Risk Analysis

1.1 Risk Analysis:

Risk Assessment is mainly aimed at preventing accident from taking place. Ranking risk to health, safety & the environment is important because we have limited resources managing them. It would be ideal to regularly review our priorities in order to decide which risk deserves more attention.

Ranking risks is a critical step in effective risk management. Ordering risks by their importance allows policy makers to focus on those issues that matter the most. It is required to ascertain:

i. What can go wrong?
ii. How likely is it to occur?
iii. What could be the consequences?
iv. What factors could influence?

Risk Analysis is the science of risks & their probability & their evaluations. Every project manager needs to be aware of the practices & the principles of effective management. The main objectives of preparing a disaster management plan in mining project includes:-

i. Preventing workers at mines from accidents.
ii. Preventing or reducing the incident severity of injuries during the mining operation.
iii. Responding immediately & adequately in case of serious accidents.

The IXth & Xth conference on Safety in Mines recommended adopting risk assessment as a tool for development of appropriate health and safety management system in Indian Mines. The XIth conference further recommended that the management of every mining company should adopt process of safety management system & commit itself to proper formulation & implementation of the same in totality.

Risk assessment at the project under reference has been carried out on the basis of DGMS circular No. 13 of 2002 & Circular No. 02 of 2011.

Normally the following hazardous operations will have to be carried out at the project:-

i. Opening up of the mine.
ii. Maintaining the working face stability.

iii. Loading of the blasted materials into dumpers/trucks either manually or mechanically.

iv. Transportation of the waste rock as well as the mineral with the help of trucks/dumpers etc.

v. Unloading of the waste material at the waste dumping yard & the mineral at the processing point.

In the process of all the above mining operations, the following risks are involved.

1.1.1. Opening Up of The Mine: In the course of the construction of roads various accidents take place while dozing, wrapping, grading etc.

1.1.2. Face Stability: Unstable faces are responsible for a number of accidents at open cast mines. Rock pieces (mineral pieces) may fall or slide and hit the loader operator or the person working around.

Face instability may arise due to presence of Geological faults or poor working method. The workers engaged in the loading of excavated material and driving the dumper / trucks will be greatly exposed to this type of risk.

1.1.2.1. Precautions Regarding Face Stability:

i. Before commencing loading at any face the face must be examined properly and loose materials dressed down to avoid uncontrolled fall of rocks.

ii. The direction of advancement of the face should be decided on the basis of geology of the area & the rock structure.

iii. In no case the height of the face should be more than the boom height of the loading machine.

1.1.3. Loading: The main hazards associated with loading are as under:-

i. Rock falling to the dumper operator.

ii. Toppling of the dumper due to unevenness of the ground.

iii. Failure of hydraulic system.

iv. Fire due to various causes

v. Falling while trying to enter into the operator cabin.

vi. Electro cution.

vii. Failure of wire ropes.

1.1.3.1. Precaution:

i. Access to the cabins must be safe & well designed.

ii. The cabin should be of sufficient strength, capable of protecting drives in case of fall of rocks.

iii. The loading machine should be well maintained.

iv. Unnecessary persons should not be allowed to stay near the loading points.

1.1.4. Transportation of Mineral:

Mainly tipping trucks or dumpers are deployed for this purpose. The main hazard arising from the use of large earth moving vehicles are:-

i. Engaging incompetent.

ii. Brake failure

iii. Lack of all round visibility from the drivers position.

iv. Access to the cab.

v. Vehicle movement particularly reversing.

vi. Rolling over.

vii. Vibrations

viii. Dust

ix. Lack of maintenance

The drivers and the pedestrians are mainly exposed to the risk. Even the driver of smaller vehicles faces the risk of getting hit by the large vehicles.

1.1.4.1 Precautions:

i. Visibility defects can be elemented by the use of visibility aids such as CC TV, Rear view camera with monitors located in the drivers cab, radar and suitable mirror. Close circuit camera is particularly helpful while reversing towards the edge of the working bench or tipping loads into primary crushers. Edge protection is necessary to check in advertent movement over the edge of the road way, bench or into crusher hoper.

ii. Seatbelt for the drivers.

iii. The risk of drivers likely to fall while trying access to an egress from the cabs can be eliminated by providing a good means of access & its proper maintenance.

7.2 Risk Assessment and its Ranking:

Sound Risk ranking is essential to effective risk management. In the absence of it, small risks may receive attention unwanted while large ones are neglected.

Risk is a function of likelihood & consequence. Likelihood is the chance that the hazard might occur. Since the risk of any hazard is dependent upon the chance that it will occur (likelihood) & the impact of an occurrence (consequence).

Risk Score= Likelihood x consequence

In some cases the persons are required to be exposed to a hazard only for a fraction of time. Therefore a more accurate analysis of the risk ranking can be carried out by taking exposure (Percentage of time pursued are required to be present) & probability (chance that they may be injured) into a account.

Therefore risk score = (Probability x exposure) x consequence.

The values of probability, exposure & consequence will have to be determined after arising at consensus among the members of the risk assessment team.

1.2.1 Risk Ranking:

Risk ranking can be done by qualitative as well as quantitative method. The choice of method will depend upon the circumstances prevalent at the mine. The tables showing risk ranking criteria have been furnished below.

Risk Assessment has been done as per guideline supplied by DGMS through its circular No. 13 of 2002 dated 31st December, 2002.

1.2.2 Process:

Using the equations in section the following values can be used to calculate Risk Score for a Hazard.

Risk score = Consequence x Likelihood

Risk score = Consequence x Probability x Exposure

1.2.3 Scale for Consequence:

Table 1.1: Showing Risk Ranking Criteria

Several dead	5
One dead	1
Significant chance of fatality	0.3
One permanent disability/ less chance of fatality	0.1
Many lost time injuries	0.01
One lost time injury	0.001
Small injury	0.0001

1.2.4. Scale for Exposure:

Table 1.2: Showing Risk Ranking Criteria

Continuous	10
Frequent (daily)	5
Seldom (Weekly)	3
Unusual (Monthly)	2.5
Occasional (Yearly)	2
Once in 5 years	1.5
Once in 10 years	0.5
Once in 100 years	0.02

1.2.5. Scale of Probability:

Table 1.3: Showing Risk Ranking Criteria

May well be expected	10
Quite possible	7
Unusual but possible	3
Only remotely possible	2
Conceivable but unlikely	1
Practically impossible	0.5
Virtually impossible	0.1

- Level 1: > 15; i.e. requiring immediate action .
- Level 2: <15 but >5; i.e. requiring management action.
- Level 3: <5; i.e. Low risks requiring periodic review.

Based on the information gathered from other mines in the region risk assessment has been done. The result of the risk assessment is given in the following table:-

Table 1.4: Hazards faced in Ball Clay Mining Operations.

S. No	Activity	Hazard Description (Risk)	Score				
			Consequences	Exposure	Probability	Risk Score	Risk Level
1.	Site planning and layout	Travel in moving vehicle in uneven terrain	0.1	10	3	3.0	Level 3
2.	Bench Formation	Rock falls or slide from the bench face (bodily injuries)	1.0	10	7	70	Level 1
3.	Shorting of material	Injurious caused by hand tools	0.01	10	7	0.7	Level 3
4.	Transportation of minerals	Vehicle Accident (bodily injuries)	1	5	7	35	Level 1
5.	Transportation of overburden	Vehicle Accident (bodily injuries)	0.1	5	3	1.5	Level 1

***