Standards required on Technical Textiles for Work place safety

FICCI – BIS Quality Conclave

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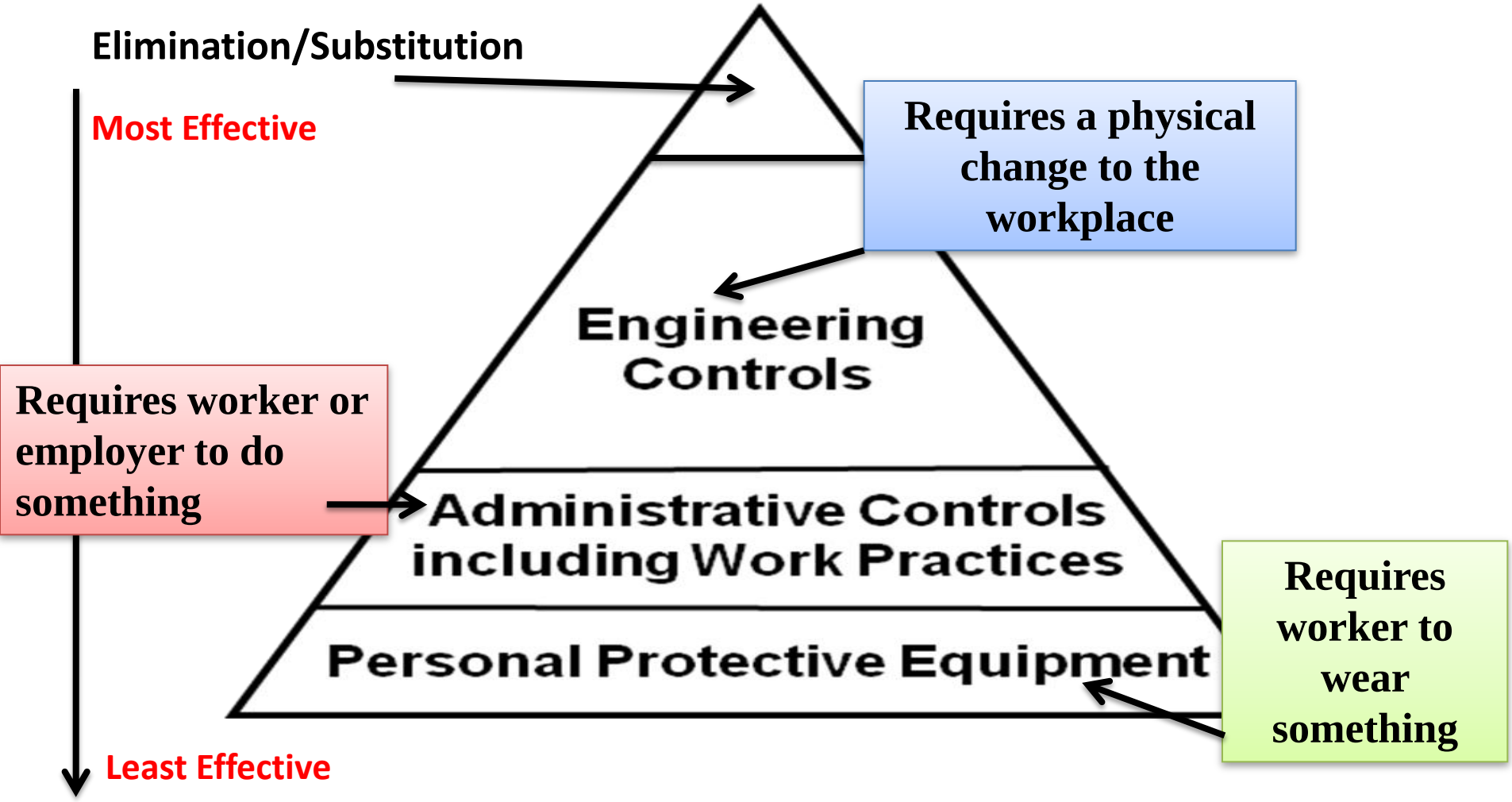
CHEMICAL & DUST HAZARDS
(cleaning products, pesticides, asbestos, etc.)
BIOLOGICAL HAZARDS
(mold, insects/pests, communicable diseases, etc.)
ERGONOMIC HAZARDS
(repetition, lifting, awkward postures, etc.)
WORK ORGANIZATION HAZARDS
Things that cause STRESS!
SAFETY HAZARDS
(slips, trips and falls, faulty equipment, etc.)
PHYSICAL HAZARDS
(noise, temperature extremes, radiation, etc.)

Hierarchy of Controls



CONTROLS: Engineering

CONTROL AT THE SOURCE!
Limits the hazard but doesn't entirely remove it.

Image: by Kare_Products

Proper equipment

Other Examples:
Mechanical Guards
Wet Methods for Dust
Enclosures/Isolation
Dilution Ventilation

Image: by purpleslog's photostream

Re-designed Tools

Image: by JohnRH4's photostream

Local Exhaust

CONTROLS: Administrative

Aimed at **Reducing Employee Exposure** to Hazards but Not Removing Them!

- Changes in work procedures such as:
  - Written safety policies/rules
  - Schedule changes, such as:
    - Lengthened or Additional Rest Breaks
    - Job Rotation
    - Adjusting the Work Pace
- Training with the goal of reducing the duration, frequency and severity of exposure to hazards

CONTROLS: PPE
Personal Protective Equipment
Control of LAST RESORT!

- Special Clothing
- Eye Protection
- Hearing Protection
- Respiratory Protection

CONTROL IS AT THE WORKER!

The Indian EXPRESS

SIT probe ordered into farmer deaths due to pesticides in Maharashtra

The incident has led the government to scrutinise recommendations of pesticide firms that prescribe formulae to farmers to enhance quality and quantity of crops.

Written by Shubhangi Khapre | Mumbai | Published:October 11, 2017 4:30 am

Pesticide poisoning: Incorrect use of pesticides, lack of protective gear kills 34 Vidarbha farmers

Updated: Oct 13, 2017 | 11:52 IST | Times Now Digital

Some relevant points

PPE is expensive as compared to normal work wear, available in the market.

Occupational Safety and Health Administration (OSHA), in USA estimates that for every US$1 spent on an effective health and safety programme about US$4 is saved.

As per National Fire Protection Association (NFPA) around 50% of fatal injuries of fire fighters are due to heat stress, which explains the necessity of comfort for the wearers.

Features of PPE

- **Selected to minimise risk to work health and safety**
- **Suitable for the nature of the work and any hazard associated with the work**
- **Suitable size and fit and reasonably comfortable for the person wearing it.**

Mumbai Mirror
Wed, Oct 25, 2017 BANGALORE MIRROR | AHMEDABAD MIRROR | PUNE MIRROR

22 OF 30 FIREMEN REFUSED TO WEAR PROTECTIVE SUITS, SAID GEAR WAS 'TOO HEAVY, HOT'

By Chaitanya Marpakwar, Mumbai Mirror | Updated: Jun 10, 2015, 02.10 AM IST

Mumbai firemen in their full uniform and protection suits

In a development that has put a huge question mark on Saturday's rescue operation at Lake Lucerne building in Chandivali - where a fire on the 14th floor killed seven people and injured more than 20 - the BMC has said that 22 of the 30 firemen involved in the operation had refused to wear the fire-proof suits, terming them "too heavy and uncomfortable".

The Lake Lucerne residents had slammed the fire brigade, saying the firemen "appeared reluctant to enter the building", and that a few people from the nearby chawls rescued several residents before perishing in the fire.

Features of Personal Protective Equipment

- Beside protective properties these should be comfortable to the wearer (e.g. Moisture vapour transfer, air permeability, smoothness of the surface etc.)
- The wearer should be able to perform his/her duty without any hindrance (design aspect)
- These should look nice and fashionable
- The price should be reasonable.

Personal Protective Equipment Legislations

In Europe it is regulated by European Directives and Standards

European Council Directive 89/656/EEC sets out minimum health and safety requirements for people who use PPE at the workplace

- **Simple**
- **Intermediate**
- **complex**

Personal Protective Equipment Legislations

European council Directive 89/656/EEC requires that PPE is:

- **Properly assessed before use to ensure that it provides the protection needed**
- **Maintained & stored properly**
- **Provided with instructions on how to use it safely**
- **Used correctly by employees**
- **Worn the whole time the wearer is exposed to a particular risk and**
- **Provided free of charge by the employer**

US Dept of labor's Occupational Safety & Health Administration(OSHA's) Mission

- **The mission of OSHA is to assure safe and healthful working conditions for working men and women by setting and enforcing standards and by providing training, outreach, education and assistance.**
- **Some of the things OSHA does to carry out its mission are:**
  - **Developing job safety and health standards and enforcing them through worksite inspections**
  - **Providing training programs to increase knowledge about occupational safety and health**

What Rights Do one hasUnder OSHA?

- One has the right to:
  - **A safe and healthful workplace**
  - **Know about hazardous chemicals**
  - **Report injury to employer**
  - **Complain or request hazard correction from employer**
  - **Training**
  - **Hazard exposure and medical records**
  - **File a complaint with OSHA**
  - **Participate in an OSHA inspection**
  - **Be free from retaliation for exercising safety and health rights**

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Safe & Healthful Workplace

- Worker Protection is Law: *The Occupational Safety and Health Act of 1970 (OSH Act)*
- OSHA was created to provide workers the right to a safe and healthful workplace
- It is the duty of the employers to provide workplaces that are free of known dangers that could harm their employees
- This law also gives workers important rights to participate in activities to ensure their protection from job hazards

Training

- Workers have a right to get training from employers on a variety of health and safety hazards and standards that employers must follow

  - Some required training covers topics such as, chemical hazards, equipment hazards, noise, confined spaces, fall hazards in construction, personal protective equipment, along with a variety of other subjects
  - Training must be in a language and vocabulary workers can understand

The following are examples of some factors that may influence the selection of protective gloves for a workplace.

- Type of chemicals handled.
- Nature of contact (total immersion, splash, etc.).
- Duration of contact.
- Area requiring protection (hand only, forearm, arm).
- Grip requirements (dry, wet, oily).
- Thermal protection.
- Size and comfort.
- Abrasion/resistance requirements.

Gloves made from a wide variety of materials are designed for many types of workplace hazards. In general, gloves fall into four groups:

- Gloves made of leather, canvas or metal mesh;
- Fabric and coated fabric gloves;
- Chemical- and liquid-resistant gloves;
- Insulating rubber gloves (See 29 CFR 1910.137 and the following section on electrical protective equipment for detailed requirements on the selection, use and care of insulating rubber gloves).

Appendix A
OSHA Standards that Require PPE

29 CFR 1910, General Industry

Standards that Require the Employer to Provide PPE:

1910.28	Safety requirements for scaffolds
1910.66	Powered platforms for building maintenance
1910.67	Vehicle-mounted elevating and rotating work platforms
1910.94	Ventilation
1910.119	Process safety management of highly hazardous chemicals
1910.120	Hazardous waste operations and emergency response
1910.132	General requirements (personal protective equipment)
1910.133	Eye and face protection
1910.135	Occupational foot protection
1910.136	Occupational foot protection
1910.137	Electrical protective devices
1910.138	Hand protection
1910.139	Respiratory protection for M. tuberculosis
1910.157	Portable fire extinguishers
1910.160	Fixed extinguishing systems, general
1910.183	Helicopters
1910.218	Forging machines
1910.242	Hand and portable powered tools and equipment, general
1910.243	Guarding of portable power tools
1910.252	General requirements (welding, cutting and brazing)
1910.261	Pulp, paper, and paperboard mills
1910.262	Textiles
1910.268	Telecommunications
1910.269	Electric power generation, transmission and distribution
1910.333	Selection and use of work practices
1910.335	Safeguards for personnel protection
1910.1000	Air contaminants
1910.1003	13 carcinogens, etc.
1910.1017	Vinyl chloride
1910.1029	Coke oven emissions
1910.1043	Cotton dust
1910.1096	Ionizing radiation

Protection for workers in the Oil & gas industries

Flash fire protection

- Resist ignition & self extinguish when ignition source is removed
- Limit heat transmission during a short term exposure to high heat flux
- Not melt or shrink upon exposure
- Maintain its structural integrity & flexibility upon exposure
- Should not generate much smoke or toxic combustion product when exposed to flame

Some standards

- EN 340 – Protective clothing – general requirements
- ISO 16602 – Clothing for protection against chemicals – Classification & performance requirement
- NFPA 1992 – Standard on liquid splash protective ensembles & hazardous chemical emergencies, 1994
- ISO 15748: 2007 – Protective clothing for industrial workers exposed to heat (excluding fire fighters and welders' clothing)

Standards of Personal Protective Textiles

- EN 381 – Protective clothing for users of hand held chain saws
- EN 469 – Protective clothing for fire fighters
- EN 11611- Protective clothing for use in welding and allied processes
- EN 11612- Protective clothing against heat and flame
- EN 13034 – Protective clothing against liquid chemicals

Protective clothing for use in welding and allied processes.

Reference Number: EN 11611

Status: European Standard

Scope: This International Standard 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. For the protection of the wearer's head and feet, this International Standard is only applicable to hoods and gaiters.

CONTENT

Remarks:

This International Standard does not cover requirements for hand protection.

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 the arc, 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.

This International Standard specifies two classes with specific performance requirements (see Annex A), i.e. Class 1 being the lower level and Class 2 the higher level. -

Class 1: Protection against less hazardous welding techniques and situations, causing lower levels of spatter and radiant heat.

Class 2: Protection against more hazardous welding techniques and situations, causing higher levels of spatter and radiant heat.

Details are given in Table 1 and Annex B. For adequate overall protection against the risks to which welders are likely to be exposed, personal protective equipment (PPE) covered by other standards should additionally be worn to protect the head, face, hands and feet.

Scope:

Small splashes of molten metal
Short contact time with flame
Radiant heat from the arc
Ultra violet radiation

Class 1 Less hazardous welding techniques / situations
Class 2 More hazardous welding techniques / situations

The standard specifies 3 areas:

1. Performance requirements material
2. Design requirements
3. Marking & guidance

1) Performance requirements for woven fabrics (after pretreatment*)

TEST	METHOD	REQUIREMENT
Physical requirements		
Dimensional change due to cleaning	ISO 5077	Max 3%
Tensile strength	ISO 13934-1	400N
Tear strength	ISO 13937-2	20 N
Innocuousness - pH value - Cr (VI) content Innocuousness is tested in new state material	ISO 3071 ISO 17075	>3.5 - < 9.5 Less than detection limit

TEST	METHOD	REQUIREMENT
Heat and flame requirements		
Limited flame spread (code A) • A1: surface ignition • A2: edge ignition	ISO 15025	• No flaming to the top or edge • No hole formation • No flaming or molten debris • Mean after flame time max 2 s • Mean afterglow time max 2 s
Impact of spatter	ISO 9150	• Class 1: minimum 15 drops before raising 40K behind the material • Class 2 : minimum 25 drops before raising 40K behind the material
Radiant heat	ISO 6942	Class1: HTI_{24} > 7seconds Class 2: HTI_{24} > 16 seconds
Electrical resistance	EN 1149-2	< 10^8 Ω

* Pretreatment:

All tests, with the exception of innocuousness, in EN ISO 11611 are carried out after a cleaning pretreatment. The amount of cleaning cycles and cleaning method is set by the manufacturer based on standardized cleaning standards. The limited flame spread (letter code A) is also carried out after the maximum amount of cleaning cycles, set by the manufacturer based on standardized cleaning standards.

Cleaning methods:

ISO 6330 Domestic laundry
ISO 15797 Industrial laundry
ISO 3175-1 Dry cleaning

Informative ANNEX A - Guidance for selection of type welders' clothing

Welders' Clothing Type	Selection criteria relating to the process:	Selection criteria relation to the environmental conditions
Class 1	• Gas welding • TIG welding • MIG welding • Micro plasma welding • Brazing • Spot welding • MMA welding (rutile covered electrode)	• Oxygen cutting machines • Plasma cutting machines • Resistance welding machines • Machines for thermal spraying • Bench welding
Class 2	• MMA welding (basic or cellulose-covered electrode) • MAG welding (CO_2 mixed gasses) • Self shielded flux cored arc welding • Plasma cutting • Gouging • Oxygen cutting • Thermal spraying	• In confined spaces • At overhead welding/ cutting or in comparable constrained positions

Categories of PPE (European councils directive)

- **Category I : Simple design, protects wearer against slight risks & from light, non-aggressive soiling. Certification not mandatory.**
- **Category III : Complex design, protects the user against the risk of death or serious and permanent injury. CE certification must.**
- **Category II : All other PPEs fall in category II.**

Thank you