



Standardization in the field of Defence and Security

**3RD NATIONAL CONCLAVE ON STANDARDS
FOR TECHNICAL TEXTILES – 2 & 3 NOV 2017, NEW DELHI**

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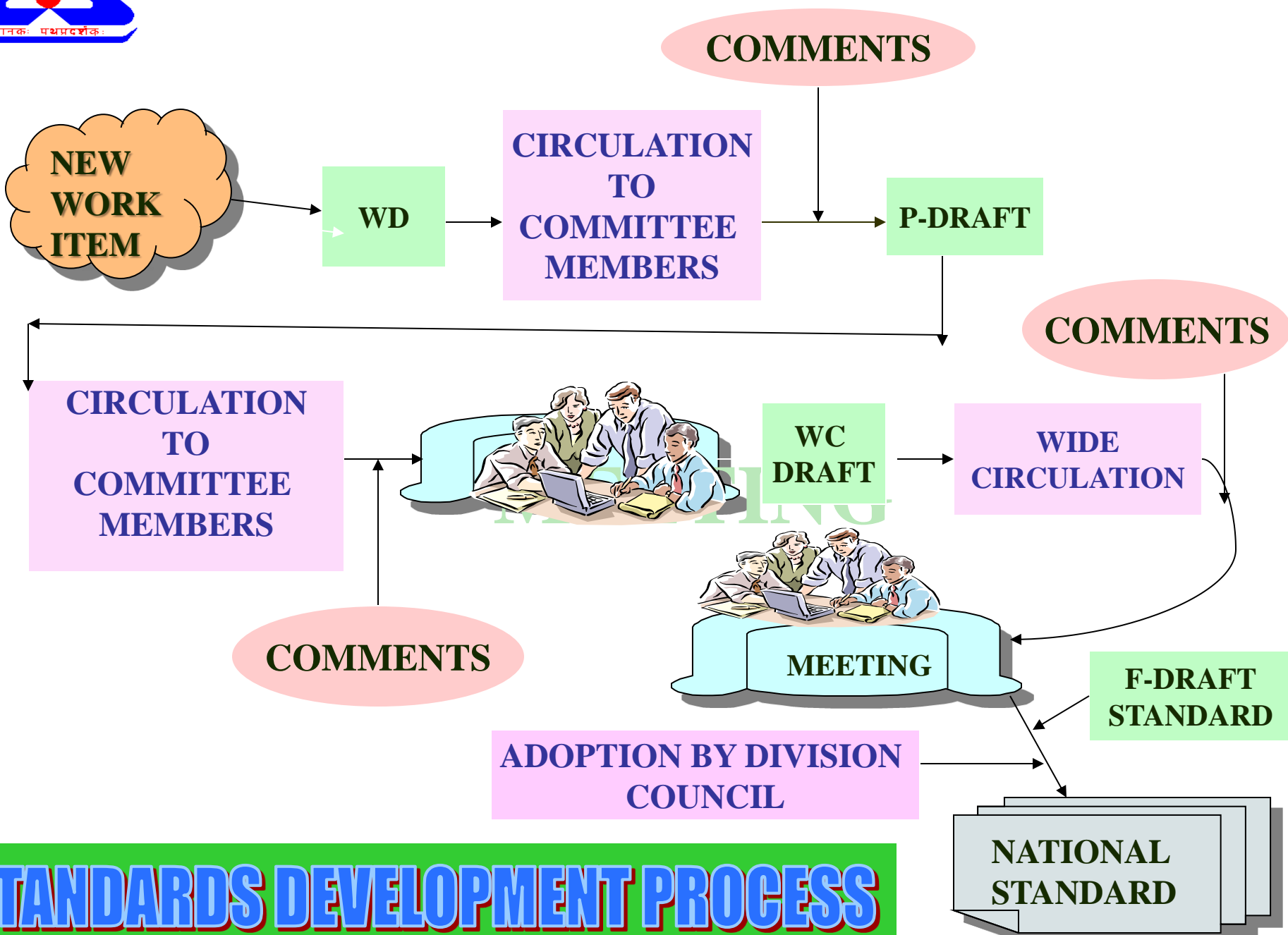
Protech Sector – Defence & Security

- Protective technical textiles are specialty textiles that provide protection to wearer in hazardous situations like fire & heat, chemical exposure, protection from bullets and other extreme atmosphere conditions. The main products include FR fabrics and apparels, protective clothing and Gloves for fire fighter, high visibility clothing, Full body protector used by RAF, NBC suits, Bullet Proof jackets and vest, Chemical protective clothing, High altitude clothing, Industrial gloves etc.
- The segment has grown at 7% in the last five years.
- The segment is projected to reach Rs.2722 crore by 2015-16 growing at 9% CAGR and further to Rs.3139 crore by 2017-18.



Standardization of Protech/ Defence textiles

- Standards for Protech at National Level are being formulated by the Textiles Protective Clothing Sectional Committee, TXD 32.
- The Scope of Work of the Sectional Committee covers Formulation of Indian Standards for testing and specification for textile protective clothing for protection from fire and other health/life hazards.
- At the moment, 28 standards on protech including FR textiles and its test methods have been formulated.
- 9 standards are under development.
- Textile Materials for Aerospace, Narrow Fabrics and Related Products Sectional Committee, TXD 13 has formulated 67 standards on defence textiles.



STANDARDS DEVELOPMENT PROCESS



Important standards formulated/ under development for defense

- **IS 16726:2017 POUCH FOR AMMUNITION AND GRENADES MADE OF DISRUPTIVE PATTERN NYLON 6 6**
- Pouch for ammunition and grenades (Ammo pouches) provide security in storing ammunition, magazines and grenades with ease and safety. Ammo pouches can be used with rifles, shotguns, and grenade launchers, making them the perfect versatile tool for carrying the necessary accessories for weapons. Ammo pouches have been shaped and formed to specifically suit different needs for different guns, as well as for other weapons like individual grenades.





Important standards formulated/ under development for defense

- **IS 16725:2017 TACTICAL 3 POINTS SLING UNIVERSAL**
- The main role of tactical sling is to serves the tactical requirements of a specific combat scenario. It is a type of strap or harness designed to allow a shooter to carry a firearm (usually a long gun such as a rifle, carbine, shotgun, or submachine gun) on his/her person and/or aid in greater hit probability with that firearm. A tactical sling also makes simple tasks like reading maps and opening doors easier while maintaining control and accessibility to firearm.





Important standards formulated/ under development for defense

■ **Protective clothing for firefighters**

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



Protective clothing for firefighters

1) Design Requirements

- a) **Configuration of clothing** – 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 either a single outer garment or an outer two piece or a series of outer and undergarments.
- b) **Ease of movement and its assessment procedure**
- c) **Requirement for multilayer clothing assemblies** – Shall consist of:
 - i) Outer layer – Mass shall not be more than 220 g/m².
 - ii) Moisture barrier – Mass shall not be more than 140 g/m².
 - iii) Thermal layer – May be a single layer or two layers quilted together and the mass shall not be more than 350 g/m².
- d) **Seams** – Shall give minimum loss in strength and protection and to maintain the integrity of the garment. Minimum seam breaking force shall be 250 N.
- e) **Hardware and closure system** – Shall not melt, drip, separate or ignite at a test temp. of 180 ± 5°C and shall not shrink more than 5 %. Closure system shall be protected by overlapping by component assembly etc. Slide fastener shall be designed to lock when closed.



Protective clothing for firefighters

- f) **Visibility requirements** – Retroreflective material shall not be less than 0.13 m^2 and give all round visibility by encircling the arms, legs and torso regions of garment (s). Fluorescent or combined performance material shall have a minimum area of 0.2 m^2 . Photometric requirements shall conform to IS 15809. It shall also meet heat resistance and flame spread (shall not permit hole formation).
- g) **Sleeve ends** – Shall protect wrist and prevent entry of burning debris.
- h) **Ease of cleaning**
- i) **Labels and size designation** – Label shall not affect the performance of garment. Size shall be designation by height and chest or bust girth as two control dimensions, in cm and include 6 sizes as S (80-88), M (88-96), L (96-104), XL (104-112), XXL (112-120), XXXL (120-124).



Protective clothing for firefighters

2) Performance requirements

- a) **Flame resistance** – Shall be tested for face and bottom ignition [IS 15758 (Part 4)] after pretreatment and shall meet:
- i) No specimen shall give flaming to top or either side edge;
 - ii) No specimen shall give hole formation in any layer;
 - iii) No specimen shall give flaming or molten debris;
 - iv) The mean value of afterflame time shall be ≤ 2 s; and
 - v) The mean value of the afterglow time shall be ≤ 2 s.
- b) **Heat Transfer (flame exposure)** - Mean heat transmission index (I_Q) of $I_{Q.24} \geq 13$ and a mean $(I_{Q.24} - I_{Q.12}) \geq 4$ [IS 15758 (Part 1)].
- c) **Heat Transfer (radiant exposure)** - At a heat flux density of 40 kW/m^2 , after the pretreatment, shall give a mean $t_2 \geq 22$ s, a mean $(t_2 - t_1) \geq 6$ s, and a mean transmission factor ≤ 60 % [IS 15758 (Part 2)].



Protective clothing for firefighters

- d) **Residual Strength of Material when Exposed to Radiant Heat** - One machine and one cross machine specimen of the outer material, before and after pretreatment of the complete assembly by method A of IS 15758 (Part 2) at a heat flux density of 10 kW/m^2 , shall have a tensile strength $\geq 450 \text{ N}$.
- e) **Heat Resistance** - Each material used in the clothing assembly, when tested at a test temperature of $180 \pm 5^\circ\text{C}$, shall not melt, drip, separate, or ignite, and shall not shrink more than 5 % (ISO 17493).
- f) **Tensile strength** - The outer material shall have a breaking load in both machine and cross direction $\geq 450 \text{ N}$ [IS 1969 (Part 1)].
- g) **Tear strength** - The outer material shall have a tear strength in both machine and cross direction $\geq 25 \text{ N}$ [IS 6489 (Part 2)].
- h) **Surface Wetting** - The outer material shall give a spray rating of ≥ 4 (ISO 4920).
- i) **Cleaning-shrinkage Resistance** - Dimensional change shall be $\leq 3\%$ in both the machine and cross machine directions (ISO 5077).



Protective clothing for firefighters

j) **Liquid-chemical Penetration Resistance** - The component assembly or multilayer clothing assembly shall give more than 80 % run-off and no penetration to the innermost surface using the following liquids (Pouring time 10 s and at a temp. of 20°C) [IS 15758 (Part 3)]:

- i) 40 % sodium hydroxide (NaOH) at 20°C;
- ii) 36 % hydrochloric acid (HCl) at 20°C;
- iii) 30 % sulfuric acid (H₂SO₄) at 20°C;
- iv) White spirit;

k) **Water-penetration Resistance** - Specimens of clothing assembly and its seams, when tested in accordance with ISO 811 at 7 kPa for a period of 5 min after the pretreatment, shall not show appearance of water drops.

l) **Water-vapour Resistance** - Specimens of clothing assembly and its seams, when tested in accordance with ISO 11092 after the pretreatment, shall have maximum water vapour resistance of 30 m² Pa/W. **High water vapour resistance can lead to a higher risk of steam burns.**



Important standards formulated/ under development for defense

■ **Protective Gloves for firefighters**

- Hand protection during firefighting is of paramount importance. Burns and other injuries to the hand, though lessened over the years, still represent a significant proportion of all fire ground injuries.
- Where there are complaints about the different elements of the protective ensemble, often gloves top the list. Complaints include them being too bulky or too restrictive on hand movements.



Protective Gloves for firefighters

- Gloves use the same principles of layering materials as applied to garments. Structural firefighting gloves employ the same functional three-layer construction as turnout gear. For gloves, there is a shell, which may be either leather or textile. Inside the shell is a moisture barrier or barrier layer that may be separate or combined with a thermal lining. All layers must work together to provide protection to the hands.
- Prescribes six unique and distinct sizes of gloves and includes the general glove design, thermal, mechanical, barrier, ergonomic and optional visibility requirements for protective gloves designed to protect against injury in fire fighting operations.



Important standards formulated on FR Textiles/Work place safety

- **IS 15741:2007 Textiles - Resistance to ignition of curtains and drapes**
- **IS 15742:2007 Textiles - Requirements for clothing made of limited flame spread materials and material assemblies affording protection against heat and flame**
- **IS 15748:2007 Textiles - Protective clothing for industrial workers exposed to heat (excluding firefighters' and welders' clothing)**
- **IS 15768:2008 Textiles - Resistance of ignition of upholstered composite used for non-domestic furniture**
- **IS 16655 : 2017 Protective clothing for use in welding and allied processes**
- **IS 14744 : 1999 Flame Retardant Protective Hoods**
- **IS 15321 : 2003 Molten Metal Splash Protective Hoods**
- **IS 15809 : 2008 High Visibility Warning Clothes**
- **IS 15071 : 2002 Chemical Protective Clothing**



Important Standards Under Development on Protech/Defence Textiles

Important Standards under development :

- Bullet resistance Jacket
- Bullet resistance vest
- Full body protector for use by law enforcing agencies
- LLIN
- Specification for Water proof multipurpose rain poncho with convertibility as bivouac
- Disruptive pattern (camouflage pattern) cloth for jungle operations made of nylon and cotton blended(NYCO) material
- Specification for coat parka/ECC/Siachen clothing
- Cut resistance clothing
- Specification for light weight ground sheet



Important standards formulated on Webbing for aerospace purpose

- Webbing is used in fabrication of parachutes and retarding chutes, safety belts etc. Their quality is important in view of safety involved and these need to be durable e.g. in respect of colour fastness to various agencies such as light and washing, breaking strength, abrasion resistance and shrinkage. These are also required to meet certain functional requirements related to exposure to weathering and sunlight such as ageing; resistance to heat; accelerated weathering, resistance to cold and pliability, resistance to combustion, etc. In addition, constructional parameters have also been specified in order to meet the performance and functional requirements and to have the consistent quality from different batches/suppliers.
- **IS 9267 Tubular Nylon Webbing for Aerospace Purposes**
- **IS 8947 Nylon Webbing for Aircraft Safety Belts**
- **IS 4727 Nylon Webbing for Aeronautical Purposes**
- **IS 3449 Cotton Webbing for Parachutes**



Important standards formulated on tapes for aerospace purpose

- Tapes are used in aerial delivery equipments including personnel parachutes and in view of safety involved, their quality is of utmost importance. The important requirements include residual shrinkage for proper fit, breaking load and elongation for durability, resistance to accelerated ageing, colour fastness to light and water during normal weathering and also the rot proofing requirements to ensure durability and minimize degradation during use and storage.
- **IS 6349 Tapes Nylon, Tubular for Aerospace Applications**
- **IS 3846 Rot Proofed Cotton Tapes for Aerospace Purposes**
- **IS 3255 Scoured or Dyed Cotton tapes for Aerospace Purposes**
- **IS 4228 Nylon tapes for Aerospace Purposes**



Important standards formulated on Light weight Parachute Fabrics

- ***Light Weight Parachute Fabrics*** - These materials are used in the fabrication of parachutes intended for personnel and other aerial delivery purposes. Various functional and durability requirements covered are air porosity (for air pressure balance during dropping), permanence of finish (for resistance to light and weathering), stability of finish, pH value of aqueous extract (for minimizing acidic degradation in use), colour fastness to light and water during weathering.
- **IS 4726 Light Weight Nylon Fabric for Parachutes**



Important standards formulated on *Webbings for Personnel web Equipments*

- The standards under this group cover webbings used in the manufacture of personnel web equipment, carrier man pack, water proof capes, snow shoes, map case, holdalls, ammunition carriers, waist belts, rifle slings and stretcher bags. Requirements for width, ends in full width, picks/cm, mass, breaking strength, weave, width, colour fastness to light, washing, pH value, water absorption, scouring loss to minimize mildew growth and moisture proofness have been specified. In case of proofed webbings requirements for water-soluble chlorides, water-soluble sulphates, water extractable matter, ash content, iron and chromium content have also been specified. **(IS 7777 Cotton Webbing Rolled edges, IS 7776 Silk Webbings, IS 10692 HDPE Webbings , IS 7426 Cotton webbings, IS 7298 Cotton Webbings, Proofed and Un-proofed, IS 6674 Cotton Webbings for Use in Packing of aero Engines and IS 6488 Cotton Webbings for Personnel Web Equipments)**



Important standards formulated on *Made up Defence textiles*

- **a) Ground Sheets** – This is a rectangular water proof sheet made from rubber proofed light weight double texture fabric hemmed and fitted with eyelets and washers on its four sides. Requirements for workmanship, finish, dimensions, mass, freedom from defects have been specified. [IS 14351 Ground Sheets (Light Weight)]
- **b) Holdalls** – Holdalls are used for packing bedding items mainly required for travel. Two types of holdalls viz heavy duty and light duty have been specified. The standard covers requirements for main body, webbing , sewing thread, straps and handle, buckles, rivets and eyelets. For performance, drop test has also been specified. (IS 7955 Specification for Holdalls)



Important standards formulated on *Made up Defence textiles*

- ***Tents and Awnings*** - The standards under this group cover requirements for tents and awnings used for shelter. Requirements for flies, ridge *KANATS*, flaps (*PURDHAS*), side walls, detachable walls, doors, bathroom, verandah, workmanship etc have been specified [IS 7609 General requirements for Tents, IS 10321 (Parts 1 to 3) Specification for 50 kg Tents, IS 15272 Caravan Awnings, IS 15566 Functional requirements and Test Methods for Caravan Awnings]
- ***Cotton and HDPE Mosquito Net*** - Indian standards on cotton and HDPE mosquito nets cover requirements of dimensions and conformance to basic raw materials used such as netting, tape, newar, reinforcing materials etc (IS 9886 Mosquito Nets and IS 10054 HDPE Mosquito netting, IS 14953 Polyester or polyamide mosquito nets, IS 1143 Cotton mosquito netting).



CONCLUSIONS

- Standardization in the field of Defence textiles has been carried out by BIS taking into consideration the latest technological advancement in the field through consultative process of all the stakeholder.
- I call upon all the stakeholder of Defence textiles to actively participate in the standard setting process for furthering the cause of National Standardization.
- I appeal to all the stakeholders of Defence textiles sector to come forward and implement the Indian Standards in their area of activity and adopt the BIS certification scheme in promoting the quality of their product and to promote Make in India initiative of Govt. of India.



THANK YOU



FOR FINER DETAILS PLEASE CONTACT

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