

## **Risk Assessment**

### **INTRODUCTION**

The steel plant is associated with potential hazards that effect to the employee and environment. It would normally require the assistance of emergency services to handle it effectively. The operation shall be taken out under the well management and control by the qualified safety manager.

Disaster management plan has to be formulated with an aim of taking precautionary steps to avert disasters and also to take such action after the disaster which limits the damage to the minimum.

### **RISK ASSESSMENT**

Risk assessment study for the Proposed Modernization Cum Expansion of steel plant will be conducted for Construction and operational Phase

#### **Risk during Construction Phase**

Construction phase of the proposed expansion of the project is divided into following activities:

- a. Site Leveling;
- b. Construction of Roads;
- c. Excavation;
- d. Construction of building;
- e. Construction of high-rise structure (i.e. Stack);
- f. Material Handling (Loading and Un loading);
- g. Cutting and Welding; and
- h. Installation of Machineries.

Risk and mitigation measures during the construction phase is given in **Table 1**

**Table 1: Risk and Mitigation Measures during the Construction Phase**

<b>Activity</b>	<b>Hazards</b>	<b>Risk</b>	<b>Mitigation Measures</b>
Site Leveling	Due to heavy vehicle movement accident may happen.	Physical injury, Life loss and organ damage	<ul style="list-style-type: none"><li>• Providing PPEs to workers</li><li>• Appointing the qualified persons for the particular job.</li><li>• Speed limit control</li><li>• Providing Training</li></ul>
Construction of	Loading and Unloading of material may cause	Physical Injury	<ul style="list-style-type: none"><li>• Providing PPEs to</li></ul>

Activity	Hazards	Risk	Mitigation Measures
Road	<p>accident.</p> <p>Heavy Vehicle movement may cause accident.</p> <p>Hot material cause burn injury.</p>	<p>Life loss</p> <p>Burn</p>	<p>workers</p> <ul style="list-style-type: none"> <li>Appointing the qualified persons for the particular job.</li> <li>Valid license for Heavy vehicle operator will be mandatory.</li> <li>Speed limit control</li> <li>Providing Training</li> </ul>
Excavation	<ul style="list-style-type: none"> <li>Excavation collapses</li> <li>Excavated material</li> <li>Falling objects or objects near an excavation</li> <li>Powered mobile equipment</li> <li>Slips, trips, and falls</li> <li>Hazardous atmospheres</li> <li>Flooding/water hazards</li> <li>Underground facilities</li> </ul>	<p>Property Loss</p> <p>Physical injury</p> <p>Life loss</p>	<ul style="list-style-type: none"> <li>Work Permit System will be followed.</li> <li>Only experienced person will asset to team.</li> <li>Excavated material will be stacked safely.</li> <li>Area will be barricaded.</li> <li>Training will be Provided to all workers</li> <li>PPEs will be provided.</li> <li>Unauthorized person entry will be banned.</li> </ul>
Construction of building	<p>Heavy Material may fall down during loading and unloading</p> <p>Structure may fall down if poor practice done</p> <p>Waste stored in open may cause cut in feet</p> <p>Storage of fuel may cause fire</p> <p>Workers may fall down from the height.</p>	<p>Physical Injury</p> <p>Life loss</p> <p>Physically handicapped</p> <p>Property Loss</p>	<ul style="list-style-type: none"> <li>Work permit system will be adopted.</li> <li>PPEs will be provided to all workers.</li> <li>IS code will be followed for Building construction.</li> <li>Fuel will be stored separately area will be isolated from ingenious material.</li> <li>Fire extinguisher will be provided</li> <li>Height work permit will be issued to the person.</li> <li>Safety belt will be</li> </ul>

Activity	Hazards	Risk	Mitigation Measures
			<p>provided to workers working on above 1.8 M height.</p> <ul style="list-style-type: none"> <li>Adequate trainings will be provided for specific job works.</li> </ul>
Commissioning of high-rise structure (i.e. 35-m height Stack);	Material may fall down Fall Hazards	Physical injury Life loss	<ul style="list-style-type: none"> <li>High rise structure will be constructed as per detailed engineering drawing.</li> <li>Safety belt will be provided to workers working on above 1.8 M height.</li> <li>Height work permit will be implemented</li> <li>Proper training will be provided for scaffolding.</li> <li>PPEs will be provided.</li> </ul>
Material Handling (Loading and Unloading)	Extra weight lifting can cause strain in body muscles	Physical Injury	<ul style="list-style-type: none"> <li>Material will lift as per safety norms.</li> <li>PPEs will be provided.</li> </ul>
Cutting and Welding	<p>Welding, cutting, and allied processes produce molten metal, sparks, slag, and hot work surfaces can cause fire or explosion if precautionary measures are not followed.</p> <p>Electric shock from electrical welding and cutting equipment can result in death or severe burns.</p> <p>Gas cylinder can cause fire accident.</p>	Physical Injury Burn Injury Property loss Life loss	<ul style="list-style-type: none"> <li>Hot work permit will follow.</li> <li>Standards Work Procedure will be developed.</li> <li>Training will be provided</li> <li>Job will be assigned to only authorized person</li> <li>Proper PPEs will be provided.</li> <li>Loose connection will be avoided.</li> <li>Area will be barricaded</li> <li>Gas cylinder will be</li> </ul>

Activity	Hazards	Risk	Mitigation Measures
			stored as per guidelines
Installation of Machineries.	<p>Due to over load lifting belt break out</p> <p>Un authorized operator of Lifting and Crain can create an emergency</p> <p>During placement of machinery structure may collapse</p>	<p>Property loss</p> <p>Physical Injury</p> <p>Life loss</p>	<ul style="list-style-type: none"> <li>Only authorized person will operate the machine</li> <li>Appropriate Belt will be used for lifting of material</li> <li>During lifting and placing of material area will be man free.</li> <li>Appropriate platform will be designed as per the load bearing calculation.</li> </ul>

#### **Additional Risk Control Measures**

- Detailed Construction Hazard Identification Risk Assessment study will be done and accordingly safety manual will be prepared.
- First aid facility will be provided.
- 24 hrs Ambulance facilities will be provided.
- Safety Gate meeting will be conducted.
- Authorized contractor will be selected.
- Safety officer will be appointed.
- Training to the workers will be provided.
- Top to bottom safety culture will be developed.
- Safety slogan and instruction will be pasted at appropriate location.
- Emergency control Numbers will be provided inside the project site at various locations.
- All safety instruction will also be provided to all contractors.

#### **Risk during Operational Phase**

Activities requiring assessment of risk due to occurrence of most probable instances of hazard and accident are both onsite and off-site.

##### **On-site**

- Exposure to fugitive dust, noise, and other emissions.
- Housekeeping practices requiring contact with solid and liquid wastes.
- Emission/spillage etc. from storage and handling.

- Unsafe condition and unsafe act.

#### **Off-site**

- Exposure to pollutants released from offsite/ storage/related activities
- Contamination due to accidental releases or normal release in combination with natural hazard
- Deposition of toxic pollutants in vegetation / other sinks and possible sudden releases due to accidental occurrences

#### **Risk Analysis Methodologies**

Risk assessment often requires the synthesis of risk profiles, which represent the probability distribution of total annual loss due to a certain set of events or activities. These assessments usually involve estimation of losses for several sub-classifications of the overall process and synthesis of the results into an aggregate risk profile. Hazard Identification and Risk Assessment study was conducted for proposed project.

#### **Hazard Identification and Risk Assessment (HIRA)**

There are three steps used to manage health and safety at work:

1. Spot the Hazard (Hazard Identification)
2. Assess the Risk (Risk Assessment)
3. Make the Changes (Risk Control)

#### ***Spot the Hazard***

A hazard is anything that could hurt you or someone else.

Examples of workplace hazards include:

- Frayed electrical cords (could result in electrical shock);
- Boxes stacked precariously (they could fall on someone);
- Noisy machinery (could result in damage to your hearing).

#### ***Assess the Risk***

Assessing the risk means working out how likely it is that a hazard will harm someone and how serious the harm could be.

For example:

- Ask your supervisor for instructions and training before using equipment;
- Ask for help moving or lifting heavy objects;
- Tell your supervisor if you think a work practice could be dangerous.

### ***Make the Changes***

The best way to fix a hazard is to get rid of it altogether. This is not always possible, but your employer should try to make hazards less dangerous by looking at the following options (in order from most effective to least effective):

- **Elimination** - Sometimes hazards - equipment, substances or work practices - can be avoided entirely. (e.g. Clean high windows from the ground with an extendable pole cleaner, rather than by climbing a ladder and risking a fall.)
- **Substitution** - Sometimes a less hazardous thing, substance or work practice can be used. (e.g. Use a non-toxic glue instead of a toxic glue.)
- **Isolation** - Separate the hazard from people, by marking the hazardous area, fitting screens or putting up safety barriers. (e.g. Welding screens can be used to isolate welding operations from other workers. Barriers and/or boundary lines can be used to separate areas where forklifts operate near pedestrians in the workplace.)
- **Safeguards** - Safeguards can be added by modifying tools or equipment, or fitting guards to machinery. These must never be removed or disabled by workers using the equipment.
- **Instructing workers in the safest way to do something** - This means developing and enforcing safe work procedures. Students on work experience must be given information and instruction and must follow agreed procedures to ensure their safety.
- **Using personal protective equipment and clothing (PPE)** - If risks remain after the options have been tried, it may be necessary to use equipment such as safety glasses, gloves, helmets and ear muffs. PPE can protect you from hazards associated with jobs such as handling chemicals or working in a noisy environment.

Sometimes, it will require more than one of the risk control measures above to effectively reduce exposure to hazards.

**Risk Classification Table: Based on Likelihood/Controls Rating x Severity Rating**

Almost certain	5	5	10	15	20	25
Likely	4	4	8	12	16	20
Possible	3	3	6	9	12	15
Unlikely	2	2	4	6	8	10
Rare	1	1	2	3	4	5
<b>Likelihood / Control Rating</b>		1	2	3	4	5
		<b>Severity Rating</b>				

The definition of risk level and acceptance criteria is given below:

	<b>Risk level</b>	<b>Category</b>	<b>Acceptability on necessary action and timescale</b>
L	1 – 3	Low	No additional controls are required unless they can be

			implemented at very low cost (in terms of time, money and efforts), actions to further reduce these risks are assigned low priority. Arrangements should be made to ensure that the controls are maintained.
Moderate RISK	4 – 8	Medium	Consideration should be given as to whether the risks can be lowered, but the costs of additional risk reduction measures should be taken into account. The risk reduction measures should be implemented within a defined time period. Arrangement should be made to ensure that the controls are maintained, particularly if the risk levels are associated with extremely harmful consequences and very harmful consequences.
HIGH RISK	09 – 25	High	Substantial efforts should be made to reduce the risk. Risk reduction measures should be implemented urgently within a defined time period and it might be necessary to consider suspending or restricting the activity, or to apply interim risk controls or maintained, controls. Arrangements should be made to ensure that the controls are maintained, particularly if the risk levels are associated with extremely harmful consequences and very harmful consequences.

#### **Review of HIRA Study**

- At least once in a year;
- Amendments / addition in legal requirements;
- Change in process or products handled;
- Internal and external audit results, including Specialized / Third Party Audits;
- Occurrence of accident, emergency;
- While initiating any corrective and preventive action;
- While purchasing and erecting any new equipment / machinery / building.

#### **POTENTIAL RISK AREA ASSESSMENT IN STEEL PLANT**

The potential risk area inside the plant is given in **Table 2**.

**Table 2: Hazard Identification and Risk Assessment (HIRA) and Control Measure**

<b>Block/Area</b>	<b>Hazards Identification</b>	<b>Associated Risk</b>	<b>Rating</b>	<b>Control</b>
Storage Area of LDO/HFO	Fire	<ul style="list-style-type: none"> <li>• Loss of Life</li> <li>• Injury</li> <li>• Property Loss</li> <li>• Health Problem to the workers</li> </ul>	High (20)	<ul style="list-style-type: none"> <li>• Dedicated storage area provided for storage of Fuel.</li> <li>• Fire Alarm System Provided.</li> <li>• Adequate capacity fire extinguisher (2 nos Foam type and 2 NOC ABC type) will be provided.</li> </ul>
Production area Induction Furnace Area, CCM and Rolling mill	Heat and current Fall hazard	<ul style="list-style-type: none"> <li>• Loss of Life</li> <li>• Injury</li> <li>• Health Problem to the workers</li> </ul>	High (20)	<ul style="list-style-type: none"> <li>• Only authorized persons with adequate PPEs will permit to the area.</li> <li>• Safety sign board will be provided.</li> <li>• Adequate fire protection system will be developed.</li> <li>• Good Housekeeping practices will be done.</li> <li>• Safety Sign board will be provided</li> </ul>
Raw Material Storage Area)	Material may Fall down if proper stacking and height not maintained	<ul style="list-style-type: none"> <li>• Injury</li> <li>• Property Loss</li> </ul>	Moderate Risk (8)	<ul style="list-style-type: none"> <li>• Proper height not more than 5-m will be maintained for stacking of the Raw Material.</li> <li>• Safety fencing will be provided.</li> <li>• Authorizes and trained persons will perform the job in particular area.</li> <li>• Use of PPEs will be strictly followed.</li> <li>• Safety Sign board will be provided</li> </ul>
Finished Goods	Material may Fall down if proper stacking and height not maintained	<ul style="list-style-type: none"> <li>• Injury</li> <li>• Property Loss</li> </ul>	High (12)	<ul style="list-style-type: none"> <li>• SOP related to handling the Finished good will be adopted</li> <li>• Proper height not more than 4-m will be maintained for stacking of the Material</li> <li>• Safety fencing will be provided.</li> </ul>



				<ul style="list-style-type: none"> <li>• Authorizes and trained persons will perform the job in particular area.</li> <li>• Use of PPEs will be strictly followed</li> <li>• Safety Sign board will be provided</li> </ul>
Transformers/Switch Yard	Electric Current and Fire	<ul style="list-style-type: none"> <li>• Property Loss</li> <li>• Health Problem to the workers due to Fire</li> </ul>	Moderate (8)	<ul style="list-style-type: none"> <li>• Safety Fencing will be provided to control the direct contact of workers.</li> <li>• Only authorized persons with adequate PPEs will permit to access the area.</li> <li>• Adequate fire protection system will be developed.</li> <li>• Good Housekeeping practices will be done.</li> <li>• Safety Sign board will be provided</li> </ul>
Road Area	Accident may happen	<ul style="list-style-type: none"> <li>• Property Loss</li> <li>• Injury</li> </ul>	High (12)	<ul style="list-style-type: none"> <li>• Vehicle Speed (not more than 20 km/hr) will be maintained inside the plant.</li> <li>• Speed breakers will be provided.</li> <li>• Drink and drive will be strictly prohibited.</li> <li>• Sufficient parking area will be provided.</li> <li>• Proper Maintenance of the Road will be done</li> <li>• Safety Sign board will be provided</li> </ul>

In addition to above control measures following safety measures will be taken:

1. Six monthly third party safety audit will be conducted and all findings will be corrected strictly;
2. EHS cell will be provided;
3. PPEs record will be maintained;
4. Work permit system will be strictly followed;
5. Timely Hazard Identification and Risk Assessment (HIRA) study will be conducted;
6. Proper maintenance of fire hydrant system will be done;
7. Safety trainings will be conducted;
8. Periodically safety mock drill will be conducted and
9. Safety sign board in dedicated area will be provided (related to associate Hazard and Risk)