Risk Assessment Studies

1 Risk assessment

Risk assessment is essentially a process for identifying assessing and controlling risks in the work place. Mining and related activities are associated with several potential hazards to both employees and the public at large. A worker in a mine should be able to work under conditions which are pleasingly safe and healthy. At the same time the environmental conditions should not spoil his working efficiency. This is possible only when there are sufficient safety measurements taken in mine. Hence, mine safety is one of the most crucial aspects of working mine. G.R.Halli Gold Mine is proposing underground operations, indeed safety of the mine and employees are taken care by the Metalliferous Mines Regulation, 1961 and its subsequent amendments.

2 Hazards in Mines

The mining industry has witnessed innumerable number of accidents which are categorized simple & fatal. Even though high priority was given to safety in true spirit, all kinds of accidents occurs. Accident of hazardous situation may arise due to occurrence of any one of the following cases:

- Outbreak of fire
- An influx of noxious gases in the mine
- Inundation
- Air blast
- Sudden rush of back fill material
- Subsidence
- Machineries, Heavy materials, Electrical installation etc.,

2.1 Outbreak of fire

Outbreak of fires is generally caused due to electrical fault, mechanical friction, blasting, welding, explosions etc. Outbreak of such a fires in an open gallery of a mine generates huge quantity of toxic gases & smokes.

2.2 Mine (noxious) Gases

The release of noxious and inflammable gases beyond tolerable limits in underground mine creates environmental hazards. The factors, which are responsible for the production of these noxious and inflammable gases, are as follows:

- Blasting
- Underground fire
- Spontaneous heating

- Exhalation by man

2.3 Inundation

An inundation is release of water from working of same mine or surface water bodies. The inundation causes due to surface water bodies, flood, hydro fracturing, fault reactivation, geo-thermal process.

2.4 Air blast

Air blasts are defined as the ejection of rocks from main solid mass accompanied by violent explosion & thunderous noise followed by blasts of hot air. Air blast is common in long wall coal mines, especially those whose roof strata are competent and do not cave immediately behind the roof supports as the face advances. However, no such danger is anticipated in proposed project working area.

2.5 Sudden rush of back fill material

Backfill is the material used to fill voids created by mining excavation. Backfill is applied in order to prevent fires & explosions to improve mine ventilation, stability of rick, to reduce subsidence effects at the surface, as well as economical & environmental facts. The sudden rush of backfill occurs due to solids losses of a material, instability, shrinkage.

2.6 Subsidence

Mine subsidence is movements of the ground surface as a result of the collapse (or) failure of underground mine workings. In active underground mining operation using long wall mining or high extraction pillar recovery methods, subsidence can occur concurrently with mining operation in a more predictable manner.

2.7 Machineries, Heavy materials, Electrical installation etc

Machine failures are common in all industries. The reasons for certain accidents were recognized for mechanical failures. A machine which has not been conducted periodical maintenance, service. Accidents were also due reckless handling of machineries, heavy materials. Electricity was the heartbeat of mines. If any power failure occurs in underground mining that would result in the death of thousands of workers.

3 Risk management in the proposed mine

3.1 Measures against the outbreak of fire

- No inflammable material will be stored in underground except supporting timber, which is used for support.
- To avoid surface fire, all structures within 10 m from the shaft, will be constructed with incombustible materials.
- Surface workshop, diesel filling station, compressor house, electrical sub-stations are provided with fire-fighting equipments and are maintained regularly.

- Dry vegetation is not allowed within 15 m from any of the entrance to the mine.
- Regular inspection will be done to remove accumulation of greasy material, cotton waste, old conveyor pieces, waste hosepipes, wooden scrap etc., are checked regularly.

Adequate number of persons will be trained in firefighting activities. Mock drills will be conducted on regular basis.

On the appearance of signs indicating that a fire has broken out, all persons other than those whose presence in the mine is deemed necessary for dealing with the fire shall be immediately withdrawn from the mine.

Firefighting operations will be carried out under the supervision of competent person along with trained fire-fighting personnel.

A sufficient supply of land or incombustible dust or sufficient portable fire extinguishers shall be provided at every entrance of the mine, landing and the bottom of shaft or winze in use, engine room and other places where timber, canvas grease, oil or other inflammable material is stored. Provision for water under pressure will be provided at suitable locations. Suitable types of fire extinguishers are provided at different locations to deal with any kind of fire.

3.2 Influx of noxious gases

- Inflammable gas shall be deemed to have been detected when the lower flame of a flame safety lamp or where methane indicators are used indicates it, they indicate one and a quarter percent or more inflammable gas.
- When any person detects the presence of inflammable gas, he shall immediately withdraw from the place and shall inform his superior official about the same.
- Whereas in place of mine, inflammable or noxious gas is detected, all persons shall be withdrawn from the place and the place shall be immediately fenced off so as to prevent persons inadvertently entering the same. No person shall be re-admitted in to the place where the gas was detected until a competent person has examined the place and has reported that the place is free from noxious gas.
- In the long drives or blind workings, flame safety lamps will be always maintained.
- Persons are trained in the use of flame safety lamps. The competent person will take steps to remove the gases by improving ventilation if reported.

3.3 Precautions against Irruption of Water

As there is no surface river, nallah etc., except few small streams joins a small tank lays along the northern part of the lease area is always dry due to acute shortage of inflow, hence possibility of danger from surface water inundation in not envisaged.

A water danger plan showing the following features will be maintained as required by the regulations.

- The position of workings below ground.
- Every borehole and shaft (with depth) drives, cross cut, winzes, raises, excavation and air passage connected therewith.
- The position of every dyke, faults and other geological disturbances with the amount and direction of throw.
- Levels taken in working below ground at easy identifiable points sufficient in number to allow of the construction of section along the drives main headings and haulage roadways.
- Every source of water such as river, stream, water course and reservoir-water logged opencast workings on surface and also the outline of all water logged workings measured in any direction.
- Every reservoir, dam or other structure, either above or below ground, constructed to withstand a pressure of water or to control an inrush of water, along with reference to its design and other details of constructions.
- Surface contour lines drawn at vertical intervals not exceeding five meters.

3.4 Precautions against Air Blast

No such danger is anticipated. However, the following precautionary measures will be observed.

- Any large scale collapse of wall rocks into voids may displace the air in violent manner and course accidents.
- Air blast shelters are established at suitable locations,
- The draw points in the stopes would not be totally emptied.

3.5 Precautions against sudden in-rush of back fill materials

- To prevent hydrostatic pressure build up, inflow and out flow of water into the stopes is closely observed
- Water levels in the stopes are regularly measured by sink and float method.
- Density of material is maintained close to the optimum
- In case of low density fill, filling operations are suspended.
- Plug formation is done carefully.
- Pressure gauge is to be installed over the barricade for continuous monitoring.

3.6 Precautions against Subsidence

The average width of the ore body is 1.20 to 1.50 m and they are dipping steeply (75^0 to 85^0E). Post-filling of stopes is being practiced at lower levels. Hence, no instability is expected in the stopes walls of the excavations. The changes in stress/included stresses do not cause any unstable conditions. Although deterioration of the immediate contacts

of excavated boundaries may occur sometime, but they do not extend further as the ore body is only 1.35 m wide and steeply dipping (75^0 to 85^0E). The stopes of the lower level are filled with classified tailings. Numerical modeling analysis will be carried out during stopes design before deciding the size of the stope and method of mining.

3.7 Precautions against Machineries, Heavy Materials, Electrical Installations etc.

Suitable overhead crane for lifting and transportation shall be provided where materials are handled. Proper tools and tackles are used with well trained man power. Precautionary instruction shall be displayed on boards, near the potent moving machinery, hazards etc. Proper guards are provided on moving parts of machinery and equipment. The side of belt conveyors is properly maintained by pull chords switches. Required electrical hazards prevention arrangement is followed and maintained on continuous basis that is zero open connections, suitable joint insulations and easy access to control panels etc., suitably precautionary instructions are displayed on board near the potent electrical hazard etc., suitable electrical protections shall be provided as required by statue.

3.8 Precautions against Dust, waste, oil etc

Dust is suppressed at the place of formation for that purpose wet drilling will be done, water is sprayed on conveyors and at crushing and screening site. Proper dust extraction system is installed in the crushing and screening plant. Machineries are installed on impervious flooring waste oil is collected in impervious pits with sand, spillage is kept bare minimum. The pits are cleaned periodically while charging oil for machines as per the schedule, waste oil is collected in cans and sent to the waste oil-refining unit separately.

3.9 Personnel safety & General

Necessary safety equipments like mask, helmet and boots are provided to all the employees working in the mining site as well as other locations. Persons are authorized for various skilled works. Suitable guards to prevent danger adequately fence every exposed part of any machinery used as or forming part of the equipment of a mine. Only authorized and trained persons are permitted to operate and maintain equipments. Danger signs are displayed at appropriate locations.

3.10 Safety Management

Safety management for mining operations is governed by a very well defined set of rules and regulations etc., framed by Government of India and modified time to time. All the operations in any metalliferous mines are carried out under the Mines Act 1952, rules and regulations framed under it. Metalliferous mines regulations is a comprehensive legislation framed under the mines act and it takes care of the technical and safety aspects of the mining operations.