RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN FOR MINING PROJECT

A major emergency in a work is one which has the potential to cause serious injury or loss of life. It may cause extensive damage to property and serious disruption both inside and outside the works. It would normally require the assistance of emergency services to handle it effectively.

An important element of risk mitigation is hazard recognition and emergency planning, i.e. recognizing that accidents are possible, assessing the consequences of such accidents and deciding on the emergency procedures both on site and off site that would need to be implemented in the event of an emergency. The overall objective of the emergency plan will be:

1. To localize the emergency and if possible eliminate it; and
2. To minimize the effects of the accident on people and property

Mining of minerals from the earth's crust involves disturbing the equilibrium of nature and invites reaction in the form of movement of strata beds, release of water and different types of gases under pressure, lowering of surface in the subsidence etc. Thus the scientific method and art of mining should focus on the subject of keeping this natural reaction under control to maintain equilibrium so that damage to life and property is prevented. Open cast mines cause impairment to the environment in terms of damage to the land by spoiling the aesthetic beauty, removal of vegetation, disturbance to the ecostatic balance, poor replenishment to the ground water and release of noxious gases by the heavy earth moving machinery. There are various factors, which can create disaster in mine. These hazards are as follows:

- Filling of the mine pit due to excessive rains.
- Slope failures at the mine faces
- Accident due to blasting
- Accident due to plying of heavy mining equipment
- Unsafe blasting
- Sabotage in magazine area

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

- Working of mines as per approved mining plans.
- All safety precautions and preventions as per the provisions incorporated in the Mines Act,1952, Metalliferous Mines Regulation, 1960, Mines Rules, 1955, Explosive Act, 1884, Explosive Rules,2008, Environmental Protection Act, 1986, The Forest Act,1980 and related notifications as amended.will be strictly followed during all mining operations.

- 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 drainage 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, mock drill 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 the concerned mining staff.

Although, no serious disaster is envisaged in mine, it is necessary to draw an action plan as a contingency measure as explained in the following paragraphs

7.5.1 Hazards Description & Remedies Measures

7.5.1.1 Hazards Such As Collapse Of Hanging Wall Due To Slope Failure

If the slope angle of the benches are more than the angle of repose or if there are any geological disturbance which lead to failure of benches due to the failure in slope, which ultimately, endanger the man and machinery. Slope stability accidents are one of the leading causes of fatalities in surface mining operations. In the subject proposal the working benches are so desined to comply with the provisions of Metalliferous Mine Regulation, 1961 and the ultimate pit slope will be maintained at an angle of 45^0. The details are incorporated in the mining plan duly approved by the IBM, Govt. of India.

Consequences of slope failures

Unexpected movement of ground causes the potential to endanger lives, demolish equipment, or destroy property. There are several ways to reduce the hazards associated with slope failures: 1) safe geotechnical designs; 2) secondary supports or rock fall catchment systems; 3) monitoring devices for adequate advance warning of impending failures; and 4) proper scaling of loose/dangerous material from highwalls. At any surface operation, some instability can be expected – from minor bench raveling to massive slope failures

Diligent monitoring and examination of slopes for warning signs is imperative for protecting workers and equipment. Geotechnical designs can be improved to increase factors of safety and proper bench designs can be improved to minimize rock fall hazards. However, even slopes with conservative slope designs may experience unexpected failure due to the presence of unknown geologic structures, abnormal weather patterns, or seismic shock. Regular

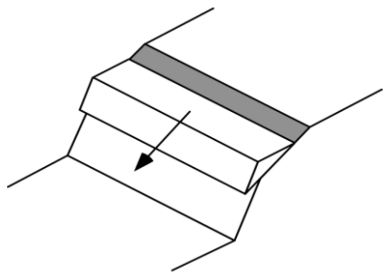
Studies by conservative and modern methods will be conducted at regular and periodic intervals.

Unanticipated movement of any amount of rock may cause severe disruptions to mining operations, pose major safety concerns for workman and machinery , or contribute to large financial losses

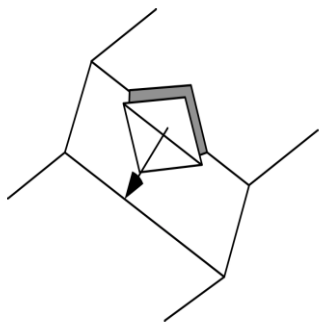
Determination of geometry of potential failure

The most important key factor with respect to major structures include orientation, spacing, trace length, and shear strength in addition to geological factors. Collecting information such as orientation, spacing, trace length, and shear strength with respect to major structures and other geologic features is an important key to determining failure potential. The basic failure modes which may occur are:

1) **Plane Failure:** Plane failures occur when a geologic discontinuity, such as a bedding plane, strikes parallel to the slope face and dips into the excavation at an angle steeper than the angle of friction

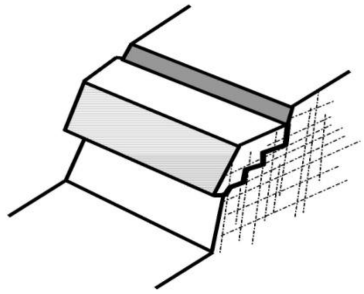


2) **Wedge Failure:** Wedge failures occur when two discontinuities intersect and their line of intersection daylights in the face.



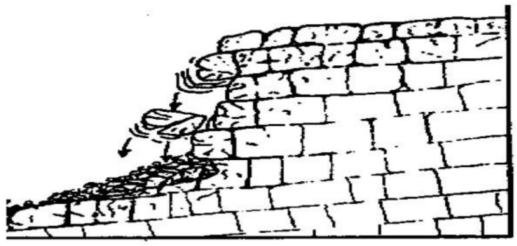
3) **Step-path Failure:** Step path failure is similar to plane shear failure, but the sliding is due to the combined mechanisms of multiple discontinuities or the tensile failure of the intact rock connecting members of the master joint set.

Step-path Failure:



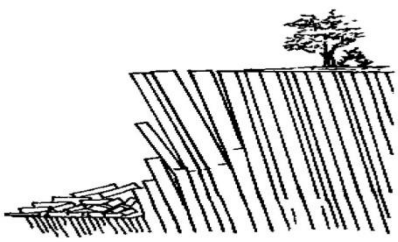
4) **Raveling:** Weathering of material and expansion and contraction associated with freeze-thaw cycles are principle causes of raveling. This type of failure generally produces small rockfalls, not massive failures.

Raveling:



5) **Toppling Failure:** Toppling can occur when vertical or near-vertical structures dip toward the pit. Under cutting in mining, strictly denied under the rules and regulations, cause a very serious safety concern for both workmen and machinery. This is the most prevalent reason for the phenomenon called as toppling. If this type of structure is present, the bench face height should be limited to a distance approximately equal to the bench width. This will help catch any toppling material and decrease the chances of impacting equipment working on the pit floor below.

Toppling Failure:



Recognizing hazards

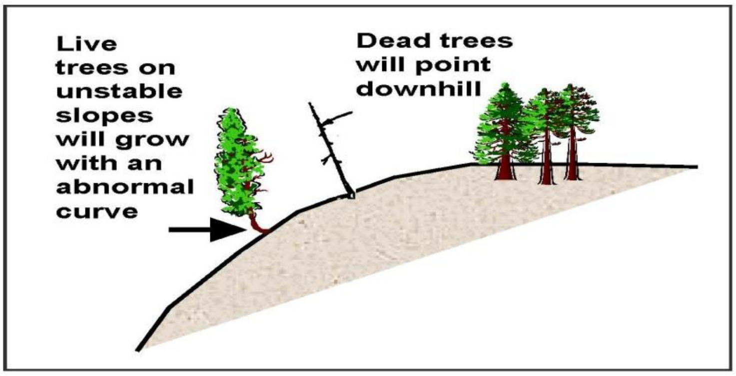
Slope failures may occur anticipating them by the warning signs will significantly contribute to the safety of operation. Some of the more common warning signs of slope instability follow:

1) **Tension Cracks**: The formation of cracks at the top of a slope is an obvious sign of instability. Cracks form when slope material has moved toward the pit. Since this displacement cannot be detected from the pit floor, it is extremely important to frequently highwalls above active work sites. Safe access should be maintained at all times to the regions immediately above the active mining. Frequent inspections may be necessary during periods of heavy precipitation or spring run-off and after large blasts.

2) **Scarps:** Scarps occur where material has moved down in a vertical or nearly vertical fashion. Both the material that has moved vertically and the face of the scarp may be unstable and should be monitored accordingly.

3) **Abnormal Water flows:** Sudden changes in precipitation levels or water flow may also precede slope failures. Spring run-off from snow melt is one of the most obvious examples of increased water flow that may have adverse affects on slopes. Dewatering wells or unexplained changes in piezometer readings may also indicate subsurface movement that has cut through a perched water table or intersected a water bearing structure. Changes in water pressure resulting from the blockage of drain channels can also trigger slope failures. Water can also penetrate fractures and accelerate weathering processes. Freeze-thaw cycles cause expansion of water filled joints and loosen highwall material. Increased scaling may be necessary during cold weather.

4) **Bulges or Creep:** Bulging material or “cattle tracks” appearing on a slope indicate creep or slow subsurface movement of the slope. Other indicators of creep can be determined by looking at vegetation in the area . While most mines do not have vegetation on the slope faces, movement of trees at the crest of a slope can be an indicator of instability.



5) **Rubble at the Toe:** Fresh rubble at the toe or on the pit floor is a very obvious indicator that instability has occurred. An effort must be made to determine which portion of the slope failed, and whether more material may fail. One of the most dangerous situations that can occur is an overhang. If workers are not aware that a portion of the material below them has failed, they may unwittingly venture out onto an unsupported ledge.
   Because the drivers cannot see the portion of the slope that has failed below the road. The weight of the trucks on the partially failed material could cause the rest of the rock mass to fail.

7.5.1.2 Remedial measures: -

Slope failures very rarely occur without some warning, and all workers need to be able to recognize potential hazards and act accordingly. If the failure is not immediately threatening to personnel, a variety of other actions can be taken in response to the movement. The selection of remedial measures taken depends on the nature of the instability and the operational impact. Each case should be evaluated individually with respect to safety, mine plans, and cost-benefit analyses.

Let The Material Fail- If the failure is in a non-critical area of the pit, the easiest response may be to leave the material in place. Mining can continue at a controlled rate if the velocity of the failure is low and predictable and the mechanism of the failure is well understood. However, if there is any question about the subsequent stability, an effort should be made to remove the material. Large-scale failures can be difficult and costly to clean up. Often, a mining crew will choose to leave a step-out in the mine design to contain the failed material and continue mining beneath the step-out. The value of the ore that is lost needs to be evaluated against the costs of clean-up to determine if this is a feasible solution. The size of the blasts may also need to be reduced to minimize impacts on the unstable zone.

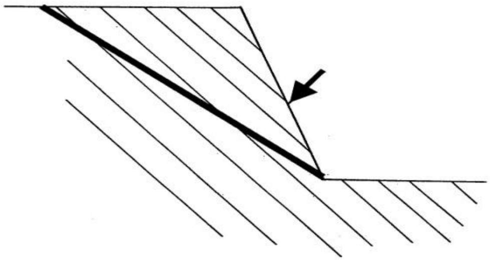
To prevent small-scale failures from reaching the bottom of the pit, both the number of catch benches and the width of catch benches can be increased. Catch fences will be installed successfully at some operations to contain falling material.

Support the material & Building Buttress: If allowing the instability to fail is not an option, artificially supporting the failure may be a solution. Some operations have successfully used reinforcement such as bolts, cables, mesh, and shot Crete to support the rock mass. Thus preventing the failure, though this option may be found to be unviable commercially.

Another potential solution to stop or slow down a slope failure is to build a buttress at the toe. The buttress offsets or counters the driving forces of the slope by increasing the resisting force. Short hauls of waste-rock often make this an attractive and economical alternative for stabilizing slope failures.

Remove the hazard: If a slope continues to fail, and supporting the slope is not a feasible alternative, steps need to be taken to remove the hazard. Often, flattening the slope to a more favorable angle with respect to the local geology will solve the problem. When catchment systems are not available, proper and sufficient scaling methods should be employed on a regular basis to remove hazards associated with small rock falls.

Removing, the top portion of a slide may also decrease the driving forces and stabilize the area. However, Call & Savely (1990) warn that this option is generally "unsuccessful" and cite situations involving high water pressure where unloading actually decreased the stability of the remaining material.



Since water pressure creates slope stability problems, dewatering using horizontal or vertical wells is a powerful means of controlling slope behavior and minimizing hazards. Surface drainage and diversions should also be used to keep surface runoff away from tension cracks and open rock mass discontinuities near the slope face.

7.5.1.3 Hazards Due To Failure Of Waste Dump

There are two types of waste dumps, which are discussed below:

Surface dump: - Sliding of surface waste dump is an equally severe risk compared with quarry slope failure. Hence, it is imperative that the degree of hazard against potential failure of waste dump slopes should be identified and that precautionary measures are adopted, if required. Average slope angle of dump will be kept below 26° which is expected to be safe. The waste dump will be stabilized by tree plantation and other arrangements as detailed below:

- Drains will be made on the dump top to regulate uncontrolled descent of water during rainy season down the slope through specially made chutes to finally discharge into garland drains.
- Plantation along the periphery of dump top over a width of 1.5 m will be done. Small pits of 0.3 x 0.3 x 0.3 m will be cut on dump slopes and seedlings will be planted to prevent erosion stabilize dump slopes.

- A stone toe wall will be constructed all around the waste dump base to prevent waste dump material being carried out to the general drainage system of the area.
- A garland drain will be constructed all around the waste dump area for smooth flow of water.
- Dump slopes will be kept at < 26° considering the optimum bench height.

Backfill dump: - The backfill dump height will vary from 12 m to 15 m which will, though, be supported at the sides by quarry batters but the main advancing front of the backfill dump towards dip side will be amenable to slope failure. The dump will be planted as soon as ultimate height (surface level) is achieved. It is planned not to have overall gradient of the dump more than 26°. As the depth of pit(s) or the heights of backfills are comparatively small, no failure of backfill dump is anticipated.

7.5.1.4 Effect of Haulage Truck Operation on Dump Point Stability

Operating mine haulage trucks near the crest of stockpiles and waste dumps is a potentially hazardous practice often resulting in slope failure and dump point accident. The dump point accident involves the fall of a haulage truck over the edge and down the front slope of the stockpile or waste dump. The practice of end dumping over the crest of the pile places the haulage truck near the edge of a marginally stable structure and leaves little room for operator error

It is evident that the complexity of the truck slope system cannot be adequately represented through conventional slope stability analysis. Conventional two-dimensional methods are useful in determining the overall stability of a slope under its own weight or by an externally applied constant load. They are not, however, useful in modeling localized three-dimensional failures on what would otherwise be considered a stable slope. A technique was required that would model these local three-dimensional failures, and would also consider the dynamic forces generated by operating haulage trucks. Utilizing the kinetic method of limit analysis, interaction between haulage truck operation and slope stability are analyzed. The analysis is based on the following fundamental assumptions:

- The slope is stable under its own weight.
- The material by which the slope is built is homogeneous, isotropic and dry or only slightly wet.
- The slope extends beyond the failure region induced by the haulage truck, with the upper surface being horizontal.
- The slope failure is induced by weight of the truck transmitted through the rear axle.
- The slope has consistent slope angle from the base of the dump of the crest.

The method determines an admissible truck weight (upper bound value) for varying distances from the slope edge. Input parameters are the material strength, slope geometry, and initial forces induced by vehicle tracking. This method can be utilized to assist in determination of safe operating distances for a haulage truck from slope edge, the development of vehicle operating procedures, and the admissible weight for static concentrated loading near the crest of an otherwise stable slope

This analysis is helpful for understanding of the factors affecting the safe operation of haulage trucks near the crest of slopes. It can also assist in determination of safe operating distance from a slope edge for a specific slope and truck combination. However, the results can be accepted with caution. The calculation is based upon an upper bound approach of limit analysis. Therefore, the actual truck limit weight will be slightly lower than indicated by the analysis. Conversely, the critical distance of the truck from the slope crest (point at which a dump point failure can be expected) is lower and will be slightly larger than indicated by the analysis. The results generated by the program are more dependent on the accuracy of the input values than the approximations assumed in the analysis. With well-estimated parameters, a factor of safety of approximately 1.2 is suggested. The measures to prevent accidents due to trucks and dumpers are listed as below:

- All transportation within the main working should be carried out directly under the supervision and control of the management.
- Vehicles must be maintained and checked thoroughly at least once a week by the competent person authorized for the purpose by the Management.
- Road signs should be provided at each and every turning point especially for night driving.
- To avoid danger while reversing the trackless vehicles especially at the embankment and tapping points, all areas for reversing of lorries should as far as possible be made clear of human movement.
- A statutory provision of the fences, constant education, training, etc. will go a long way in reducing the incidents of such accidents.
- Haul trucks should be oriented essentially perpendicular to the bream, while unloading.
- Dumping of overburden or waste material by dumpers and dozers should follow certain general precautions.

7.5.1.5 Care And Maintenance During Temporary Discontinuance

The following protective measures will be taken up to deal with the unforeseen circumstances that may arise due to temporary discontinuance of the mine.

- Necessary statutory notices will be served to the appropriate authority in the stipulated period assigning the reasons for discontinuance

- All heavy earth moving mining machinery from the mine will be withdrawn and brought to the safe place so that these do not get buried due to bench collapse, if any, and get damaged during the period of discontinuance.
- The entries to pit will be fenced with Notice Boards at the fences prohibiting entry into the pit by unauthorized persons.
- The boundaries of the pit will be fenced to prevent cattle entering the pit.
- At the entrances and strategic points, sentries/watchmen will be posted to guard the mine areas and explosive magazine. They will be provided with mobile phones/ walky-talkies to contact the mine authorities / police for help during an emergency.
- The mine area will be kept illuminated during night time. Audible warning sirens will be established at the mine office to be used during an emergency so that prompt help can be received from proper sources.
- Managerial, supervisory and competent persons of the mine would be engaged for supervising machinery maintenance and housekeeping of the mine areas, as per needs.

7.5.1.6 Hazards Due To The Absence Of Garland Drains

In the absence of Garland Drains, when heavy rainfalls occurs the mass quantity of rain water flood pit and damage the benches and slope efficiency which leads to the accidents. In addition it also increases the mining cost

Garland drains intervened by settling ponds to be constructed to arrest silt and sediment flows from watering the mine area, roads, green belt development etc. The drains shall be regularly de-silted particularly after monsoon and maintained properly.

Garland Drain (Size, gradient and length shall be constructed for both mine pit and for waste dump and sump capacity shall be designed keeping 50% safety margin over and above peak sudden rainfall (based on 50 years data) and maximum discharge in the area adjoining the mine site. Sump capacity shall also provide adequate retention period to allow proper settling of silt material. Sedimentation pits shall be constructed at the corners of the garlands drains and de-silted at regular interval.

Garland drains have been provided to channelize the run-off water into the settling tanks. The flow from the settling tanks is then channelizing through series of silt check dams. All the natural storm water flow is passed through silt check dams.

7.5.1.7 Hazards Due To Blasting Failure

Mine blasting risk assessment presents several challenges. A blaster must accurately determine blast area bounds and manage safety issues.

A blaster's decision in estimating the bounds of the blast area is greatly influenced by the engineering design of the blast, geology of the blast, regulatory requirements, and company policy.

7.5.1.7.1 Hazards And Causes Of Explosions Or Mine Blasting Accidents

1. **Explosives**: Uncontrolled explosives and accessories (i.e.: Detonators)
   Explosives can cause mine blasting incidents due to:

- Failure to comply with mine blasting procedures
- Failure to comply with explosives management procedures
- Inadequate storage and transportation of explosives
- Not obeying legal requirements
- Negligence
- Natural Calamities

2. **Fly rock**: Material which is projected outside the declared danger zone by a quarry blast. Fly-rock may be caused by poor blast design or unexpected zones of weakness in the rock.
   Fly rock can be the cause of mine blasting incidents due to:

- Poor communication
- Inadequate demarcation of blasting areas
- Inadequate evacuation of personnel
- Inadequate placement of guards
- Inadequate warning of blast
- Untrained manpower handling blasting

Accident data indicate that blasters and helpers often suffer injuries due to lack of adequate shelter from a blast. The blaster and blasting crew are typically closer to a blast than other employees and need to use shelter that will provide complete protection from fly rock that may be projected from a blast. Fly rock from a blast can travel vertically and does not fall like gentle rain. Fly rock can also travel along a horizontal path and become a deadly projectile.

3. **Lightning storms:** A thunderstorm, also known as an electrical storm, a lightning storm, thundershower or simply a storm, is a form of turbulent weather characterized by the presence of lightning and its acoustic effect on the Earth's atmosphere known as thunder.
   Adverse weather can also be a cause of mine blasting incidents.
4. **Electromagnetic fields:** The field of force associated with electric charge in motion, having both electric and magnetic components and containing a definite amount of electromagnetic energy.

Two way radios and cell phones can trigger explosion when used in its close proximity. Due care will be taken near the storage and application of explosives.

Blast area shall be properly barricaded off, required warning signs to be placed at the blast entrance. Signs and/or contraband boxes to be placed e.g.:

- No smoking
- No naked flames
- No cell phones
- No two-way radios
- No unauthorized entry

5. **Spontaneous ignition:** Spontaneous combustion is a type of combustion which occurs by self heating (increase in temperature due to exothermic internal reactions), followed by thermal runaway (self heating which rapidly attains high temperatures) and finally, ignition
   Spontaneous ignition can be caused by:

- Substandard explosives transport equipment
- Not separating critical types of explosives
- Containers not secured on vehicle
- Due precautions as incorporated in Explosives regulations and transporting of Dangerous Goods regulations at all times will be adhered to.

7.5.1.8 Factors responsible for Accidents

It is estimated that 80-90% of all accidents are caused by human factors, and listed five salient elements which contributed to these accidents:

1. **Negligence** – failure to observe safety rules and instructions, or awareness/ignorance
2. **Hasty decisions** – acting before thinking usually leading to hazardous shortcuts, or inability to comprehend
3. **Inadequate instruction** – untrained or improperly trained personnel, not competent
4. **Overconfidence** – taking chances, or known as a risk taker
5. **Lack of planning** – insufficient understanding of a blasting situation, not competent
6. . **Accidents due to blasting-**
   Accidents due to blasting in mines may take place due to followings:

- Carelessness and Mishandling of explosives while transportation of explosives; &
- At blasting site at the time of preparation, stemming o holes, and handling of misfired shots.

7.5.1.9 Risk Mitigation Measures & Responsibilities And Contribution To Safety

Concept of conducting a hazard and risk assessment in order to prevent mining injuries. A site-specific hazard and risk assessment based on the probability of an event and its severity is an excellent tool for the blasting community.

Mine blasting releases a tremendous amount of energy within a very short time and is considered a hazardous operation. An analysis of site-specific risk factors will help in understanding and mitigating possible hazards. The following guidelines in the form of directives will be adhered to by all with relevant sing boards displayed prominently at the appropriate places.

- Do not enter demarcated areas and areas where “no entry” signs are erected
- Before entering a blasting area ensure the miner/blaster is aware of your presence in the area and get permission
- Never go past a blasting guard
- Never play with a detonator – report to the blaster
- Do not use your cell phone or 2-way radio on a blast block
- Obey blasting guard instructions
- Always react to blasting alarms. Evacuate the area to beyond the blasting guard control points
- Only authorized blasters should handle explosions
- Never handle or tamper with explosives
- Never smoke near explosives or on blast block

“Be alert and share information; know the blasting time, blast area and clearing procedure; and DO NOT enter the blast area until an “all-clear” signal is sounded”

7.5.1.10 Hazards Due to Noise & Vibration

In opencast mines, noise is generated in almost all the mining operations, becoming thereby an integral part of the mining environment. Prolonged exposure to high levels of noise (>90dBA) proves harmful. Noise may also bring about other physiological disorders which could lead to irritability and lowering of efficiency. Before initiating any administrative, engineering and medical measures against the noise hazards, noise surveys are essential. They help in identifying the noise pollution sources and quantifying the risk exposures of workers. Effective noise measures ear plugs and similar can accordingly be formulated and implemented.

Noise

Assessment of risk: The assessment shall, as appropriate, consider:

(a) The risk of hearing impairment;
(b) The degree of interference to communications essential for safety purposes; and
(c) The risk of nervous fatigue, with due consideration to the mental and physical workload and other non-auditory hazards or effects.

In order to prevent adverse effects of noise on workers, employers shall:

(d) Identify the sources of noise and the tasks that give rise to exposure;
(e) Seek the advice of the authority and/or the occupational health service about exposure limits and other standards to be applied;

(f) Seek the advice of the supplier of processes and equipment about expected noise emission.

Control Strategies: Based on the assessment of the exposure to noise in the working environment, the employer shall establish a noise-prevention programme with the aim of eliminating the hazard or risk, or reducing it to the lowest practicable level by all appropriate means

Workers' Health Surveillance, Training And Information:

1. Workers who may be exposed to noise levels exceeding occupational standards shall receive regular audiometric testing.
2. The unit will ensure that workers who may be exposed to significant levels of noise are trained in the effective use of hearing-protection devices and the role of audiometric examination.
3. If the elimination of noisy processes and equipment as a whole is impracticable, their individual sources shall be separated out and their relative contribution to the overall sound pressure level identified.
4. If reducing the noise at source or intercepting it does not sufficiently reduce workers' exposure, then the final options for reducing exposure shall be to:
   a. Install an acoustical booth or shelter for those job activities where workers' movement is confined to a relatively small area;
   b. Minimize by appropriate organizational measures the time workers spend in the noisy environment;
   c. Provide hearing protection;
   d. Offer audiometric testing.

<u>Vibration</u>

Hazard Description: Exposure of workers to hazardous vibration may be two types: Whole-body vibration when the body is supported on a surface that is vibrating or when working near vibrating machines and hand-transmitted vibration which enters the body through the hands is caused by various processes in which vibrating tools or work pieces are grasped or pushed by the hands or fingers.

Assessment of risk: If workers or others are frequently exposed to hand transmitted or whole-body vibration and obvious steps do not eliminate the exposure, employers shall assess the hazard and risk to safety and health resulting from the conditions, and the prevention and control measures to remove them or to reduce them to the lowest practicable level by all appropriate means.

The assessment will identify the ways in which vibrating tools are used, and determine in particular whether:

- The high-risk use of tools can be eliminated;
- Workers have had sufficient training in the use of the tools; and
- The use of tools can be improved by supports.

For the prevention of adverse effects of vibration on workers, management of unit will:

- Identify the sources of vibration and the tasks that give rise to exposure;
- Seek the advice of the supplier of vehicles and equipment about their vibration conditions & its effect

Control Strategies:

1. Employers shall ensure that workers who are exposed to significant vibration hazards are informed about the hazards and risks of prolonged use of vibrating tools, correct handling and use of hand tools measures within the workers' control.
2. Manufacturers shall provide vibration values for their tools, redesign processes to avoid the need to use vibrating tools, use, as far as practicable, anti-vibration handles.
3. Seating in vehicles, including static plant with integral seating, shall be designed to minimize transmission of vibration to the rider, and shall permit an ergonomically good working position.
4. Where workers are directly or indirectly exposed to vibration transmitted via the floor or other structures, the vibrating machines shall be mounted on vibration isolators (anti-vibration mounts) or designed and manufactured according to internationally recognized plant and equipment standards.
5. Machinery or vibrating tools shall be maintained regularly because worn components may increase vibration levels

7.6 ONSITE EMERGENCY PLAN FOR LIMESTONE MINING PROJECT

Onsite plan lays down an overall approach to manage any situation to prevent any loss to human beings, property and the environment. The plan would therefore include:

7.6.1 Identifying Resources

Effectively handling of a disaster will depend on how soon the various resources required during the emergency are secured. It is proposed to make an exhausted list of various items required to meet the emergency situation.

The sources from where these resources would be mobilised during the emergency and firm commitments for their availability will be obtained.

7.6.2 Alarm and Communication Mechanism

Communication is a crucial factor in handling an emergency. It is the practice at many works that any employee can raise an emergency alarm, so allowing the earliest possible action to be taken to control the situation.

- Alarm system will be provided at strategic point.
- The purpose is to alert the incident controller who would assess the situation and implement appropriate emergency procedure.

- There will be system for informing the emergency services as soon as the alarm is raised on site.

7.6.2.3 Organization for Disaster Management

It is proposed to prepare a simple structured Organisation chart showing the hierarchy or responsibilities of all the key personnel involved in the management of disaster and liaison with outside agencies:

- Chief Disaster Coordinator
- Area Coordinator
- Communication Officer
- Medical Coordinator

❖ **On Site Emergency Co-ordination**

Manager of the mines or duly competent person so designated will be responsible for co-ordination in case of emergency. He will be called as a "key personnel (or incident controller)"

❖ **Outside Agency Telephone Number:**

The telephone directory of CCR of cement plant, CCR of TPP, colony, Amanganj, Semariya & Panna has been available at the mine office, which need to be updated regularly.

- Hospital: Public Health Centre, Cement plant complex, Amanganj, Semariya, Govt. Hospital, Panna
- Police station: Amanganj & Semariya
- District Collector: Panna
- Fire Brigade: Panna

❖ **Responsibilities of Key Personnal**

- **Chief Disaster Coordinator and Area Coordinator:** General Manager (Mine) will assume the role of Chief Disaster Coordinator. He shall be the overall in charge of the situation. He will co- ordinate all internal and external activities.
  - To call ambulance. He can also take help from outside for police, fire brigade ambulance if required.
  - Ensure that the casualties if any, are given attention, and if necessary, ensure that the relatives are informed, liaise with officials and other statutory and advise them of all possible effects outside.
  - Also inform in writing the district, state and central Govt. authorities as the statutory provisions.
  - Ensure counting of the personnel.
  - Regulate traffic movement within the premises.
  - Arrange for relief of personnel if emergency is prolonged.
  - Ensure preservation of evidence for inquiries to be conducted by statutory authorities.

- Authorize the sounding of the 'all dear" siren, which will be a continuous long siren for minute.
- Safety of personnel.
- Minimize damage to property.
- Arrange for rescue of trapped workers and those in a state of shock.
- Stop all the non-emergency jobs and evacuate workers safety on those jobs.
- Call outside emergency services if necessary.
- Report all the developments to the GM (Mine).
- Preserve all evidence for use in subsequent inquiry.

➢ **Personnel & Administration Staff:** They shall be responsible for the following functions:

- Immediately proceed to the emergency control centre
- Under the direction of the VP (Head of the Mines, a competent person so designated statutorily) handle police, press and other inquiries, receive report or roll call from emergency assembly areas and pass on the absenteeism information to the incidence controller.
- Ensure that casualties receive adequate and immediate attention.
- Control traffic in the mines and ensure that alternate transport is available when need arises and ensure free access is available for casualties.

7.6.2.4 Action in Emergency

Following should be informed in case of emergency

- Medical Aids / Ambulance
- Head of the Mines, a competent person so designated statutorily
- Key personal as per the list

In case a disaster occurs after office hours and or holidays inform

- Concern officer on duty or

➢ **Post Emergency**

The incidence controller will check the areas thoroughly for cause of hazard. The key personnel will meet to evaluate the overall performance of designated staff in responding to the emergency situation, namely

- Rehabilitation of evacuated area.
- Adoption of measures to prevent similar recurrence.
- Effectiveness of emergency response plan
- Mine crew performance.
- Any need for updating or revision of the emergency response plan.

➢ **Avoidance of Emergency**

To avoid occurrence of emergency situation checklists pertaining to the concerned department have been made to ensure safety of equipment and machinery. These checklists are made for daily, weekly and monthly inspection of equipment and machinery for preventive maintenance. Safety audits and daily inspections ensure safe working place and rechecks unsafe conditions / practice which may lead to emergency situations.

7.6.2.5 Safety Equipment

The following safety equipment will be kept handy for regular use by the mine personnel working in risk prone areas / activities of the Mine

1. Safety helmets
2. Safety spectacles (cup type goggles)
3. Gas tight rubber goggles
4. Axes/hand saw
5. Gloves (PVC, asbestos, special rubber make)
6. Ropes
7. Ladders
8. Blanket
9. Rubber sole shoes and gum boots
10. Safety shoes with toe protection
11. Shoes with non-skid soles