


SAFETY GUIDELINES FOR UDYOGI		
	<b>PERSONAL PROTECTIVE EQUIPMENT (PPEs) MANAGEMENT</b>	Effective Date : 1.4.2019

## 1. Objective

The purpose of this guideline is to outline requirement for the usage, handling and maintenance of Personal Protective Equipment (PPEs) to be observed to ensure optimal level of protection arisen from hazards like physical, mechanical, flammability, chemical, electrical, biological, hygiene, radioactivity etc. as a result of work place activity and processes.

## 2. Scope

This guideline is applicable to all locations of Udyogi as per applicability.

## 3. Procedure

### 3.1 Definitions

**Personal Protective Equipment:** Personal Protective Equipment (**PPEs**) refers to protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury or infection. The hazards addressed by protective equipment include physical, electrical, heat, chemicals, biohazards, and airborne particulate matter. It is considered as the last line of defense in hierarchy of controls. Usage of PPEs depends upon the vicinity of hazard as well as hazard associated with specific job or activity.

**PPE Free Zone:** Specific locations where use of PPEs is not mandatory are called PPE Free Zones.

### 3.2 Roles & Responsibility related to PPEs

**The line manager shall:**

- i) Select and ensure that their employees including contract employees use the appropriate type of PPEs for the personal protection from the hazards identified at work places or in his job. All PPEs shall be of good and sound material and adequate strength of safe design for the work to be performed conforming to EN/ ANSI/ IS standards.
- ii) Ensure that PPEs fits well and are correctly used by employees.
- iii) Display applicable PPEs at the entrance of each section of shop floor.
- iv) Explore other hierarchy of controls for mitigation of risk related to that hazard considering PPE as last line of defense.

- v) Ensure that a system of feedback and reporting about quality of PPE has been established and reviewed regularly in departmental safety committee.

**Contractors shall:**

- i) Provide and ensure that their employees use PPEs which is specified by the organization they are working for.
- ii) Ensure that PPE fits and is correctly used by employees.
- iii) Ensure that all PPEs shall be of good and sound material and adequate strength of safe design for the work to be performed conforming to EN/ ANSI/ IS standards.

**Employees shall:**

- i) Use all applicable PPEs for the protection from hazards and know the correct way of usage.
- ii) Give correct feedback about PPEs related to its hazard protection and comfort.

**Training:** The line manager shall provide training to each employee who is required to use PPEs, as per the following:

- i) When PPE is necessary,
- ii) What PPE is necessary,
- iii) How to properly don, doff, adjust, and wear PPE,
- iv) The limitations of the PPE,
- v) The proper care, maintenance, useful life and disposal of the PPE,
- vi) Each affected employee shall demonstrate an understanding of the training and the ability to use PPE properly, before being allowed to perform work requiring the use of PPE.

### **3.3 PPE Requirement for Head to Toe Protection**

PPEs requirement for head to toe protection is described in the following subsection.

#### **i) Head Protection**

**Purpose:** To protect the head from injury due to falling or moving objects, impact on stationary objects and from impact due to falls.

**Requirements:**

- a) Safety helmets must be worn where recognized potential for the injuries described above exists.
- b) Safety helmets shall not be modified or painted as this may affect the integrity of the helmet.

- c) In order to allow safety helmet colours to be used to differentiate personnel and visitors from other personnel and to make personnel visibility different colours should be reserved and followed:
- d) Helmet should be made up of FRP which should meet the standard IS: 2925 or EN 397.
- e) Helmets should be cleaned by dipping in hot water (140 °F) with good detergent for 1 minute and scrub.
- f) It should be periodically inspected for any scratches, wear and tear.

## ii) **Eye Protection**

**Purpose:** To protect eyes from damage due to impact, penetration, burns, splashes and flying particles and ultra violet radiation.

### **Requirements:**

- a) Safety goggles must be worn at all times in all secure boundary areas except while inside an office, amenity, cabin or fully enclosed vehicle. If the employee has power in eyes (myopic/ hypermetropic), power industrial glasses shall be used. In absence of well suited power industrial goggles, over goggles with prescription glasses shall be used.
- b) Selection of goggles must be done on the basis of type of job/ environment.
- c) Different type of goggles should be used for chemical splashes, dusty environment, heat prone areas, for oven inspection or while looking at the red molten metals.
- d) Safety Goggles should be made up of polycarbonate material & meet the Standard ANSI Z87.1 2003 or EN166.
- e) For cleaning Polycarbonate glasses, they should be washed with water and then wiped off to avoid scratches.

## iii) **Hearing Protection**

**Purpose:** To conserve the hearing of personnel by use of hearing protection appropriate for reducing the received sound energy levels of noisy equipment and processes to acceptable levels.

### **Requirement:**

- a) Specified hearing protection i.e. ear plug or ear muff shall be worn if the noise level is above 85 decibel. All areas requiring the wearing of hearing protection shall be clearly sign posted.
- b) Ear muff & Ear plug should meet the Standard EN 352.
- c) Disposable ear plugs should be discarded after every use or as it gets dirty.

## iv) **Hand Protection**

**Purpose:** To protect the hand from injuries such as cuts, grazes, burns, ingress of chemicals & electric shock.

**Requirements:**

- a) The personnel should wear hand gloves as per the hazard other than general purpose cotton hand gloves or knitted hand gloves while performing their job/task as mentioned in the SOP.
- b) Hand Gloves should meet the standard EN 420 for general requirement, EN 388 for mechanical hazard, EN 407 for molten metal splashes and heat applications.
- c) Selection of hand gloves should be done on basis of application.
- d) Before use, they should be checked for punctures, tears or other defects and discarded if found not OK. Chemical-use gloves should be tested for leaks periodically by inflation with air and immersion in water. Do not use this test for polyvinyl alcohol gloves as they are water soluble.
- e) Disposable gloves should not be reused. Contaminated gloves must be disposed in an appropriate manner and should not be placed in the regular trash. Always store gloves in a clean, accessible area. Never store contaminated gloves – dispose of them in the appropriate manner.

**v) Foot Protection**

**Purpose:** To protect the feet from risks ranging from crush and impact injuries to slips, cuts, penetration wounds, electric shock and splashes with liquids and molten metal.

**Requirements:**

- a) Personnel working inside the plant must wear ISO /EN approved safety footwear, in good condition.
- b) To ensure footwear quality, personnel are required to wear prescribed company issued safety footwear, in good condition, while working in the plant.
- c) The personnel should wear Heat resistance boot if the surface temperature is more than 100 Degree Celsius in their work place.
- d) The personnel should wear PVC Gum boot if they have to perform their job in muck/ mud or leg can dip into above the ankle.
- e) Safety shoes meet the standard ISO 20345.

**vi) Respiratory Protection**

**Purpose:** To protect all employees (of the company as well as of the contractors) against respiratory hazards through the use of respiratory protective equipment.

**Requirements:**

- a) The primary control of contaminated air shall be maintained through engineering methods by confining processes, providing exhausts, or providing substitution of less toxic materials. Where engineering remedies are not feasible or are not available, or while they are being evaluated or implemented, and when the atmospheric exposure to a toxic material may exceed the recommended ceiling or time-weighted average limit for a given pollutant, respiratory protection will be required to protect the health of employees.
- b) Suitable respirator will be provided to the employee by the department in consultation with Safety expert and manufacturer (if required).
- c) While selecting a respirator for a particular job environment following factors to be considered
  - Severity of hazard
  - Expected activity of the wearer
  - Degree of protection required
  - Ease and comfort with which it can be worn
  - People using the equipment should understand its operation and necessity of use.

#### **vii) Body Protection**

**Purpose:** To protect the body from injuries such as cuts, grazes, burns and the effects of exposure to heat, cold and ultra violet radiation & collision from moving machines.

**Requirements:**

- a) Persons working in the plant are required to wear right industrial clothing in good condition. Clothing must fully cover the legs and arms. If specified in Departmental Standard Operating Procedure (SOP), it may be acceptable to wear short sleeved shirts in specific plant areas or for specific tasks.
- b) Specific PPE should be used if person is exposed to hazard of molten metal splashes, electric flash, high heat, radiation, chemical splash complying to relevant EN/ ANSI standards. Clauses like E for molten spatter protection in EN 11612 shall be applicable.
- c) Chemical protective clothing should be used when there may be exposure to chemicals presenting a skin contact hazard, for example, when transferring chemicals from one container to another, when opening or entering systems such as pipelines, reactors, filters, or storage tanks, or when connecting or disconnecting cargo tanks.
- d) When working with mixture of chemicals, the best material for some components of the mixture may be totally inadequate for one or more of the remaining components. TECP (Totally Encapsulating Chemically Protective

suits), face shields, goggles, aprons, footwears shall be adopted as per application.

- e) High visibility jacket complying to EN 471 or equivalent should be used to make personnel more visible to avoid collision from heavy vehicles and moving equipment Machines.
- f) Rail crew jackets should be worn for people working on or near rail tracks.
- g) Double Lanyard Full Body Harness to be used while working at height.

### **viii) Electric Arc Flash Protection**

- a) Arc Flash Suit: Ref. NFPA-70E clause 3-3.9.5. Flash suit and their closure design shall permit easy and rapid removal. The entire flash suit, including the window, shall have energy absorbing characteristics that are suitable for arc-flash exposure.
- b) Arc Thermal Performance Value (ATPV): ATPV is the minimum energy causing the predicted onset of second-degree burns.
- c) Break down threshold energy EBT: It is the average of the five highest incident energy exposure values below the stoll curve where the fabric does not exhibit break open. EBT is reported when ATPV cannot be measured due to FR fabric break open.
- d) Factors affecting the worker injury when exposed to electric Arc: Electric arc intensity depends on fault current, system voltage, electrode gap, number of phases involved, open arc configuration or enclosure, electric Arc duration, distance of the worker from the electric Arc, Type and fit of the clothing worn, Age and health factors.

- **Guideline for High Voltage Arc Flash Suit (above 600 volts) suitable for hazard risk category-4 as specified in NFPA-70E:**

The electric Arc flash suit shall consist of Flame Resistant (FR) pant and FR shirt and Double layer switching coat (It is assumed that operator shall wear cotton underwear beneath the Arc flash suit). The combination of both should be suitable for hazard risk category-4 as defined in NFPA-70E. The total weight of the complete Arc flash suit should be in the range of 24-30 oz/yd<sup>2</sup>. The Minimum Arc Thermal Performance Value (ATPV) or breakdown threshold energy (E<sub>BT</sub>) rating of complete Arc Flash suit should be 40 cal/cm<sup>2</sup> as specified in NFPA-70E. Hand gloves (Inner & Outer), Hard Hat as per NFPA 70E requirement to be supplied along with the HT Electric Arc Flash Suit Kit.

- **Guideline for LV Arc flash Jacket / FR Jacket (8.5 ~ 9 Cal/cm<sup>2</sup>) for use in system >260V <=690V:**

The Electric LV Arc flash Jacket / FR Jacket (8.5 ~ 9 Cal/ cm<sup>2</sup>) shall be worn continuously by all the persons entering the sub-station, while working on the any electric equipment inside the sub-station or anywhere

outside at Shop floor. This Jacket is mandatory even if person is standing in front of the LV panel (indoor/ outdoor) and not doing the work. The LV Arc Flash jacket/ FR Jacket must be worn with full sleeves ON and all buttons closed.

- **Guidelines for uses of Arc face shield and Electrical safety hand gloves in system voltage >260V <=690V:**

**Mandatory use of Arc Face shield of 12 Cal/Cm<sup>2</sup> for the jobs listed in Note-1 for the voltage >260V <=690V:**

The list given in Note-1 is not exhaustive; Engineer in-charge can add some more jobs as per the site requirement but cannot omit any of the listed jobs.

Note-1: The List of Jobs- a) Rack in and rack out of the modules like ACB/MCCB/SFU etc. b) Inspection of Power rail (DSL for Cranes, Power lines for Coke oven machines etc.).

**Mandatory use of 12 Cal/Cm<sup>2</sup> Safety Hand gloves for the voltage >260V <=690V for the jobs listed Note-2 if isolation of power with Positive Isolation at least at two levels is not done.**

The list given in Note-2 is not exhaustive; Engineer in-charge can add some more jobs as per the site requirement but cannot omit any of the listed jobs.

Note-2: The List of Jobs- a) Rack in and rack out of the modules like ACB/MCCB/SFU etc. b) Inspection of Power rail (DSL for Cranes, power lines for Coke oven machines etc. c) Working on Bus bar / Conductor / Power line / Motor Terminal Block etc. d) Switching on and off of SFU and Isolators e) Power testing f) Earthing etc.

(Full form: ACB-Air Circuit Breaker, MCCB- Moulded Case Circuit Breaker, SFU- Switch Fuse Unit, DSL- Direct Supply Line)

### 3.4 Clothing Policy

Employees and contractors working in the plant are required to wear right industrial clothing in good condition.

- i. Clothing must fully cover the legs and arms. Where specified in Departmental SOP, it may be acceptable to wear short sleeved shirts in specific plant areas or for specific tasks. Employees coming to and from work, office based workers, and visitors to the plant are permitted to wear short sleeve shirts remain within non plant areas or defined safe walkways in plant areas. Preferably all employees should wear cotton clothes.
- ii. Loose fitting or “baggy” clothing must not be worn around machinery as it increases the risk of garments being caught and the wearer being dragged into the machinery. For example, ties should be removed but may be tucked into the shirt between the second and the third buttons. Vests should be close fitting and fastened. Shirts should be buttoned and tucked in. Loose clothing

- can get caught in the moving parts of machinery and may pull the employee into the hazardous area. Make sure loose clothing is not worn around moving machinery or open flame construction areas. Loose clothing like Dhoti/ Kurta/ Pajama/ Sari/ Salwar-Suit is not allowed on shop floors or at construction sites.
- iii. Rings, bracelets, dangling pierced earrings, and long neck chains, shall not be worn machinery or where mechanical/ electrical/ construction work is being performed.
  - iv. Long hair can be a hazard around moving machinery. It can get caught in moving parts and pull the employee into the hazardous area. Restrain long hair in a hair net or style it to ensure that it will not get caught in the machinery.
  - v. While working near moving parts of machine/ equipment hand gloves shall not be worn. If at all required for protection from burrs/ chips/ cuts high dexterity (proper fit) gloves may be used.
  - vi. Loose winter clothing like muffler/ loose woolen jackets are not allowed at shop floors or construction sites.
  - vii. High visibility jacket shall be used in yards like shipping & dispatch yard so that person moving in the yard shall be visible to crane drivers, trailer, truck drivers. It shall be used by the pedestrian & cyclist while moving in roads.
  - viii. Areas where there is potential to burn injury due to molten metal splash employees including visitors/auditors must have to wear FR Jacket & FR trousers.
  - ix. For activity like lancing or gas cutting/ welding employees have to wear FR Jacket & FR trousers.

### **3.5 Rejection of the PPE**







The PPE should be inspected by an employee before use to ensure that it is in reliable condition to perform the intended function at all the time otherwise it should be rejected. All PPE should be discarded whenever it gets damaged.
















## References





- 1) Tata Steel India Safety Standard: Personal Protective Equipment & clothing standard general specification (SS/GEN- 58), Electric Flash Suit (SFT/PRO-04).
- 2) IS: 2925 'Specification for Industrial Safety Helmets'.
- 3) American Standards ASTM F2413-05, ANSI Z87.1, NFPA 70E, ASTM -F1506, ASTM-F1958/F1958M-99
- 4) European Standards EN 344, EN 345, EN 346, EN 347, EN 11612, EN 1486, EN420, EN 388, EN421, EN 374, EN 60903, EN 407, EN 659, EN 381, EN 511, EN 166, ISO 20345

### [Annexure: Sample Photograph of PPEs](#)

S.No.	Item Description	Hazard/ Application	Sample Photograph of PPE
1	FRP safety helmet	Head protection	
2	Safety Goggles with Clear Glass	Eye Protection: Use for general purpose gives protection from dust, mist, fumes	
3	Clear polycarbonate face shield	Full Face protection: Full Face protection from heat, dust, flying particles	
4	Welding & gas cutting shield	Full Face protection: Use while Gas cutting & welding, gives Full face protection heat, flying particle & radiation hazard	
5	Dust respirator	Respiratory Protection: Protection against dust, mist, fumes.	
6	Ear plug	Hearing Protection: Protection against noise	

7	Ear muff	Hearing Protection: Protection against noise	
8	Kevlar hand gloves	Hand Protection: For handling hot objects	
9	Leather cum cotton hand gloves	Hand Protection: For Material Handling	
10	Cut resistant hand gloves	Hand Protection: For protection against cut while handling sharp objects	
11	welder's Gloves	Hand Protection: For welding & gas Cutting.	
12	Nitrile hand gloves	Hand Protection: For handling oil/grease/chemical etc.	
13	Leg guard with two protective rib	Body Protection: For protection of shin of the leg if they strike against sharp objects.	

14	FR Jacket	Body protection from molten metal Splashes & High temperature Environment (above 50 Degree Centigrade)	
15	FR Trouser	Body protection: Protection from molten metal Splashes & High temperature Environment (above 50 Degree Centigrade)	
16	PVC Apron	For protection against chemical splash	
17	High Visibility Vest	Body protection: For High Visibility	
18	High Voltage Arc Flash Suit (above 600 volts)	Protection For protection against HV Electrical flash	
19	Double density PU sole Safety shoe	Foot protection: For general purpose use.	

20	PVC Gum Boot	Foot protection: For protection of foot in steel toe muck/ mud & oil where the foot can dip into	
21	Double Lanyard Full Body Harness	For protection against fall harness while working at height	
22	LV Arc Flash Jacket	For use in the system voltage >260V <=690V (For persons entering the sub-station, while working on the any electric equipment inside the sub-station or anywhere outside at Shop floor)	
23	Electrical hand gloves	For Arc flash and cut protection for the voltage >260V <=690V	
24	Arc Face shield kit	Arc face shield kit of 12 Cal/Cm2 for the voltage >260V <=690V	