

RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN

Coal mines have dangers or risk like explosion, fires, inundation, failure of machinery, which need be investigated addressed and it is important to mitigate them. Disaster management formulated with an aim of taking precautionary steps to avert disaster and also to take such action after the disaster which limits the damage to the minimum. Application of Information Technology will also lead to mechanized mining for improving the precision, safety and overall yield from mining.

Inundation

Inundation is the most frequently occurring disaster in mines. It may be caused by direct rainfall, seepage from the backfilled areas or flooding of neighbouring drainage systems. It may cause drowning of machineries, collapsing of mines benches, contamination of exposed coals, damage to roads and ramps, etc.

However, in the proposed mines, the possibility of inundation will be suitably addressed with state of art management system. Sufficient pumping capacity has been provided to preclude the possibility of inundation. Garland drain along periphery of the mine has been proposed to prevent the possibility of rain water ingress from adjoining areas. A separate surface plan with contours showing particularly the low-lying areas has to be prepared and kept in cases of emergency.

Disaster Due to Failure of Pit Slope

Though the present open cast will be operational for 7 years, the proposed mine has a life of 22 years. The maximum quarry depth will be about 145 m. in 7 years.

Slopes of pits (opencast mine) with such depth can cause pit slope failure thus endangering the safety of the mine. The exposed ends of the coal seams and over burden will be left with a safe slope to avoid slope failure and collapse of benches. Similarly, at the end of the mining operation, safe terminal pit slope will be provided to avoid failure.

Disaster Due to Failure of Waste Dump

The dump slopes will be prone to serious erosion during heavy rain and suffer from weathering if left exposed. The surface erosion and chances of skin failure will cause gully formation. The instability of the dump will be caused also by the rise in ground water level, reduction in spoil material strength or adverse geometry thereof. This instability will be counted upon by under-clay strength, material strength and placement method or designed geometry including topography of the foundation surface.

Individual tiers of O.B. dumps would have maximum height of 30 m at an angle of 20°-22°. Overall slope angle of OB dump would be about 28°. Maximum top level of internal dump will be 40 m. Plantation on the OB dump will be done as soon as ultimate height (surface level) is achieved.

Adequate planning has been made for drainage control and slope stabilization in the mine slopes and dumps. Surface run-off will be diverted away from the dump by garland drains at higher contour. The surface run-off from the overburden dump is to be collected in a garland drain provided at the foot of the dump. This foot drain would carry water to a sedimentation tank from where the overflow would be directed into natural drain through controlled discharge outlets.

Disaster Due To Surface Fire/Coal Stockyard Fires

Accidental fires can be caused by various reasons, the main being spontaneous combustion of fire or accidental or open fires. Spontaneous combustion is caused as coal absorbs atmospheric oxygen and

gets heated if exposed for period longer than the incubation period. Accidental or open fires are chemical reactions where a fuel reacts with atmospheric oxygen.

Sufficient fire extinguishers will be installed at selected locations on surface like Electrical Sub-stations, work-shop, Garage, Stores, etc. Besides, sufficient number of water hydrants with sufficient hose pipes will be made available in the surface for fire protection. In order to prevent fire hazards in coal stock piles following types of precaution shall be taken.

- Prevent the happening or presence of any external source of fire in the vicinity of coal stockpiles i.e.
 - Naked fire
 - Electric fire
 - Fuel oil fire
- Restrict the stacking height of the coal to below two meters. Higher height may only be attempted for shorter interval of stacking. The time and height shall be established with respect to spontaneous combustion which helps in restricting to safe parameters.
- In case of electric equipment operating in the vicinity of fuel oil being used or stored in the vicinity of the coal stock piles, appropriate types of fire extinguishers will be provided on or near such equipment in order to extinguish the fire at the very start.
- Appropriate arrangement will be made by inserting pipes in the stack to monitor the internal temperature of coal. In case, temperature is found to shoot above safe limits, the coal from the part of stack shall be immediately dug out and disposed safely.

The appropriate measures for management of fire at coal faces in the mine and coal stockyard would be adopted in the mining phase and there will be no safety hazards for the neighbouring community after the mine closure.

Explosive Handling

The magazines will be designed as per the statutory requirements of the Indian Explosives Act 1884. All the statutory provisions for storage, transportation and use of explosives will be implemented. Vans of approved design would be provided for transportation of explosive. For blasting qualified blasting-in-charges will be recruited.

MEASURES TO AVOID MINE ACCIDENTS

With a view to avoiding mine accidents, the following safety precautions would be adopted:

Safety Equipment's: Safety equipment's such as helmets, mining shoes, hand gloves, goggles will be provided. Safety belts are provided when working at height to prevent against danger from falling

First Aid Stations: First aid stations with adequate medical equipment's will be provided at vulnerable points. Sufficient trained persons will be provided for the same.

Table 1: Suggested Items in First Aid Kit

Sl. No.	Description	Quantity
1	First aid leaflet	1 copy
2	Sterilized finger dressing	10 nos.
3	Sterilized hand or foot dressing	10 nos.
4	Sterilized body or large dressing	6 nos.
5	Sterilized burns dressing-small	4 nos.
6	Sterilized burns dressing-large	2 nos.

Sl. No.	Description	Quantity
7	Sterilized burns dressing-extra large	6 nos.
8	Sterilized cotton wool (25 gm)	2 nos.
9	Cetavolon (28 gm)	2 tubes
10	Eye pads	6 nos.
11	Adhesive plaster	1 spool
12	Assorted roller bandage	6 nos.
13	Triangular bandages	6 nos.
14	Safety pins	6 nos.
15	Scissors, ordinary, 12.7 cms, both sides sharp	1 pair
16	Savlon liquid, 150 ml, or equivalent	2 nos.
17	Cotton wool for padding, 100 gm	2 packets
18	Eye Ointment of sulphacetamide preparation	1 tube
19	Loose woven gauze (28"x8"), compressed pack	1 packet
20	Aspirin, 300 mg (10 tablets)	5 strips
21	Scribbling Pad, 4"x6" with a pencil in a plastic cover	1 nos.
22	Adhesive dressings strips	10 strips
23	Field dressing of modified army pattern	3 nos.
24	Record cards in a plastic cover	1 set
25	Torch, medium size without cells	1 nos.
26	Wooden splints, big	1 Set
28	Wooden splints, big	1 set

Treatment of affected persons

- Injured / Affected persons shall be provided suitable first-aid treatment and sent to company doctor for further treatment depending on injury.
- Patients requiring further treatment shall be sent in ambulances to nearest hospitals. Patients suffering from minor problems shall be discharged and sent home after preliminary treatment.

Post Emergency Activities

Medical checkup: Medical checkup of affected persons if any and suitable medical aid shall be provided.

Collection of Records: Exact information shall be collected regarding cause of Emergency and remedial measures suggested preventing recurrence.

Inquiry: Detailed inquiry shall be carried out to find out cause which will be in the form of fact finding and recommendations made to suitable authority.

Insurance Claims (if any): Insurance claims for damage due to consequences of emergency shall be filed.

Road Accidents: Sufficient arrangements for illumination of roads including haul roads will be provided. Warning placard would be installed at the entry point of the haul road that no pedestrians should enter the haul road. Dumpers and HEMM vehicles are fitted with sound warning while reversing.

Protection against noise: Earplugs will be provided when working near noise generating areas and equipment.

Training: Persons directly responsible for handling emergencies will be given training. However, following types of training is suggested to be imparted to employees: -

- Basic training to new entrants
- Refresher training to old employees

- First aid training

Safety Education & Awareness: To create safety awareness and impart education on safe practices, the following steps are taken: -

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

ON-SITE DISASTER MANAGEMENT PLAN

The On-site and Off-site emergency plans cover personnel employed at the coal mines. The Emergency Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operation in the same order of priorities. The objective of the emergency plan is to make use of the combined resources of the plant and the outside service to achieve the following:

- Reliable and early detection of an emergency and careful planning
- The availability of resources for handling emergencies
- Safeguard the personnel located in the premises
- Minimize damage to property and environment
- Organize rescue and treatment of affected persons
- Initially contain and ultimately bring the incident under control
- Identify any casualties
- Provide authoritative information to the news media
- Secure the safe rehabilitation of affected persons
- The command, co-ordination and response organization structure along with efficient trained personnel
- Regular review and updating of the DMP
- Preserve relevant records and equipment for the subsequent enquiry into the cause and circumstances of emergency.

Action Plan For On-Site Emergency

Identification of Responsibilities: The onsite disaster management plan identifies Chief Incident Controller (General Manager of the Project), Work incident controller (AGM/DGM) and Designated Key Personnel of emergency control centre. The plan also specifies responsibilities of these personnel in case of an emergency and draws an action plan to be followed. Chief incident controller and works incident controller shall be assisted by two support teams as follows:

Support team to Chief Incident Controller {CIC}	<ul style="list-style-type: none"> • Consisting of heads of personnel, Material and Finance Division: to function in consultation with CIC for the following • Contacting statutory authorities. • Arranging for relievers and catering facilities • Giving information to media. • Contacting media centers and nursing homes • Providing all other support, as necessary. • Arranging for urgently required materials through • Cash purchase or whatever means.
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Support team to Work Incident Controller {WIC}	<ul style="list-style-type: none"> Consisting of Sr. Manager (Admn), Sr.Supdt. (Operation), Sr Supdt. (Elect. maintenance), Sr Suptd. (Mech. Maintenance) And any more persons depending upon the need to assist the (WIC) in manning communication and passing Instruction to the team. One steno secretary shall also be available with WIC for recording all information coming In and instruction going out.
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In addition to the support teams mentioned above, there will be a team for each functional area, as described below:

Task Force	<ul style="list-style-type: none"> To identify source of hazard and Try to neutralize/contain it. To isolate remaining plant and keep that in safe condition. To organize safe shutdown of plant, if necessary. To organize all support service like operation of the fire pump, sprinkling system etc.
Maintenance Team	<ul style="list-style-type: none"> Attend to all emergency maintenance jobs on top priority. To take step to contain or reduce the level of hazard created due to disaster. To organize additional facilities as desired.
Fire Fighting Team	<ul style="list-style-type: none"> To rush to fire support and extinguish fire. To seek help from outside fire-fighting agencies. To evacuate persons effected.
Auto base team	<ul style="list-style-type: none"> To make the auto base vehicles ready to proceed for evacuation or other duties, when asked for To send at least one mechanic at the site of incidence where he may help in attending minor defects in ambulance, fire tenders or other vehicles To arrange petrol / diesel supply Make all arrangements regarding transportation.
Communication team	<ul style="list-style-type: none"> To maintain the communication network in working condition To attend urgent repairs in the communication system, if required. To arrange messengers for conveying urgent messages when needed.
Security team	<ul style="list-style-type: none"> To provide two men at all gates. To ban entry of unauthorized persons. To allow the ambulance /evacuation vehicles etc. to go through the gates without normal check.
Administration team	<ul style="list-style-type: none"> To rescue the casualties on priority basis To transport casualties to first aid post, safe place or medical centers To account the personnel. To pass information to the kith and kin of fatal or serious injured persons.
Safety team	<ul style="list-style-type: none"> To arrange required safety equipment To record accidents. To collect and preserve evidences in connection with accidents injuries To guide authorities on all safety related issues.
Medical Team	<ul style="list-style-type: none"> To arrange first aid material / stretchers immediately and reach to site of incidents To arrange for immediate medical attention. To arrange for sending the casualties to various hospitals and nursing homes etc. To ask specific medical assistance from outside including through medical specialist in consultation with CIC / WIC

Monitoring team	<ul style="list-style-type: none"> To measure gas concentration, in case of gas leakage at various places.
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EVALUATION OF FUNCTIONING OF DISASTER PLAN

In order to evaluate the functioning and effectiveness of procedure laid in disaster management plan; regular mock drills should be conducted. The Mock drills should be carried out step by step as stated below.

First Step	Test the effectiveness of communication system.
Second Step	Test the speed of mobilization of the plant emergency team
Third Step	Test the effectiveness of search, rescue and treatment casualties
Fourth step	Test emergency isolation and shut down the remedial measure.
Fifth step	Conduct a full rehearsal of call the actions to be taken.

Here are two types of mock drills recommended in disaster management plan- full Mock drill (to be conducted at least once in every 6 months) and Disaster management efficiency drill (to be conducted at least once in 3 months). The details of these drills presented as follows:

Full Mock Drill: This shall be conducted with plant head as Chairman: Head of O&M as Chairman; head of the Operation, Maintenance, Medical, personnel, CISF, Auto base and materials as members and head of safety as convener and it shall test the following:

Functioning of emergency control centre, very specifically availability of all facilities etc as mentioned in the plan and its functional healthiness.

- To evaluate communication of the Disaster plan to all segments of employees, to familiarize them about their responsibilities in case of any disaster including evaluation of behavior of the employees and other.
- To ensure that all facilities as required under the plan from within or from nearby industries /aid center under mutual assistance scheme or otherwise are available.
- To ensure that the necessities under material assistance scheme is properly documented and the concerned employees are fully aware in this regard.
- To ensure that employees are full aware to fight any emergency like sealing of chlorine leakage, fire fighting other such cause.

Disaster Management Efficacy Drill: This shall be conducted with head of (O&M) as chairman and heads of personnel, Communication, CISF and Medical as Members and Head of safety as convener and it shall test the following:

- All employees will be trained about their responsibilities / duties. They all will be aware about evacuation routes, direction of evacuation of equipment's to be used during evacuation or the method of evacuation.
- All employees will be fully trained to rescue their colleagues, who are effected due to cause of disaster. In case they are unable to rescue their colleagues, they should know to whom they have to inform about such persons.
- All employees will be fully trained in first aid use of desired equipment's including breathing apparatus First Aid box etc. available at the desired location.
- All warning alarms and Public Address system should be functional.

- All telephone lines/ communication systems are provided in control rooms and there is no removal of the facilities (as prescribed) for the control rooms.
- It is very clear amongst the concerned managers who shall call for assistance under mutual aid scheme or the facilities from within.
- It is clear at the mines, who shall declare emergency.
- It is clear at the mines, who shall inform the district authorities, State authorities and corporate center.

The disaster management plan shall be periodically revised based on experiences gained from the mock drill.

OFF-SITE DISASTER MANAGEMENT PLAN

In the proposed mine, the following condition can ordinarily constitute an off-site emergency:

- Major fire involving combustible materials like oil, and other facilities.

Under the Environmental Protection Act, the responsibility of preparation of Off-Site Emergency plan lies with the state government. The Collector/ Deputy Collector are ordinary nominated by State Government to plan Off-Site Emergency Plan.

The District Collector or his nominated representative would be the team leader of planning team, who shall conduct the planning task in a systematic manner. The members of planning team for off-site emergencies are Collector / Deputy Collector, District Authorities in charge of Fire Services and police and members drawn from Medical Services, Factory Inspectorate, Pollution Control Board, Industries and Transport. In addition to these members, there are Co-opted Members also from district authorities concerned, civil defense, publicity department, Municipal Corporation, and non-official such as elected representative (MPs, MLAs, voluntary organization, non- governmental organizations etc).

POST EMERGENCY RELIEF TO THE VICTIMS:

The public liability insurance act, 1991 provides for the owner who has control over handling hazardous substances to pay specified amount of money to the victims as interim relief by taking insurance policy for this purpose. The district collector has definite role in implementation of this act. After proper assessment of the incident, he shall invite applications for relief, conduct an enquiry into the claims and arrange payment of the relief amount to the victims.