

RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN

MAHULSUKHA IRON AND MANGANESE ORE MINES

The mining activities involve certain types of hazards, during operation, which can disrupt normal activities abruptly and lead to disaster like fires, inundation, failure of machinery, explosion, slope failure etc. The impending dangers or risks which need be investigated addressed, disaster management plan formulated with an aim to taking precautionary steps to avert disaster and also to take such action after the disaster which limits the damage to the minimum.

OBJECTIVES

The objectives of environmental risk assessment are governed by the following, which excludes natural calamities:

- a) To identify the potentially hazardous areas so that necessary design safety measures can be adopted to minimize the probability of accidental events.
- b) To identify the potential areas of environmental disaster which can be prevented by proper design of the installations and its controlled operation?
- c) To manage the emergency situation or a disastrous event, if any, from the mining operation.

The major hazards related to the mining activities are as follows:

- Open cast bench slope failure
- Accident due to fall of quarry sides
- Accident due to machineries
- Accident due to explosives
- Accident due to loading and unloading
- Accident due to transportation of ore and waste

ENVIRONMENTAL RISK EVALUATION

From environmental hazards point of view for the mining activities and processing of ore in various point of work the relative risk potential analysis is made on the following three factors:

- Likelihood of occurrence
- Likelihood of detection
- Severity of consequence

Each of these factors is graded and compiled to determine the risk potential. The factors governing the determination of relative risk potentials are presented in the **table below**.

Determination of Risk Potential

A		B		C	
Likelihood of occurrence		Likelihood of detection		Severity of consequence	
Criteria	Rank	Criteria	Rank	Criteria	Rank
Very High	5	Very High	1	None	2
High	4	High	2	Minor	4
Moderate	3	Moderate	3	Low	6
Low	2	Low	4	Moderate	8
Very Low	1	Very Low	5	High	10

Risk Potential (Rp) = (A + B) x C

Based on the above stated criteria for assessing the risk, each probable event has been evaluated by addressing several questions on the probability of event occurrence in view of the in-built design features detection response, operational practice and its likely consequence.

In order to take care of above hazards/disasters, the following will be strictly followed:

- Working of mines as per approved plans.
- Safe blasting practice as per the explosive rule.
- Regular maintenance and testing of all mining equipment as per manufacturer's guidelines.
- Provision of adequate capacity pumps for pumping out water from the mining pit with standby arrangements.
- Checking and regular maintenance of garland drains and earthen bunds.
- Entry of unauthorized persons will be prohibited.
- Periodic checking of worthiness of fire fighting and first aid provision in the mining area.
- Training and refresher courses for all the employees.
- Cleaning of mining faces regularly.
- As a part of disaster management plan, a rescue team will be formed by imparting specialized training to select mining staff.

RISK ASSOCIATED WITH THE MINING ACTIVITIES AND MITIGATION

The major risk associated with the project is as below:

Failure of slope in the pit:

In order to avoid risk due to open cast slope failure, slope stability estimation have been made for the existing quarries after determining various physical parameters of the ground mass like; uniaxial compressive strength, triaxial compressive strength, cohesion, angle of friction, specific gravity of the rock, water pressure etc. Besides, all the discontinuities have been plotted in stereo-plots (Net), which indicates that there is no chance of any planer failure or wedge failure, even than factor of safety has been determined against overall slope failure as well as against individual bench slope by circular failure, planer failure and wedge failure. Besides determining factor of safety, the slopes are monitored at regular intervals to check for any possible failure. The well-developed drainage system over the lease area ensures that storm water does not accumulate in the lease area and therefore hydrostatic pressure remains at a low level. For future working also similar measurement and inspection shall be carried out. The mine has been designed based on the above consideration with sufficient safety margin to eliminate any chance of slope failure in the pit.

Failure of slope of external dump:

The slopes of external dump have been initially planned at the angle of repose of the dump material. However, as the edges attend final position, the slopes will be terraced and proper vegetation will be laid which will cause lowering of slopes as well as binding of the soil, preventing any slope failure. The angle of repose of the dump will be 37° and overall slope of the dump will be 27° . Dump slope will be provided with the garland drain and retaining wall.

Fly rock fragment & vibration due to blasting operation:

Trial blasting has been carried out at the field empirical equation based on which the charge for delay shall be regulated to protect the nearby structures. All the precaution related to control of fly rocks (are / will be) taken during the blasting operations. Safety zone of 500 meters as per statutes is being maintained. Proper SOP for stemming, charging and blasting will be strictly followed.

Drilling

- Drilling will be carried out only by trained driller.
- Drilling equipment will be properly checked before operation
- Periodical preventive maintenance and replacement of accessories in the compressor and drill equipment.
- All drills shall be provided with wet drilling arrangement
- Operator shall regularly use all the personal protective equipment.

Surface fire:

Spillage of HSD and resultant fire constitutes a potential risk. The quantity of oil, which can spill is not much more and can be easily controlled. Sufficient numbers of potable fire extinguishers have been provided at strategic location to take care of any eventually.

There are risks of fire at the electrical sub-station and transformers. Dry and foam type potable fire extinguisher are available at the electrical sub-station and control room. In case of any electrical fire, the personnel on duty shall shutdown the electrical fire and inform the shift-in-charge. Personnel trained in dealing with electrical fire will be summoned. The fire area will be cordoned off till the fire is fully extinguished and remain so until all wreckage and debris is cleared away. After effecting necessary repairs the power may be restored. The clearance for restoration of power shall be given only by the shift- in-charge.

As soon as any fire reported the shift-in-charge shall assume the function of disaster controller. In case of serious fire and depending on the gravity of the situation, the Mines Manager may be summoned to assume charge. Personnel trained in dealing with fires will be summoned. Meanwhile the hospital will be informed to handle the casualties. The fire area will be cordoned off till the fire is fully extinguished and remain so until all wreckage and debris is cleared away.

Possible danger due to storage of explosive:

There is no proposal for storage of explosive within the lease area. The blasting will be outsourced to the authorized agencies. Agreement has been made for carrying out blasting by the thirdparty agency. Copy of the agreement attached **Annexure 25**. Blasting will be carried out twice in a week with prior information of the worker and with all the precautionary measures.

Transportation of Ore and waste and Dumping

- The internal haul roads will be properly maintained.
- The trucks and tippers will be operated only by trained drivers and before operation the maintenance check for the vehicle will be carried out.
- Avoiding overloading of the trucks and dumpers.
- No vehicle will leave unattended within the mines.

DISASTER MANAGEMENT:

A disaster is a catastrophic situation whereby suddenly, people are plunged into helplessness and suffering and, as a result, need protection, clothing, shelter, medical and social care and other necessities of life.

Objectives of Disaster management Plan (DMP)

The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities. For effective implementation of the Disaster Management Plan, it should be widely circulated and personnel training through rehearsals / drills.

The Disaster Management Plan should reflect the probable consequential severalties of the undesired event due to deteriorating conditions or through 'Knock on' effects. Further the management should be able to demonstrate that their assessment of the consequences uses good supporting evidence and is based on currently available and reliable information, incident data from internal and external sources and if necessary, the reports of the outside agencies.

To tackle the consequences of a major emergency inside the mines or immediate vicinity of the mines, a Disaster Management Plan has to be formulated and this planned emergency document is called "Disaster Management Plan".

The objective of the Industrial Disaster Management Plan is to make use of the combined resources of the plant and the outside services to achieve the following:

- Effect the rescue and medical treatment of casualties.
- To Safeguard other people;
- Minimize damage to property and the environment;
- Initially contain and ultimately bring the incident under control;
- Provide authoritative information to the news media;
- Secure the safe rehabilitation of affected area;
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the Emergency.

In effect, it is to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy.

Emergency plan:

- 1) On realizing anything serious that may happen anywhere in the mine immediate action to inform nearest mining official will be taken.
- 2) On being informed about the emergency it will be verified for the correctness of information and telephone in particular to the Manager and other mining officials of the mine and managers of adjoining mine.

- 3) On receiving information of emergency situation intimation will be sent to the consultative committee which is already formed. Shift in-charge will ensure that all the materials and transport system to deal with emergency situation is alerted.
- 4) First aid facilities will be readily available.

Responsibility has been given to following officers of the mines for Emergency preparedness plan.

Responsibility for Emergency Preparedness

Sl. No.	Designation	Address	Responsibility
1	Mines Manager	Mahulsukha Iron and Manganese Mine At/ PO- Koira Dist- Sundargarh	Disaster control, sounding the alarm at danger / accident and information to the Lessee regarding the situation.
2	Assistant Manager		-do-
3	Foreman		Labour management & mob control. Information to the security personnel to evacuate all the persons from the area in case fire or any disaster except the fire brigade personnel.
4	Mate		-do-

Care and maintenance

❖ During temporary discontinuance:

An emergency plan for the situation of temporary discontinuance due to court order or due to statutory requirements or any other unforeseen circumstances may indicate measures of care, maintenance and monitoring of status of discontinued mining operations expected to re-open in near future.

Lease area is planned to operate for iron ore continuously over a period of 32 years till date. However, during the course of mining, there may be temporary discontinuance due to unforeseen causes such as:

- Court order
- Natural Calamities
- Statutory Requirements

- Any other unforeseen circumstances
- Accidents in the Mine
- Local issues

EMERGENCE PLAN NECESSARY TO RE-OPEN THE MINE:

- Intimation to authorities concerned (IBM, DGMS, Directorate of Mines, Circle Mining Office etc.) in the prescribed form for temporary discontinuance.
- Explanation to the local community regarding the cause of temporary discontinuance and possibility of re-opening of the mine in future.
- Listing and proper storing of machines / equipment / vehicles, assets and documents.
- Tightening of the security for proper watch and ward.
- Monitoring of status of discontinued mining operation in respect of bench height, width, individual bench slope angle, overall quarry slope angle, overhang, undercut, misfire, noise levels or any other parameters whose levels either in form of higher side or lower side is dangerous for further mine working.
- Preparation of plan & sections of discontinued mining operation.
- Projection of benches in plan & sections which is safe for further working.
- Formation of safe benches as per plan & sections.
- Management of misfire, fly rock movement, maintenance of machinery etc which is risk free and not dangerous for further working.
- Intimation to the concerned authorities for re-opening once the mine is risk free.