



**PRODUCT MANUAL
FOR PROTECTIVE CLOTHING FOR FIREFIGHTERS
ACCORDING TO IS 16890:2018**

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure coherence 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 licence/certificate.

1.	Product	:	IS 16890:2018
	Title	:	Protective Clothing for Firefighters
	No. of Amendments	:	0
2.	Sampling Guidelines:		
a)	Raw material	:	No specific requirement
b)	Grouping guidelines	:	Sample of each configuration to be tested separately for considering GOL/Inclusion. However, any size may be tested for covering other sizes in scope of licence. Scope to be restricted based on manufacturing and testing capacity. During operation of licence, sample of each variety to be drawn in rotation.
c)	Sample Size	:	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
3.	List of Test Equipment	:	Please refer ANNEX –A
4.	Scheme of Inspection and Testing	:	Please refer ANNEX –B
5.	Possible tests in a day :		
	All tests are possible in a day except for water vapour resistance if pre-conditioned samples are available		
6.	Scope of the Licence:		
	“Licence is granted to use Standard Mark as per IS 16890:2018 with the following		

	scope:	
	Name of the product	Protective Clothing for Firefighters
	Type	Single outer garment/Outer Two piece suit consisting of a pair of jacket/Series of outer and under garments designed to be worn together
	Sizes	S/M/L/XL/XXL/XXXL
	Optional Requirements	Dry Cleanable/Not Dry Cleanable

ANNEX A

List of Test Equipment

Major test equipment required to test as per the Indian Standard

Sl. No.	Tests used in with Clause Reference	Test Equipment
1.	Multilayer Clothing Assemblies 4.2.3, and Clothing Mass, 4.2.9, and Size, 4.12	GSM Circular cutter Electronic weighing balance Ruler, Measuring Tape, Measuring Table
2.	Seams 4.2.4	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, 4.2.7	Suitable retroreflectometer designed for the measurement of coefficient of retroreflection
4.	Pre treatment 5.4	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 6.1	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
6.	Heat Transfer (Flame exposure) 6.2	Heat Transfer Index Tester as per IS 15758 part 1 - consisting of <ul style="list-style-type: none"> - 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) 6.3	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.	Residual strength of material when exposed to radiant heat 6.4	Universal Testing Machine (CRE Type) plus test equipment as per 6.3
9.	Heat Resistance,6.5; Hardware, 4.2.5, and Closure Systems, 4.2.6	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
10.	Tensile Strength 6.6	Universal Testing Machine (CRE Type)
11.	Tear strength 6.7	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)
12.	Surface wetting 6.8	Spray tester as per ISO 4920 Conical flask, Distilled/fully de-ionized water Stop watch
13.	Cleaning shrinkage resistance 6.9	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 6.10	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 6.11	Pressure head tester with manometer and fabric clamp as per ISO 811 General Lab apparatus and reagents

16.	Water Vapour Resistance	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

The above list is indicative only and may not be treated as exhaustive.

ANNEX B

Scheme of Inspection And Testing

1. LABORATORY - A laboratory shall be maintained which shall be suitably equipped (as per the requirement given in column 2 of Table 1) and staffed, where different tests given in the specification shall be carried out in accordance with the methods given in the specification.

1.1 The manufacturer shall prepare a calibration plan for the test equipments.

2. TEST RECORDS – The manufacturer shall maintain test records for the tests carried out to establish conformity.

3. LABELLING AND MARKING–The Standard Mark as given in the Schedule of the license and shall be marked on each Fire-fighter Suit including separable parts and its packaging, provided always that the product thus marked and packed conforms to all the requirement of the specification.

3.1 Marking and labelling shall be done as per the provisions of the Indian Standard. In addition, the following details shall be mentioned on each Firefighter Suit or the packaging or attached label:

a) BIS Licence No. CM/L _____.

b) BIS website details i.e–“For details of BIS certification please visit www.bis.gov.in”

3.2 **Manufacturer’s Information** as specified in IS 16890:2018 shall be provided with each Fire-fighter Suit.

4. CONTROL UNIT: For the purpose of this scheme, entire quantity of Firefighter Suits of manufactured from the same consignment of material and produced under similar conditions of manufacture in a day, shall constitute a single control unit.

5. LEVELS OF CONTROL - The tests as indicated in column 1 of Table 1 and the levels of control in column 3 of Table 1, shall be carried out on the whole production of the factory which is covered by this plan and appropriate records maintained in accordance with paragraph 2 above.

5.1 All the production which conforms to the Indian Standards and covered by the licence should be marked with Standard Mark.

7. REJECTIONS – 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

(1)				(2)	(3)		
Test Details				Test equipment requirement R: required (or) S: Sub-contracting permitted	Levels of Control		
Cl.	Requirement	Test Method			No. of Sample	Frequency	Remarks
		Clause	Reference				
4.2	Design Requirements		IS 16890				
4.2.2	Restriction of movement	4.2.2	IS 16890	R		Each firefighter suit	
4.2.3	Multilayer clothing assemblies	4.2.3	IS 16890	R		Each firefighter suit	
4.2.4	Seams		IS/ISO 13935	R	1	Each control unit Seams of finished suits to be tested	
4.2.5	Hardware		ISO 17493	R	1	Each consignment Each type of hardware shall be tested	
4.2.6	Closure systems		ISO 17493	R	1	Each consignment	
4.2.7	Retroreflective elements	4.2.7	IS 16890	S	1	Each consignment One sample from each consignment shall be tested if not accompanied by a Test certificate from manufacturer	
4.2.8	Sleeve ends	4.2.8	IS 16890	R		Each firefighter suit	
4.2.9	Clothing Mass	4.2.9	IS 16890	R		Each firefighter suit	
4.2.10	Ease of cleaning	4.2.10	IS 16890	R		Each firefighter suit	
4.2.11	Labels	4.2.11	IS 16890	R		Each firefighter suit	
4.2.12	Size designations	4.2.12	IS 16890	R		Each firefighter suit	

6	Performance requirements		IS 16890				
6.1	Flame resistance		IS 15758(Part 4)	R	3	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.
6.2	Heat Transfer (Flame exposure)		IS 15758 (Part 1)	R	2	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.
6.3	Heat Transfer (Radiant Exposure)		IS 15758 (Part 2)	R	2	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.
6.4	Residual Strength of Material when exposed to Radiant heat		IS 1969 (Part 1) & IS 15758 (Part 2)	R	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.
6.5	Heat Resistance		ISO 17493	R	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.
6.6	Tensile Strength		IS 1969 (Part 1)	R	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.
6.7	Tear Strength		IS 6489 (Part 2)	R	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.
6.8	Surface wetting		ISO 4920	R	2	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.

6.9	Cleaning-shrinkage Resistance		ISO 5077	R	2	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.
6.10	Liquid-chemical Penetration Resistance		IS 15758 (Part 3)	R	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.
6.11	Water-penetration Resistance		ISO 811	R	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.
6.12	Water-vapour Resistance		ISO 11092	S	1	Once in six months	

Note-1: Whether test equipment is required or sub-contracting is permitted in column 2 shall be decided by the Bureau and shall be mandatory. Sub-contracting is permitted to a laboratory recognized by the Bureau or Government laboratories empanelled by the Bureau.

Note-2: Levels of control given in column 3 are only recommendatory in nature. The manufacturer may define the control unit/batch/lot and submit his own levels of control in column 3 with proper justification for approval to BO head.