Hazard Identification and Risk Assessment (HIRA) Procedure

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1. OBJECTIVE:

Objective of this procedure is to define guidelines for Hazard identification, Risk assessment and determination of controls.

2. SCOPE:

This procedure applies to all operating plants and project sites of Tata Power Group companies including JVs/subsidiaries.

3. EXPECTED RESULTS:

3.1. Manage activities with reduction of risk involved with acceptable risk and safely.

4. ACCOUNTABILITY & RESPONSIBILITY:

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

4.2. **RESPONSIBILITY**: Respective Core team members / Head of Departments - HODs (Unless otherwise specified).

5. GLOSSARY/ DEFINITIONS:

BC – Business Concern: Any hazard and Risk which will result in Fatal accidents / severe damage to human health and safety, Damage to property resulting in loss of Production, huge financial implications etc. (Example - major fire, gas leak, explosion, toxic release etc.)

Controls: Methods used to manage safety risks. Controls can be Elimination, Substitution, Isolation/ separation, Engineering controls, signage/warnings and /or administrative controls, PPE.

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.

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

IPC – Interested Party Concern: The hazard / Risk having a concern expressed by Employees, Neighbours, local residents etc.(Example –excavation on public road for cable laying job which involve traffic interface, erection of transmission tower at community area etc.)

Job Safety Analysis: Job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular 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.

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

(Note: The head of the department conducts the risk assessment for any complaint received by any employee or interested party and if he is convinced with complaint then

the same is considered as interested party concern and the risk is treated as significant. Proper control measures are to be taken to manage the risk)

LC – Legal Concern: The hazard or risk is addressed by applicable legal requirements such as Indian Factory act / State factory rules, Indian electricity Act & rules etc. (Example - use of uncertified lifting tools & cranes, operation of unguarded machines etc.)

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

Non-Significant Risk: Any risk less than RPN 6 and not falling under any of qualitative risk category (Legal Concern, Business Concern and Interested Party Concern).

OCP: Operational Control Plan

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

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 in order to reduce risks to acceptable levels.

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

Significant risk: Any activity falling either under any of qualitative risk category (Legal Concern, Business Concern and Interested Party Concern) or having Risk Priority Number (RPN) 6 and above.

Shall: Mandatory requirement

Should: Optional requirement

Statutory requirements: Laws, regulations applicable at the location of plant /work.

SOP: Standard Operating Procedure

SMP: Standard Maintenance Procedure

Task / Activity: A sequence of steps taken to conduct a job. A task/activity is a sub element of a Job.

Unacceptable Risk: Any activity having Risk Priority Number (RPN) 10 and above.

WI: Work Instructions

6. PROCEDURE:

6.1. General:

6.1.1. All Tata Power Divisions/JVs/Subsidiary shall maintained updated list of all Activities of significant risk (qualitative) and having Risk Priority Number (RPN) 6 and above, which include Medium Risk, High Risk and Very High Risk (refer Annexure – 1: Risk Priority Number (RPN) Matrix and Annexure – 4 : Risk Based Control Plan).

6.1.2. All Tata Power Divisions/JVs/Subsidiary shall develop, maintained and implement updated HIRA (Hazard Identification & Risk Assessment) register for all significant risk (qualitative) and having Risk Priority Number (RPN) 6 and above,

which include Medium Risk, High Risk and Very High Risk Activities. The Procedure for Hazard identification and Risk assessment is defined below.

6.2. **Methodology for Preparation of HIRA.** Following methodology shall be followed for preparation of HIRA (Hazard Identification & Risk Assessment).

6.2.1. **Key Requisites:**

6.2.1.1. Classify the work activities

6.2.1.2. Identify the Hazards & determine Risks.

6.2.1.3. Determine existing control measures.

6.2.1.4. Assess the Risk considering the probable failures in the existing risk control measures (i.e. Effectiveness of existing risk control measures).

6.2.1.5. Decide whether the risk is acceptable.

6.2.1.6. Decide the additional Risk Control Plan to bring risk to acceptable level**.**

6.2.2. **Composition of Team**: The HIRA is generally carried out by a team comprising of -

6.2.2.1. Employees supervising the job

6.2.2.2. Employees with safety knowledge

6.2.2.3. Employees with technical knowledge of the activity/Job

6.2.2.4. The number of team members will depend on and vary with the complexity of the Activity/job.

6.3. **Steps of preparation of HIRA:**

6.3.1. **Step -1**: **Collection of information**: Team shall collect the following information wherever possible, for each work activity.

i. Activities to be carried out, its duration and frequency.
ii. Location/s where the activities to be carried out.
iii. Persons involved in the activities?
iv. Other persons who may be affected by the work (e.g. visitors, contractors, the public)
v. Training of persons involved in the activities.
vi. Type of activities – Routine/non-routine activities
vii. Availability of Standard Operating Procedure (SOP)/Standard Maintenance Procedure (SMP) for Routine Activities.
viii. Availability of Permit-To-Work (PTW) for Non-Routine Activities.
ix. Size, shape, surface conditions, weight of materials that might be handled.
x. Utility services such as compressed air/steam.
xi. Other materials to be used or encountered during the work
xii. Physical form of materials to be used and its recommendations as per Material Safety Data Sheet (MSDS).
xiii. Legal and other requirements applicable for the activities.
xiv. Records of past incident/s and analysis pertaining to activities.
xv. Communications from employees and other interested parties (if any).

xvi. Work place monitoring data.
xvii. Existing Control measures to be in place.
xviii. Safety committee reports

6.4. **Step – 2**: **Hazard Identification**: Identify hazards and determine risks. Hazard identification and risk assessment to be pro-active rather than reactive.
The broad categories of hazards are:

i. Mechanical (Example: Fall / slip due to slippery floor, Exposure to moving / rotating parts of machine etc.)
ii. Electrical (Example: Electric shocks / electrocution)
iii. Chemicals (Example: acids / alkali /salts etc.).
iv. Fire and Explosion.
v. Radiation (Example: Exposure to X-rays/ Radiography during Non-Destructive Testing (NDT) etc.)
vi. Toxic release (Example: Leakage of chlorine, ammonia etc)
vii. Natural calamities.(Earth quake, Floods, Severe wind storm, lightening etc)
viii. Biological hazards (Example: Sources of biological hazards include bacteria, viruses, insects, plants, birds, animals, and humans. These sources can cause a variety of health effects ranging from skin irritation and allergies to infections (e.g., Tuberculosis, AIDS, Cancer etc.)

6.4.1. Following three questions to be explored and recorded during hazard identification

i. Is there a source of harm?
ii. Who (or what) could be harmed?
iii. How could harm occur?

6.4.2. Following factors shall be considered while identifying the hazards and determining the risks-

i. Human behaviour, capabilities and other human factors.
ii. Hazards originating “outside the workplace” capable of adversely affecting the health and safety of personnel under the control of the organization within the workplace.
iii. Hazards created in the vicinity “inside the workplace” by work related activities under the control of the organization.
iv. Infrastructure, equipment and materials at the workplace, whether provided by the organization or others.
v. Changes or proposed changes in the organization, it’s activities and materials.
vi. Applicable legal obligations relating to risk assessment and implementation of necessary controls.

vii. Design of workplace, processes installations, machinery / equipment, operating procedures and work organization, including their adaptation to human capabilities.

6.5. **Step – 3**: **Review of Existing Control Measures**: Team shall carry out review of adequacy of existing control measures and based upon review of the adequacy of existing control measures qualitative and quantitative risk assessment shall be done as below.

6.5.1. QUALITATIVE ASSESSMENT OF RISKS:

6.5.1.1. **Legal Concern (LC)**: The hazard or risk is addressed by applicable legal requirements such as Indian Factory act / State factory rules, Indian electricity Act & rules etc. (Example - use of uncertified lifting tools & cranes, operation of unguarded machines etc.)

6.5.1.2. **Interested Party Concern (IPC)**: The hazard / Risk having a concern expressed by Employees, Neighbours, local residents etc.(Example – excavation on public road for cable laying job which involve traffic interface, erection of transmission tower at community area etc.)

(Note: The head of the department should conducts the risk assessment for any complaint received by any employee or interested party and if he is convinced with complaint then the same is considered as interested party concern and the risk is treated as significant. Proper control measures are to be taken to manage the risk)

6.5.1.3. **BC** – **Business Concern (BC)**: Any hazard and Risk which will result in: Fatal accidents / severe damage to human health and safety. Damage to property resulting in loss of Production, huge financial implications etc. (Example **-** major fire, gas leak, explosion, toxic release etc.)

6.5.1.4. **Potential Emergency (PE):** Situations which result in loss or damage to humans / property / environment. Any situation, such as arising out of major fire, gas leak, explosion, toxic release, flooding which is likely to go out of control and requires controlling by a pre-determined team. The situation may result in injury/ill health to group of employees and/or general public and/or, property damage which require mitigation of losses. All such potential emergencies shall be assessed and considered in any of LC, IPC or BC category as appropriate.

6.5.1.5. Any Hazard / Risk which is associated with a Legal Concern (LC), Interested Party Concern (IPC), and Business Concern (BC) are considered as Significant Risks by default irrespective of its subsequent Risk Priority Number (RPN) as per Quantitative Risk Assessment and necessary control measures shall be taken address all such concerns..

6.5.2. **QUANTITATIVE ASSESSMENT OF RISKS**: After identifying the hazards and determination of risks, carrying out risk assessment and classify the risks based on the risk priority number (RPN) refer **Annexure - 1**.

6.5.2.1. **RISK PRIORITY NUMBER (RPN)** is obtained by multiplying the following factors: **RPN = F x S.** Where;

F - **Frequency:** likelihood of the occurrence on Incident

S - **Severity of harm:** The risk from the hazard is determined by estimating the potential severity of the harm.

Refer to Annexure- 2 & 3 for allocating values for Frequency (F) & Severity (S)

6.5.2.2. While assigning **Frequency (F) & Severity (S)** ratings, consider the adequacy and effectiveness of existing risk control measures (probable failures in existing risk control measures).Some Examples of probable failures in control measures.

i. Supervision / Human intervention is must for Controls.
ii. People not wearing PPE, / PPEs not available,
iii. People not aware of control measures / untrained personnel,
iv. Damaged PPEs etc.

6.5.2.3. Additional control measures shall be recommended to reduce the Risk as per Risk Control Plan mentioned in Annexure – 4.

6.5.2.4. **Hierarchy of Risk Control measures:** While determining risk controls or considering changes to existing controls, consideration shall be given to reducing the risks according to the following hierarchy:

i. **ELIMINATE (REMOVE) / SUBSTITUTION**
(Example - If practicable, Eliminate the hazards altogether, or combat the risk at source, for example Use Hypo-chloride in place of Chlorine, Use tools instead of handling with bare hands, Use trolley and truck instead of hand carrying, Use man lift instead of Ladder)

ii. **ENGINEERING CONTROLS**
(Example - Fully automate process, Application of interlocks, Installation of Safety Valve, Alarm & Detection System etc.)

iii. **ADMINISTRATIVE CONTROLS.**
(Example- Good housekeeping, Safe systems at work, Training and information, Welfare, Monitoring, Training, supervision etc.)

iv. **PERSONAL PROTECTIVE EQUIPMENTS (PPEs - Last resort).**
However PPEs are mandatory for all jobs.

6.6. **Step- 4**: HIRA Format (GSP/HIRA/005/FORM/01) as per Annexure - 6 should be used for recording Hazard Identification and Risk Assessment (HIRA).

6.6.1. Hazard Identification and Risk Assessment (HIRA) shall be approved by Division Chief.

6.7. **Step – 5**: Hazard identification and Risk assessment shall be reviewed at least once in two (02) years to keep this information up-to-date. However, Hazard identification and Risk assessment shall be reviewed before implementing changes to the activity / process / equipment / existing risk control measures. Review of Risk assessment shall be carried out during the following situations.

i. During changes from normal operation,
ii. New or modified process/ installation,
iii. Changes in raw materials, chemicals etc,
iv. During expansion, contraction, restructuring
v. New or modified legislation etc.
vi. New information/inputs from interested parties

7. Records:

1.1. HIRA Register as per HIRA Format (GSP/HIRA/005/FORM/01) - Retention period five (05) years

1.2. List of Unacceptable (High & Very High) Risks activities/Jobs (RPN 6 and above) - Retention period five (05) years

8. Training & Communication:

1.3. Training of Hazard Identification & Risk Assessment (HIRA) shall be included and covered in Safety Training Calendar as per Safety Training needs.

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

9. VERIFICATION

1.5. Verification of implementation shall be done during Safety audit, field safety visit and site inspections.

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

11. REFERENCES

- Tata Power Safety Management System (TPSMS) Manual
- EPM 01.08.02 - Hazard Identification Risk Assessment and Risk Management
- OHSAS 18001:2007
- Tata Power Document Control Procedure (TPSMS/GSP/DC/014).
- Tata Power Safety Capability Building procedure(TPSMS/SCB/DC/016)

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 :

Annexure – 1: Risk Priority Number (RPN) Matrix

Annexure – 2: Table for Frequency

Annexure – 3: Table for Severity

Annexure – 4: Risk Based Control Plan

Annexure – 5: Types of controls and their effectiveness

Annexure – 6: HIRA Format (GSP/HIRA/005/FORM/01)

Annexure – 1

Risk Priority Number (RPN) Matrix

Frequency	**5** **(Very High -** Has happened more than once per year in the Divisions)	**5 (Low)**	**10 (High)**	**15 (High)**	**20 (Very High)**	**25 (Very High)**
	4 **(High -** Has happened in the Division and more than once per year in Company**)**	**4 (Low)**	**8 (Medium)**	**12 (High)**	**16 (Very High)**	**20 (Very High)**
	3 **(Medium-** Has happened in the Company**)**	**3 (Low)**	**6 (Medium)**	**9 (Medium)**	**12 (High)**	**15 (High)**
	2 **(Low-** Happened in The Power Industries globally last 20 Years**)**	**2 (Very Low)**	**4 (Low)**	**6 (Medium)**	**8 (Medium)**	**10 (High)**
	1 **(Very Low-** Happened in the Industries globally last 10 years **)**	**1 (Very Low)**	**2 (Very Low)**	**3 (Low)**	**4 (Low)**	**5 (Low)**
		1 (Very Low)	**2 (Low)**	**3 (Medium)**	**4 (High)**	**5 (Very High)**
		Severity				

Annexure – 2

Table for Frequency

Rating	Level	Description
5	**Very High**	Has happened once during last one year in the Division
4	**High**	Has happened in the Division or once during last one year in Company
3	**Medium**	Has happened in the Company
2	**Low**	Happened in The Power Industries globally during last 20 years.
1	**Very Low**	Happened in the Industries globally during last 10 years.

Annexure – 3

Table for Severity

	Very Low	**Low**	**Medium**	**High**	**Very High**
	1	**2**	**3**	**4**	**5**
	Consequence Severity Increases				
People (Health and Safety	Physical discomfort	Noticeable and requiring First Aid or slight health problem	Temporary Disability (MTC/ RWDC) or health problem causing MTC/RWDC	Partial Permanent Disability/ Lost work Day case (LWDC) or major health problem causing LWDC	Fatal/Total Permanent Disability (TPD) or severe health problem causing Fatal/TPD
Environmental	Negligible effect confined to within plant grounds / environment	Minor effects neighbours adjacent to plant complain	Localize release makes local TV coverage / newspaper	Major release make national TV coverage / news paper	Massive damage makes International TV coverage / new paper
Product or Service Quality	Some product or service fails to meet standards	Several costumer complain verbally	Several customer complain in writing	Important / major customer cancelled orders	Loss of substantial marked share due problem
Asset or financial loss	*Slight damage; Upto Rs. 50,000/-*	*Noticeable damage; more than Rs 50000 but not more than 5 Lakhs*	*Large damage; more than Rs 5 Lakh but not more than 25 Lakhs*	*Major damage more than Rs 25 Lakh but not more than 1.25 Crore*	*Severe damage more than 1.25 crore*
Reputation (Local, National, or International	Slight to moderate impact	Loss of reputation at Community level	Loss of reputation at State Level	Loss of reputation at National Level	Loss of reputation at International Level

Annexure- 4

Risk Based Control Plan

RPN	Risk category	(Risk based Control Plan) Decision / What needs to be done?
< 3	Very Low Risk (Non-Significant)	**Control Plan (CP) - 1** • Activities having RPN < 3, considered as acceptable risk. No additional controls are necessary other than to ensure that existing controls are maintained & implemented.
3 – 5	Low Risk (Non-Significant)	**Control Plan (CP) - 2** • Activities having RPN between 3 -5, considered as acceptable risk. • No additional controls are required unless they can be implemented at very low cost i.e. improved supervision, enhanced monitoring.
6 – 9	Medium Risk (Significant)	**Control Plan (CP) - 3** • Additional control measures shall be put in place to reduce the RPN to acceptable level (less than 6). • The risk reduction measures shall be implemented within a defined period. Arrangements shall be made to ensure that the controls are maintained. •
10 – 15	High Risks (Significant & Unacceptable)	**Control Plan (CP) - 4** • Engineering control/Work Instructions (WI) shall be followed to reduce risk to acceptable level (less than 6). • In case of absence of Work Instructions (WI), Job/activity specific Operational Control Plan (OCP) shall be developed and followed • The risk reduction measures shall be implemented within a defined period (before start of work). • The work activity should be halted until risk controls are implemented. If it is not possible to reduce the risk, the work should remain prohibited. • Arrangements shall be made to ensure that the controls are maintained.
16-25	Very High Risks (Significant & Unacceptable)	**Control Plan (CP) - 5** • It shall incudes all the requirements of Control Plan (CP) - 4 and necessary changes by Engineering Controls (for example - Fully automate process, Application of interlocks, Installation of Safety Valve, Alarm & Detection System etc.) to reduce risk to acceptable level (less than 6). • The work activity shall be halted until risk controls are implemented as Control Plan (CP) - 5. If it is not possible to reduce the risk, the work shall remain prohibited. • Arrangements shall be made to ensure that the controls are maintained.

Annexure- 5

Types of Controls and their effectiveness

Type of Controls	Effectiveness
1. Eliminate the hazard completely.	**100%**
2. Engineering Controls: Create a barrier between the person and the hazard.	**40–99%**
3. Administrative Controls: by use & implementation of regulation, law, SOP/SMP/WI/OCP, safety procedures, etc.	**20–40%**
4. Provide personal protective equipment.	**1- 20%**

GSP/HIRA/005/FORM/01 **Annexure – 6**

(Note: for HIRA workable excel format, pl refer Sheet#2: HIRA Format of EPM Process No. 01.08.02

GSP/HIRA/005/FORM/01

HAZARD IDENTIFICATION AND RISK ASSESSMENT (OCCUPATIONAL HEALTH & SAFETY)

PREPARED BY :
APPROVED BY :
DIVISION & DEPARTMENT :

Document No. :-
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SL NO	ACTIVITIES	SUB ACTIVITIES	Type of Activities (Routine-R/Non Routine-NR)	OCCUPATIONAL HAZARDS NAME	HAZARDS	RISK/IMPACT	Nos of Person exposed	Existing Controls				EVALUATION OF RISK							SAS	Risk Based Control Plan (CP)	Proposed controls/ Improvements / Control measures modifications planned				Residual Risk			Remark (if any)
								Engg Control	Admin Control	PPE Provided	Other Controls	QUALITATIVE			Ref of Leg. Req	QUANTITATIVE					Engg Control	Admin Control	PPE Provided	Others	QUANTITATIVE			
												LC	BC	IPC		Frequency (F)	Severity (S)	RPN (FXS)							Frequency (F)	Severity (S)	RPN (FXS)	