

RISK ASSESSMENT & DISASTER MANAGEMENT PLAN

This chapter comprises aspect of disaster management. This chapter deals with identification of hazards and disaster and preventive measures for disaster. Proposed Dhenkanal Steel Plant may face certain types of hazards which can disrupt normal activities abruptly and lead to disaster like fires, inundation, failure of machinery, hot metal spill, electrocution to name a few. Disaster management plan is formulated with an aim of taking precautionary steps to control the hazard propagation and avert disaster and also to take such action after the disaster which limits the damage to the minimum.

7.1 HAZARD IDENTIFICATION AND RISK ASSESSMENT

As a consequence of health and safety awareness many measures shall be taken to ensure the security of an individual working in the industrial premises. Risk assessment follows an extensive hazard analysis. Risk is defined as a likelihood of an undesired event (accident injury or death) occurring within a specified period or under specified circumstances. This may be either a frequency or a probability depending on the circumstances. In the working atmosphere, it is not possible to avoid or eliminate risk factor completely. However it is possible to minimize the risk factor to minimal or acceptable level.

The simple six-step risk assessment process includes:

1. Identification of a hazard
2. Identification of the associated risk
3. Assessment of the risk, which includes the (i) likelihood, (ii) severity and (iii) assigning a priority for correction
4. Control of the risk, which includes (i) Elimination, (ii) Engineering a barrier, (iii) Administration controls and (iv) Personal protection equipment
5. Documentation of the process.
6. Monitoring and review of the process.

7.1.1 Identification of a hazard and associated risk

The hazard shall be higher for workers directly exposed to hot metal, machines with moving parts, hot machines, hot water conduits, high places, near high pressure equipment, noise, etc. There the danger due to failure of machinery, spillages, exposure to heat, hazard of explosion due to high pressure. Several examples of hazards that may cause injury or illness can

be:

- (i) slips, trips and falls on the same level;
- (ii) falls from height;
- (iii) unguarded machinery;
- (iv) falling objects;
- (v) engulfment;
- (vi) working in confined spaces;
- (vii) moving machinery, on-site transport, forklifts and cranes;
- (viii) exposure to controlled and uncontrolled energy sources;
- (ix) exposure to asbestos;
- (x) exposure to mineral wools and fibres;
- (xi) inhalable agents (gases, vapours, dusts and fumes);
- (xii) skin contact with chemicals (irritants (acids, alkalis), solvents and sensitizers);
- (xiii) contact with hot metal;
- (xiv) fire and explosion;
- (xv) extreme temperatures;
- (xvi) radiation (non-ionizing, ionizing);
- (xvii) noise and vibration;
- (xviii) electrical burns and electric shock;
- (xix) manual handling and repetitive work;
- (xx) failures due to automation; etc

There can be hazards on the road while coming and going from duty, during transportation of material due to following:

- High concentration of traffic during duty hours
- Heterogenous traffic
- Violation of traffic rules/ speed limit
- Road Condition
- Condition of vehicle

7.1.2 Assessment of the risk

Risk analysis follows as extensive hazard analysis. It involves the identification and assessment of potential impact. This requires a thorough knowledge of failure probability, credible accident scenario, vulnerability of population, etc. Much of this information is difficult to get or generate. Consequently the risk analysis is often confined to maximum credible accident studies.

Risk evaluation

Risk is defined as probability of occurrence of an accident and its consequences. The risk may be computed by the following formula:

$$FAR = \frac{108}{24 \times 365 \times N} \sum_{i=1}^n (x_i \cdot f_i)$$

Where:

| | | |
|-------|---|--|
| x_i | = | Number of deaths from a particular accident |
| f_i | = | Frequency of occurrence of the particular accident |
| n | = | Potential types of accidents |
| N | = | Total number of people at risk |
| FAR | = | Fatality accident rate |

The above concept of risk is quite straight forward. It is based on one specific aspect i.e. individual working in a particular environment that is exposed to a definite level of risk. The formula is based on actual historical record of the accident episodes reported in that particular type of environment. Accordingly the risk factor i.e. probability level of occurrence of accident works out to nil in this case.

All systems natural or man made shall be subject to failure. The nature of failure varies widely as do the causes of failure and the events leading to failure. The failure of systems could be due to:

- Misconception of required capability of systems or environment.
- Design deficiencies and erroneous assumption.
- Errors in operational process
- Improper management of the systems.
- Risk evaluation to determine the acceptable level and reduce the risk level.
- Control decision monitored for meticulous implementation to prevent the occurrence of unclassified and unacceptable accidents.

Attempts have been made to reduce failures of man-made systems with the introduction of safety measures, quality control, reliability analysis, condition monitoring and other approaches in design in order to reduce the probability of failure. Use of measures such as factor of safety shall be usually resorted to in order to improve the reliability of design and where health of the person is at great risk. Such factor has to be very high reducing probabilities of accidents/ disaster to a very low level.

The auxiliary fuels as Low Sulphur Heavy Stock (LSHS) shall be required at

proposed steel plant. For storage of auxiliary fuels, underground fabricated steel tanks shall be installed, which shall conform to the regulations. Since the tank(s) shall not be above ground, assessment of fire in tank and pool fire in dyke have not been carried out.

The fuel storage tanks shall be operated at ambient conditions. Fire hydrant points and fire extinguishers shall be provided at these locations. The characteristics of auxiliary fuel based on IS 11489 -1985 (Reaffirmed in 2001) has been given in **Table 7.1**.

TABLE 7.1
FUELS CHARACTERISTICS

| Sl. No. | Parameter | Specification |
|---------|---|--|
| 1 | Pour Point °C | +66 Max. |
| 2 | Flash Point (PMC), °C | 76 Min. |
| 3 | Kinematic Viscosity, at 100°C, cSt | 50 Max. |
| 4 | Relative Density @ 15 °C g/ml | Report |
| 5 | Gross Calorific Value, Cal/g | Report |
| 6 | Acidity, Inorganic, mg KOH/gm, | NIL |
| 7 | Ash, percent by Mass. | 0.10 Max. |
| 8 | Sediment, percent by Mass | 0.25 Max. |
| 9 | Sulphur, Total percent by Mass | 1.0 Max. |
| 10 | Water content % by Vol. | 1.0 Max. |
| 11 | Accelerated Dry Sludge, percent by Mass | 0.10 Max |
| 12 | Spot Test for cleanliness, Rating | No 2 (Faint or poorly defined inner ring), Max |

7.1.3 Risk control

On site emergency planning

The on site emergency plan would be related to the final assessment and it is the responsibility of the management to formulate it. The plan must therefore, be specific to the site.

The plan sets out the way in which designated people at the site of the incident initiate supplementary action at an appropriate time. Designated people may or may not be from amongst the workers. An essential of the plan is the provision for making the affected unit safe, for example, by shutting it down. The plan also contains the full sequence of key personnel to be called in from other sections or from off site.

Off site emergency plan

The off site emergency plan is an integral part of any major hazard control system. It should be based on those accidents identified by the works management, which could affect people and the environment outside the works. Thus, the Off Site Plan follows logically from the analysis that took

place to provide the basis for the On Site Plan and the two plans should therefore complement each other. The key feature of a good off site emergency plan is flexibility in its application to emergencies other than those specifically included in the formation of the plan. The role of the various parties that may be involved in the implementation of an offsite plan has been described below. The responsibility for the off site plan will be likely to rest either with the works management or with the local authority.

7.2 TYPE OF DISASTER

Disaster can be natural or man made which have a negative impact on society or environment or both.

1) *Natural disasters*

A natural disaster is the consequence of a natural hazard (e.g. earthquake, flood, tsunamis, hurricane, etc.) which affects humans. The damage is caused by the lack of appropriate emergency management leading to financial, environmental and human life loss. Due to the location of this plant, earthquake is the first and foremost natural hazard followed by flooding. This shall is not near the coast and thus, is not affected by tsunamis or hurricanes.

2) *Man-made disasters*

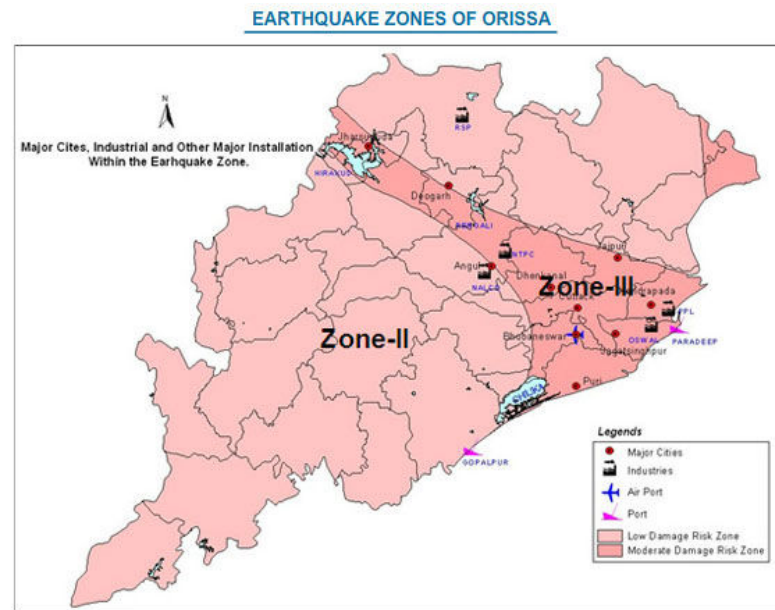
The man-made disasters shall be caused by human action, negligence, error, or involving the failure of a system. Human-made disasters can be termed as technological disaster. Technological disasters shall be the results of failure of technology involving material, design, system or operational failures.

7.2.1 Natural disasters

7.2.1.1 *Seismic & Earthquake risk management*

According to GSHAP data, the state of Odisha falls in a region of low to moderate seismic hazard. As per the 2002 Bureau of Indian Standards (BIS) map, the plant area falls in Seismic Zone II. Historically Odisha has experienced very few moderate to large earthquakes. Some events with magnitudes in excess of 5.0 have originated in the Bay of Bengal off the coast of the state.

The earthquake hazard map from National Disaster Management Agency is given in **Fig 7.1**.

FIG 7.1: EARTHQUAKE HAZARD MAP

(Source: <http://www.ndma.gov.in/images/odisha-3.jpg> accessed 28.12.2018)

No major earthquake has been noticed in Odisha state since 2002. However, details of the earthquakes in last 2 decades is given below. (Source: Amateur Seismic Centre, <http://asc-india.org/seismi/seis-orissa.htm>, last accessed on 28.12.2018):

| Date | Description |
|-----------------|---|
| 08 April 1982 | Bay of Bengal, Mw 5.2 18.510 N, 86.310 E, D=024.0 kms, OT=02:41:16 UTC |
| 14 October 1982 | Khajuripada-Banigochha area, Odisha, Mb 4.7 20.390 N, 84.420 E, OT=12:56:09 UTC |
| 01 July 1985 | Bay of Bengal, Mw 5.4 18.367 N, 87.188 E, D=010.0 kms, OT=02:23:52 UTC |
| 27 March 1995 | Laimura-Deogarh area, Odisha, Mb 4.6 21.671 N, 84.565 E, D=010.0 kms, OT=07:52:10.60 UTC |
| 21 June 1995 | Kasijodi-Nuakot area, Odisha, Mb 4.7 21.780 N, 85.327 E, D=033.0 kms, OT=18:35:41.23 UTC |
| 12 June 2001 | Konokjora-Sundargarh area, Odisha, Mw 4.7 22.240 N, 83.918 E, D=025.5 kms, OT=12:41:00 UTC |

After assessment of the website <https://earthquaketrack.com/in-21-dhenkanal/recent> (accessed 28.12.2018) which lists the latest earthquakes, it was found that no earthquakes were found to have occurred in or within 10 km radius of the project site in the last ten years. The earthquake, nearest to project site was on January 19, 1986, 06:53 UTC (approximately 33 years ago) about 4.4 magnitude earthquake, with epicenter at 21.003, 85.172, 8.2 km from Talcher.

Despite the low level of seismicity and the proximity of low magnitude earthquake that has occurred in the region, the construction of the buildings will be done as per National Building Code and IS 875. In case of damage due to earthquake, the disaster management shall be done in line with National Disaster Management Authority's system.

There is no threat of landslide at project site, it being flat in topography. Although Jharbandh reserve forest is near to the project and located on a hill, the presence of forest will protect the hillside from sliding.

Management Measures:

Things that need to be done shall be as follows:

- During construction, the various building byelaws and BIS codes will be followed.
- A common meeting point inside the plant site and a contact outside the plant will be identified and known to all employees and workers.
- List important telephone numbers and torch, water, transistor, first-aid kit and non-perishable food will be kept at a designated place. An emergency kit shall be ready at all times.
- Train workers in basic first aid. Teams for first-aid; search and rescue etc. will be formed in the area and preparedness drills will be conducted for what to do in case of an event.

In case of occurrence of an earthquake, every individual would have to follow the pointers below:

- Keep calm and help others to keep calm. Do not panic.
- If you shall be inside of a building: Protect yourself by ducking under sturdy table, and staying there until the shaking stops. Turn off electricity and gas.
- If you shall be on the road in a built up area: Immediately move away from buildings, slopes, streetlights, power lines, hoardings, fly-overs etc. into open spaces. Do not run or wander; keep the roads free for movement.
- If you shall be driving: Stop the vehicle away from the buildings, slopes and electric cables; come out of the vehicle, hold it and stay by its side
- Keep calm and expect aftershocks.
- Check if you or anyone else is hurt. Use first-aid and wait for medical help.
- Do not move seriously injured people.
- Do not turn-on electrical appliances and gas.
- Check your building for damages.
- Do not waste water and do not block telephone lines.
- Do not spread rumours and don't panic.

- Volunteer to help.
- Keep the streets clear for emergency services.
- Do not use matches, lighters, camp stoves or electrical equipments, appliances until you can be sure there are no gas leaks. They may create a spark that could ignite leaking gas and cause an explosion and fire.
- Do not use your telephone except for a medical or fire emergency. It could tie up the lines needed for emergency response. If the phone doesn't work send someone for help. Conserve mobile phone & laptop batteries for use in emergency as power may be cut for long.

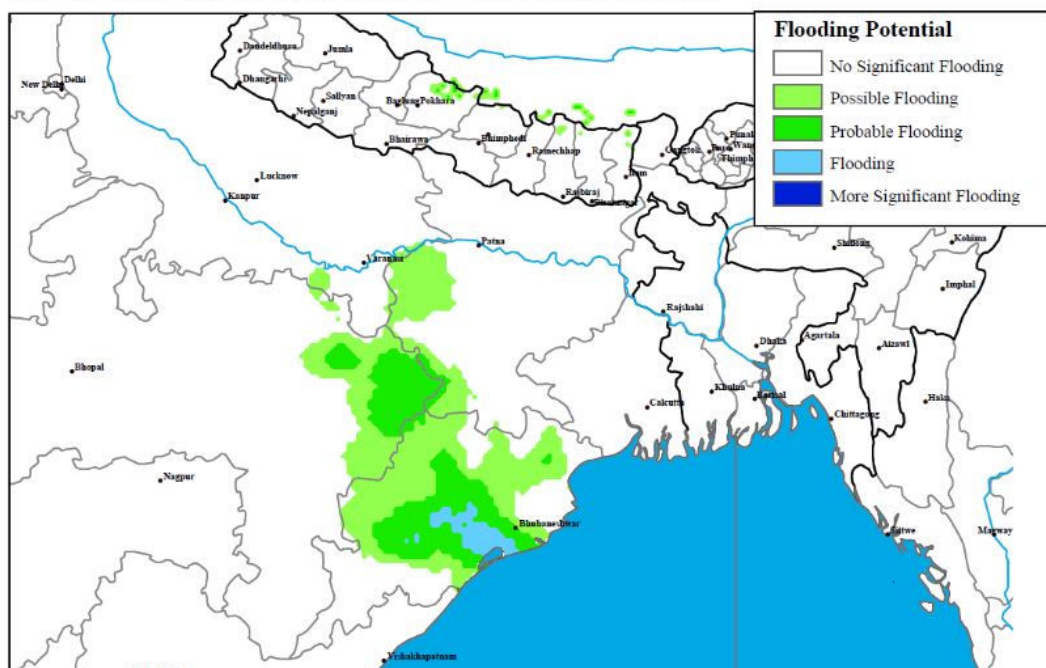
7.2.1.2 Flood Hazard

A perusal of the flood potential map of Odisha state given in **Fig 7.2** shows that the project area lies in the area of “no significant flooding”.

FIG 7.2: FLOOD POTENTIAL MAP

India: Flood Potential Map for 20131012

Source: Satellite Derived Precipitation and NOAA GFS Precipitation forecast



Source : <http://floodlist.com/wp-content/uploads/2013/10/Phailin-India-flood-map-121.jpg>
accessed 29.12.2018

Flood management

In case of extreme scenario of occurrence of flood in study area, people from the nearby-flooded villages might flock for shelter to the higher elevations and this project could be one of their refuges in times of distress. Hence, arrangement of flood shelter is proposed in the project as follows:

- Several clean containers for water, large enough for a 3-5 day supply of water.

- A 3-5 day supply of non-perishable food and a non-electric can opener.
- A first aid kit and manual and prescription medicines and special medical needs.
- A battery-powered radio, flashlights, and extra batteries.
- Sleeping bags or extra blankets.
- Water-purifying supplies, such as chlorine or iodine tablets or unscented, ordinary household chlorine bleach.
- Baby food and/ or prepared formula, diapers, and other baby supplies.
- Disposable cleaning cloths, such as "baby wipes" for the whole family to use in case bathing facilities are not available.
- Personal hygiene supplies, such as soap, toothpaste, sanitary napkins, etc.
- An emergency kit for your car with food, flares, booster cables, maps, tools, a first aid kit, fire extinguisher, sleeping bags, etc.
- Rubber boots, sturdy shoes, and waterproof gloves.
- Insect repellent containing DEET or Picaridin, screens, or long-sleeved and long-legged clothing for protection from mosquitoes which may gather in pooled water remaining after the flood.

7.2.2 Man made disasters

Disaster may occur due to following hazards in the steel complex.

- Fire
- Explosion
- Oil spillage
- Electrocution
- Hazardous waste
- Accident
- Liquid hot metal spill

In any plant there shall be various activities or area which pose substantial threat to the workers and hence hazardous in nature. In the proposed project, type of likely hazards that can occur shall be tabulated in **Table 7.2**.

TABLE 7.2
HAZARD IDENTIFICATION OF THE PROPOSED STEEL PLANT

| Group | Item | Nature of Hazard | Hazard Potential | Remarks |
|--------------------------------|--|-------------------------|-------------------------|-----------------------------------|
| Raw materials handling | Coal for coking | Fire | Moderate | Fire hazard |
| | Water treatment Chemicals like acids/alkalis | Toxic | Major | Bio-corrosive |
| | Lube oils/greases | Fire | Moderate | Flammable |
| Production units | | | | |
| - Coke Plant | Dusts and fumes | Asphyxiation | Moderate | Air pollution |
| | VOC emissions from battery | Toxic | Moderate | Health hazard |
| | Coke over gas | Fire & Toxic | Major | Fire and CO hazard |
| - Agglomeration (Sintering) | Dusts | Respiratory | Moderate | Ambient air pollution |
| - Iron making in | Release of untreated DRI/BF wastewater | Toxic | Major | Severe pollution of surface water |
| | BFG handling | Fire | Major | Fire hazard |
| | Hot metal & slag Handling, dolochar | Fire | Major | Fire hazard |
| - Steel making in | Release of untreated BOFs wastewater | Toxic | Major | Severe pollution of surface water |
| | BOFG handling | Fire | Major | Fire hazard |
| | Hot liq. Steel & Slag Handling | Heat radiation | Major | Bio-corrosive |
| - Rolling Mills | Gas firing/fuel firing | Fire | Major | Fire hazard |
| | Release of untreated wastewater | Toxic | Major | Severe pollution of surface water |
| - Captive Power Plant (CPP) | MBF Gas, Coke over Gas | Fire | Major | Fire hazard |
| Utilities | | | | |
| - Fuel gas | Gas leaks | Fire & Toxic | Major | Fire & Co Pollution |
| - Electric Power Supply | Short circuit | Fire | Major | Fire hazard |
| - Liquid fuel | Fuel handling & storage area | Fire & Toxic | Major | Fire Hazard |
| - Hydraulic oil and lubricants | Accidental discharge of hydraulic oil under pressure | Fire & Toxic | Moderate | Fire & personal injury |

7.3 ACCIDENT LEVEL

If there is any disaster in any part of plant/work place due to any reason the classification of area, which may be affected, and nature of accidents can be made as follows:

| | | | |
|---|-------|-----|-------------------------|
| 1 | Level | I | Operator level |
| 2 | Level | II | Local community level |
| 3 | Level | III | Regional/national level |
| 4 | Level | IV | International level |

Out of the above, only level-I and level - II class of accidents can be considered applicable for steel complex.

Level - I Accidents

Accidents that may happen due to electrocution, fire, explosion, oil spillage, liquid hot metal spill and spontaneous ignition of combustible material at operator level. This level has low probability of occurrence and affects persons inside the plant. Various hazardous area, which have been mentioned above in **Table 7.2** as potential hazard area will be affected during this level of accidents.

Level-II Accidents

Accidents of this level can occur in case of sabotage and complete failure of all automatic control/warning systems, and also if the fuel oil stored in tank leaks out. However probability of occurrence of this is very low due to adequate security, training and education of persons of plant responsible for operating such systems.

7.4 DISASTER PREVENTION MEASURES

In order to prevent disaster due to fire, explosion, oil spillage, electrocution, liquid hot metal spillage and other accidents, following preventive measures shall be adopted:

1. Design, manufacture and construction of all plant and machineries building will be as per national and international codes as applicable in specific cases and laid down by statutory authorities.
2. Provision of adequate access way for movement of equipment and personnel shall be kept.
3. Minimum two no. of gates for escape during disaster shall be provided.
4. Water spraying in coal storage shall be provided.

5. System of fire hydrants comprising electrical motor division and diesel engine drivers fire pumps with electrical motor driver jockey pump for keeping the fire hydrant system properly pressurized and automatic water sprinkling system for all important transformers.
6. Fire hydrants with fire hoses in all areas where fire can break.
7. Shielded cover will be paved on the signal cable to separate from the power cable if they shall be laid together.
8. Steam fire extinguishers shall be adopted at all the dangerous places in the workshops and plant.
9. Ventilation and temperature control facilities is set at all operation room, duty room, and assistant room as well as overhang fans to ensure labour health.
10. The design of this project is set with safety measurements such as lighting proof grounding and anti- electric shock.
11. The safety exit and safety evacuation space would meet the requirements of building design for fireproofing regulations GBJ16-87 (1997 Edition).

7.4.1 Site emergency control room

In order to control the disaster more effectively, a Site Emergency Control Room (SECR) shall be established at the plant site. The facilities proposed to be provided shall be given in following sections:

- Plant Layout.
- Plant Layout with inventories and locations of fuel oil, storage tanks, coal storage, assembly points, location of safety equipment, etc.
- Hazard identification chart, maximum number of people working at a time, etc.
- Population around factory.
- Internal telephone connections.
- External telephone connections.
- Hotline connection to district collector, police control room, fire brigade, hospital etc.
- Public address system.
- Torch-lights.
- List of dispensaries and registered medical practitioners around factory.

- Area map of surrounding villages.
- Nominal roll of employees.
- List of personnel with addresses, telephone numbers
- Note pads and ball pens to record message received and instructions to be passed through runners.
- The blown up copy of Layout plan showing areas where accident has occurred.
- Fire hydrant system in different location.
- Truck parking information
- Specialized monitoring & management equipment will be available at all the sensitive points to deal with small to medium spillages of the chemical.

7.4.2 Safety department

Safety department shall be manned by experienced engineers and other supporting staff who shall bring safety consciousness amongst the work force of plant.

The safety department will conduct regular safety awareness courses by organizing seminars and training of personnel among the various working levels.

7.5 CONTINGENCY PLAN FOR MANAGEMENT OF EMERGENCY

To tackle the situation, a disaster control room will be set up having links with all control rooms of the plant. An up to date communication facility will be provided to control rooms. In case of disaster, emergency meeting of all concerned sectional heads will be convened to decide control measures and ensure its implementation. The emergency organisation shall be headed by emergency leader called Site Main Controller (SMC) who will be plant manager. In his absence senior most person available at plant shall be emergency leader till arrival of plant manager.

Besides the top officials described above, rest of the employees shall be divided into three action teams namely A, B, C, and a Non-action Group D. Action team 'A' will consist of staff of section in which accident has occurred. Action team 'B', will consist of staff of non-affected sections and maintenance department. Action team 'C' will consist of supporting staff i.e. Security supervisor, Warehouse Supervisor, Shift Supervisor etc. Group 'D' will consist of people not included in those teams like contractor, labour, security men etc.

Team 'A' comprising staff of affected section will be taking up the action in case of an emergency. Team 'B' will help team 'A' by remaining in their

respective sections ready to comply with specific instructions of SMC. Team 'C' consisting of supporting staff will help team 'A' as required and directed by Team 'B'. Group 'D' will be evacuated to safe region under supervision of Team 'C'.

A multichannel communication network shall connect SECR to control rooms of plant, various shops, and other departments of plant, fire station and neighboring industrial units. Co-ordination among key personnel and their team has been shown in **Fig 7.3**.

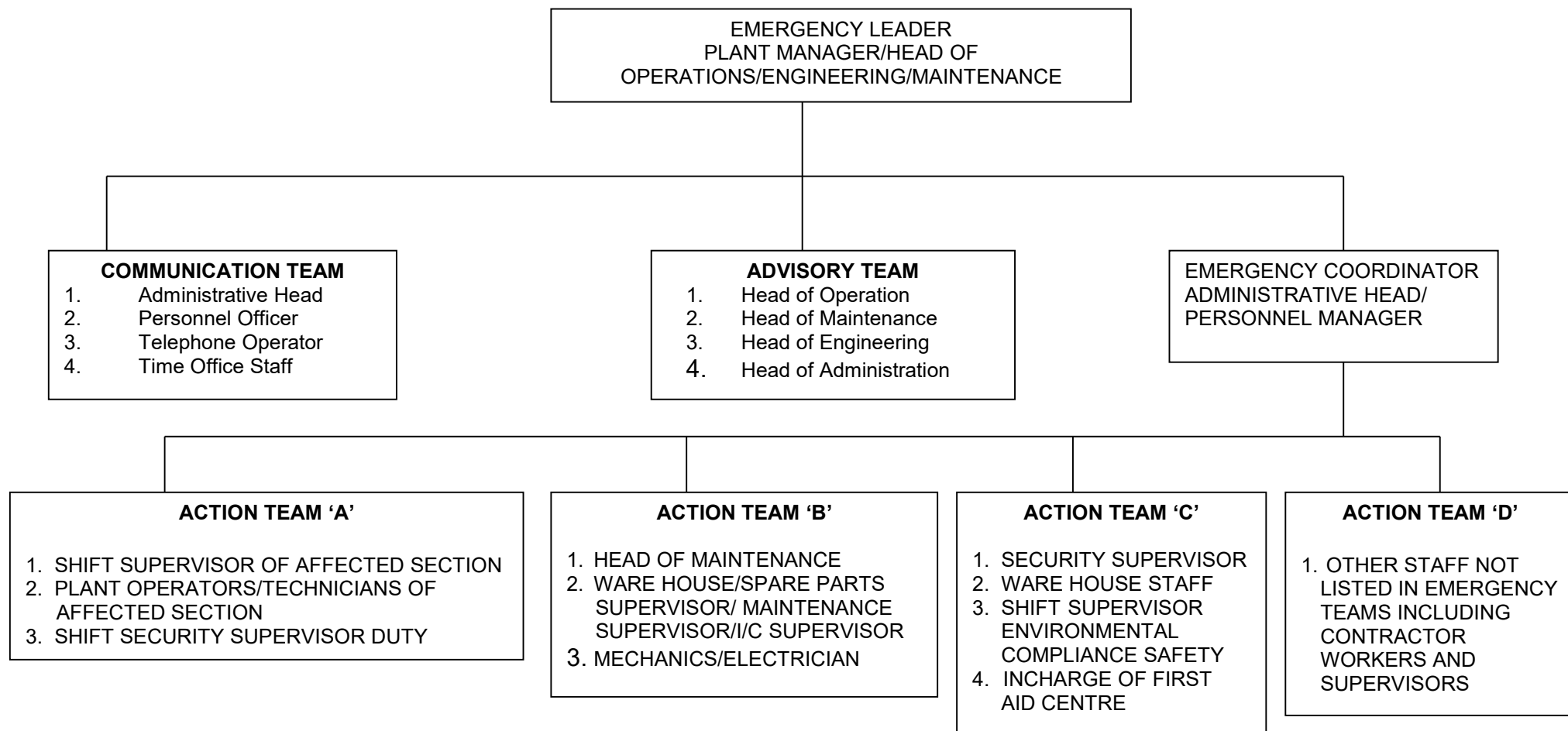
7.5.1 Outside organisations involved in control of disaster

In the event of massive spillage of fuel oil or occurrence of fire, population inside and outside plant boundaries, vegetation and animal etc. may be affected. In such circumstances secondary fire may also take place. In such an event help shall be taken from outside agencies also.

The organizations that shall be involved shall be as follows:

- (a) State and local authorities: District Collector, Revenue Divisional Officer, etc
- (b) Factory Directorate, Director of factories and boiler, Joint Director of factories and boiler, Asstt. Director of factories and boiler
- (c) Environmental agencies: Member Secretary of State Pollution Control Boards, Regional Officer State Pollution Control Board.
- (d) Fire Department: Chief District Officer
- (e) Police Department: District Superintendent of Police, SHOS of nearby Police Stations
- (f) Public Health Department:
 - District Medical Officer
 - Residential medical officers of PHCs in a radius of 4-5 km around plant site
- (g) Local Community Resources
 - Regional Transport officer
 - Divisional Engineer Telephones

The outside organisations shall directly interact with district magistrate, who in consultation with SMC, shall direct to interact with plant authorities to control the emergencies.

FIG 7.3: GENERAL COORDINATION AMONG ON SITE EMERGENCY TEAM MEMBERS

7.5.2 Hazard emergency control procedure

The onset of emergency will in all probability, commence with a major fire or explosion, the following activities will immediately take place to interpret and take control of emergency.

1. Staff member on duty will go to nearest fire alarm call point and trigger off the fire alarm.
2. On site fire crew led by fireman will arrive at the site of incident with fire foam tenders and necessary equipments.
3. Site main controller will arrive at SECR, from where he will receive information continuously from incident controller and give decisions and direction to the incident controller, plant control room, Emergency security controllers and to the site medical officer to take care of casualties.

Site Main Controller will be directing and deciding a wide range of issues. In particular SMC has to decide and direct:

- Whether incident controller requires reinforcement of manpower and facilities
- Whether plant is to be shut down or more importantly kept running.
- Whether staff in different locations is to remain indoor or to be evacuated and assembled at designated collection center.
- Whether missing staff members shall be searched or rescued.
- Whether off-site emergency plan to be activated and a message to that effect is to be sent to district headquarter.

When the incident has eventually been brought under control as declared by the Incident Controller, the SMC shall send two members of his advisory team as inspectors to incident site for:

- An assessment of total damage and prevailing conditions with particular attention to possibility of re-escalation of emergency which might, for the time being, be under control.
- Inspection of other parts of site, which might have been affected by impact of incident.
- Inspection of personnel collection and roll call centers to check if all persons on duty have been accounted for.
- Inspection of all control rooms of plant to assess and record the status of respective plants and any residual action deemed necessary.

Post emergency, the inspectors will return to SECR with their observations and report of finding and will submit the same to SMC.

7.6 MISCELLANEOUS PREVENTIVE MEASURES

7.6.1 Alarm system to be followed during disaster

On receiving the message of “Disaster, from Site Main Controller, fire station control room attendant will sound SIREN I WAILING TYPE FOR 5 MINUTES. Incident controller will arrange to broadcast disaster message through public address system.

On receiving the message of “Emergency Over” from Incident Controller the fire station control room attendant will give “All Clear Signal, by sounding alarm straight for two minutes. The features of alarm system will be explained to one and all to avoid panic or misunderstanding during disaster.

7.6.2 Actions to be taken on hearing the warning signal

On receiving the disaster message following actions will be taken:

- All the members of advisory committee, personnel manager, security controller, etc. shall reach the SECR.
- The process unit persons will remain ready in their respective units for crash shutdown on the instruction from SECR.
- The persons from other sections will report to their respective officer.

7.6.3 Safety devices/equipments

In order to make the services more effective the workers and rescue team will be provided with the safety equipments and items like gas mask respirators, fire entry suits, fire blankets, rubber shoes or industrial shoes, rubber glove, ladders, ropes, petromax lamp torches etc.

7.6.4 Fire extinguisher

The different type of fire extinguishers have been proposed at strategic locations in the plant and given in **Table 7.3**.

TABLE 7.3
DIFFERENT FIRE EXTINGUISHERS AT DIFFERENT SITES

| Name of Site | Type of Fire Extinguishers |
|--------------------------|---|
| Generator area | CO ₂ & Foam Type, Dry Chemical Powder |
| Cable galleries | CO ₂ & Foam type, Dry chemical powder |
| High voltage panel | CO ₂ & Foam type, Dry chemical powder |
| Control rooms | CO ₂ & Foam type, Dry chemical powder |
| MCC rooms | CO ₂ & Foam type, Dry chemical powder |
| Pump Houses | CO ₂ & Foam type, Dry chemical powder |
| Fuel storage | CO ₂ & Foam type, Dry chemical powder sand basket |
| Guest houses and offices | Dry chemical powder, foam type |
| Godowns, store | CO ₂ & Foam type |

7.6.5 Casualty services

The casualty services section will be headed by a medical officer who will be responsible for immediate medical aid and first aid. The section will be fully equipped with all first aid medical facilities. An ambulance will be on duty round the clock to tackle the emergency. On receiving the call of emergency, the medical officer will report immediately to disaster site along with mobile first aid equipment and ambulance. The immediate first aid will be made available and the medical officer will assess further line of action in the best interest of victim.

7.6.6 Specific Treatment

Specific treatment / preventive measures for injuries and hazards will be provided in the Medical Centre. Eye and body showers will be provided in different required places of plant which shall be identified by the Safety Officer. Major hazards/injuries and treatment facilities in the plant shall comprise of All primary pathological diagnosis, X-Ray, Ultra sound, ECG, Trauma cases, Audiometry Test, Spirometry test, Vision testing, Eye treatment, Burn treatment, Poisoning treatment Electrical Shock treatment and Ambulance Facility.

The emergency, critical cases & diseases which cannot be treated shall be referred & treated at larger hospitals in the district or Medical Colleges or super speciality hospitals.

7.6.7 Industrial Safety

For protection of working personnel, equipment and machineries from any damage or loss and to ensure uninterrupted production, adequate safety and fire fighting measures have been planned for the proposed plant. Important provisions shall be as follows:

- Laying down specific Safety, Health & Environment policy to guide.
- Provision of adequate personal safety appliances to workers engaged in hazardous installations.
- Practices of safety inspections / monitoring at regular intervals by a team of experienced professionals to guide & educate the workforce.
- Provision of detection and alarm system to allow a developing fire to be detected at an early stage.

Plant uses a wide variety of specialized equipments and methods for handling raw materials. This equipment ranges from the most basic forklift to Cranes, Derricks, Hoists, Elevators and Conveyors. The hazards of using powerful equipment and of moving heavy materials require a wide variety of protective measures for employees on the site. The work talks about regulatory requirements and safe use for this equipment. The work covers safe rigging and slings for proper lifting, and safety requirements for specific

types of Cranes, Derricks, Hoists, Elevators, Conveyors, and forklifts. Bearing this in mind the cranes, hoists, lifts shall be periodically tested and certificate issued for continuous use.

Fitted dress and use of personnel protective equipment will be essential by everyone. All unsafe conditions or unnatural occurrences should be reported promptly to the supervisor/ head of the department of safety.

7.6.8 Safety management

The number of elements of safety management shall be quite large. They also vary from case to case. They can be grouped under five broad categories or sub-systems as follows:

- Managerial Systems
- Accident Prevention Systems
- Support Systems
- Event Management Systems
- Evaluation Systems

Managerial systems is comprising of:

- Safety Policy
- Safety Organization
- Safety Objectives
- Safety Responsibilities
- Safety Accountability
- Safety Coordination
- Safety Budget
- Safety Committees
- Safety Meetings
- Safety Laws / Rules

Accident prevention systems is comprising of:

- Equipment and workplace standards
- Maintenance & Testing Procedures
- Contractor & Visitor Control
- Safety Work Permit (SWP)
- Hazard Identification, Reporting, Investigation & corrective Action
- Inspection Systems
- Monitoring Systems
- Risk Assessment
- Personal Protective Equipments

Support systems is comprising of:

- Induction
- Management skills training
- Job specific training
- Safety Awareness Promotion
- Safety Information Services

Event management systems is comprising of:

- Emergency Management
- Occurrence Reporting, Investigation & Analysis
- Compensation & Rehabilitation

Evaluation systems is comprising of:

- Safety Performance Reviews
- Safety systems audits (Internal)
- Safety systems reviews
- SWPs compliance
- Safety action plan review
- Safety system audits (External)

7.6.9 Appropriate Personal Protective Equipments (PPE)

Personal protective equipments shall be given in **Table 7.4**.

TABLE 7.4
PERSONAL PROTECTIVE EQUIPMENTS

| Sl. No. | Unit | Hazard | Injury | Use of PPE |
|---------|-------------------------------|--|---|---|
| 1. | Material handling and storage | Dust pollution Hands going between running parts of conveyors Machine's sound | Eye Injury, Dust inhalation Physical injury Hearing system damage | a) Safety Goggles Eye wash taps b) Safety boot, Hand leather gloves c) Ear muffles Fire fighting equipments |
| 2. | All manufacturing sub-units | Dust pollution, hand going into parts of machines/ conveyors, body part touching hot components, machine's sound, explosion/ blast, hot air/ steam release, hot metal spillage | Burn injury, physical injury, fatality, damage to ear drum | a) Safety Goggles Eye wash taps b) Safety boot, Hand leather gloves, leather aprons c) Ear muffles Fire fighting equipments |

7.7 SOCIAL IMPACT ASSESSMENT MATRIX

| Parameter | Present Status | Future impact | Action plan for impact mitigation/ target fulfillment |
|---|--|---|---|
| I. Lifestyle | | | |
| Loss of land and homestead | 540.705 acres private land has been acquired through IDCO after paying requisite compensation. Also 54 families have been compensated and resettled from the project area, also through IDCO. A monthly livelihood allowance is also paid by the company to the resettled families. Currently 90% of the land is with the company and remaining 10% land is government land, which is under process at Tehsildar level | Land losers and homestead losers will be entitled to job. The company has already started giving employment to some of them since construction under EC dated 02.08.2010 began in 2017. | Preference will be given, for employment and contracts |
| Employment in plant and related activities | There are limited economic opportunities available to the people since they are mostly into agriculture (rain fed) and animal husbandry. | Proposed plant will generate employment for 2600 people. Other economic opportunities are also expected to rise due to the plant. | To Increase employability of local villagers, their capacity building through ITI training at Karanda at company cost shall be undertaken |
| Additional employment opportunities outside plant | There are no opportunities in transportation or construction activities or any colony, at present. | Opportunities in transportation, contractual jobs and construction activities will arise. When a colony shall be built to accommodate the non-natives. The villagers will help in providing various services such as cleaning, washing, cooking, driving, security, etc. and also generate additional income for | Seamless amalgamation of the culture of the natives and non natives to be ensured by sensitising the outsiders to local culture. |

| Parameter | Present Status | Future impact | Action plan for impact mitigation/ target fulfillment |
|-------------------------------|---|---|--|
| | | themselves. | |
| II. Cultural impacts | | | |
| Religious beliefs | There are various religious temples which have been repaired/ renovated and several more which need renovation or maintenance | Galpada temple requires boundary wall, which will be constructed by the Company. If any additional requirement arises from local people, the same shall be addressed. | Financial support is to be provided by the company for construction of boundary wall |
| Customs & heritage | Company constructed socio- cultural mandap at Jharbandh village | Company shall continue to have a positive impact with their contributions by giving donations for religious and national festivals and contributes to the marriage of girl child by giving utensils, clothes, food etc. | Fulfill the targets of CSR plan as outlined in Chapter 8, and as per budget allotted annually according to The Companies Act |
| III. Community impacts | | | |
| Change in land use | The land under the steel plant has been converted to industrial use. There are no major visible major changes in land use in surrounding areas. | 67.790 acres government land is under acquisition which will be changed to industrial use | Company will be remain aware of its surroundings regarding any land use changes |
| Infrastructure | <ul style="list-style-type: none"> Places of worship have been renovated Assistance for books, uniforms, furniture, etc had been given in the schools | Company shall continue to have a positive impact with their contributions etc. | The physical infrastructure is proposed as a part of CER (Corporate Environmental Responsibility) as given in Section 8.5, Chapter 8. |
| Services | The management has installed deep | The company intends to improve | The installation of these |

| Parameter | Present Status | Future impact | Action plan for impact mitigation/ target fulfillment |
|--|---|--|--|
| | bore-wells in all the villages – Jharbandh, Tarkabeda, Galapada. Company also supplies drinking water through water tankers in acute summer, during May and June. Drinking water supply through pipe lines and overhead tanks has also been provided in village Jharbandh. | infrastructure such as roads, sanitation, drinking water, solar lights etc in the the villages in 2 km radius | infrastructure is proposed as a part of CER (Corporate Environmental Responsibility) as given in Section 8.5, Chapter 8 and the cost of its operation and maintenance shall be covered under CSR (Section 8.4, Chapter 8). |
| NGOs/ SHGs, activity networks and cohesion | The activities are continued in the village but company has not participated in value addition of such activities till now. | This aspect will be looked and requisite support provided to the women for increasing output, creating multiple forward sales linkages and give training for additional products | Fulfill the targets of “Sustainable Livelihood Options” under CSR plan as outlined in Section 8.3.2, Chapter 8. |
| Education and training | Local people were given financial and social support in education and training in sustainable livelihood opportunities to increase their source of income 102 educated unemployed youths from among the affected families have already been trained in local Industrial Training Centres (ITC) for up-gradation of their skills and employability. Some of them have successfully passed in All Odisha Trade Test (AITT). 30 other candidates presently are under training in two batches in the local Industrial Training Centres (ITC) who | The management is also establishing its own ITC in the locality for providing training on skill development and employability. | Fulfill the targets of “Sustainable Livelihood Options” under CSR plan as outlined in Section 8.3.2, Chapter 8. |

| Parameter | Present Status | Future impact | Action plan for impact mitigation/ target fulfillment |
|----------------------------|---|--|--|
| | would pass out shortly in two years. | | |
| IV. Quality of life | | | |
| Security | There has been no change in the availability of government security mechanism. Nearest police station is at Balmi, at 20km from project site | The security system shall come up and be maintained for the plant and shall remain available to the villagers, on demand for special occasions | - |
| Livability | The livability index is equivalent to that existing in rural areas | The livability will increase marginally due to availability of more money to the villagers. Considering various parameters such as (i) housing, (ii) Neighbourhood, (iii) Transportation, (iv) Environment, (v) Health, (vi) Engagement and (vii) Opportunity, the major improvement can be there in the case of Opportunity | There will be an improvement in opportunities for job and in the income level of the local people. |
| Aspirations for the future | There are limited sources of income and people are expecting employment only. | People may now aspire to have their children well educated, have higher education, have vocational training, good health facilities, good services such as drinking water, piped supply and infrastructure such as pucca roads and eventually get employment in the plant | Company will continue to provide financial support under CSR and CER for these activities (described in Chapter 8) |
| V. Health impacts | | | |
| Physical well being | There are only government schemes for health and medical facilities | Medical and health check up camps will be organized in nearby villages Jharband, Galpada and Tarkabeda | The capital cost shall be met as a part of CER (Corporate Environmental Responsibility) as |

| Parameter | Present Status | Future impact | Action plan for impact mitigation/ target fulfillment |
|-------------------|---|---|--|
| | | periodically. Ambulance on call will become available for people to be shifted to Primary Health Centre in Angul. It is proposed to provide mosquito nets to people and awareness shall be given regarding cleanliness so that diseases such as malaria, typhoid etc do not spread | given in Section 8.5, Chapter 8 and the cost of its operation and maintenance shall be covered under CSR (Section 8.4, Chapter 8). |
| Social well being | There were traditional social activities in which people intermingled and shared their joys and sorrows | Company will support financially as well as participate in various festivals, cultural events etc. organized in villages of surrounding areas. Company will add to the various social events that occur in the area by celebrating occasions like World Environment Day by distributing saplings to villagers, sports competitions, competitions for school children, Safety week, awareness campaigns, etc. | Company provides financial support under CSR for these activities (described in Chapter 8) |