Standard and Regulation for FR textiles for use at workplace

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

J. K. Gupta, Scientist 'D',
Bureau of Indian Standards

Standardization of FR textiles for use at work place

- Standards for Fire Retardant Textiles/work place safety at National Level are being formulated by the following two committees at BIS:
- **Textiles Protective Clothing Sectional Committee, TXD 32**
- Scope:- Covers Formulation of Indian Standards for testing and specification for textile protective clothing for protection from fire and other health/life hazards.
- **Occupational Safety, Health and Chemical Hazard, CHD 08**
- Scope:- To formulate Indian Standard for i) Terminology relating to Occupational Health and Safety ii) Specifications and code of practice for testing of safety equipment iii) Code of safety for operational hazards in industries other than chemical industries iv) Occupational health and safety management system, procedure and practices.
- No. of standards formulated- TXD32– 28 and CHD 08- 49

INDIAN STANDARDS ON FR TEXTILE PRODUCTS/Work place safety

- **Indian Standards published/Finalized by BIS on FR Textiles/work place safety so far cover the following:**
  - IS 15748 Protective Clothing for Industrial Workers
  - IS 15742 Protective Clothing with Limited Flame Spread Properties
  - IS 16655 Protective clothing for use in welding and allied processes
  - IS 15809 High Visibility Warning Clothing
  - IS 14744 Flame retardant protective hoods
  - IS 15321 Molten metal splash protective hoods
  - IS 15071 Chemical protective clothing
  - Protective clothing for Fire fighter
  - Protective gloves for fire fighter
  - Test Methods for testing and evaluation of Flame Retardancy/Flammability/Ignition Resistance of these FR Textiles, Floor Coverings, Blankets, etc.

IS 15748:2007 TEXTILES - PROTECTIVE CLOTHING FOR INDUSTRIAL WORKERS EXPOSED TO HEAT (EXCLUDING FIREFIGHTERS' AND WELDERS' CLOTHING) (WITH AMENDMENT NO. 1)

- **Applicable to protective clothing consisting of outer garments made from flexible material to protect specific parts of the body. Hoods and gaiters are included but all other types of protection for the head, hands and feet are excluded. It specifies the following requirements:**

  - **The limited Flame Spread Index (code letter A)**

    (IS 15748-4/ISO 15025)
  - **Heat resistance as per with ISO 17493 at a temperature of (180 ± 5)°C; no ignition or melting and shrinkage not more than 5 percent and**
  - **One or more of other heat transmission performance requirement (code letters B to F) at level 1 or above:**
    - **Convective Heat - Heat Transmission Index (Code Letter B; Levels B1 to B5) (IS 15748-1/ISO 9151)**

IS 15748:2007 TEXTILES - PROTECTIVE CLOTHING FOR INDUSTRIAL WORKERS EXPOSED TO HEAT (EXCLUDING FIREFIGHTERS' AND WELDERS' CLOTHING) (WITH AMENDMENT NO. 1)

- Radiant Heat (Code Letter C; Levels C1 to C4) (IS 15748-2/ISO 6942)
- Molten Aluminum Splash (Code Letter D; Levels D1 to D3) (IS 15748-5/ISO 9185)
- Molten Iron Splash (Code Letter E; Levels E1 to E3) (IS 15748-5/ISO 9185)
- Contact Heat (Code Letter F; Levels F1 to F3) (ISO 12127-1)

- Durability of Flame Retardant Treatment (50 Laundering Cycles)

IS 15742:2007 TEXTILES - CLOTHING MADE OF LIMITED FLAME SPREAD MATERIALS AND MATERIAL ASSEMBLIES AFFORDING PROTECTION AGAINST HEAT AND FLAME (WITH AMENDMENT NO. 1)

- **Specifies the following requirements for the limited flame spread properties of textile materials and material assemblies used in protective clothing affording protection against heat and flame mainly due to accidental contact with small igniting flame:**
  - **Fire Retardancy in terms of Flame Spread Index 1, 2 or 3. The value 1 being the minimum and 3 as maximum flame protection**
  - **Durability of Flame Retardant Treatment after 50 laundering cycles**
- **This standard is applicable to clothing used in kitchens of office canteens, guest houses, restaurants, hotels, motels, inns, hospitals, etc.**
- **Materials giving Index 1 shall only be used as part of a material assembly complying with Index 2 or Index 3 and shall be supplied with a statement that they shall not be used next to the skin.**

REQUIREMENTS FOR LIMITED FLAME SPREAD INDEX (FSI) 1, 2 and 3

- **FSI 1**
  - Flame or hole not to reach the upper or either vertical edge of specimen
  - No flaming or molten debris
  - Any afterglow shall not spread from the carbonized area to the undamaged area after the cessation of flaming.
- **Additional Requirements for FSI 2**
  - No specimen shall give hole formation.
- **Additional Requirements for FSI 3**
  - No specimen shall give hole formation.
  - Mean after flame time of any set of six specimens shall not exceed 2 s.

IS 16655 Protective clothing for use in welding and allied processes

- Specifies minimum basic safety requirements and test methods for protective clothing including hoods, aprons, sleeves, and gaiters that are designed to protect the wearer's body including head (hoods) and feet (gaiters) and that are to be worn during welding and allied processes with comparable risks.
- This type of protective clothing is intended to protect the wearer against spatter (small splashes of molten metal), short contact time with flame, radiant heat from an electric arc used for welding and allied processes, and minimizes the possibility of electrical shock by short-term, accidental contact with live electrical conductors at voltages up to approximately 100 V d. c. in normal conditions of welding.
- Sweat, soiling, or other contaminants can affect the level of protection provided against short-term accidental contact with live electric conductors at these voltages.

IS 16655 Protective clothing for use in welding and allied processes

- **This standards covers the following requirements:**

1) General and design requirements (Size designations and fit, clothing configuration, pockets and flap closures, closure and seams, Hardware)

2) General performance requirements-

a) Classification- Class 1- For lower level of spatter and radiant heat

Class 2 - For higher level of spatter and radiant heat

b) Tensile strength- 400 N minimum both for machine and cross machine direction

c) Tear strength- Class 1- 15 N minimum, Class 2- 20 N minimum

d) Bursting strength of knitted material and seams- Minimum 100 kpa for test area of 50 cm2 or 200 kpa for 7.3 cm2 test area

e) Seam strength- Minimum 225 N

f) Dimensional change- ±3 % for woven and ±5 % for knitted

IS 16655 Protective clothing for use in welding and allied processes

3) Specific performance requirements:

a) Limited flame spread for clothing assembly, seams, hardware, closure system, Labels, badges, retroreflective materials etc.

b) Impact of spatter (small splashes of molten metal) - The outer material or material assembly shall require:

- — at least 15 drops of molten metal to raise the temperature behind the test specimen by 40 K for Class 1, and
- — at least 25 drops of molten metal to raise the temperature behind the test specimen by 40 K for Class 2.

IS 16655 Protective clothing for use in welding and allied processes

c) **Heat transfer (radiation) –** At a heat flux density of 20 kW/m2, single layer or multilayer garments, and/or clothing assemblies 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.

d) **Electrical resistance** - 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) for all assemblies of the clothing. Seams shall be taken into account when preparing test samples.

IS 15809 High visibility warning clothing

- **High visibility warning clothing is one of the personnel protective equipment worn as a means to provide visual signal of the wearer's presence and intended to provide conspicuity of the wearer under any light conditions by day and under illumination by vehicle headlights in the dark.**
- **Conspicuity is enhanced by increasing the contrast between the clothing and its ambient background or surroundings. Classes of visibility hazards are identified and appropriate markings for the clothing are suggested based on worker risk hazards, such as complex backgrounds, vehicular traffic density and speeds.**

IS 15809 High visibility warning clothing

- **High visibility warning clothes are of two types depending on the colour for background and combined performance materials:**

  a) *Type* I - Fluorescent yellow - Green. and

  b) *Type* 2 - Fluorescent orange – Red

- **Each type of high visibility warning clothing are classified based on the level of conspicuity as follows:**
- **a) *Class* I - For use in occupational activities that permit full and undivided attention to approaching traffic.**
- **b) *Class* 2 - For use in occupational activities where users require greater visibility for inclement weather conditions, activities on or near roadways with higher traffic levels.**
- **c) *Class* 3 -For use in high-risk occupations when workers are exposed to high speed traffic , or a wide range of weather conditions.**

IS 15071 Chemical Protective clothing

- **Increased use of chemicals, phenomenal growth of process industries, and introduction of more complex and hazardous processes result in enhanced potential of chemical exposure. Engineering measures are the most preferred method to prevent/control exposure to hazardous chemicals. However, many times, as the last line of defence, personal protective equipment are relied upon to control chemical exposure of personnel.**
- **The primary function of protective clothing is to prevent, or reduce to an acceptable level, the exposure of the skin to a chemical hazard. Type and extent of chemical hazard, necessity for additional protections such as eye or respiratory protection, expected duration of exposure are some of the key aspects considered before selecting the protective clothing.**

IS 15071 Chemical Protective clothing

- **This standard provides requirements and methods of sampling and tests for chemical protective clothing. It also gives guidance for the selection of clothing intended to protect the skin against contact with chemicals and prescribes the basic requirements for the fabric. Four types of protective clothing have been specified.**

Type	Breakthrough Time	Action if Contaminated	Application
1	Over 6 h	Wash off/clean at the end of work period	Long term continuous exposure
2	2 to 6 h	Wash off/clean at the end of work period	Routine tasks
3	12 min to 2 h	Wash off/clean immediately	Short term protection
4	Up to 12 min	Remove as soon as possible	Emergency use/disposable garments only

IS 15741:2007 TEXTILES - RESISTANCE TO IGNITION OF CURTAINS AND DRAPES (WITH AMENDMENT NO. 1)

- **Specifies following requirements for the resistance to ignition of textile curtains or drapes or their fabrics for use in public places/buildings as per their hazards categories, such as:**
  - **Ignitability**
  - **Durability of FR Treatment up to 50 laundering cycles**
  - **Toxicity on Burning (Toxicity Index of 1.00 *Max*)**
  - **Visibility due to Smoke Released on Combustion (Class A or Class B when tested as per IS 15782).**
- **The Hazard Category of public places/buildings are as per the National Building Code (NBC) Of India 2016 and cover these as under:**
  - **Low Hazard Occupancies,**
  - **Moderate Hazard Occupancies and**
  - **High hazard Occupancies**

IS 15768:2008 TEXTILES – RESISTANCE TO IGNITION OF UPHOLSTERY FABRICS USED FOR NON-DOMESTIC FURNITURE (WITH AMENDMENT NO. 1).

- This standard specifies the following requirements for upholstery fabrics for non-domestic furniture:
- Ignitability depending upon the Category of Hazard of Public Place/Building
  - Low Hazard Category – To pass the smouldering cigarette test and the match flame equivalent test
  - Moderate Hazard Category – To pass the smouldering cigarette test, the match flame equivalent test and the crib test (Source 1)
  - High Hazard Category - To pass the smouldering cigarette test, the match flame equivalent test and the crib test (Source 2)
- Durability of Flame Retardant Property – To pass the relevant ignition tests as applicable for the type of hazard category before and after 50 laundering cycles.
- Toxicity Index (1.0 *Max*)
- Visibility Due to Smoke Released on Combustion (Class A or Class B when tested as per IS 15782)

REGULATION FOR FR TEXTILES IN INDIA

- **Presently no regulation exist in India for FR Textiles used in public places/buildings/work place safety.**
- **In view of large number of fires in public places/buildings like exhibition grounds, marriage pandals, schools, hotels, railways, etc. observed recently, a strong need has been felt to promulgate regulations for safety of the masses/public involved especially for textile materials and their assemblies which spread fire rapidly and give toxic gases on burning. It shall also include protective clothing used by industrial workers.**
- **Draft Flame Retardant Textile Materials (Requirements for Compulsory Registration) Order 2016, under the BIS Act is the most significant and right step in this direction which mandates use of Indian Standards on FR Textiles.**

REGULATION FOR FR TEXTILES IN INDIA

- **The intention of this QC Order is to make the quality FR Textile Products available in the market for use in public places for safety/health of public involved/work place safety and stopping manufacture, sale or storage or import of sub-standard product thereby indirectly making mandatory use of FR Textiles in public places/work place.**
- **The implementation/enforcement of the Order shall be done by the Ministry of Textiles through central/state government officials as well as fire safety officers of state governments/UT's.**

DRAFT FIRE RETARDANT TEXTILE MATERIALS (QUALITY CONTROL) ORDER, 2013

- **This draft order presently cover the following Indian Standards:**

- **IS 15741:2007 Textiles – Resistance to Ignition of Curtains and Drapes - Specification**
- **IS 15742:2007 Textiles — Requirements for clothing made of limited flame spread materials and material assemblies affording protection against heat and flame - Specification**
- **IS 15748:2007 Textiles – Protective Clothing for Industrial Workers Exposed to Heat (excluding firefighters' and welders' clothing)**
- **IS 15768:2008 Textiles – Resistance to Ignition of Upholstery fabrics used for Non-domestic Furniture**

Thank You
For
Kind Attention

FOR FURTHER DETAILS PLEASE CONTACT

J K GUPTA
SCIENTIST 'D'
BUREAU OF INDIAN STANDARDS
MANAK BHAWAN
9, BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002
EMAIL: txd@bis.gov.in and
textiles.bis@gmail.com