Clause	Reference			
5.2.1	Design Requirements	5.2.1	IS 16890	Firm to have adequate in-process controls to check compliance of this parameter as given in the Indian Standard. However, appropriate records shall be maintained by the manufacturer for evidence of conformity.		
5.2.2	Restriction of movement	5.2.2	IS 16890			
5.2.3	Multilayer clothing assemblies	5.2.3	IS 16890			
5.2.4	Seams	--	IS/ISO 13935			
5.2.5	Hardware	--	IS 17468	One	Each consignment	Each type of hardware shall be tested
5.2.6	Closure systems	--	IS 17468	One	Each consignment	
5.2.7	Retroreflective elements	5.2.7	IS 16890	One	Each consignment	One sample from each consignment shall be tested if not accompanied by a Test certificate from manufacturer
5.2.8	Sleeve ends	5.2.8	IS 16890	Firm to have adequate in-process controls to check compliance of this parameter as given in the Indian Standard. However, appropriate records shall be maintained by the manufacturer for evidence of conformity.		
5.2.9	Clothing Mass	5.2.9	IS 16890			
5.2.10	Ease of cleaning	5.2.10	IS 16890			
5.2.11	Labels	5.2.11	IS 16890			
5.2.12	Size designations	5.2.12	IS 16890			
7	Performance requirements					
7.2	Flame resistance	--	IS 15758 (Part 4), IS 13360 (Part 6/sec 10)	One	One in every 7 th control unit	If there is a change in consignment of any of the multi-layered garments, test shall be repeated on the next immediate control unit.
7.3	Heat Transfer (Flame Exposure)	--	IS 15758 (Part 1)	One	One in every 7 th	

7.4	Heat Transfer (Radiant Exposure)	--	IS 15758 (Part 2)	One	control unit	If there is a change in consignment of any of the multi-layered garments, test shall be repeated on the next immediate control unit.
7.5	Contact Heat	--	Is 17462 (Part 1)		One in every 7 th control unit	If there is a change in consignment of any of the multi-layered garments, test shall be repeated on the next immediate control unit.
7.6	Residual Strength of Material when exposed to Radiant heat	--	IS 1969 (Part 1) & IS 15758 (Part 2)			
7.7	Heat Resistance	--	ISO 17493			
7.8	Tensile Strength	--	IS 1969 (Part 1)			
7.9	Tear Strength	--	IS 6489 (Part 2)			
7.10	Cleaning- shrinkage Resistance	--	ISO 5077			
7.11	Liquid-chemical Penetration Resistance	--	IS 15758 (Part 3)			
7.12	Water-penetration Resistance	--	IS 391			
7.13	Water-vapour Resistance	--	IS 17376	One	Once in six months	