

RISK ASSESSMENT & MANAGEMENT

Mining and allied activities are associated with several potential hazards to both the employees and the public at large. 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 in both opencast and underground mines.

Significance of Risk Management (Safety Management System (SMS))

Minimize adverse effects of the risk, to which the workers are exposed in execution of different activities. Risk management involves the entire staff in the realization of safety improvement programme with responsibility and accountability sharing proportionately with the decision making authority.

The Directorate General of Mines Safety issued following Technical Circular to implement SMS:

- a) DGMS. Tech. Cir.13 of 2002 - Safety Management System - A guideline for Implementation.
- b) DGMS. Tech. Cir.8 of 2009 - System Study and Safety Audit for the purpose of eliminating the Risk of Accidents & Dangerous Occurrences.
- c) DGMS (Tech) (S&T) Circular 2 of 2011 - Provision for Audit and Review of SMS.

Safety Management System (SMS)

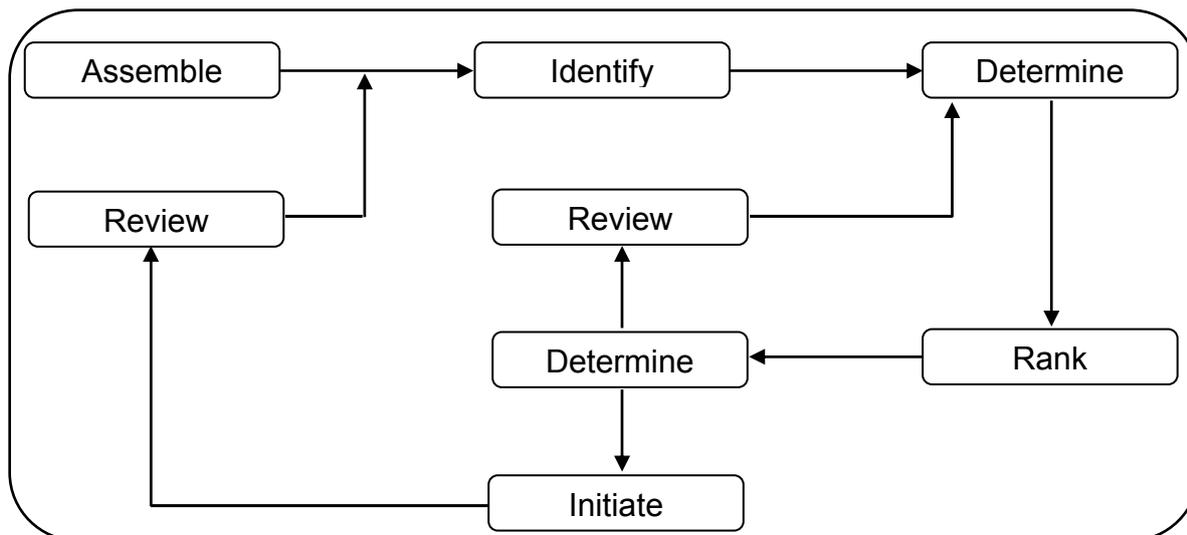
- Identify the hazard.
- Dissect each activity to as smallest node as possible,
- Assess risk by considering the exposure, probability and consequence
- Prioritise and implement control measures
- Find out the residual risk, if any and procedures for handling of situations
- Continual improvement by adopting new methods and procedures

Hence, **Safety Management System** is one of the most essential aspects to operate the mine in safe way.

Risk Assessment Process

Risk Assessment is to be performed on a regular basis. The goal for each risk assessment session is to identify hazards, determine risk rating and controls, and to review the implementation of risk controls from previous risk assessment sessions.

The following workflow diagram illustrates the areas involved in performing a risk assessment session.



Identifying the Hazards

The process of identifying hazards is possibly the most important part of the whole risk assessment process.

The PK OC Project is an amalgamation of the two mines in the Bhadradi Kothagudem district, Telangana State.

Hazard Identification can be done in many ways but the objective is to ensure that all of the possible Hazards are identified.

PK OC Project is an amalgamation of the two mines with Shovel and dumper combinations, the Hazards were identified basing on the previous experience of the technology applied for opencast with the following criteria.

- Design parameters of the proposed mine
- Work process evaluation
- Accidents or occurrences
- Consultation with employees
- Safety statistics
- Significant incident, near miss or accident reports
- Inspection in the mine

The following are the possible hazards identified for the proposed project basing on the Tasks / Activities / Work places involved.

1 Inundation

There is a remote chance of inundation of proposed Prakasham Khani OC Mine workings due to inrush of surface water in the rainy season.

The main precautions that are taken to prevent inundation in Prakasham Khani OC Mine are as follows:

- ❖ Sufficient water garlands are provided to prevent inrush of surface water into the quarry from dump yards and catchments water from surface areas.
- ❖ Construction/strengthening of berms/bunds on surface along quarry boundary is done during every rainy season. Suitable monitoring system is established to take care of any contingencies.

- ❖ Proper drains are cut around the quarry to divert away the water during rainy season, from entering the quarry. The drains will be connected to natural drainage system of the area. Sumps and pumps of adequate capacity are provided within the quarry.
- ❖ The actual working plans of the opencast mine and the old plans of the developed underground mine workings are maintained and checked regularly. The HFL of the nallah, river or tank is marked on the plan.
- ❖ If any faults intersect the drain around the quarry/ drain connecting to natural drainage system and/or loose strata found at the bed of drain around quarry, RCC slabs suitably designed as per the site conditions will be laid in the disturbed areas of drains. Further, geo membrane will also be provided under RCC slab portion to prevent seepage at portions where faults exist.
- ❖ Sumps and pumps of adequate capacity will be provided within the quarry.

Diversion of Gorrepeta Vagu:

- ❖ An ephemeral tributary of Godavari, Gorrepeta Vagu is flowing over the quarry area from South-East Direction to North-West direction. A part of Vagu will be diverted along the boundary of the quarry at western and northern edge of the quarry.
- ❖ The following precautions will be taken up in this regard

As per the Regulation 126 (1) (a) of the CMR, 1957 to divert the seasonal Nallah the following protective measures will be taken:

 - Diversion of the Vagu will be done as per the design approved by the I&CAD Dept of the State Government, TS.
 - All precautionary measures suggested in the approval are being followed in Toto.
 - A bund of +3m will be constructed against the diverted portion of Gorrepeta Vagu to avoid inadvertently entry of water into the quarry area.
 - Continuous monitoring of the flow of water in the Vagu will be done in monsoon and post monsoon season.
 - During heavy rains additional personnel, supervisors and officers will be deployed for monitoring, four stations were established and shall be regularly monitored during rainy season.
 - Before on set of monsoon season de-silting of Vagu & other water courses will be done.
 - The adequacy of embankment will be ascertained from time to time and strengthening will be done if required.
 - Regular monitoring shall be done by recording the ground vibrations. In the both the mines till now PPV values are not more than 10mm/s.
- ❖ Before onset of the monsoon season pre-monsoon audit will be conducted by the Internal Safety Organization of the company to
 - assess the danger of surface inundation
 - assess the adequacy of the existing precautionary measures
 - to suggest mitigative measures
 - One Float Alarm fixed near Gorrepeta vagu at 791.3 RL which is 1.2m below the HFL at that point and monitoring is being done in rainy season by Under Manager and Overman. When water reaches 791 RL guard near float alarm will inform the quarry overman about it, so that he can withdraw all the manpower and machinery to a safe place.

Fires

Fire in coal stock yard may be expected due to spontaneous heating of coal. As the proposed project is mining of virgin coal seam there will not be any fire on coal bench.

2 Slope stability

i. In Pit Slope Stability (OB benches)

The ultimate working depth of the proposed quarry is between 15 m to 210 m. There may be chances for slope failure, where the depth is more.

ii. Overburden dump slope stability

The external overburden dumps were planned to a maximum height of 120 m above ground level with 30 mtrs height decks. No major dump sliding was noticed in SCCL opencast mines where height is 120 m. The voids of de-coaled area will be raised to 120 m above ground level at mine closure stage.

3 Sliding

Sliding of material may possible, whenever the height of OB or coal bench exceeds the digging height of the machine, while excavating Near Fault Plane, during handling fiery material etc.

4 HEMM Movement

The Prakasham Khani OC Mine is an already operating mine, in which total coal extraction & part of OB removal is being done by departmental HEMM. Part of OB removal is being done by outsourcing. Movement of HEMM poses a major risk for safety of persons employed. Measure to Prevent Accidents due to Trucks and Dumpers are as under:

- ❖ All transportation within the mine working is being 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 week by the competent person authorized for the purpose by the Management.
- ❖ Sufficient lighting and road signs will be provided at each and every turning point specially for the guidance of the drivers at the night.
- ❖ To avoid danger to human life while reversing at the embankment and tipping points, these areas will be maintained human free. Human movement in the haul roads will be avoided.
- ❖ All statutory provision of the fences, constant education, training etc. will be arranged to reduce accidents.
- ❖ Drains will be provided on either side to keep the road dry. Sharp curves will be avoided.
- ❖ The haul road width of 30 m has been designed considering space for dozer track, pipes, electric lines, cables.
- ❖ Haul roads will be designed in such a way to have one-way traffic where ever possible. Where one way is not possible there the haul road will be sufficiently widened.
- ❖ Separate haul roads provided for coal and OB transportation.
- ❖ Separate way for light vehicles will be maintained.
- ❖ Traffic rules are framed and strictly implemented in true spirit.
- ❖ Only properly trained workmen will be employed in the mine.
- ❖ Safety gadgets like radium jackets, whistles are provided to all workmen.
- ❖ The safety procedures to be followed by contractor are being incorporated during tendering process itself.

5 Drilling

Accidents occur while transporting, positioning of drill machines and during drilling operations. The following precautions will be taken.

While transporting drill machine, its mast will be lowered, even within the drilling area on inclined plane (High gradients) to avoid toppling of drill machine.

- While positioning drill machine on inclined planes, wedges will be used under jack pads for leveling of the drill machine.
- While changing drill rods, proper Holding of drill rods on drill mast is ensured.
- The drilling crew will be provided with radium jackets.

6 Blasting Operation

Opencast operations involve heavy blasting in overburden and coal. Most of the accidents in blasting occur due to the projectiles, as they may sometimes go even beyond the danger zone, mainly due to overcharging of shot holes or as a result of certain special features of the local ground. Fly rocks, Vibrations, dust and noise problems are common problems associated with blasting operations.

Proper precautions will be taken by way of posting guards, siren etc. at the time of blasting. Men and machinery will be withdrawn to safer place before blasting. Blasting will be done between shift timings. Proper care in storage, transport and handling of explosives will be taken to ensure safety in blasting operations.

7 Electricity

Accidents / Incidents may occur due to switching on power when persons are at work, dragging of cable by hoisted body of dumper / drill where the Transmission lines / cables cross the haul roads.

8 Lighting

There are chances for accidents due to insufficient lighting at work places

9 Health Hazards

Health hazards due to inhalation of air borne dust, while working in dust atmosphere and noxious gases while working near fiery coal in coal yards. Noise levels can create stress, increase workplace accident rates.

The following table illustrates in detail about the control measures and action to be taken for each hazard for elimination or reduction of risk involved.

Identified Hazards	Mechanism	Control	Action
(1)	(2)	(3)	(4)
1. Inundation	A part of the Gorrepeta vagu passes over the proposed quarry area.	The existing drainage network shall be diverted to realign the original tank.	Shift In charge to inspect the surface drainage system weekly to arrest any possibility of water entry to the quarry.
	Catchment Area water during Rains	All around the dumps drains are to be prepared to collect the rain water from the catchments of the dumps. In case of any siltation or damage, the drain may cause water entry into the quarry. De-siltation will be done every year before onset of monsoon and when ever required during monsoon.	Periodical inspection of the drains by competent person is arranged after every rain with a minimum interval of one week. Sufficient capacity pumps shall be maintained by making proper fund allocation for pumping. Manager, Asst Manager, Under Manager should inspect the protective works.

Identified Hazards	Mechanism	Control	Action
		<p>Sufficient height bund shall be maintained all along the edge of the quarry to prevent inadvertent entry of water</p> <p>A berm with dimensions of not less than two metres height and 2 metres width at the top shall be made in trapezium shape all along the edge of each deck to prevent erosion of dumps and gully formation.</p> <p>The terrace shall be kept free of obstructions (OB heaps), sloped in bye and maintained with uniform gradient for free flow of water in order to avoid accumulation of water leading to gully formation and dump slides.</p> <p>Plantation shall be done over and around OB dumps to ensure stability of slopes.</p> <p>Water danger plan will be prepared and maintained.</p>	
2. Drowning of persons in main Sump	Foot valve repairing by pump operators/fitters	Safety jackets, life line to be used.	Repairing mechanism to be done under the supervision of foreman/charge hand
3. Fires	<p>Spontaneous heating in coal stock yard</p> <p>Spontaneous heating in the crushed coal by Surface miner</p>	<p>Water pipeline with sufficient pressure will be laid all along the periphery of the coal stock yard to quench the fire.</p> <p>Coal will be lifted on first dumped first dispatched basis.</p> <p>Sufficient water spraying arrangement will be provided by using Water sprinklers / through pipe lines.</p>	<p>A suitable provision has to be made for this purpose and a separate Fire Fighting Organization with trained personnel shall be maintained for fighting these fires.</p> <p>Separate Fire Fighting crew shall be trained for fighting the fires.</p>
4. Slope Stability	Failure of Pit Slope when the depth is more and intercepted by number of faults	<p>The overall pit slope varies from 70° to 33°. This has been done to ensure safe pit slope for the prevalent strata conditions.</p> <p>For Slope stability, special care will be taken while forming the batter in the east side of the quarry fault zone by pre-split blasting.</p> <p>This may, however, be confirmed through slope stability studies.</p>	<p>The movement of the slope shall be observed by installing movement pillars.</p> <p>Surveyor should ensure frequently.</p>
	Dump Slope Failure	The overall dump slope for spoil has been kept at 25°.	The movement of the slope shall be observed by installing

Identified Hazards	Mechanism	Control	Action
		<p>The dump slope stability be confirmed through studies. To leave safe margin between the dump and quarry. To protect the dump from getting water charged.</p>	<p>movement pillars. A minimum width equal to the height of the dump shall be maintained between the toe of the dump and the line of the excavation. No water shall be allowed to accumulate / stock over any dump top particularly near the edge of the dumps Surveyor should ensure frequently.</p>
5.Sliding	Sliding of OB or coal due to more height of the bench than the digging height of the machine.	<p>a) The height of the benches shall be planned in such a way that they match the digging height of the shovels. b) Not to deploy the shovels where the bench height is more than its digging height. c) No bench shall be allowed to merge with another bench, resulting in increase of bench height. d) Overall pit slope shall not exceed 70⁰</p>	<p>a) Drilling should be done in such a way that the bench height will not be more than the digging height of the shovel. b) The excess height of the blasted material should be reduced to match the digging height of the shovel Further where ever the soft layers at the bottom of the bench may be reduced by dozing to match the digging height of the shovel. c) Progress of any bench towards a top bench should be stopped at a distance of equal to the height of bench. d) Surveyor should ensure frequently</p>
	Sliding of OB / Coal while excavation near fault plane.	<p>a) No bench shall be worked parallel to fault planes. b) Cleaning of top and hade portions of the fault planes must be ensured, when ever the shovel works near fault plane.</p>	<p>a) i. A plan indicating all the faults position running over the different benches should be maintained and same may be indicated in the plan supplied to operation staff and the marking of the same in the field should be ensured always. ii. Benches shall be planned always at right angles or oblique to the fault plane but definitely not parallel to the fault plane. b) While working near fault plane, see that, the reach of bucket is more than the height of fault plane</p>
	Sliding of dump slopes / edges	<p>a) Not to allow excess dump heights or merging of any two dump decks. The height of each deck is limited to 30 m and overall dump height shall not exceed 120 m. Not to allow any Dumpers / Tippers to</p>	<p>i) Top of the dumps up to the edges shall be thoroughly compacted to prevent any possible ingress of rain water and also to provide a gentle slope towards toe drains. i) Individual dump deck height shall be maintained around 30</p>

Identified Hazards	Mechanism	Control	Action
		move over the un consolidated the dump edge / slope	mtrs. Merging of any two dump decks in any case is not allowed. ii)No movement of Dumpers / Tippers is allowed over the edge of unconsolidated dump / dump having excess height. iii) However HEMM can be allowed up to a distance of 3.00 mtrs. from the edge of consolidated dump with the provision of a berm at the edge of the dump as required by law.
	Fall of hot material or ash on men and machinery while excavating fiery material.	a) No hot / fiery material shall be handled with any machine as it is.	a) Thorough quenching of hot / fiery material shall be done before it is handled.
6. HEMM movement	i. Failure of vehicle stability resulting toppling.	i) Ensure placement and movement of HEMM only on the stable and level ground. ii) To provide ideal conditions at Loading, while Hauling and at unloading points for HEMM	a) Level and compact the blasted material before allowing any HEMM to ply over it. b) Not to allow any HEMM movement within a distance of 5 m from the edge of blasted / loose bench. a) Provide stable and level ground at loading point for placement of HEMM. b) Berms shall be provided on both sides of the elevated haul roads as required by law. c) Ensure super elevation at curves of haul roads. d) Arrange level and stable platforms with suitable size of berms as required by law at unloading point with the help of dozer. e) Always ensure a minimum height of 1½ feet safety girder at the crusher unloading point. f) Unloading of material shall be done over the stable dumps at a distance of minimum 3.00 mtrs. from the edge. g) Ensure tyre height berm at the edge of the dump
		iii) Run the HEMM with in permissible speed limits. iv) Using good quality tyres	a) Ensure by surprise checks whether the HEMM is being operated within the speed limits as specified by the Manager. b) Arrange speed locking over HEMM where ever it is possible.

Identified Hazards	Mechanism	Control	Action
			a) Replace worn out tyres in time with good quality tyres. b) Not to use re treated tyres on front sides in any case.
Run over by vehicles / HEMM	i) Persons/ conveyance vehicles to maintain a safe distance on haul roads and 50 mtrs at loading and unloading points from working HEMM. ii) Prevent unauthorised drivers.	a) To develop awareness among employees to maintain a minimum distance of 30 mtrs. on haul roads and 50 mtrs. at loading and unloading points from moving and working HEMM. a) Insist all Operators / drivers to wear identity cards while they are on duty. b) Verify the validity of driver's licensee of operators and drivers before authorisations and identity cards are issued. c) Verify the HEMM operations as per the allotment by surprise checks and also check up the details of drivers / operators and confirm.	a) To ensure no person shall be allowed to enter with in a distance of 30 mtrs of moving vehicles. b) To stop any vehicle / HEMM persons must use whistle / red flags / red light before going near to the machines for any reason. a) Develop awareness among the employees not to board / alight from moving vehicles/ HEMM.
	v) Persons shall not be allowed to take rest under / by the side of parked vehicles / HEMM. Prevent sleeping of persons in mine premises.		a) Develop awareness among all the employees not to take rest under / by the side of parked vehicles / HEMM. b) Educate all the operators / drivers to verify the surroundings including underneath the machine / vehicle for possible presence of any person before starting the same. c) Create awareness among all the employees not to sleep while on duty in mine premises
Sliding of dumpers / tippers / dozers at dump edge.	i) Restrict the deck height to 30 mtrs. only. ii) No HEMM shall be allowed to work over the		a) To ensure that the height of each deck doesn't exceed 30 m. under any circumstances

Identified Hazards	Mechanism	Control	Action
		edge of any unconsolidated dump.	a) Always ensure sufficient size of berm at the edge of the dump as required by law. b) Not to allow any HEMM over the edge of any unconsolidated dump. c) To deploy a spotter for guiding the tippers / dumpers at unloading point on elevated platform.
	Simultaneous operations at loading and un loading points. For this purpose the following are considered as (separate) individual operations. i) Drilling ii)Charging & Blasting iii) Dozing iv) Grading v) Loading vi) Un loading	i) Not to allow more than one operations at the face at a time.	a) To maintain a minimum distance of 50 mtrs. between the places of i) Drilling & Loading ii) Charging & Loading. b) To maintain a minimum distance of 15 mtrs between drilling and charging operations. c) Except as above, no two operations shall be allowed to undergo at a time at one place. d) To maintain a minimum distance of 15 mtrs. between loading tippers / dumpers and dozer at unloading point.
	Crossing 3 way / 4 way junctions.	i) Not to allow traffic in more than one direction at a time at junctions.	a) To engage a signal men at all the junctions. b) To ensure traffic controlling by surprise checks.
	Un authorised riding on HEMM.	i) Not to allow un authorised persons to ride on HEMM ii)To provide sufficient no. of suitable and comfortable conveyance vehicles to all the workmen, available at their reach whenever they want to move.	a) Educate all the employees about the danger involved in riding on HEMM b) Check the unauthorised riding on HEMM by surprise inspections. c) Ensure even, authorised person also travel by sitting in the cabin having pillion. a) Ensure whether sufficient no. of suitable and comfortable conveyance vehicles are made available. b) Ensure vehicle availability at the reach of the persons whenever they are required to move.
	Spillage of boulders from loaded tippers / dumpers	i) Avoid over loading of tippers / dumpers. ii)To control speed of the vehicles. iii) To avoid sharp curves.	a) Educate all the operators not to over load the dumpers / tippers. b) Ensure the loading is up to the brim level of the tippers / dumpers. a) Ensure strict implementation of code of traffic rules. a) Haul roads shall be

Identified Hazards	Mechanism	Control	Action
			formed without sharp curves. Where ever mild curves are inevitable suitable super elevation shall be provided
	Stoppage of HEMM / vehicles on active haul roads due to break-down.	i) Break down equipment from active haul roads must be attended immediately and repair / remove at the earliest possible. ii) To provide protection against break down equipment an active haul roads.	a) To keep emergency steering mechanism in order. So that operator himself can remove the equipment. b) Immediate information to Engineers / Technicians about the break down machine on active haul roads. c) Engineers / Technicians must repair / remove the equipment at the earliest possible. d) Till the equipment is repaired or removed protection against hitting by running equipment shall be provided on both sides by dumping OB heaps. e) To arrange red flags and lights on both traffic sides of the breakdown equipment
7. Drilling	Toppling of drill machine. Mast contact with overhead power transmission line	While transporting drill machine, its mast must be lowered, even within the drilling area on inclined plane (High gradients) to avoid toppling of drill machine and in contact with over head power transmission line. For positioning on inclined planes (High gradients), wedges must be used under jack pads for levelling of the drill machine.	Transportation of drill should be done under the supervision of competent person.
	While changing drill barrels / rods	Ensure proper holding of drill barrels, while loading / unloading (Attachment / Detaching) on the drill mast.	Drill operator should ensure.
	While drilling	Prior to marking of drill holes as per the designed pattern, care shall be taken up to ensure proper blasting All the holes drilled should be pegged to avoid leg in.	Drill operator should ensure.
8. Blasting	While transportation	Transport the explosives and accessories in vehicle approved under explosive rules. Standard Operating Procedures (SOP) should be followed	Transportation of explosive should be done under the supervision of competent person.
	While charging	i) Blasting design and initiation pattern such that	1. Blasting in charge should design the drilling pattern

Identified Hazards	Mechanism	Control	Action
		<p>the maximum charge per delay is within the stipulated range.</p> <p>ii) Wherever possible, the progress of detonating holes, through delay intervals, should progress away from the structures to be protected.</p>	<p>2. The blast parameters will be established during actual mining operations, after conducting field trial blasting considering the local geo-mining conditions.</p>
	While blasting	<p>iii) Stray current from nearby power systems</p> <p>i) Avoid blasting during cloudy days and when the wind is blowing towards structures.</p> <p>ii) All loose debris will be cleared off from the blasting site</p> <p>iii) A free face will always be maintained.</p> <p>iv) In multi row blasting, greater relief will be provided between rows using suitable delay intervals.</p> <p>v) Proper use of different type of relay / delay detonator for proper sequencing of the blast will be used.</p> <p>vi) If required, all the holes will be suitably muffled before blasting to control the fly rock.</p> <p>vii) Standard Operating Procedures (SOP) should be followed</p>	<p>3. Proper earthing of SMS vehicle while charging the holes.</p> <p>Blasting in charge should ensure.</p>
9. Electricity	<p>Switching on power when persons are at work</p> <p>Dragging of cable by hoisted body of dumper, where the Transmission lines / cables cross the haul roads.</p>	<p>Shut down procedure shall be strictly implemented.</p> <p>Identification of cables and switches shall be displayed.</p> <p>Transmission lines / cables shall only be laid on 12 meter height towers, as per Indian Electricity Rules 1956</p>	<p>Supervisors having valid electrical supervisory certificate only shall be deployed on the jobs.</p> <p>Planning shall be done in initial stages for laying of 12 m height towers.</p>
10. Lighting	Insufficient lighting at work places	<p>Working places shall be well illuminated as per the standards fixed by DGMS Circular No.1 of 1976</p> <p>All persons shall wear radium jackets in during dark hours.</p> <p>All persons shall possess Cap Lamps in dark hours.</p> <p>All persons shall have whistles.</p>	<p>Engineer and electrical supervisor shall ensure the lighting as per the DGMS circular.</p>

11. Health Hazards

Occupational safety and health is very closely related to productivity and good employer – employee relationship. This subject is dealt with strictly as per circulars and orders of DGMS including the Mine Rules and Coal Mines Regulations, 2017. Some of the measures proposed for occupational safety and health have been listed below:

1. Effective dust removal system in the crusher house
2. Provision of wet drilling
3. Provision of rest shelters for mine workers with amenities like drinking water, fans, toilets etc.
4. Provision of personal protection devices to the workers.
5. Rotation of workers, if necessary, exposed to noise to reduce exposure time
6. Closed control room in crusher house with proper ventilation.
7. Dust suppression of haul road and dumps
8. First - Aid facilities in the mining area
9. Provision of communication network between pit working areas and manager.
10. Provision of alarm system at working areas
11. Training of personnel including contract workmen in Mines Vocational Training Centres to inculcate safety consciousness through modules, video clippings, slogans and posters and introduction of safety awards
12. Safe design of height, width and slope of working benches of OB & coal, overall pit slope kept less than 33°.
13. Safe design for formation of OB dumps, over all dump slopes kept at 26 degrees.
14. Safe design of haul roads.
15. Provision of fire fighting equipment
16. Safe storage of explosives and other inflammable substances.
17. Regular / periodical monitoring of mine environment to ensure the efficacy of various protective measures.
18. Initial and Periodical medical examination for the employees.

Storage, Handling and Disposal of Hazardous Waste

Hazardous waste generated such as used oil, waste oil, empty oil drums, batteries, non-ferrous scrap etc. Explosives, HSD oil, Hydraulic oils shall be handled, stored, disposed, transported as per Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2016 and CPCB guidelines.

1. The waste generated shall be disposed as per HWM rules within 90 days from date of generation to authorized recycler.
2. The handling, transport and storage of explosives shall be as per Indian Explosive Act.
3. Transportation and storage of explosive shall be as per the approved code of practice.
4. Flammable, ignitable, reactive and non-compatible wastes shall be stored separately and never stored in the same storage shed.
5. Adequate storage capacity (i.e. 50 % of the annual capacity of the hazardous waste incinerator) shall be provided in the premises.

6. Storage area shall be provided with the flameproof electrical fittings and strictly adhered to.
7. Adequate fire fighting systems shall be provided for the storage area, along with the areas in the facility.
8. There should be at least 15 meter distance between the storage sheds.
9. Loading and unloading of wastes in storage sheds shall only be done under the supervision of the well trained and experienced staff.
10. Fire break of at least 4 meter between two blocks of stacked drums shall be provided in the storage shed. One block of drum should not exceed 300 MT of waste.
11. Minimum of 1 meter clear space shall be left between two adjacent rows of pallets in pair for inspection.
12. The storage and handling shall have at least two routes to escape in the event of any fire in the area.
13. In order to have appropriate measures to prevent percolation of spills, leaks etc. to the soil and ground water, the storage area should be provided with concrete floor.
14. Measures shall be taken to prevent entry of runoff into the storage area. The storage area shall be designed in such a way that the floor level is at least 150 mm above the maximum flood level.
15. The storage area floor should be provided with secondary containment such as proper slopes as well as collection pit so as to collect leakages / spills etc.
16. All the storage yards should be provided with proper peripheral drainage system connected with the sump so as to collect any accidental spills in roads or within the storage yards as well as accidental flow due to fire fighting.
17. The stacking of drums in the storage area should be restricted to three high on pallets (wooden frames). Necessary precautionary measures should be taken so as to avoid stack collapse. However, for waste having flash point less than 65.5°C, the drums shall not be stacked more than one height.
18. Drums containing wastes stored in the storage area shall be labelled properly indicating mainly type, quantity, characteristics, source and date of storing etc.
19. The storage areas shall be inspected daily for detecting any signs of leaks or deterioration if any. Leaking or deteriorated containers should be removed and ensured that such contents are transferred to a sound container.
20. In case of spills / leaks / dry adsorbents / cotton should be used for cleaning instead of water.
21. Proper slope with collection pits shall be provided in the storage area so as to collect the spills / leakages.
22. Proper records with type of waste received, characteristics as well as the location of the wastes that have been stored in the facility need to be maintained.

The Risk Management Plan (RMP) prepared for the project under the provisions of DGMS Circular and Recommendations of 9th National Safety Conference will be implemented to tackle risks associated with each and every operation(s).

The RMP will be modified periodically to the changed conditions / circumstances by the project authorities.

DISASTER MANAGEMENT PLAN

Disaster Management Plan (DMP), a general plan of action for use in the event of inundation, fire, high wall failure, dump failure or any other dangerous occurrence or in the time of emergency. The DMP will have three stages:-

1. Information Stage
2. Assessment Stage
3. Action Stage

Information Stage:

Any person employed in a mine observes / discovers any dangerous incident; he shall immediately inform to the Manway Clerk (Attendance Clerk) or the nearest official(s) available who shall inform to the Manway Clerk and Manager or Senior Officials in his absence.

The Manway Clerk shall immediately inform the Manager or Senior Mine Official in his absence, inform the rescue station and collect information regarding place of accident / occurrence, number of persons involved and nature of help required. He should record the above information with name of the person who informed and the exact time and pass on the same to the manager. He should not leave the place for any purpose what so ever.

The Manager shall inform the Project Officer, General Manager and Nodal Officer to initiate DMP and also rush to the spot / mine if he is at out of project premises. Personally assess the gravity of situation by contacting the frontline supervisors / witness available or through wireless set.

Nodal Officer shall rush to the mine and inform: GM (Safety), All Directors, SO to C&MD, DGMS Authorities, District Magistrate and Collector, Supdt. of Police, Mine / Area Level Representative and recognized Union Delegates, Local Dispensary, Chief Medical Officer and All Area Departmental Heads.

Assessment Stage:

The role and functions of following persons will be envisaged in the detailed DMP available during operation.

1. Role of Mining Sirdar, Overman and Foreman
2. Role of Manager, Project Officer and Area General Manager
3. Role of in-charge at operations or at place accident.
4. Function of Core Committees
5. Function of Support Committees
6. Functions of Surface Control Room

Supporting Committees:

The composition, functions, infrastructure required for core and supporting committees, etc. will be envisaged in the detailed DMP available during operation.

7. Public Relations Committee
8. Catering Committee
9. Medical Committee
10. Men and Material Management Committee
11. Transport Committee
12. Survey Committee
13. Casualty Committee
14. Security Committee

15. Cash Committee

16. Accommodation Committee.

Action Stage:

Action stage deals with the functions of Disaster Management Committee (DMC) and duties of following personnel.

- 1. Director, DMP
- 2. Area General Manager
- 3. GM (Safety)
- 4. GM/GM (E&M)
- 5. GM (Personnel)

The Risk Management Plan for proposed PK OC Project is enclosed as **Figure No. 7.1.**

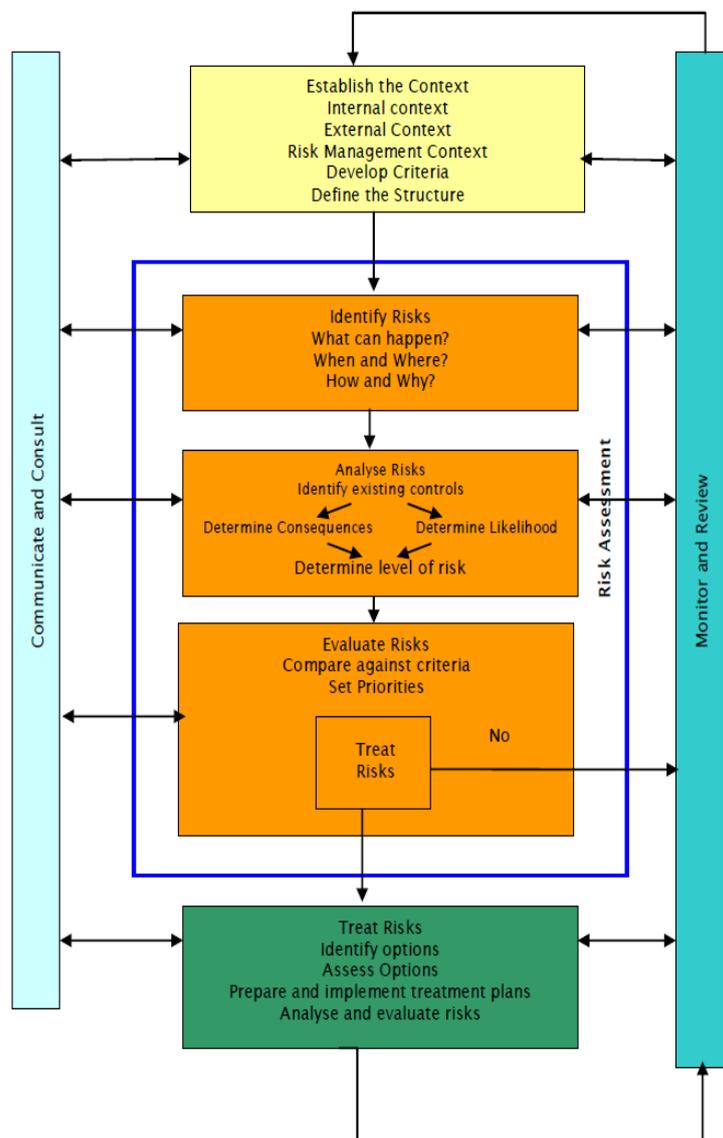


Figure 7.1 Risk Management Plan

