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1.0 Risk Assessment

The complete mining operation will be carried out under the management control and direction of a qualified mine manager holding a First Class Manager's Certificate of competency to manage a metalliferous mine granted by the DGMS, Dhanbad. The DGMS have been regularly issuing standing orders, model standing orders and circulars to be followed by the mine management in case of disaster, if any. Moreover, mining staff will be sent to refresher courses from time to time to keep them alert. However, following natural/industrial hazards may occur during normal operation.

- Accident due to explosives;
- Accident due to heavy mining equipment; and
- Sabotage in case of magazine.

In order to take care of above hazard/disasters, the following control measures will be adopted:

- All safety precautions and provisions of Mine Act, 1952, Metalliferous Mines Regulation, 1961 and Mines Rules, 1955 will be strictly followed during all mining operations;
- Entry of unauthorized persons will be prohibited;
- Fire fighting and first-aid provisions in the mine office complex and mining area;
- Provisions of all the safety appliances such as safety boot, helmets, goggles etc will be made available to the employees and regular check for their use;
- Training and refresher courses for all the employees working in hazardous premises; Under Mines vocational training rules all employees of mines shall have to undergo the training at a regular interval;
- Working of mine, as per approved plans and regularly updating the mine plans;
- Cleaning of mine faces shall be regularly done in order to avoid any overhang or undercut;
- Handling of explosives, charging and firing shall be carried out by competent persons only under the supervision of an Assistant Mine Manager;
- Provision of magazine at a safe place with fencing and earthen mound and necessary round the clock security arrangement;
- Regular maintenance and testing of all mining equipment as per manufacturer's guidelines;
- Suppression of dust on the haulage roads by regular deployment of water sprinklers;

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- Adequate safety equipment will be provided at explosive magazine; and
- Increasing the awareness of safety and disaster through competitions, posters and other similar drives.

For any type of above disaster, a rescue team will be formed by training the mining staff with specialized training.

1.2.1 Possible Hazards in Open Cast Mine

There are various factors, which can cause disaster in the mines. These hazards are as follows:

- Blasting;
- Waste Rock Dumps;
- Heavy Machinery; and
- Explosives storage.

In addition to the above general types of hazards, one specific type of hazard associated to the Deposits-10 is breaching of tailing dam constructed to treat the slimes generated, in the event of floods or earthquakes. The mining activity has several disaster prone areas. The identification of various hazards in open cast mining is depicted in **Figure-1**.

1.2.1.1 *Blasting*

Most of the accidents from blasting occur due to the projectiles, as they may some times go even beyond the stipulated danger zone of 500 m, mainly due to overcharging of the shot holes as a result of certain special features of the local ground. Flying rocks are encountered during initial and final blasting operations in a particular bench. Vibrations also lead to displacement of adjoining areas. Dust and noise are also problems commonly encountered during blasting operations.

1.2.1.2 *Waste Rock Dumps*


The waste rock dumps may cause landslides. High rock dumps created at the quarry edge may cause sliding of the dump or may cause failure of the pit slope due to excessive loading, thereby causing loss of life and property. Siltation of surface water may also cause run-off from waste rock dumps.

1.2.1.3 *Heavy Machinery*

Most of the accidents during transport of dumpers, trucks, excavators, ripper dozers and other heavy vehicles are often attributable to mechanical failures and human errors.

1.2.1.4 *Storage of Explosives*

In Deposits-10, the blasting operations are carried out once or twice in a week. The main hazard associated with the storage, transport and handling of

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explosives is fire and explosion. The Rules as per the Indian Explosive Act and Rules 1883 shall be followed strictly for handling of explosives.

The storage, transportation and use of explosives shall be carried out with complete safety, in accordance with rules and regulations. The magazine is kept guarded round the clock by security personnel. The entire magazine area is fenced by high chain link with barbed wire at top. Security watchtower and morchas are provided for surveillance of the area around magazines. The storage and maintaining of stock records of magazine is done by an authorized magazine in-charge under the guidance of blasting engineer. The magazines are kept under lock and key and are guarded by security personnel.

Suitable explosive vans duly licensed by the controller of explosives are utilized for daily transportation of explosives between magazine and blasting site both for bringing and returning the explosives. Necessary foolproof arrangements are made for transportation/bringing of detonators in separate vehicles to the blasting site. It is ensured that high explosives and detonators/detonating fuse not ore transported in the same compartment of explosive van in order to avoid any possible accidents.

During monsoon season and cloudy weather, no charging of explosives in the field are carried out. Necessary precautions such as keeping the detonating fuse properly covered with drill cuttings/stemming material are taken during onset of rains/stormy weather in order to prevent any possible premature firing due to lighting.

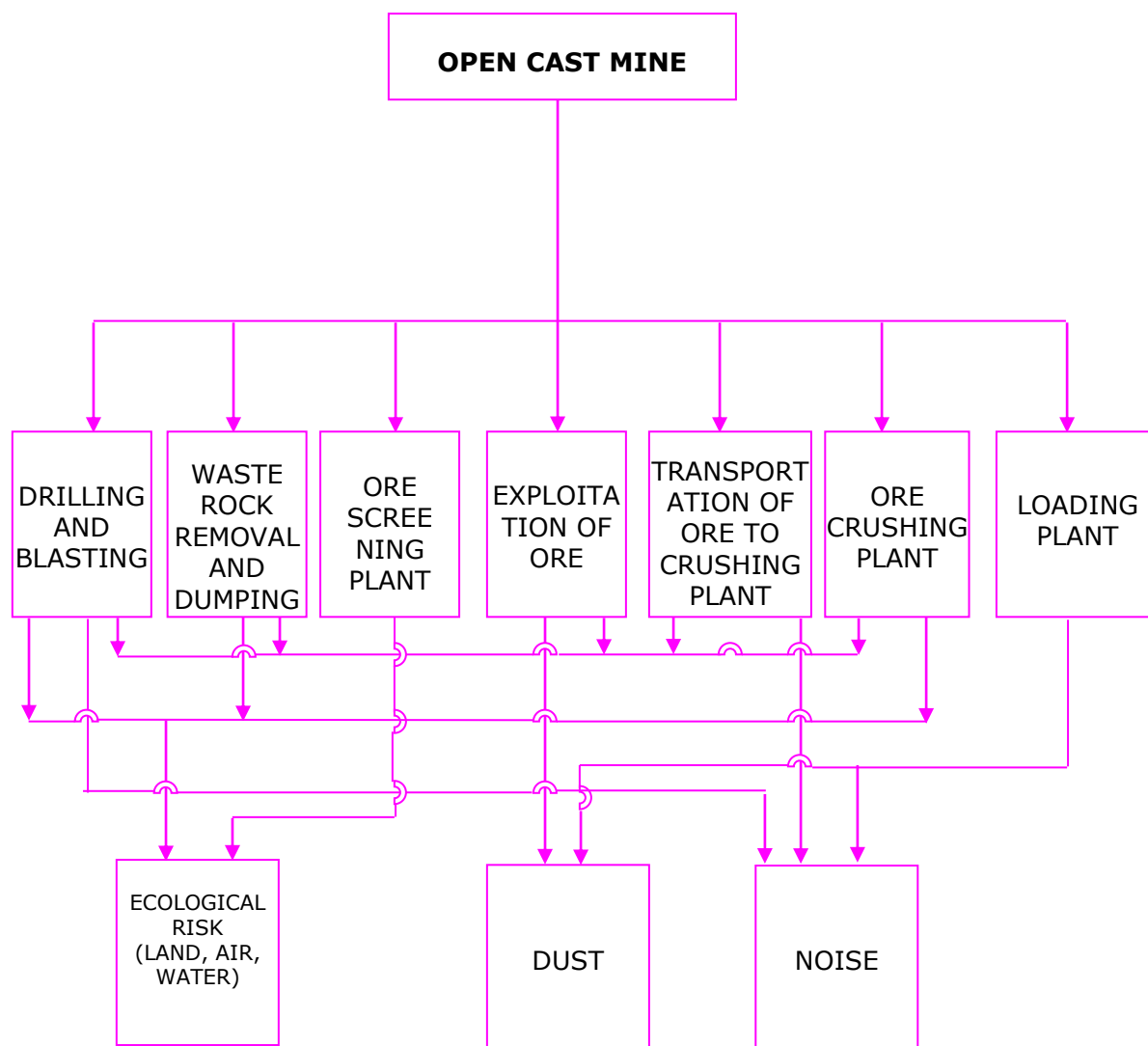



FIGURE-1
IDENTIFICATION OF HAZARDS IN OPEN CAST MINE

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• Type of Explosives

Types of explosives currently in use at Bailadila Iron Ore Complex are given below:

1. Nitroglycerin base explosive viz. Open Cast Gelignite (OCG) supplied by Indian Explosives Ltd;
2. SME (Site Mixed Emulsion Explosive) supplied by M/s. ORICCA, M/s. NFCL & M/s. KEL Tech.

• Storage of Explosives:

The present consumption of explosives is about 1000 T/Year which may go up to 1250 T/Year at the maximum excavation of 7.0 MTPA. The monthly consumption varies from 80 to 150 T/month. The storage capacity for 3 to 5 weeks requirement of the mine has been provided. The explosives are stored in 4 licensed project magazines each of 27 tonnes capacity, which strictly conform to the specifications laid down in Indian Explosives Act and Rules made there under. Transportation of the explosives from the magazines to the site of use is done prior to the actual charging operation in approved licensed explosive vans.

1.2.1.5 Fuel Storage

A 70 KL HSD underground fuel storage facility was provided at the lease area hilltop to cater to the needs of HEMM. Similarly, a 15 KL HSD storage is provided at Bacheli to cater the fuel requirements of HEMM.


1.2.1.6 Water Logging

Water logging in the mine site can be avoided by adopting following measures:

- Position of water body should be correctly known;
- Water from the surface water bodies should not be allowed to enter in the mines;
- Draining of mine water by suitable capacity pumps; and
- Surface water bodies should be correctly marked together with their highest flood level on the mines.

1.2.1.7 Failure of Tailing Dam

The mined out ore of the deposit is being processed in the screening plants by wet process after crushing. The sized ore is separated in the screening plant and the tailings from the outlet of the discharge are transported in the form of slurry into the tailing dam where the slime gets settled and the overflow, which is free from tailings, is recycled back to the process. Tailing Dam-2 is being used for this purpose.

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The main hazard due to tailing dam giving away (due to floods or earthquakes), is inundation in the downstream areas. Heavy loss of vegetation, soil erosion or death of inhabitants and loss of property may occur if proper measures are not taken. The villages/settlements at the downstream may get affected if the tailing dam failure takes place. There is very less agricultural area at the downstream of the tailing dam.

In order to handle the emergencies, safe passage channels are constructed to divert the water safely. Alternatively, all efforts are made to evacuate the people in the probable affected areas in case of emergency.

However, the chances of inundation due to tailing dam failure is remote occurrence because the construction of tailing dam is of heterogeneous type, which provides safety against overturning and slicing on the preatic line. As it is, there is no danger from immediate and subsequent flooding of the mine, as the mine is of hilly terrain type. As a matter of precaution proper and substantial drainage system is maintained all the time in order to divert the water in the check pond properly.

1.2.2 Safety Measures

NMDC ensures implementation of all the possible safety measures in the course of its endeavour to mine iron ore from the Bailadila area. This is in line with the company's policy that all the efforts made towards enhancement of safety pays rich dividends in terms of higher productivity and reduction of losses.

A brief description of the measures taken-up by NMDC during the process of quarrying are mentioned below:


1.2.2.1 *Mine Layout*

The Deposit-10 is of hilly type. To overcome the problem due to complex geological structure of the deposit and to ensure safe and stable working benches, following measures are taken:

- The deposit is opened up from the top of the hill, to enable slicing method of open cast working pattern to be followed. This ensures that there are no left over benches above the working benches, which can cause unstable workings;
- The benches are kept sufficiently wide for greater stability as well as for easy movement of the Heavy Earth Moving Machinery; and
- The height of the benches is kept commensurate with the digging height of the excavators. This facilitates easier operation of the loading machines at the face and the benches remain stable as well.

1.2.2.2 *Measures Suggested to Avoid Accidents due to Blasting*

To ensure safe blasting, the following steps are followed:

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- The use of Non Electric System of Initiation of the Blast Holes by using Excel detonators and connectors. It ensures bottom hole initiation of the explosive charge, thereby reducing the ground vibration and fly rock problem;
- Use of ground vibration and air blast monitoring instruments to monitor the blasts. The instrument reveals efficiency of the blasting activity;
- Complete evacuation of the area falling within 300-m of the blast site by sounding siren and by sending guards to avoid any exposure of the human beings and other animals to the danger associated with blasting;
- All the blasts are carefully planned and executed by experienced blasters under proper supervision of qualified and experienced mining engineers to ensure effective utilization of the explosive material towards breaking of the rock;
- The explosive material is stored properly in an approved magazine, which is guarded by CISF personnel round the clock;
- No secondary blasting is carried out. All the big boulders are broken using a Hydraulic Rock Breaker, thereby eliminating the risk of flying fragments associated with secondary blasting.
- The blasting operation shall be strictly conducted as per the guideline given in metalliferous mines regulation, 1961;
- All employee and equipment shall be cleared from the blast area and removed to a safe location prior to any scheduled blasting;
- To prevent unauthorized entry, guards shall be posted at all access points leading to the blast area; and
- Audible signals such as sirens, whistles, etc. shall be used to warn employees, visitors and neighbours about the scheduled blasting event.


1.2.2.3 Ripping and Dozing

The existing Dozers of the NMDC are utilized, especially to excavate mineral from the areas having close proximity to structures, likely to be affected by blasting. This machine completely minimizes the blasting activity, thereby ensuring safety at the critical locations.

1.2.2.4 Transport of Mineral

To ensure safe working of the rear dump trucks, which transport the mineral from the quarry to the crusher, following measures are taken-up:

- The haul roads are kept sufficiently wide to ensure free and easy movement;
- The curves on the roads are given proper super elevation;

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- Drains along the roads are designed to carry away rainwater without causing damage to the road;
- The valley side of the road is clearly demarcated either by erecting stone walls or by fixation of drums;
- Proper illumination of the roads has been done to facilitate work in the night hours.
- All transportation within the main working area should be carried out under the direct supervision and control of the management;
- The vehicles must be maintained in good repairs and checked thoroughly at least once a week by a competent person authorized for this purpose by the management;
- Broad signs should be provided at each and every turning point specially for the guidance of the drivers at night; and
- To avoid dangers while reversing the trackless vehicles, especially at the embankment and tripping points, all areas for reversing of lorries should, as far as possible, be made man free, and there should be a light and sound device to indicate reversing of trucks.

1.2.2.5 Other Features

Automatic Fire Fighting Systems are provided for the critical equipment like Excavators, Loaders etc. All the Heavy Earth Moving Equipments are maintained in the efficient working order by a team of well experienced and qualified personnel at the mine site. Personal checking of the following features is being carried out on daily basis.


- Brakes;
- Horns and auto reverse horns; and
- Lights.

All the staff are provided with essential personal protective equipment like safety shoes, helmets, hand gloves, goggles, apron, guards, ear muffs etc. Regular training is being imparted to the related staff of the mines for safe and proper operation and maintenance of the machines.

1.2.2.6 Measures to Prevent the Danger of Overburden

To prevent the failure of overburden slopes, especially during the rainy season, the following precautions shall be taken:

1. Proper terracing of the dump slopes, with a maximum bench height of 30 m; and
2. In flat areas where the dumping operations have come to an end, the slope angle should be flattened by about 5° lower than the angle of repose which varies from site to site but not less than 25°.

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- Planting vegetation as early as possible over the overburden dump slopes;
- Provide drainage channels along the overburden dump toe for additional protection, in such a way that a distance of 15 m should be maintained left between the overburden dump and the bench; and
- If a mine is abandoned, the bench and overburden dump should be separated from each other by digging a trench of 6 to 10 m width.

1.2 Emergency Measures

The following emergency measures are taken up in case of emergency like fire and accidents.

1.2.1 Standing Consultative Committee

This committee shall be formed with the following members:


1. Head of the Project;
2. DGM (P);
3. Sr. Manager (T&S);
4. DMS;
5. DC CISF;
6. DGM (M&S);
7. DGM (Plant);
8. Head Electrical;
9. Head Civil; and
10. Head Mining.

This committee will meet in case of severe emergency, advice and help the project officer to deal with the situation.

1.2.2 Active Committee

This committee shall consist of following officers of the mine:

1. Mines Manager;
2. Safety Officer;
3. Head CISF ;
4. Dy G.M (M&S);
5. DGM (Plant);
6. Sr. Manager;
7. Head Electrical Plant;
8. Head Mining;
9. Head Civil;
10. OHS Medical Officer;
11. Manager Environment;
12. Personal Officer; and
13. Work Men's Inspector.

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This committee, works under the guidance and control of the project office, will share working of emergency responding plan. The advice given by consultative committee and action to be taken by action committee should be legibly entered in the operating log book.

1.2.3 Emergency Response Supervisors (ERS)

The persons named below will be Emergency Response Supervisors (ERS) and will be responsible for notification of the emergency and for taking immediate steps to control the situation until the action committee and other senior officers take over.

While on duty, the ERS member should wear a special sticker on their helmet for easy identification:

1. Shift In-charge – Mining;
2. Shift In-charge – Crushing Plant;
3. Shift In-charge – Down hill Conveyor system;
4. Shift In-charge – Screening Plant ; and
5. Shift In-charge – Loading Plant.


1.2.4 Emergency Information

All telephone numbers and quarter numbers of all rescue trained persons of the mine and respective fire services shall be prominently displayed in all sections of the project:

1. Head Mining;
2. Manager Mining;
3. All Shifts In-charges;
4. Fire Services; and
5. Fire Control.

1.2.5 Fire Fighting Measures

- CISF units will be responsible for fire fighting in the project;
- The telephone numbers at which immediate information is to go in case of fire, will prominently be displayed in all sections of the project. This will be the primary responsibility of ERS in specific of all the persons working in areas in general;
- CISF will post only fully qualified fire officer, or the inspector (trained in a recognized institution);
- All machinery operators, drivers, attendants and supervisory staff will be trained in the First Aid and fire fighting;
- Refresher training for fire fighting persons at the mine will be arranged at least once in a year;

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- Dumpers will be provided with automatic fire detection of the linear heat sensing type and a integrated suppression system;
- Adequate numbers of Fire extinguishers (DCP, CO₂, Foam type) will be provided at Dumper, Dozers, Graders, Shovels and other machinery. Adequate numbers of Fire extinguishers will also be provided at ore crushing plants, downhill conveyor systems, screening plants and loading plants;
- About 10% of the number of each type of fire extinguishers measured/distributed in the mine will be kept as standby in stores;
- Adequate number of fire buckets (9 lit capacity) are provided in work shop, OSCL plant, sub station, POL station etc. Sand dumps are maintained at such locations;
- Water hydrants system are made available at respective mining dumper platform to fill up the fire tenders with water;
- Fire tenders in working condition are kept ready all the time; and
- Fire Hoses, couples of specified length in sufficient numbers are by fire fighting wing, their maintenance and check and periodic inspection is being done by CISF fire wing. This is monitored by Head (TSS).

1.2.6 Communication

All the officers working in the mine, plant and other important officers working in Hospital and CISF are provided with the one or more following types of communicate system:

- Wacky – Talky system;
- Telephone both as office and residence; and
- PA System in OSCL plant.


Important places like mining office, time office, dumper platform, crushing plant, loading plant, screening plant and all CISF check gates are provided with high frequency wireless sets.

Siren ringing in continuous raps will be given to communicate all the personal regarding emergency. The attendance room/time office will have true update of all the personnel and their telephone numbers.

1.2.7 Withdrawal of Workers

During the emergency, the respective ER supervisor will withdraw all the persons in the area affected or from the area likely to be affected.

No person other than those permitted by the control room will remain in or enter the affected area. For prompt identification in the field, the authorised persons will be issued evergreen emergency badges instead of written authorisation.

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Normal work will not be resumed in the affected area without the permission of the mines manager.

1.2.8 Allocation of Rooms

To avoid continuous overcrowding at the time of emergency, the rooms mentioned below will be used for the purposes indicated against each of them:

- ⇒ Operation of Control Room: Site office or time Office of the area concerned;
- ⇒ Casualty room: Hospital;
- ⇒ Mortuary: Project Hospital; and
- ⇒ Public relation, Police, Press, Catering: Time Office/Canteen/Guest house.

1.2.9 Control Room

The following items are always being available or they are maintained in the control room:

- ⇒ Emergency Response Plan;
- ⇒ Fire Fighting Plan;
- ⇒ Emergency Badges;
- ⇒ Duty Cards;
- ⇒ Telephone log book;
- ⇒ Operator log book; and
- ⇒ Copies of up to date information of emergency.

1.2.10 Assistance from Outsides

Assistance from outside administration as indicated below can be taken in an emergency:

- District Collector;
- District Medical officer; and
- Nearest Police Station (Bacheli/Kirandul).

1.2.11 Emergency Duties


The duty of key persons at the time of emergency will be described and the cards containing the details of the duties are prepared and relevant portion of the duties will be displayed prominently in the control room.

1.2.12 Disposal of Pollutants

The pollutants produced during the process of dealing with the emergency will be disposed off in an environmentally friendly way.

1.2.13 Periodic Inspection and Maintenance

All important and emergency equipment like fire fighting tender, Portable fire extinguishers, communication systems will be checked once in every fourteen days for their efficiency. The result of every such inspection will be conserved in a

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book maintained for the purpose. Fault detected/found if any, will be promptly rectified.

1.2.14 Training in Emergency Response

Required and relevant training to workmen will be imparted for proper response during emergency.

The mock rehearsals are conducted periodically separately for the different sections in order to assess the training undergone by the persons to act during emergency.

1.2.15 Fire Fighting Plans

A fire fighting plan on a surface plan showing the following details are prepared and displayed in the projected places in the mine. In the same way, a separate plan is maintained for the plant indicating the details of the fire fighting equipments, fire hydrants and hose etc.

- Fire stations;
- Pumps with head and quality and their pipelines with control valves, water transfer points/filling pumps;
- Fire fighting pumps and system of pipeline, hydraulics and hoses, couplers nozzles etc;
- Fire buckets and sand dumps;
- Fire extinguishers indicating locations, capacity and number thereof at each location;
- An inset indication that the fire fighting equipment available in stores;
- Water lodges (tanker, ponds, reservoir etc) in colour form, from where the water can be drawn to fight fires with quantities at each such places;
- First aid station route, dispensary, hospitals; and
- Gradient of wide roads, if steeper 1 in 16.


1.3 **Disaster Management Plan**

1.3.1 Objectives of Disaster Management Plan

The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities. For effective implementation of the Disaster Management Plan, it should be widely circulated and personnel training through rehearsals/drills.

The objective of the Disaster Management Plan is to make use of the combined resources of the mine and the outside services to achieve the following:

- Effect the rescue and medical treatment of casualties;
- Safeguard other people;
- Minimize damage to property and the environment;
- Initially contain and ultimately bring the incident under control;
- Identify any dead;

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- Provide for the needs of relatives;
- Provide authoritative information to the news media;
- Secure the safe rehabilitation of affected area; and
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the emergency.

In effect, it is to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy.

1.3.2 Emergency Organization

Emergency Organization has been setup at the Deposit-10. In case of emergency, a senior executive, General Manager (Production) who has control over the affairs of the mine would be heading the Emergency Organization. He would be designated as Site Controller. As per the General Organization chart, Mines Manager would be designated as the Incident Controller. In the case of stores, utilities, open areas, which are not under the control of the Production Heads, Senior Executive responsible for maintenance of utilities would be designated as Incident Controller. All the Incident Controllers would be reporting to the Site Controller.


Incident Controller organizes a team, responsible for controlling the incidence with the personnel under his control. Shift In-charge would be the reporting officer, who would bring the incidence to the notice of the Incidence Controller and Site Controller.

Emergency Co-ordinators would be appointed who would undertake the responsibilities like fire fighting, rescue, rehabilitation, transport and provide essential and support services. For this purposes, Security In-charge (CISF), Personnel Department, Essential services personnel would be engaged. All these personnel would be designated as key personnel.

In each shift, electrical supervisor, electrical fitters, pump house in-charge, and other maintenance staff would be drafted for emergency operations. In the event of power or communication system failure, some of the staff members in the mine offices would be drafted and their services would be utilized as messengers for quick passing of communications. All these personnel would be declared as essential personnel.

1.3.2.1 *Emergency Communication*

Whoever notices an emergency situation such as fire, growth of fire etc. would inform his immediate superior and Emergency Control Centre. The person on duty in the Emergency Control Centre would appraise the Site Controller. Site Controller verifies the situation from the Incident Controller of that area or the Shift In-charge and takes a decision about an impending On Site Emergency. This would be communicated to the Incident Controller, Emergency Co-ordinators. Simultaneously, the emergency warning system would be activated on the instructions of the Site Controller.

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1.3.3 Emergency Responsibilities

The responsibilities of the key personnel are appended below:


1.3.3.1 *Site Controller*

On receiving information about emergency, he would rush to Emergency Control Centre and take charge of ECC and the situation and:

- ⇒ Assesses the magnitude of the situation on the advice of Incident Controller and decides;
 - Whether the affected area needs to be evacuated;
 - Whether personnel who are at assembly points need to be evacuated.
- ⇒ Declares emergency and orders for operation of emergency siren;
- ⇒ Organizes announcement by public address system about location of emergency;
- ⇒ Assesses which areas are likely to be affected, or need to be evacuated or are to be alerted;
- ⇒ Maintains a continuous review of possible development and assesses the situation in consultation with Incident Controller and other Key Personnel as to whether shutting the mine operation required and if evacuation of persons is required;
- ⇒ Directs personnel for Rescue, rehabilitation, transport, fire brigade, medical and other designated mutual support systems locally available, for meeting emergencies;
- ⇒ Controls evacuation of affected areas, if the situation is likely to go out of control or effects are likely to go beyond the mine boundary, informs to District Emergency Authority, Police, Hospital and seeks their intervention and help;
- ⇒ Informs the statutory authorities;
- ⇒ Gives a public statement if necessary;
- ⇒ Keeps record of chronological events and prepares an investigation report and preserves evidence; and
- ⇒ On completion of On Site Emergency and restoration of normalcy, declares all clear and orders for all clear warning.

1.3.3.2 *Incident Controller*

- ⇒ Assembles the incident control team;
- ⇒ Directs operations within the affected areas with the priorities for safety to personnel, minimize damage to property and environment and minimize the loss of materials;
- ⇒ Directs the shutting down of the operations and areas likely to be adversely affected by the emergency;
- ⇒ Ensures that all key personnel help is sought;
- ⇒ Provides advise and information to the Fire and Security Officer and the Local Fire Services of CISF as and when they arrive;
- ⇒ Ensures that all non-essential workers/staff of the affected areas evacuated to the appropriate assembly points, and the areas are searched for casualties;

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- ⇒ Has regard to the need for preservation of evidence so as to facilitate any inquiry into the caused and circumstances, which caused or escalated the emergency;
- ⇒ Co-ordinates with emergency services at the site;
- ⇒ Provides tools and safety equipment to the team members;
- ⇒ Keeps in touch with the team and advise them regarding the method of control to be used; and
- ⇒ Keeps the Site Controller of the progress being made.

1.3.3.3 Emergency Coordinator – Rescue, Fire Fighting

- ⇒ On knowing about emergency, rushes to ECC;
- ⇒ Helps the Incident Controller in containment of the emergency;
- ⇒ Ensure fire pumps in operating conditions and instructs pump house operator to ready for any emergency with standby arrangement;
- ⇒ Guides the fire fighting crew i.e. firemen, trained mine personnel and security staff;
- ⇒ Organizes the shifting of fire fighting facilities to the emergency site, if required;
- ⇒ Takes guidance of the Incident Controller for fire fighting as well as assesses the requirements of outside help;
- ⇒ Arranges to control the traffic at the incident area;
- ⇒ Directs the security staff to the incident site to take part in the emergency operations under his guidance and supervision;
- ⇒ Evacuates the people in the mine or in the nearby areas as advised by Site Controller;
- ⇒ Searches for casualties and arranges proper aid for them;
- ⇒ Assembles search and evacuation team;
- ⇒ Arranges for safety equipment for the members of this team;
- ⇒ Decides which paths the evacuated workers should follow; and
- ⇒ Maintains law and order in the area, and if necessary seeks the help of police.

1.3.3.4 Emergency Coordinator - Medical, Mutual Aid, Rehabilitation, Transport and Communication

- ⇒ In the event of failure of electric supply and thereby internal telephone, sets up communication point and establishes contact with the Emergency Control Centre (ECC);
- ⇒ Organizes medical treatment to the injured and if necessary will shift the injured to near by hospitals;
- ⇒ Mobilizes extra medical help from outside, if necessary;
- ⇒ Keeps a list of qualified first aiders and seek their assistance;
- ⇒ Maintains first aid and medical emergency requirements;
- ⇒ Makes sure that all safety equipment are made available to the emergency team;
- ⇒ Assists Site Controller with necessary data and to coordinate the emergency activities;
- ⇒ Assists Site Controller in updating emergency plan, organizing mock drills verification of inventory of emergency facilities and furnishing report to Site Controller;
- ⇒ Maintains liaison with Civil Administration;
- ⇒ Ensure availability of canteen facilities and maintenance of rehabilitation centre;

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- ⇒ He will be in liaison with Site Controller/Incident Controller;
- ⇒ Ensure transportation facility;
- ⇒ Ensures availability of necessary cash for rescue/rehabilitation and emergency expenditure;
- ⇒ Controls rehabilitation of affected areas on discontinuation of emergency; and
- ⇒ Makes available diesel/petrol for transport vehicles engaged in emergency operation.

1.3.3.5 Emergency Coordinator - Essential Services

- ⇒ He would assist Site Controller and Incident Controller;
- ⇒ Maintains essential services like Diesel Generator, Water, Fire Water, power supply for lighting;
- ⇒ Gives necessary instructions regarding emergency electrical supply, isolation of certain sections etc to shift incharge and electricians; and
- ⇒ Ensures availability of adequate quantities of protective equipment and other emergency materials, spares etc.

1.3.3.6 General Responsibilities of Employees During an Emergency


During an emergency, it becomes more enhanced and pronounced when an emergency warning is raised, the workers in-charge should adopt safe and emergency shut down and attend any prescribed duty as essential employee. If no such responsibility is assigned, he should adopt a safe course to assembly point and await instructions. He should not resort to spread panic. On the other hand, he must assist emergency personnel towards objectives of DMP.

1.3.4 Emergency Facilities

1.3.4.1 Emergency Control Centre (ECC)

Mine Office Block is envisaged as Emergency Control Centre. It would have external Telephone, Fax, Telex facility. All the Site Controller/ Incident Controller Officer, Senior Personnel would be located here. Also, it would be at an elevated place. The following information and equipment are to be provided at the Emergency Control Centre (ECC).

- Intercom, telephone;
- P and T telephone;
- Safe contained breathing apparatus;
- Fire suit/gas tight goggles/gloves/helmets;
- Hand tools, wind direction/velocities indication;
- Public address megaphone, hand bell, telephone directories;
- Internal, P and T layout, site plan;
- Emergency lamp/torch light/batteries;
- Plan indicating locations of hazard inventories, sources of safety equipment, work road plan, assembly points, rescue location vulnerable zones, escape routes;
- Hazard chart;
- Emergency shut-down procedures;
- Nominal roll of employees;

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- List of key personnel, list of essential employees, list of Emergency Co-ordinators;
- Duties of key personnel;
- Address with telephone numbers and key personnel, emergency coordinator, essential employees; and
- Important address and telephone numbers including Government agencies, neighboring industries and sources of help, out side experts, population details around the Mine.

1.3.4.2 Assembly Point

Number of assembly points depending upon the mine location would be identified wherein employees who are not directly connected with the disaster management would be assembled for safety and rescue. Emergency breathing apparatus, minimum facilities like water etc. would be organized. In view of the size of mine, different locations should be earmarked as assembly points. Depending upon the location of hazard, the assembly points are to be used.

1.3.4.3 Emergency Power Supply

Mine facilities would be connected to Diesel Generator and would be placed in auto mode. Thus, water pumps, mine lighting and emergency control centre, administrative building and other auxiliary services are connected to emergency power supply. In all the blocks flame proof type emergency lamps would be provided.

1.3.4.4 Fire Fighting Facilities

First Aid Fire Fighting equipment suitable for emergency would be maintained in each operation areas of the mine as per statutory requirements.

1.3.4.5 Location of Wind Sock


On the top of the Administration block, wind socks would be installed to indicate direction of wind for emergency escape.

1.3.4.6 Emergency Medical Facilities

Stretchers, gas masks and general first aid materials for dealing with chemical burns, fire burns etc. would be maintained in the medical centre as well as in the emergency control room. Private medical practitioners help would be sought. Government hospital would be approached for emergency help.

Apart from plant first aid facilities, external facilities would be augmented. Names of medical personnel, medical facilities in the area would be prepared and updated. Necessary specific medicines for emergency treatment of burns patients and for those affected by toxicity would be maintained.

Breathing apparatus and other emergency medical equipment would be provided and maintained. The help of near by industrial managements in this regard would be taken on mutual support basis.

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1.3.4.7 Ambulance

An ambulance with driver availability in all the shifts, emergency shift vehicle would be ensured and maintained to transport injured or affected persons. Number of persons would be trained in first aid so that in every shift first aid personnel would be available.

1.3.5 Emergency Actions

1.3.5.1 Emergency Warning

Communication of emergency would be made familiar to the personnel inside the mine and people outside. An emergency warning system would be established.

1.3.5.2 Evacuation of Personnel

In the event of an emergency, unconnected personnel have to escape to assembly point. Operators have to take emergency shutdown procedure and escape. Time Office maintains a copy of deployment of employees in each shift. If necessary, persons can be evacuated by rescue teams.

1.3.5.3 All Clear Signal

Also, at the end of an emergency, after discussing with Incident Controller and Emergency Co-ordinators, the Site Controller orders an all clear signal. When it becomes essential, the Site Controller communicates to the District Emergency Authority, Police, Fire Service personnel regarding help required or development of the situation into an Off-Site Emergency.

1.3.6 General Information


1.3.6.1 Employee Information

During an emergency, employees would be warned by raising siren in specific pattern. Employees would be provided with information related to fire hazards, antidotes and first aid measures. Those who would be designated as key personnel and essential employees would be given training to emergency response.

1.3.6.2 Co-ordination with Local Authorities

Keeping in view of the nature of emergency, two levels of coordination are proposed. In the case of an On Site Emergency, resources within the organization would be mobilized and in the event of extreme emergency local authorities help would be sought.

In the event of an emergency developing into an off site emergency, local authority and District Emergency Authority (normally the Collector) would be appraised and under his supervision, the Off Site Disaster Management Plan would be exercised. For this purpose, the facilities that are available locally, i.e. medical, transport, personnel, rescue accommodation, voluntary organizations etc. would be mustered. Necessary rehearsals and training in the form of mock drills would be organized.

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1.3.6.3 Mutual Aid

Mutual aid in the form of technical personnel, runners, helpers, special protective equipment, transport vehicles, communication facility etc. would be sought from the neighboring industrial managements/government agencies.

1.3.6.4 Mock Drills

Emergency preparedness is an important tool of planning in Industrial Disaster Management. Personnel would be trained suitably and prepared mentally and physically in emergency response through carefully planned, simulated procedures. Similarly, the key personnel and essential personnel would be trained in the operations.

1.3.6.5 Important Information

Important information such as names and addresses of key personnel, essential employees, medical personnel, transporters address, address of those connected with Off Site Emergency such as Police, Local Authorities, Fire Services, District Emergency Authority would be prepared and maintained.

The on-site emergency organization chart for various emergencies is shown in **Figure-2**.

1.4 Off-Site Emergency Preparedness Plan

The task of preparing the Off-Site Emergency Plan lies with the District Collector. However, the off-site plan would be prepared with the help of the local district authorities. The proposed plan would be based on the following guidelines.

1.4.1 Aspects Proposed to be considered in the Off-Site Emergency Plan

The main aspects which should be included in the emergency plan are:

- **Organization**


Details of command structure, warning systems, implementation procedures, emergency control centres, names and appointments of incident controller, site main controller, their deputies and other key personnel

- **Communications**

Identification of personnel involved, communication centre, call signs, network, lists of telephone numbers.

- **Specialized Knowledge**

Details of specialist bodies, firms and people upon whom it may be necessary to call e.g. those with specialized knowledge of fire control;

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- **Voluntary Organizations**

Details of organizers, telephone numbers, resources etc;

- **Chemical Information**

Details of the hazardous substances stored or procedure on each site and a summary of the risk associated with them;

- **Meteorological Information**

Arrangements for obtaining details of whether conditions prevailing at the time and whether forecasts;

- **Humanitarian Arrangements**

Transport, evacuation centres, emergency feeding treatment of injured, first aid, ambulances, temporary mortuaries;

- **Public Information**

Arrangements for dealing with the media press office and informing relatives, etc;

- **Assessment**

Arrangements for: (a) collecting information on the causes of the emergency; (b) reviewing the efficiency and effectiveness of all aspects of the emergency plan.

1.4.2 Role of the Emergency Co-ordinating Officer

The various emergency services should be co-ordinated by an emergency coordinating officer (ECO), who will be designated by the district collector. The ECO should liaise closely with the site main controller. The ECO should inform the DGMS authorities in case of accidents as per the statutory requirement. Again depending on local arrangements, for very severe incidents/accidents with major or prolonged off-site consequences, the external control should be passed to a senior local authority administrator or even an administrator appointed by the central or state government.

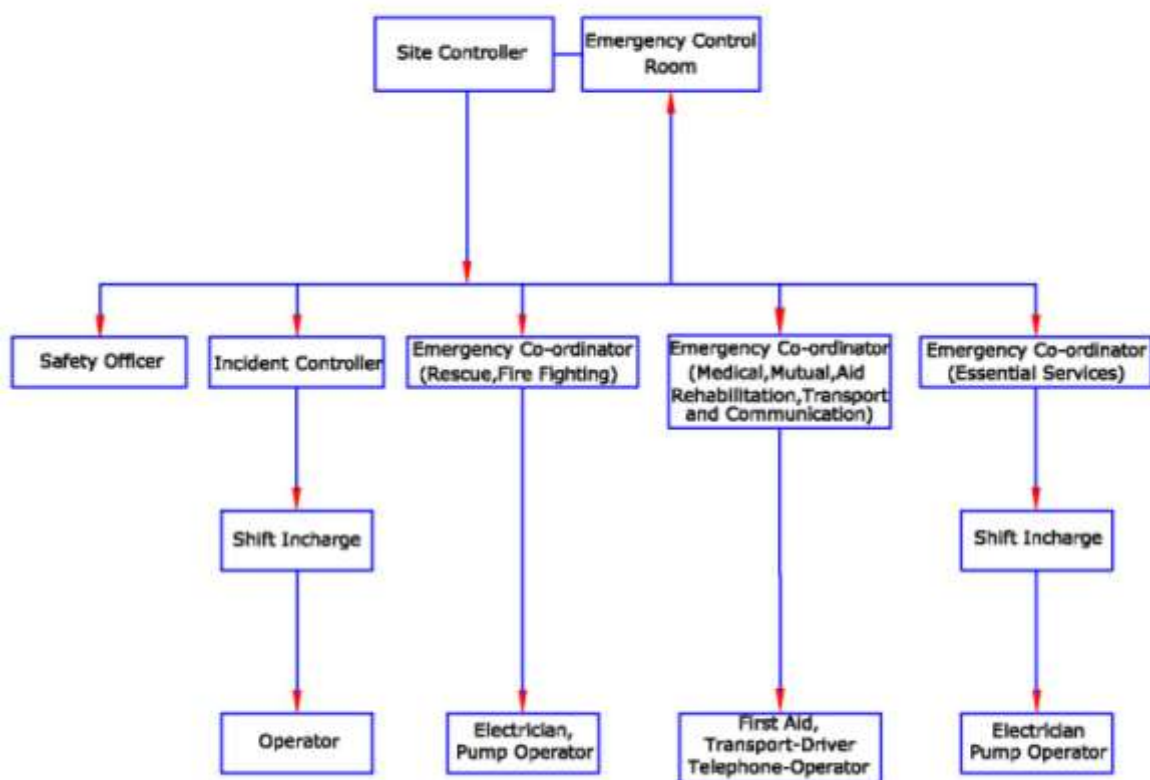



FIGURE-2
ON-SITE EMERGENCY PLAN

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1.4.3 Role of the Local Authority

The duty to prepare the off-site plan lies with the local authorities. The emergency planning officer (EPO) appointed should carry out his duty in preparing for a whole range of different emergencies within the local authority area. The EPO should liaise with the works, to obtain the information to provide the basis for the plan. This liaison should ensure that the plan is continually kept upto date.

It will be the responsibility of the EPO to ensure that all those organizations which will be involved off site in handling the emergency, know of their role and are able to accept it by having for example, sufficient staff and appropriate equipment to cover their particular responsibilities. Rehearsals for off-site plans should be organized by the EPO.

1.4.4 Role of Police

Formal duties of the police during an emergency include protecting life and property and controlling traffic movements. Their functions should include controlling bystanders evacuating the public, identifying the dead and dealing with casualties, and informing relatives of death or injury.

1.4.5 Role of Fire Authorities

The control of a fire should be normally the responsibility of the senior fire brigade officer who would take over the handling of the fire from the site incident controller on arrival at the site. The senior fire brigade officer should also have a similar responsibility for other events, such as explosions. Fire authorities in the region should be apprised about the location of all stores of flammable materials, water supply points and fire-fighting equipment. They should be involved in on-site emergency rehearsals both as participants and, on occasion, as observers of exercises involving only site personnel.

1.4.6 Role of Health Authorities


Health authorities, including doctors, surgeons, hospitals, ambulances, and so on, should have a vital part to play following a major accident, and they should form an integral part of the emergency plan.

For major fires, injuries should be the result of the effects of thermal radiation to a varying degree, and the knowledge and experience to handle this in all but extreme cases may be generally available in most hospitals.

Major off-site incidents are likely to require medical equipment and facilities additional to those available locally, and a medical "mutual aid "scheme should exist to enable the assistance of neighboring authorities to be obtained in the event of an emergency.

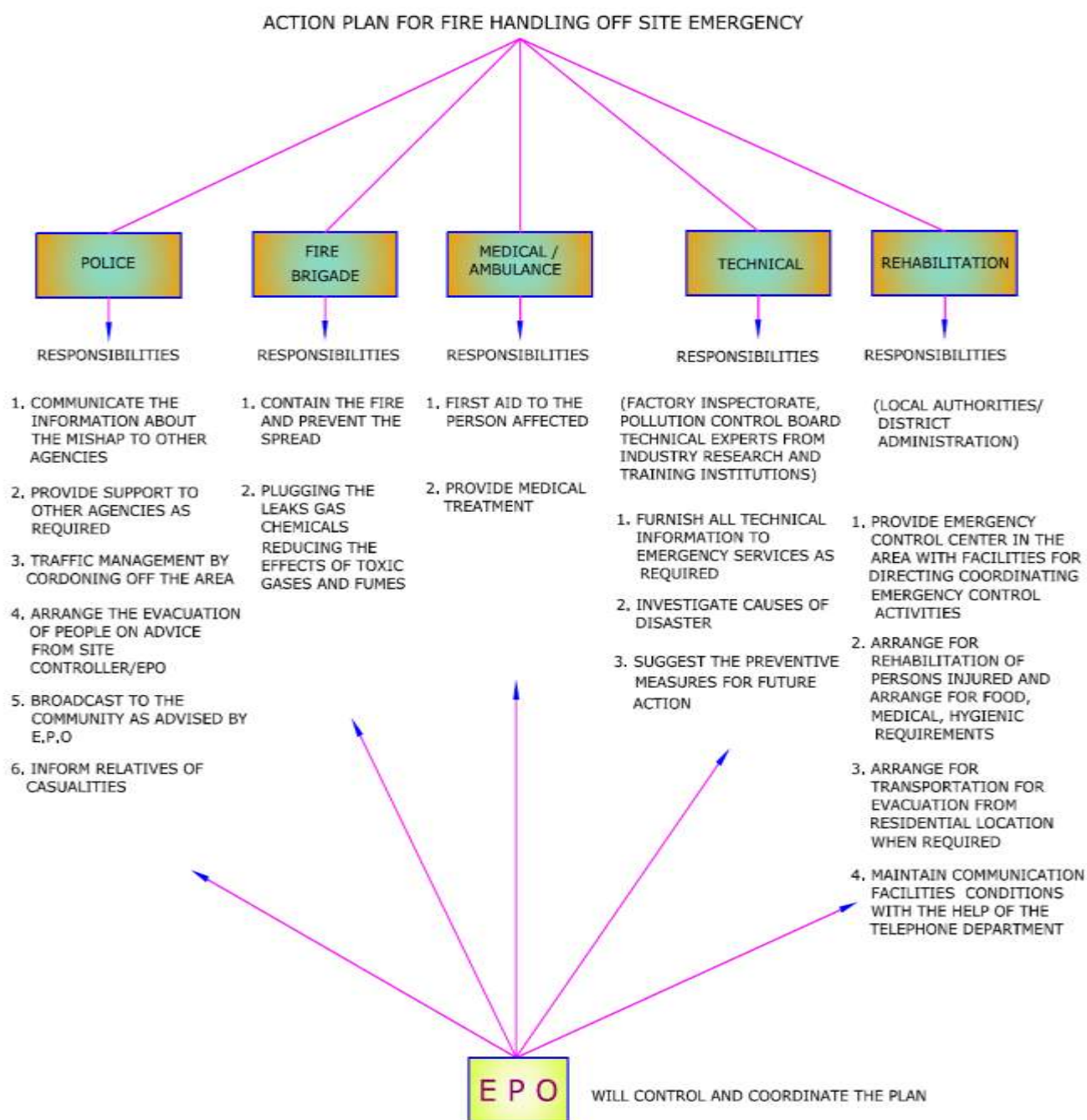
1.4.7 Role of Government Safety Authority

This will be the factory inspectorate available in the region. Inspectors are likely to want to satisfy themselves that the organization responsible for producing the off-

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site plan has made adequate arrangements for handling emergencies of all types including major emergencies. They may wish to see well documented procedures and evidence of exercise undertaken to test the plan.

In the event of an accident, local arrangements regarding the role of the factory inspector will apply. These may vary from keeping a watching brief to a close involvement in advising on operations in case involvement in advising on operations. The off-site emergency organization chart for major disaster is shown in **Figure-3.**



Source: Vimta Labs Limited, Hyderabad

**FIGURE-3
OFF-SITE EMERGENCY PLAN**