FIRE SAFETY MANAGEMENT PROCEDURE

Rev No.	Reason for Revision	Prepared By	Reviewed By	Approval by
Rev 00	Initial Release	Navendra Singh	Sanjay Kale	Shrinivas Katti
Rev 01	To implement Tata Power Fire Safety Management Standard	Navendra Singh (Group Head – P & CB; Corp Safety.)	Sanjay Kale (Head – Fire & Safety; Corp Safety)	Vijay Chourey (Chief – Corp Safety)
Rev 02	Periodic review	Anand Gurav Group head- Office Safety & Strategy Deployment; Corp safety	Navendra Singh Head- Safety (T&D) Corp safety	Suresh Khetwani Chief - Corporate Safety & Environment
Rev03	To revise category of Fire incident based upon Revised loss criteria	Navendra Singh Head- Safety (T&D) Corp safety	Rajesh Sharma Head- Safety (Generation) Corp safety	Suresh Khetwani Chief - Corporate Safety & Environment

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1. **OBJECTIVE:** Objective of this procedure is to specify the minimum mandatory requirements to ensure prevention of fire related incidents and managing / controlling their impacts if they do occur.
2. **SCOPE:** This procedure applies to all operating and project sites of Tata Power Group companies including JVs/Subsidiaries .
3. **EXPECTED RESULTS:**

   3.1. Prevention of occurrence of fire incidents.

   3.2. Control of incidents related to Fire to minimize loss of lives and property.

   3.3. Compliance to Regulatory requirements to Fire Safety Management
4. **ACCOUNTABILITY & RESPONSIBILITY:**

   4.1. ACCOUNTABILITY: Concerned Division's Heads / Assets Custodian

   4.2. RESPONSIBILITY: Concerned engineer/s

5. **GLOSSARY/ DEFINITIONS:**

   Auto Ignition Point: The lowest temperature to which a solid, liquid or gas requires to be raised to cause self-sustained combustion without initiation by a spark or flame.

   BCDMP – Business Continuity and Disaster Management Plan

   Class A Fire: Fires involving solid combustible materials or organic nature such as wood, paper, rubber, plastics, etc, where the cooling effect of water is essential for extinction of fires.

   Class B Fires – Fires involving flammable liquids or liquefiable solids or the like where a blanketing effect is essential.

   Class C Fires – Fires involving flammable gases under pressure including liquefied gases, where it is necessary to inert gas, powder or vaporizing liquid for extinguishment.

   Class D Fires – Fires involving combustible metals, such as magnesium, aluminum, zinc, sodium, potassium, etc, when the burring metals are reactive to water and water containing agents and in certain cases carbon dioxide, halogenated hydrocarbons and ordinary dry powders. These fires require special media and techniques to extinguish.

   Explosive Limit: Explosive limits are those concentrations of inflammable vapour or gas in air below or above which, propagation of a flame does not occur on contact with a source of ignition.

   Fire Extinguishing Method: Extinguishing fire involve removal or limiting of one or more of the factors depicted by the fire triangle. The method of extinguishing fire may be classified under the following heads:

   - Starvation – Elimination of fuel
   - Smothering – Removal of oxygen supply
   - Cooling – Removal of Heat

Fire Category: *Fires can be classified based on the intensity, Direct loss and business interruption as given below:*

- *Minor Fire- where the fire resulting loss or Incident is up to Rs. 5 Lakh*
- *Moderate/Medium Fire - where the fire resulting loss more than Rs 5 Lakh but not more than 25 Lakhs*
- *Serious Fire - where the fire resulting loss more than Rs 25 Lakhs but not more than 1.25 crore or business interruption of more than 07 days.*
- *Extreme Serious Fire - where the fire resulting loss Rs 1.25 crore or more or business interruption of more than 30 days*
  (Note: Both Serious Fire and Extreme Serious Fire will be termed as Major Fire)

Fire Point: It is the minimum temperature at which a liquid gives off sufficient vapors to form a mixture with air near the liquid surface within the container and gives sustained fire when an external source of ignition is brought to it.

Fire Tetrahedron: New understanding in 'Fire Safety Management' has necessitated the addition a fourth element to the Fire Triangle (i.e. the chemical chain reaction) making the fire triangle now a "Fire Tetrahedron"

Fire Triangle: Three elements Fuel, oxygen and Heat are necessary for initiation of a fire or combustion and it's known as "Fire Triangle".

Fire: Fire is a chemical reaction where matter reacts with oxygen under certain conditions to release heat and light energy.

Flash Point: The minimum temperature at which the liquid gives so much vapour that this vapour, when mixed with air, forms an ignitable mixture and gives a momentary flash on application of small pilot flame under specified conditions of test.

Ingredients of Fire:

- Fuel: in form of vapor, liquid and solid.
- A source of ignition (Heat or thermal energy): Sufficient to initiate and propagate the chemical reaction of combustion
- Oxygen: In sufficient proportion to form a combustible mixture

Lower Explosive Limit: The Lower Explosive Limit (LEL) is the minimum concentration of inflammable vapour/ gas in air below which the vapour air mixture is too "lean" to burn or explode.

Shall: Mandatory requirement

Should: Optional requirement

Upper Explosive Limit: The Upper Explosive Limit (UEL) is the maximum concentration of inflammable vapour/ gas in air above which the vapour air mixture is too "rich" to burn or explode.

Volatility: When liquid is in an open container and exposed to the atmosphere, it will gradually change into vapor and disappear. This process takes place more rapidly with some liquids than with others. Example: If a small quantity of gasoline is

exposed to the air it disappears very quickly, diesel requires longer period to evaporate and grease even longer. The inherent tendency of a substance to vaporize is termed as volatility.

6. PROCEDURES:

6.1. Division/JVs/subsidiaries shall follow corporate safety procedure on Fire safety management.

6.2. The management of Fire-Risk deals with three aspects:

6.2.1. Fire Prevention: It is the adoption of safe practices initially at the design stage and subsequently in the day to day operation to prevent break out of fires

6.2.2. Fire Protection: It involves different facilities which shall help in immediate handling of fire effectively.

6.2.3. Firefighting: It is the physical phenomenon of handling the fire with the use of fire protection equipment, facilities as well as with the help of firefighting personnel who have been specifically trained for this job.

6.3. All these three distinct aspects are very closely related to each other but are completely separate in their individual scope with a philosophy that all fires can be prevented.

6.4. Divisions/JVs shall adopt a Preventive approach to Fire Safety (i.e. Control on ignition source, Safe handling of fuel source)

6.5. Facilities shall be designed and constructed in accordance with applicable laws, codes, and regulations in force in that jurisdiction. In the absence of local regulations / laws, facilities shall be designed with technically sound practices.

6.6. Sites / Facilities should be managed in a way that fires are prevented, injuries and business losses are avoided, property is protected, and trust is fostered in the communities in which the Division/JV operates

6.7. Facilities should be managed, operated, and maintained in such way that the fire safety features are not compromised

6.8. Fires are to be controlled in the initial stage itself and not allowed to spread

6.8.1. Fire equipment is to be used for intended purpose only

6.8.2. BCDMP Plans shall be put in place.

6.9. As part of the due diligence review, each Division/JV shall assess the level of fire protection / prevention in use or being planned in case of:

6.9.1. Acquisitions and Divestments

6.9.2. Process shutdowns / phase outs

6.9.3. Selection / Design Stage:

6.10. Fire Risk Assessment: During the selection / design of a site / office / facility, a risk assessment and fire load calculation shall be carried out. The following key elements shall be considered:

6.10.1. Risk of fire occurring to the particular facility / site

6.10.2. Assessment of fire load to the particular facility/site

6.10.3. Provision of means of escape

6.10.4. Fire Compartmentation (Passive measures) etc.

6.10.5. Fire Detection (Active measures)

6.10.6. Firefighting & Emergency Handling arrangements

6.10.7. Emergency procedures

6.10.8. In the case of a new facility being constructed it shall be ensured that fire prevention / protection systems are installed. These systems are to be designed and constructed in accordance with applicable laws, codes regulations and they shall be authenticated by a fire expert or a third party fire engineer.

6.10.9. For occupied buildings located in the vicinity of a high hazard facility, a separate risk assessment shall be carried out to assess the risk due to the external threat of fire / explosion. Individual location to decide on the emergency plan in this case.

6.10.10. Hazard studies on 'high hazard facilities' (e.g. Process Hazard Reviews etc.) shall consider the potential scenarios associated with a fire.

6.10.11. Where there is no reasonable alternative to hot working methods, a hot work permit system shall be utilized to ensure that appropriate control measures are put in place. In case of hot work is to be carried out, provision of fire fighting shall be made from the near by hydrant or else, arrangement shall be made for water and fire extinguisher at site.

6.10.12. Fire Risk Assessment should be done by considering neighboring areas as well. i.e. asses the possibility of fire spreading from the neighboring areas to the companies specific site / facility / business unit

6.11. Fire Detection & Alarm Systems:

6.11.1 Effective means for detecting an outbreak of fire and warning people who may be at risk shall be established.

6.11.2 Fire detection and alarm systems shall be installed in every site / office / facility.

6.11.3 The following types of detection systems are available and should be chosen based on their suitability for use at locations where they are required:

6.11.3.1 VESDA (Very Early Smoke Detection Apparatus) systems

6.11.3.2 Fire Alarm and Detection System – With Various type of fire alarm detectors like as Heat Detector, Smoke detector, Heat &

Smoke Combined detector, Flame detector, Beam Detector, Normal Manual call points (MCP), intrinsically safe Manual call point, Hooter, Beacon light etc.

6.11.3.3 Gas Detection System – With Various types of detectors like as Ammonia detector, Chlorine detector, Bromine detector, Hydrogen detector, Carbon monoxide detector, H2S detector, Beacon light etc. as applicable.

6.11.4 The detection system is to be selected as per the following criteria:

6.11.4.1 Type of Occupancy

6.11.4.2 Nature of Fire and Emergency Hazard

6.11.4.3 Quantum of Hazard

6.11.4.4 Selection of appropriate detector device considering the hazard

6.11.4.5 Physical and environmental condition

6.12 Fire Protection / Control Systems: The following two types of fire protection systems are to be used:

6.12.1 Passive restraints / protection: Passive fire protection systems should be installed to contain fires or reduce the speed at which they may spread, through:

6.12.1.1 Compartmentalization

6.12.1.2 Segregation

6.12.1.3 Separating distances

6.12.1.4 Use of Fire resistance wall, Floors & doors etc.

6.12.1.5 Dykes for storage tank

6.12.1.6 Fire resistant/retardant coatings

6.12.1.7 Fire retardants paints / Cables

6.12.1.8 Fire sealing

6.12.1.9 use of fire resistance material

6.12.2 Active restraints / protection: This requirement is a risk based decision, and suggests the provision for suitable and sufficient firefighting/escape equipment. Devices will be determined by the fire risk assessment.

6.12.3 A combination of the following types of protection systems shall be considered

6.12.3.1.1 Portable type system

6.12.3.2 Portable Fire protection systems, which are used at the incipient stage of fire for immediate control, need to be installed. Some examples are:

6.12.3.3 Fire extinguishers (Based on extinguishing media: DCP, Co2, Water, Foam)

6.12.3.4 Sand buckets

6.12.3.5 Fixed / Semi fixed type system

6.12.3.6 Fixed / Semi fixed fire protection systems needs to be installed. Some Examples are:

6.12.3.7 Fire Hydrant system

6.12.3.8 Fire Alarm & Detection system

6.12.3.9 Sprinkler system

6.12.3.10 Gas flooding system

6.12.3.11 Medium velocity & High velocity water spray system

6.12.3.12 Mobile type system

6.12.3.13 Mobile Fire Protection systems (Fire Vehicles) need to be provided / mobilized as appropriate. Some examples are:

6.12.3.13.1 Fire Tenders – With various type of firefighting media like as Water, Foam, Dry Chemical powder, Carbon dioxide.

6.12.3.13.2 Rescue Van – With Various type of Rescue equipment Like as TRIPOD, lifting Pads, COMBI

6.12.3.13.3 TOOL, Hydraulic RAM, Descended/De-rope device, Rescue rope, Rescue stretcher, Emergency light mast etc.

6.12.3.13.4 HAZMAT (hazardous material) Response Van – With Various types of equipment like as hazardous chemical spill control kit, Leak arrest Kit, decontamination unit, various suits etc.

6.13 Inspection and Maintenance: To ensure integrity and reliability of the fire protection systems, they should be checked, inspected, maintained, and tested periodically. The inspection and maintenance shall:

6.13.1 Ensure that the systems are available for intended protection all the time and are in a working condition at all times

6.13.2 Ensure that the systems perform as per design specifications

6.13.3 Safe systems of work shall be established and implemented for entry into gas and water flood protected areas to ensure that the extinguishing media is not discharged whilst the area is occupied.

6.13.4 Applicable technical codes and standards are to be referred for inspection and maintenance of fire detection/ protection systems.

6.13.5 Each Division/JV shall ensure that there is a documented maintenance schedule and shall ensure that this schedule is adhered to.

6.14 Fire Index:

6.14.1 Fire equipment shall be inspected and maintained as per defined philosophy under SAP PM and fire index shall be calculated based upon adherence to PM plan and availability fore fire equipment.

6.15 Hot work/Jobs:

6.15.1 Hot work such as welding, gas cutting etc. shall be managed by adequate fire protection such as fire extinguishers, Fire hose with running/change water,

fore watch during the execution of such jobs and same control to be considered in JSA of such work/job.

6.16 Emergency Preparedness:

6.16.1 An emergency preparedness plan shall be put in place to address emergencies on account of fires. This emergency plan shall ensure that there is no harm to life, environment or property.

6.16.2 Each Division/JV shall have BCDMP emergency plans based on their requirements. Roles and responsibilities are to be defined in the plan. The plan should also be communicated to all personnel who may be affected by the emergency.

6.16.3 Auxiliary support squad shall be identified for responding to emergencies & assisting the fire fighters. Their names shall be displayed in operation/fire control rooms.

6.16.4 Each site / premises shall include in their emergency plan, risks on account of potential fires and the appropriate measures for:

6.16.4.1 Raising the fire alarm, in the Division/JV,

6.16.4.2 Evacuation of personnel to safe assembly area

6.16.4.3 Quick reporting the fire to ‘on site’ or ‘off site’ emergency services,

6.16.4.4 Containment of the fire until arrival of the emergency services, and

6.16.4.5 Periodic testing to demonstrate adequacy of the plan / resources to manage the foreseeable scenarios.

6.16.5 Regular mock drills should be conducted as per the Division/JV’s standard/procedure.

7 RECORDS :

7.1 Record of inspection/test of fire equipment/system (Retention -Three years)

7.2 Record of mock drills (Retention - Three Years)

8 TRAINING & COMMUNICATION:

8.1 Training shall be conducted to ensure appropriate response in times of an emergency. The training should be conducted, in the following categories:

8.2 Awareness Training: To be conducted for all employees and Contractors. It should cover basics of fire, emergency preparedness, emergency response and general do’s and don’ts

8.3 Specific fire Training- This training and competency testing is to be conducted for individuals on specific topics such as how to handle fire extinguishers,

emergency management plans etc. Those who are trained in this usually become fire marshals/fire guards (or equivalent)

8.4 Training and competency testing for Fireman-To be conducted for the dedicated fire response team as per the individual Division/JV's standard/procedure

8.5 Ensure that all employees and contractors are competent enough to handle fire related emergencies.

8.6 Auxiliary Support Squad shall be trained to ensure their capability to respond to emergencies.

8.7 Initial Communication to be done through Corporate Communication, Email and subsequently shall be made available at safety portal at Sangam.

9 VERIFICATION

9.1 Audits shall be carried out to ensure identification of areas of strengths and weakness of the fire safety management systems.

9.2 These audits should be undertaken to meet the following objective:

To ensure that fire detection/protection and firefighting systems are in place

To ensure that proper inspection and maintenance schedules are followed

To ensure that adequate training has been imparted

To ensure that proper emergency procedures are in place

9.3 Fire Safety Audit and Fire Load Study shall be conducted as per legal requirements. In case of absence of legal requirement these shall be done once within three (3) years and in no case this duration shall exceed more than five (5) years.

9.4 Both internal and external audits shall be carried out by companies. These audits shall be carried out at a predefined schedule.

10 EXCEPTION: Any Exception to this procedure shall only be done as per Document Control .Procedure (TPSMS/GSP/DC/014**).**

11 REFERENCES

- Tata Group Fire Safety Management Standard
- IS 2190: 2010
- Occupational Health and Safety Code 2020
- Tata Power Document Control .Procedure (TPSMS/GSP/DC/014**).**
- Tata Power Safety Audit Procedure (TPSMS/GSP/AUDT/012)

12 REVIEW;

12.1 Review of this procedure shall be done as and when but not later than once in every three (03) years. Typical Factors like Changes in legislation, Review of Incident Reports, Inspection & Audit findings, Feedback from users, Recommendations in Incident investigation reports may be inputs for the review and revision of the procedure.

12.2 In case release of revised procedure gets delay due to obtaining feedback or any other reasons, safety advisory may be issued immediately to take precautions for the proposed changes in the procedure and revised procedure should be released subsequently.

13 ATTACHMENTS/APPENDIX :

Nil