

RISK ASSESSMENT

Human health and Environmental risk from developmental activities is mainly due to occurrence of some accident consisting of an event or sequence of events explosion, fire and toxic hazards. Risk analysis provides a numerical measure of the risk that a particular facility poses to the public. It begins with the identification of probable hazardous events at an operational area and categorization as per the predetermined criteria. The consequences of major events or accidents are calculated for different combinations of weather conditions to stimulate worst possible scenario. These predictions of consequences are combined to provide numerical measures of the risk for the entire facility. Risk assessment should be done on the basis of past accident analysis at similar projects, previous judgments and expertise in the field of risk analysis especially in accident analysis.

Mining and allied activities are associated with potential hazards to employees as well as the public. A worker in a mine should be able to work under conditions, which are adequately safe and healthy. At the same time the environmental conditions should be such as not to impair his working efficiency. This is possible only when there is adequate safety at workplace. Hence safety is one of the most essential aspects of the industrial activities.

Objective of Risk Assessment

- Identifying hazardous activities
- Assessment of risk level and severity in different operations
- Identification of control measures
- Setting monitoring process
- Reduce the impact of mishaps of all kinds
- Reduce the inherent potential for major accidents

The possible risks in the case of mining projects are erosion, inundation/floods, and accidents due to vehicular movement, drilling & blasting (occasional) and accidents during mineral loading and transporting etc. Mining and allied activities are associated with several potential hazards to both the employees and the public at large.

1.1.1 Risk Management

The following precautionary measures shall be taken to prevent any accident

- Elimination of the source of hazard
- Substitution of hazardous process and materials by those which are less hazardous
- Geographical/ physical isolation of hazards from vulnerable communities
- Use of engineering controls to reduce the health risk
- Adoption of safe working practices such as regular equipment maintenance
- Use of Personal Protective Equipment should be mandatory.
- Active edge of opencast workings will be kept properly fenced.
- Regular dressing of bench sides to ensure safety of workers employed within 5m of working face.
- Drafting and implementation of preventive maintenance schedule for various kinds of machinery deployed in opencast workings.
- Provision of maintenance of properly laid haul roads with parapet wall fencing or guards and road signs at strategic points.
- Precautions against danger while traversing dumpers, excavators etc. by installing audio-visual alarms and appointment of spotters.
- Transportation of ROM within mine workings by vehicles under the direction, supervision and control of Mine Management only.
- Proper maintenance of vehicles and weekly examination by an engineer and daily examination by a competent person.
- Entry of any unauthorized person into mine will be completely prohibited.
- Training and retraining (at specified interval) of the machinery operators.
- Adequate maintenance of electrical equipment.
- Adequate illumination after daylight.

1.1.2 Hazard Identification

It is a mining project which may have the following types of hazards associated with it.

- **Natural Hazards**
 - Earthquake
 - Flooding – Heavy Rainfall/ Water Bodies
- **Man-Made Hazards**
 - Bench Slope Failure
 - Vehicles and Machinery
 - Loading and Excavation of Mineral
 - Drilling and Blasting
 - Fugitive Emissions from Mining Operations

1.1.3 Assessment of Risks involved during Mining and Mitigation Measures:

Factors of risks involved due to human induced activities in connection with mining operations are as under:

1. Floods

Risk Involved:

There is always a risk of floods due to flooding of Auranga river and in heavy rainfall. Since this river is at a distance of 2.2 km from the mine site and the elevation of river is about 30m lower than the elevation of mining area, hence it is highly unlikely that the flooding from the river will have potential flooding impact to mining site.

Flood from the canal which is flowing adjacent to the lease in the eastern direction is also unlikely as elevation of canal is also lower than the elevation of lease area. Hence, there are very less chances of the mine site being get flooded.

2. Open cast Bench slope failure

Risk Involved:

Reasons for failure are -

- Inadequate nos. of competent persons for carrying out statutory inspections.
- Lack of supervision.
- Failure to make and keep the quarry sides secure by proper benching, sloping and keeping benches of adequate height and width.
- Undercutting so as to cause dangerous covering.

3. Vehicular Movement

Risk Involved:

- Possibilities of road accidents are possible due to rash driving/brake failure/lack of visibility.
- Possibility of overloading may injure the passer-by public.
- Vehicles moving in a steep gradient or on benches of inadequate width.
- Accidents are common due to reversing of vehicles.

4. Mineral Loading, unloading and Transportation/Use of machinery:**Risk Involved:**

- Use of substandard equipment.
- Accident due to generation of fly rock.
- Attempt to clean moving parts of machinery.
- Non provision or removal of guards for moving parts of machinery.

5. Drilling and blasting:**Risk Involved:**

The mining will be done with "other than fully mechanized method" without blasting. In place of blasting with explosives, crackamite will be used for dislodging of rocks when necessary. Crackamite is soundless and non-explosive and safe demolition agent causing no generation of dust or gases. Thus there is no risk associated with use of crackamite.

There shall be limited drilling involved during mining as the mining will be carried out in the existing quarry. Drilling may cause accidents and generates dust.

Vulnerability Analysis

A vulnerability assessment was performed for the hazards associated with the project.

S.no	HAZARD IDENTIFICATION	Severity (1-5)	Likelihood (1-5)	Severity x Likelihood (1-25) (Hazards scoring 1-9 are less serious hazards & 9-25 are very serious hazards & require risk assessment)	Proposed General Mitigation Measure/ Control
	Natural hazard				
1	Flood	3	1	3	<ul style="list-style-type: none"> Limited Mining will be done during rainy season. Pre warning signs on possible heavy rains or floods or cyclones from the meteorological department will be followed. Hence during any such case the project site will be evacuated. Or if possible the excavated site will be fenced. To prevent inadvertent entry of people near the excavated pits, long poles will be grouted as a sign of excavated site. Warning signs in local language will be erected at the site to avoid any mishappening. Nearby villagers will be informed.
	Man-made hazards				
2	Opencast bench Slope Failure	1	1	1	<ul style="list-style-type: none"> The bench height will be maintained at 3m, overall pit slope will be kept at 45°. Hence, it is highly unlikely that any slope failure will take place in this mine. However, slope failure study will be conducted through an accredited agency and an ongoing assessment of the stability of these slopes will be regularly done. This assessment depends on good geological, geotechnical and groundwater models as well as an understanding of the risks and economic consequences of slope instability. A good open slope design is one that integrates all of these factors to produce a balanced compromise between safeties on the one hand, and operational and economic efficiency on the other. There shall be adequate supervising staff and mining operation will be done under strict supervision of the Mining Engineers and Asst. Mining Engineer to avoid any mishap. For determining factor of safety, the bench slopes will be monitored regularly by sensitive instruments

					<p>at precise level at regular intervals to check for any possible ground movement.</p> <ul style="list-style-type: none"> • Stability of benches and slope shall be ensured by full compliance of the mine plan duly approved by IBM.
3	Vehicular Movement	4	4	16	<ul style="list-style-type: none"> • All transportation within the mining lease working shall be carried out directly under the supervision and control of the management. • The vehicles will be maintained in good condition and checked thoroughly at least once a month by the competent person authorized for the purpose by the management. • Road signs will be provided at each and every turning point up to the main road (wherever required). • To avoid danger while reversing the equipment's/ vehicles especially at the working place/loading points, stopper shall be posted to properly guide reversing/spotting operating, otherwise no person shall be there within 10m radius of machine. • Reverse horns will be fitted in all vehicles. • The maximum permissible speed limit shall be ensured. • Overloading of material will be avoided. • A statutory provision of the fences, constant education, training etc. will go a long way in reducing the incidents of such accidents. • Edge protection will be done to prevent inadvertent movement. • Visibility defects can be eliminated by the use of visibility aids such as closed circuit television and suitable mirrors.
4	Fugitive Emissions during mine operations such as excavation and loading.	2	5	10	<ul style="list-style-type: none"> • Regular sprinkling shall be done with operations generating dust emission. • Dumpers shall be covered with tarpaulin during transportation of material and waste. • Dust masks shall be provided for operations involving high fugitive emissions or when required.
5	Mineral Loading and Excavation/ Machinery Operation/Slip and Trip of Workers in Working Areas	4	4	16	<ul style="list-style-type: none"> • Regular safety audit shall be carried out. • Only authorized personnel will be allowed in the operation area. • Vocational training shall be given to all operators and workers of the mine. Mining operations shall be carried out under proper supervision.

					<ul style="list-style-type: none"> • All the trucks loading and operating machines will have horns. • The mineral will be loaded in trucks mechanically i.e. by JCB during mining. There is least possibility of injury to the person during loading operation at mine. • Complete mining operation will be carried out under the Management and control of experienced and qualified Mines Manager. • During heavy rainfall the mining activities will be closed. • All persons in supervisory capacity will be provided with proper communication facilities. • Competent persons will be provided first aid kits which they will always carry. • Mobile Fencing shall be installed during operation at the bench. • Signage shall be installed for all movement areas of machines and everyone on site will be made to wear PPE in these areas. • All machines and vehicles shall be maintained by the maintenance incharge.
6	Drilling	4	3	12	<ul style="list-style-type: none"> • Training shall be given for proper drilling operation • Proper PPE shall be used for drilling operation • Signage and restricted entry shall be done in areas of drilling operation

1.2 DISASTER MANAGEMENT PLAN

Safety of mine and the employees is taken care of by the mining rules & regulations as per Metalliferous mines regulations 1961, which are well defined with laid down procedure for safety, which when scrupulously followed safety is ensured not only to manpower but also to machines & working environment. Disaster Management Plans are prepared as proactive measures which help reduce effect of the accident/disaster and enable quicker recovery.

Plans for Disaster Management:

1.2.1 Onsite emergency planning:

An onsite emergency is caused by an accident or hazard that takes place within the plan area and the effects are confined to the plant area.

The onsite emergency plan consists of following key elements:

- Planning as per hazard analysis
- Preventive measures
- Emergency response procedure
- Recovery procedure

On Site plan shall be in place which includes the following:

- a. Regular safety audit/inspection
- b. Incident Response team and role and responsibility of each member
- c. Procedures for taking care of incidents/emergencies
- d. Mock drills
- e. Assembly point
- f. Communication system/arrangement with administrative and regulatory agencies, media and public etc.
- g. Siren for declaring/closing emergency.
- h. Regular training on first aid and evacuation etc.

Flood

- A training plan will be prepared for mine workers to cope up with the disaster. A mock drill will be carried out before the start of the rainy season so that at the time of disaster workers do not panic and can do pre assigned jobs regarding safeguard of themselves and others.
- Limited mining will be done during rainy season.
- The meteorological department gives pre warning on possible heavy rains or floods or cyclones. Hence during any such case the project site will be evacuated or if possible the excavated site will be fenced.

- To prevent inadvertent entry of people near the excavated pits, long poles will be grouted as a sign of excavated site.
- There will be warning signs in local language will be erected at the site to avoid any mishappening. Nearby villagers will be informed.

Waste Dump Management

The OB and other waste generated shall be dumped only within the dumping yard located in the lease area. The dump is at south- western side of the lease area. Parapet wall along with garland drain along with settling pond is constructed at the toe of the dump and the dump will be terraced properly.

Fire Management

There shall be provision of mobile fire extinguishers at the mine office. There will also be buckets for sprinkling sand if there is a fire outbreak as water is not readily available at the site.

Explosive Handling

No blasting with explosives will be done; instead crackamite will be used for dislodging of rocks.

Training

Following training shall be provided to the workers from time to time:

- Safety Education & Awareness
- Holding annual safety weeks
- Imparting basic and refresher training to new and old employees respectively.

Communication

Supervisor will be provided with wireless/mobile phones to communicate in case of any abnormality.

1.2.2 Offsite emergency planning

Offsite emergency plan defines the various steps to tackle any offsite emergencies which may affect surrounding areas of the project has to be prepared after due final discussion with local panchayat and revenue officials

Offsite emergency planning mainly consists of –

- a. Contact details of fire brigade, local police, hospitals, local district administration, factory inspector, state pollution control board, state electricity board etc.
- b. Demographic details and topography map of the surrounding area.
- c. Communication system/arrangement with above mentioned agencies, media and public.

Communication

The telephone numbers and addresses of adjoining mines, rescue station, police station, fire service station, local hospital, electricity supply agency and standing consultative committee members are also maintained for any emergency requirement.

Disaster Management Team

A standing consultative committee will be formed under the head of mines manager. The members consist of safety officer/medical officer/Asst. manager/ public relation officer/ Foreman/ and environmental engineer.

Roles and responsibilities of the team shall be-

- Any abnormality shall be reported to the Top management.
- The management shall make cordial relations with the local authorities, hospitals etc. to help them during crisis.
- There will be communication facilities provided by the management at the mining site for better response time.
- A doctor and supporting staff will be there to provide first aid facilities to the workers in case of any mishap.
- Provision of Ambulance at the site with first aid facilities.