Process Safety Management Procedure

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Rev 00	First Release	Rajesh Sharma	Suresh Khetwani

1. OBJECTIVE:

The objective of this document is to provide a standardized & uniform guideline to implement Process Safety Management in Tata Power, its JVs, and subsidiaries to prevent or minimize the consequences of releases of toxic, flammable, pressurized or uncontrolled chemicals/Steam/Water or any other material which may result in toxic, fire, explosion, burn or flood like situation.

2. SCOPE:

This procedure is applicable to all operating and project sites of Tata Power and its group companies, JVs, and subsiders where hazardous chemicals / coal / water/ oil / steam is stored, used or produced (as product, by-product, effluent or waste).

3. ACCOUNTABILITY & RESPONSIBILITY:

3.1 ACCOUNTABILITY: Concerned Division's Heads / SBU Heads / Assets Custodian.

3.2 RESPONSIBILITY: Working department, Contractors.

4. GLOSSARY/ DEFINITIONS:

4.1 Atmospheric tank*: means a storage tank which has been designed to operate at pressures from atmospheric through 0.5 p.s.i.g. (pounds per square inch gauge, 3.45 Kpa).*

4.2 Boiling point*: The boiling point of a liquid at a pressure of 14.7 pounds per square inch absolute (p.s.i.a.) (760 mm.).*

4.3 Catastrophic release *means a major uncontrolled emission, fire, or explosion, involving one or more highly hazardous chemicals, that presents danger to employees in the workplace or public in the vicinity.*

4.4 Facility *means the buildings, containers or equipment which contain a process.*

4.5 Hazardous material *means a substance possessing toxic, reactive, corrosive flammable, or explosive properties.*

4.6 Hot work *means work involving electric or gas welding, cutting, brazing, or similar flame or spark-producing operations.*

4.7 Un-manned station / Normally unoccupied remote facility*: a facility which is operated, maintained, or serviced by employees who visit the facility only periodically to check its operation and to perform necessary operation or maintenance tasks. No employees are permanently stationed at the facility.*

4.8 . e-MOC: *MOC initiated through SAP Platform.*

4.9 Job Safety Analysis: Job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job. In a JSA, for each basic step of the job, it is to identify potential hazards and to recommend the safest way to do the job.

4.10 Hazard: *Source or situation with potential for harm, something that can cause body injury / occupational illness, damage property.*

4.11 Hazard Identification & Risk Assessment: *Hazard Identification & Risk Assessment is to identify and evaluate the hazards, Risk and put controls measures for safe execution of activities.*

4.12 Job: *A piece of physical work defined by time or other limits and that has a clear start and end point MOC: Management of Change*

4.13 Management of Change: *Any Modification/change/replacement pertaining plant / equipment / Machines / structure which is Replacement not–in–Kind (RNIK) to previous one (for example replacement of any new spare which is not like previously used spare, replacement of outdoor switchyard with Gas Insulated switchgear (GIS), Changing route of pipelines, modifying set values of Safety devices like safety valve etc.).*

4.14 Non-Routine Job / Task: *Where an SOP / SMP is not available or the conditions of the SOP / SMP have changed*

4.15 Replacement not–in–Kind (RNIK): *Replacement of any new spare which is not similar to previously used spare.*

4.16 Replacement in–Kind (RIK): *Replacement of any new spare which is like previously used spare, may be change in brand/manufacturer.*

4.17 Risk: *Effect of uncertainty, Risk is a combination of the consequences of an event and the associated "likelihood" of occurrence.*

4.18 Risk Assessment: *A systematic and structured process whereby hazards present in a workplace, or arising from workplace activity, are identified, risks assessed / evaluated, and decisions prioritized to reduce risks to acceptable levels.*

4.19 Severity: *The level of consequence / harm of an event that could occur due to exposure to the hazard present*

4.20 Shall: *Mandatory requirement*

4.21 Should: *Optional requirement Statutory requirements: Laws, regulations applicable at the location of plant /work.*

4.22 Process: *any activity involving a hazardous material including any use, storage, manufacturing, handling, or the on-site movement of such chemicals, or combination of these activities. For purposes of this definition, any group of vessels which are interconnected and separate vessels which are located such that a highly hazardous chemical could be involved in a potential release shall be considered a single process.*

4.23 Trade secret*: any confidential formula, pattern, process, device, information, or compilation of information that is used in an employer's business, and that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it.*

5. ***Employee participation in Safety:*** As good safety practice, consult with employees and their representatives, Contractors and Contractors workers for the hazard's analyses and other elements of process safety management.

6 ***Process safety information.*** Process safety information includes information pertaining to the hazards of the chemicals / material stored, used, or produced by the process. It also includes information pertaining to the technology of the process, and the equipment in the process. (Please refer Annexure 1 Template for Process safety Information)

6.1 *Information pertaining to the Hazards of the Chemical/ Material in process:* shall be included:

i. Toxicity information.
ii. Permissible exposure limits
iii. Physical Proprieties.
iv. Reactivity Properties:
v. Corrosivity Properties.
vi. Thermal and chemical stability data; and
vii. Hazardous effects of inadvertent mixing of different materials

Safety Data Sheet (earlier referred as Material Safety Data Sheet or MSDS) may be referred to collect the above information

6.2 Information pertaining to the technology of the process: Following information pertaining to the technology of the process, shall be included:

i) A block flow diagram or simplified process flow diagram
ii) Process chemistry.
iii) Maximum intended inventory,
iv) Safe upper and lower limits for such items as
(1) Temperatures,
(2) Pressures,
(3) Flows
(4) Compositions; and
v) Evaluation of the consequences of deviations, including those affecting the safety and health of employees. If the original technical information is not available readily (OEM Catalogues / Design Data) , it may be developed in conjunction with the process hazard analysis.

6.3 *Information pertaining to the equipment in the process*.: Following information may be added:

6.3.1 Materials of construction.
6.3.2 Piping and instrument diagrams (P&ID's).
6.3.3 Electrical classification.
6.3.4 Relief system design and design basis.

6.3.5 Ventilation system design.
6.3.6 Design codes and standards employed.
6.3.7 Material and energy balances for processes
6.3.8 Safety systems e.g., interlocks, detection, or suppression systems.
6.4 It must be ensured that equipment complies with recognized and generally accepted good engineering practices.

7 ***Process hazard analysis****:* PHA (hazard evaluation) shall be performed on all hazardous processes.

7.1 *Methodologies:* One or more of the following methodologies shall be adopted to determine and evaluate the hazards of the process

7.1.1 What-If.
7.1.2 Checklist.
7.1.3 What-If/Checklist.
7.1.4 Hazard and Operability Study (HAZOP).
7.1.5 Failure Mode and Effects Analysis (FMEA);
7.1.6 Fault Tree Analysis; or
7.1.7 An appropriate equivalent methodology

7.2 The process hazard analysis shall address

7.2.1 The hazards of the process.
7.2.2 The identification of any previous incident which had a likely potential for catastrophic consequences in the workplace.
7.2.3 Engineering and administrative controls applicable to the hazards and their interrelationships such as appropriate application of detection methodologies to provide early warning of releases. (Acceptable detection methods might include process monitoring and control instrumentation with alarms, and detection hardware such as hydrocarbon sensors.);
7.2.4 Consequences of failure of engineering and administrative controls.
7.2.5 Facility siting.
7.2.6 Human factors; and
7.2.7 A qualitative evaluation of a range of the possible safety and health effects of failure of controls on employees in the workplace.

7.3 *The process hazard analysis shall be performed by a team* with expertise in engineering and process operations, and the team shall include at least one employee who has experience and knowledge specific to the process being evaluated. Also, one member of the team must be knowledgeable in the specific process hazard analysis methodology being used.

7.4 Team's findings and recommendations shall be addressed promptly; assure that the recommendations are resolved in a timely manner and that the resolution is documented; document what actions are to be taken; complete actions as soon as possible; develop a written schedule of when these actions are to be completed; communicate the actions to operating, maintenance and other employees whose work assignments are in the process and who may be affected by the recommendations or actions

7.5 At least every five (5) years after the completion of the initial process hazard analysis, the process hazard analysis shall be updated and revalidated by a team to assure that the process hazard

7.6 Process hazards analyses and updates or revalidations for each process, as well as the documented resolution of recommendations shall be retained for the life of the process.

8 ***Operating procedures***.: Written Operating Procedures shall be developed and implemented to provide clear instructions for safely conducting activities involved in each process consistent with the process safety information and shall address at least following elements.

8.1 Steps for each operating phase:

8.1.1 Initial startup.

8.1.2 Normal operations.

8.1.3 Temporary operations.

8.1.4 Emergency shutdown including the conditions under which emergency shutdown is required, and the assignment of shutdown responsibility to qualified operators to ensure that emergency shutdown is executed in a safe and timely manner.

8.1.5 Emergency Operations.

8.1.6 Normal shutdown; and,

8.1.7 Startup following an overhaul, or after an emergency shutdown.

8.2 Operating limits:

8.2.1 Consequences of deviation; and

8.2.2 Steps required to correct or avoid deviation.

8.3 Safety and health considerations:

8.3.1 Properties of, and hazards presented by, the chemicals used in the process

8.3.2 Precautions necessary to prevent exposure, including engineering controls, administrative controls, and personal protective equipment.

8.3.3 Control measures to be taken if physical contact or airborne exposure occurs.

8.3.4 Quality control for raw materials and control of hazardous chemical inventory levels; and,

8.3.5 Any special or unique hazards.

8.3.6 *Safety systems and their functions.*

8.4 Operating procedures shall be readily accessible to employees who work in or maintain a process.

8.5 The operating procedures shall be reviewed as often as necessary to assure that they reflect current operating practice, including changes that result from changes in process chemicals, technology, and equipment, and changes to facilities. The employer shall certify annually that these operating procedures are current and accurate.

8.6 The employer shall develop and implement safe work practices to provide for the control of hazards during operations such as lockout/tagout; confined space entry; opening process equipment or piping; and control over entrance into a facility by maintenance, contractor, laboratory, or other support personnel. These safe work practices shall apply to employees and contractor employees.

9 *Training* — Please refer Tata Power Procedure on Training and Safety Capability

9.1 *Skill building initial training*.

9.1.1 Each employee presently involved in operating a process, and each employee before being involved in operating a newly assigned process, shall be trained in an overview of the process and in the operating procedures. The

training shall include emphasis on the specific safety and health hazards, emergency operations including shutdown, and safe work practices applicable to the employee's job tasks.

9.1.2 In lieu of initial training for those employees already involved in operating a process on 01.01.22, Chief O&M may certify in writing that the employee has the required knowledge, skills, and abilities to safely carry out the duties and responsibilities as specified in the operating procedures.

9.2 *Refresher training*. Refresher training shall be provided at least once in every three years, and more often if necessary, to each employee involved in operating a process to assure that the employee understands and adheres to the current operating procedures of the process. In consultation with the employees involved in operating the process, Division shall determine the appropriate frequency of refresher training.

9.3 *Training documentation*. Division shall ascertain that each employee involved in operating a process has received and understood the training required. The Chief O&M and HR department shall prepare a record which contains the identity of the employee, the date of training, and the means used to verify that the employee understood the training.

10 Contractors Safety Management – Please refer Tata Power Contractor Safety Code of Conduct for details.

11 *Pre-startup safety review (PSSR)*. Please refer PSSR Procedure for details

11.1 A pre-startup safety review shall be performed for all new / modified or overhauled plants, equipment, and facilities.

11.2 The PSSR shall be conducted prior to the introduction of hazardous chemicals / steam / Oil / Water into a process to confirm that:

11.2.1 Construction of a new facility /plant are in accordance with design specifications and Process Hazard Analysis has been performed and recommendations have been resolved or implemented

11.2.2 Safety, operating, maintenance, and emergency procedures are in place and are adequate.

11.2.3 For Modified facilities to ensure that requirements contained / described in management of change are completed

11.2.4 Training of each employee involved in operating a process has been completed.

12 *Mechanical integrity—*

12.1 Requirements of this section applies to the following process equipment but not limited to

12.1.1 Pressure vessels and storage tanks.
12.1.2 Piping systems (including piping components such as valves).
12.1.3 Relief and vent systems and devices.
12.1.4 Emergency shutdown systems.
12.1.5 Controls (including monitoring devices, sensors, alarms, and interlocks)
12.1.6 Pumps.
12.1.7 Lifting Equipment, Tools and Tackles

12.2 *Written procedures:* Departments shall establish and implement written procedures to maintain the on-going integrity of process equipment.

12.3 *Training for process maintenance activities*. Departmental Head shall ensure that training of each employee involved in maintaining the integrity of process equipment in an overview of that process and its hazards and in the procedures applicable to the employee's job tasks to assure that the employee can perform the job in a safe manner.

13 *Inspection and testing.*

13.1 Inspections and tests shall be performed on process equipment.

13.2 Inspection and testing procedures shall follow Recognized & Generally Accepted Good Engineering Practices.

13.3 The frequency of inspections and tests of process equipment shall be consistent with legal requirements or applicable manufacturers' (OEM) recommendations. If it is not available Recognized & Generally Accepted Good Engineering Practices may be followed or developed through prior operating experience.

13.4 Each inspection shall be documented and test that has been performed on process equipment. The documentation shall identify the date of the inspection or test, the name of the person who performed the inspection or test, the serial number or other identifier of the equipment on which the inspection or test was performed, a description of the inspection or test performed, and the results of the inspection or test.

13.5 *Equipment deficiencies*. Deficiencies in the equipment, that are outside acceptable limits, shall be corrected before further use or in a safe and timely manner when necessary means are taken to assure safe operation.

14 *Quality assurance*.

14.1 In the construction of new plants and equipment, it shall be ensured that equipment as it is fabricated is suitable for the process application for which they will be used.

14.2 Appropriate checks and inspections shall be performed to assure that equipment is installed properly and consistent with design specifications and the manufacturer's instructions.

14.3 Management shall assure that maintenance materials, spare parts and equipment are suitable for the process application for which they will be used.

15 *Permit to Work System:* Please refer Tata Power Permit to Work Procedure for details .

15.1 The employer shall issue a hot work permit for hot work operations conducted on or near a covered process.

15.2 The permit shall document that the fire prevention and protection requirements in have been implemented prior to beginning the hot work operations; it shall indicate the date(s) authorized for hot work; and identify the object on which hot work is to be performed. The permit shall be kept on file until completion of the hot work operations.

16 *Management of change*. Please refer Tata Power Procedure on Management of Change for details

16.1 Tata Power procedure on Management of Change establish and implemented to manage changes (except for "replacements in kind") related to Plant, equipment , process chemicals, technology, layout and procedures; and changes to facilities that affect a covered process.

16.2 Employees involved in operating a process and maintenance and contract employees whose job tasks will be affected by the change in the process shall be informed of, and trained in, the change prior to start-up of the process or affected part of the process.

16.3 If a change results in a change in the process safety information, such information shall be updated accordingly.

16.4 If a change results in a change in the operating procedures or practices such procedures or practices shall be updated accordingly.

17 *Incident investigation*: Please refer Tata Power Procedure on Incident Reporting and Investigation for details

17.1 Each incident which resulted in or could reasonably have resulted in a catastrophic release of highly hazardous chemical in the workplace shall be investigated as per the above procedure.

17.2 An incident investigation shall be initiated as promptly as possible, but not later than 48 hours following the incident.

17.3 An incident investigation team shall be established and consist of at least one person knowledgeable in the process involved, including a contract employee if

the incident involved work of the contractor, and other persons with appropriate knowledge and experience to thoroughly investigate and analyze the incident.

17.4 A report shall be prepared at the recommendation must be share to prevent the recurrence.

17.5 The report shall be reviewed with all affected personnel whose job tasks are relevant to the incident findings including contract employees where applicable.

17.6 Incident investigation reports shall be retained for five years.

18 ***Emergency planning and response*. Please refer Tata Power Business Continuity and Disaster Management Procedure for details**

19 ***Compliance Audits*.: Please refer guidelines / procedure for Tata Power combined Fire and Safety Audit**

20 ***Trade secrets*.:** All information shall be made available to persons responsible for compiling the process safety information, assisting in the development of the process hazard analysis, responsible for developing the operating procedures, and involved in incident investigations, BCDMP and compliance audits.