RISK

7.1 RISK ASSESSMENT & DISASTER MANAGEMENT:

M/s Bengal Energy Ltd, at-Daukais at present running with 0.6 MTPA Non-Recovery/heat recovery Coke Oven and 40 MW Power Plant. The project has proposed its expansion for which prior EC is in the process.
After expansion, the facilities will be as follows:

1. 2x0.6 MTPA non-recovery Coke oven Plant with waste heat recovery boiler
2. 4x500 TPD DRI kilns
3. 4x350 TPD DRI Kilns
4. 2x320m^3 MBF
5. 1x60m^2 Iron Ore Sinter plant
6. 2x80T EAF with CCM
7. 3x20T IF with CCM
8. 35 MW AFBC based Power plant
9. 22 MW BF gas fired based Power Plant
10. 80 MW Coke Oven gas(WHRB) power Plant
11. 68 MW DRI kiln flue gas(WHRB) Power Plant &
12. 120 TPD ASU.

Besides these operating processes, which can cause major hazards due to leakage of toxic gases and red hot metal liquids; there will be one month's fuel stock at all the time of a year. Coal will be stocked under shed and LDO in 150 KL above ground tank; these are combustible and Fire/ pool fire is anticipated from these materials
It is presumed that the proposed steel plant would be designed and engineered with all possible safety measures and standard code of practices of engineering. In spite of this, there may be some design deficiency or due to operation and maintenance fault which may lead to accidental events causing damage to the life and property. This chapter presents an overview of environmental risks associated with the production facilities, suggested remedial measures and a model outline of the emergency preparedness plan.

7.2 OBJECTIVES

The objectives of environmental risk assessment are governed by the following, which excludes natural calamities:

- To identify the potential hazardous areas so that necessary design safety measures can be adopted to minimize the probability of accidental events.
- To identify the potential areas of environmental disaster which can be prevented by proper design of the installations and its controlled operation
- To manage the emergency situation or a disastrous event, if any, from the plant operation.

Managing a disastrous event will obviously require prompt action by the operators and the crisis management personnel using all their available resources like alerting the people and other plant personnel remaining inside, deployment of firefighting equipment, operation of emergency shut off valves, opening of the escape doors, rescue etc.
Minimizing the immediate consequences of a hazardous event include cordoning off, evacuation, medical assistance and giving correct information to the families of the affected persons and local public for avoiding rumors and panic.

Lastly, an expert committee is required to probe the cause of such events and the losses encountered and suggest remedial measures for implementation so that in future such events or similar events do not recur.

7.3 DEFINITION OF ENVIRONMENTAL RISK

The following terms related to environmental risks are defined before reviewing the environmental risks:

- Harm : Damage to the person, property or environment.
- Hazard : Something with the potential to cause harm; this could be a Characteristic of material being processed or malfunctioning of the equipment. An environmental hazard is thus going to be a set of circumstances, which leads to the direct or indirect degradation of environment and damage to the life and property.
- Risk : The probability of the harm or likelihood of harmful occurrence being released and its severity. Environmental risk is a measure of the potential threat to the environment, life and property.
- Consequence: Effect due to occurrence of the event, which may endanger the Environment permanently or temporarily and, or, loss of life and property.
- Environmental Disaster : The consequence is so severe that it can extensively damage a one or all the four components of the environment, namely, (i) Physico-chemical, (ii) biological, (iii) human and (iv) aesthetics.

7.4 IDENTIFICATION OF HAZARDS

The hazards are attributable due to raw materials and chemicals used in steel making and the plant operation. A list of major raw materials used in the plant and the process units with their hazard potential is presented in Table below.

Gen. ToR 3(x) Hazard Identification and details of proposed safety measures.

Table 7.1 Hazard Identification of the Proposed Steel Plant

SL NO	ACTIVITY CREATING HAZARD	Rank						Risk potential	Preventive Measures
		Likelihood of occurrence (A)	RANK	Likelihood of detection (B)	RANK	Severity of consequence (C)	RANK	= (A+B)XC	
Oxygen Plant									
1	Handling of Liquid Oxygen	HIGH	4	MODERATE	3	LOW	6	42	Leather apron, leather gloves and safety shoes
DRI									
1	Cleaning of cooler transfer chute	HIGH	4	VERY LOW	5	MODERATE	8	72	Safety rope and PPE to be used
2	cleaning of dust settling chamber	HIGH	4	VERY LOW	5	MODERATE	8	72	Use of PPE like safety shoes, helmets, gloves, aprons and goggles
SMS									
1	Fall of material due to Excess N2 purging	LOW	2	VERY HIGH	1	HIGH	10	30	Purging to be done with calculated amount of N2
2	Burn injury due to overflow of hot material	LOW	2	VERY HIGH	2	HIGH	10	40	Use of PPE like safety shoes, helmets, gloves, aprons and goggles
3	Burn injury due to broken of wire rope	LOW	2	VERY LOW	5	HIGH	10	70	Cordening of area with hooter arrangement during transportation
4	Fall of ladle due to broken of hanger	LOW	2	VERY LOW	5	HIGH	10	70	Cordening of area with hooter arrangement during transportation
5	Slip and fall due to accumulation of sponge iron on shop floor	MODERATE	3	MODERATE	3	LOW	6	36	Use of PPE like safety shoes, helmets, gloves, aprons and goggles
6	Falling of scrap due to mishandling of scrap during charging of scrap to SMS	MODERATE	3	MODERATE	3	MODERATE	8	48	Use of helmets and safety shoes

7	SLIPING OF PERSONS DUE TO Spillage of material on the shop floor during charging of raw material through mobile equipment	MODERATE	3	MODERATE	3	MODERATE	8	48	Use of PPE like safety shoes, helmets, gloves, aprons and goggles
8	Electrical Flashing / shock during Air cleaning of furnace capacitors and switch gear	LOW	2	LOW	4	HIGH	10	60	Electrical isolation, tagging, spot earthing
9	Electrical Shock during Checking of Capacitor bank	VERY LOW	1	MODERATE	3	MODERATE	8	32	Rubber hand gloves and insulator tools
11	Occurrence of static electricity/electric spark in the Mill Cellar Room	VERY LOW	1	VERY LOW	5	HIGH	10	60	Proper earthing to be ensured
12	Splashing of molten metal and slag	LOW	2	VERY HIGH	1	HIGH	10	30	Face shield, helmet, asbestos appron
Rolling Mill									
1	Fall of material during hot slab handling	LOW	2	VERY LOW	5	HIGH	10	70	Sling to be checked from time to time, Use of PPE
2	BODY PART in between slab/chain	LOW	2	VERY LOW	5	MODERATE	8	56	Use of Hand gloves, Stopper switch at short intervals
3	Fire due to Electric short circuit during Firing with Tar	LOW	2	VERY LOW	5	LOW	6	42	Use of MCB
4	Back firing during Firing with Producer gas	LOW	2	VERY LOW	5	LOW	6	42	Use of Face shield
5	Fall of Plate, Cutting set, Fall on person during Plate/Cobble Cutting	LOW	2	VERY LOW	5	LOW	6	42	Use of helmet
6	Collision of hot coil strips during Shifting of Coil	LOW	2	very low	5	low	6	42	To be mechanically handled
7	Falling of objects from top	MODERATE	3	VERY LOW	5	MODERATE	8	64	Use of helmet & Safety Shoe
8	Un safe disposal of oily wastes of Rolling Mills	HIGH	4	Low	4	Moderate	8	64	To be collected in drums and capped
CPP									

1	Furnace oil transfer from tanker to storage tank 1.Slip & Fall 2. Fire	LOW	2	HIGH	2	MODERATE	8	32	To be transferred Mechanically and Use of PPE
2	Operation of Boiler 1.EXPLOSION 2.TUBE LEAKAGE 3. BACKFIRE	LOW	2	LOW	4	HIGH	10	60	Periodic NDT to know the thickness of pipe and replacement with thinned down pipes. Interlocking of ID fan running with LDO firing.
3	Oil leakage from bearings & oil line on main steam line	LOW	2	LOW	4	LOW	6	36	Shrouding of evaporator coil
4 1. ACID / ALKALI SPILLAGE	Chemical handling	MODERATE	3	LOW	4	MODERATE	8	56	Use of PPE like safety shoes, helmets, gloves, aprons and goggles
5	Generation of dust during ash unloading on trucks	VERY HIGH	5	VERY HIGH	1	LOW	6	36	Use of Dusk Mask
6	Fall from height while working in the height	LOW	2	LOW	4	HIGH	10	60	Use of safety belt
7	Oil wastes/oil sludge handling	LOW	2	High	2	Mode rate	8	32	Use of PPE like safety shoes, helmets, gloves, aprons and goggles
8	Collapsing of acid/ alkali storage tanks	VERY LOW	1	High	2	High	10	30	Use of vacuum breaker
9	Leakages of steam line	LOW	2	HIGH	2	MODERATE	8	32	NDT of steam line at regular intervals specially at bends and thermal insulation of pipeline
SINTER PLANT									
1	Working near moving equipment	HIGH	4	LOW	2	HIGH	10	60	Guards for moving equipment, PPE
2	Generation of dust NOx, SOx & Dioxins	HIGH	4	HIGH	4	MODERATE	8	64	PPE like mask, Good ventilation of Working Place.

From the Table, it may be observed that the major on-site emergency situation may occur from the organic coal chemicals storage and handling, fuel gas handling, molten metal and slag handling, acids and alkali storage and handling and electrical short-circuit. The off-site environmental disaster may occur if large-scale fire and explosion occurs, the effect of which extends beyond the plant boundary. The off-site environmental disaster may occur due to significant environmental degradation for a sustained period.Off-site environmental disaster not envisaged for this integrated steel plant. However pool fires from fuel oil storage tanks are not ruled out, and needs addressal.

7.5 ENVIRONMENTAL RISK EVALUATION

From environmental hazards point of view for the raw materials and consumable chemicals and processing of the same in various production units, relative risk potential analysis is made on the following three factors:

- Likelihood of occurrence
- Likelihood of detection
- Severity of consequences

Each of these factors is graded and compiled to determine the risk potential. The factors governing the determination of relative risk potentials are presented in the Table 7-2.

Table 7.2 – Determination of Risk Potential

Likely hood of occurrence		**Likelihood of detection**		**Severity of consequences**	
Criteria (A)	Rank	Criteria (B)	Rank	Criteria (C)	Rank
Very High	**5**	Very High	**1**	None	**2**
High	**4**	High	**2**	Minor	**4**
Moderate	**3**	Moderate	**3**	Low	**6**
Low	**2**	Low	**4**	Moderate	**8**
Very low	**1**	Very low	**5**	High	**10**

RISK POTENTIAL (RP) = (A+B) X C

Based on the above stated criteria for assessing the risk, each probable event has been evaluated by addressing several questions on the probability of event occurrence in the view of the in-built design features detection response, operational practice and its likely consequence. A summarized list of environmental risk potential for the likely events is presented in Table 6-3

This evaluation has been done with the presumption of common events as observed from the past experience in the operation of an integrated iron and steel plant and best practicable designs for the proposed project. The present risk potential evaluation is primarily based on human errors or faulty operation or failure of the control systems.

From the table 7.3, it appears that some events carry risk potential above 50. these vents will be considered as risk prone hazardous events and need adequate safe design operation and maintenance in order to reduce the risk.

Risk Management Measures

The Risk management measures for the proposed project activities require adoption of best safety practice at the respective construction zones within the Works boundary. In addition, the design and engineering of the proposed facilities would take into consideration of the proposed protection measures for air and water environment. The Evaluation is given in the Table No. 7.3.

7.6 DISASTER MANAGEMENT PLAN

Tor-7(xiii) Onsite And Offsite Disaster Preparedness And Emergency Management Plan Including Risk Assessment And Damage Control.

Manpower

Table 7.3 Manpower to be in position

Department / Section	Shifts				Total per week day	Total on Pay Roll
	General	I	II	III		
Coke Oven Plant	20	60	60	60	200	230
Sponge Iron Plant	15	100	100	100	315	325
BF	10	30	30	30	70	75
EAF & IF	10	75	75	75	235	250
Captive Power Plant	15	50	50	50	165	175
Sinter Plant	5	20	20	20	65	70
Maintenance and Services	30	40	40	40	170	175
Quality Assurance and Lab	5	15	15	15	50	55
Total	**110**	**390**	**390**	**390**	**1280**	**1355**

From the manpower deployment table, it can be seen that at any point of time in general shift hours 500 people will be available in plant, and 390 people during night. More over some contract labors and security guards will be available in the plant. If it is a time of changeover of shift additional 390 people will also be inside plant premises. Therefore, planning has to be made for safety of these people during any onsite disaster.

In an integrated steel plant like this one, it is imperative that accidents occurring due to unforeseen acts and events will not affect the surrounding areas. Therefore, an onsite emergency plan for prevention and mitigations of accidents will be enough to cater for unforeseen acts and events that may occur.

Identification of most credible Hazard Scenarios

All the anticipated hazard scenarios associated with this integrated steel plant are critically examined and the following scenarios are identified as credible scenarios:
Credible scenario-A : Pool fire in any of 2x200 KL LDO tanks
Credible scenario- B : Pool fire in 1x200 KL FO tank
Credible scenario- C : Toxic release and fire due to CO from MBF
Credible scenario-D : Leakage of liquid Oxygen from ASU

The LDO/FO tanks will be provided with standard auxiliaries such as conservative vent valve, flame arrestor, drain connection. Oil from these tanks shall be transferred to the respective consumer units by 2 x 100 per cent fuel oil transfer pumps through filters. Return oil, if any, shall be discharged back to the storage tank. The tank farm will be provided with dyke wall and suitable fencing all around according to statutory requirement. However accidental fire may not be ruled out.
Models done for this scenario show that credible hazard can occur in winter night time. In this case the significant heat levels of interest(SHL) for the pool fire as predicted by model shall be as per the following table.

There are three significant "Heat Levels" of interests which are as follows.

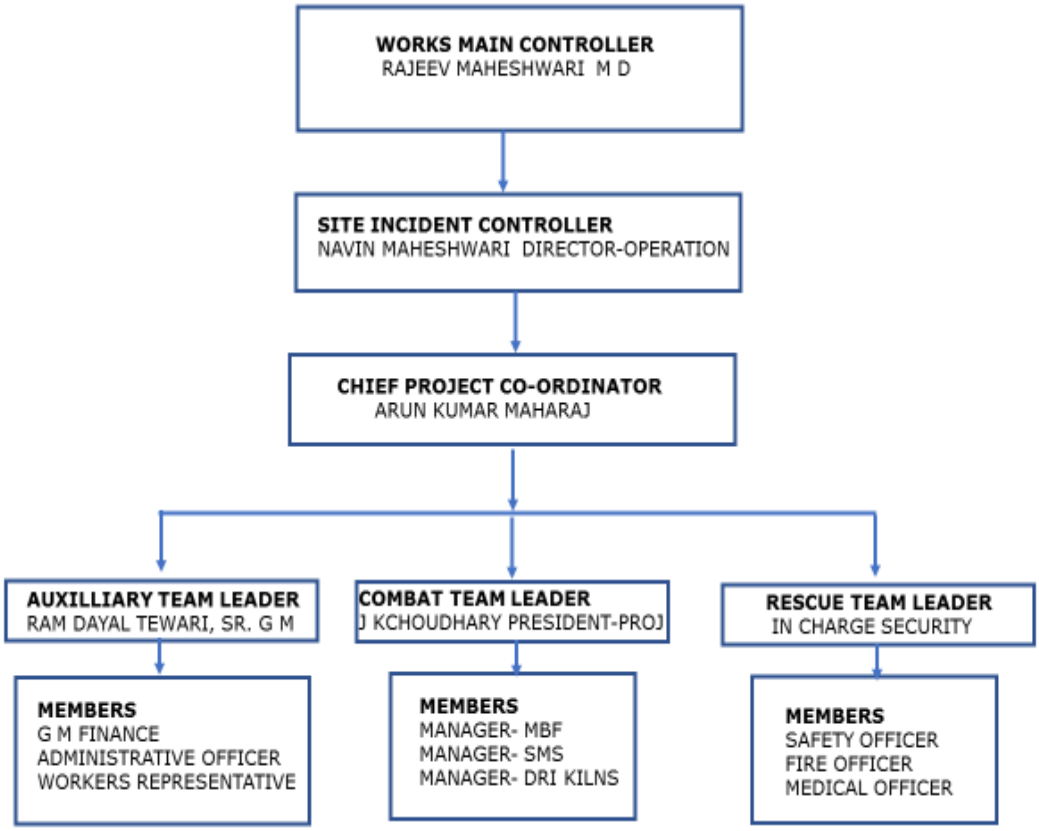
S H L	**Value**	**Experience at distance pool A**	**Experience at Distance pool B**	**Indication**
SHL-1	4.5 KW/m^2	10.01m	9.57m	Causes pain if unable to cover the body within 20 seconds
SHL-2	12.5 KW/m^2	6.19m	5.91m	Minimum energy for melting plastic
SHL-3	37.5 KW/m^2	3.68m	3.51m	Sufficient to cause damage to equipments

As pool fire can cause damage to equipments within distance estimated, no such equipments to be constructed within that distance. This hazard is not considered as most credible scenario.
As to toxic release and fire due to CO release, BF gas contains about 25-30% CO. This considered as most credible scenario and for that on sight emergency plan has been made.
Leakage of liquid Oxygen from Oxygen storage tank or ASU will vigorously accelerate the combustion or initiate explosion of organic or oxidizable material. Many materials that are not combustible in air(20% Oxygen) can burn in oxygen rich atmosphere. Oxygen tank may vent rapidly or rupture violently from pressure when involved in a fire situation.

Toxicological Information

Oxygen is neither combustible nor acutely toxic under normal pressure but helps in combustion. So associated fire hazard due to leakage of Oxygen is rare and much less in magnitude as compared to fire from LDO or FO tanks. The coal storage area and LDO/FO storage tanks to be away from Oxygen storage tank.

Emergency command structure



7.7 ROLE OF KEY PERSONS

7.7.1 WORKS MAIN CONTROLLER:

He is the Managing Director of the unit and is generally available in the factory or in the colony nearby except on tours. On emergency, he can reach work site at any odd hour within 20 minutes time. In his absence, HOD project & co-ordination shall take up his charge as Works Main Controller (WMC).

On being informed of an incident, he has to:

- Rush to the emergency Site, collect all information from SIC.
- Decide if emergency is to be declared and advise Site incident Controller (SIC) accordingly and reach Emergency Control Room (ECR).
- Advise Rescue Team Leader (RTL)/ Security Gate to blow the siren with appropriate code for declaration of emergency.
  Two minutes with a pause of five seconds for 3 times for fire hazard.
  Three minutes with pause of five seconds for 5 times for Gas leakages.
- Advice (Auxiliary Team Leader) ATL for communication to statutory authorities and for mutual aid as required.
- Through (Auxiliary Team Leader) ATL ensure constant communication to statutory authorities and to mutual aid partners as required.

- Maintain continuous communication with Site Incident Controller (SIC) to review the situation and assess the possible course of action for emergency operations.
- To declare normalcy at the end of operation and advise Rescue team leader (RTL)/security Gate to blow "all clear siren" [for 1 minute continuously].
- Ensure the record keeping of emergency operations chronologically.

7.7.2 SITE INCIDENT CONTROLLER:

He is available at the factory or in the colony nearby. At any point of time and on being informed about an accident, he has to:

- Intimate the works main Controller (WMC) and proceed to the emergency site.
- Take the necessary instruction from Combat Team Leader (CTL), assess the situation and call Rescue Team Leader (RTL) and Auxiliary Team Leader (ATL).
- Inform Works Main Controller (WMC) regarding the situation.
- Take necessary steps and provide guidance to Combat Team, Rescue Team, and Auxiliary Team Leaders to mitigate the emergency situation.
- Examine for major emergency shut down operation activities, decide safe escape route and announce for evacuation to Assembly Point.
- Inform Works Main Controller (WMC) about the status of the situation at regular intervals.

7.7.3 COMBAT TEAM LEADER

He is the leader to attend to the emergency and is available in the factory or in the colony at any instant.
On being informed about an accident, he has to:

- Immediately rush to the site and lead the team to control the situation.
- Inform Site incident controller (SIC) about the incident and request him to rush to the spot.
- Instruct the rescue Team leader (RTL) for fire fighting and medical assistance.
- Co-ordinate the activities of team members and combat the emergency, so as to eliminate the route cause of the hazard.
- Shut-down the plant if necessary to take up repair measures.
- To arrest the leakage and spillage from various equipments, shut down the concerned equipments.
- Take necessary action to remove unwanted persons from the site of the incident.
- Keep informed about the developments to Site incident Controller (SIC).

7.7.4 RESCUE TEAM LEADER

He is the person who conducts rescue operations and should be available at any instant.
On receiving the information about the incident he has to:

- Rush to site of emergency through safe route.
- Ensure presence of all his team members, availability of fire fighting facilities and take necessary action to arrest the fires/leakage of gas.

- Arrange for safe escape of entrapped persons.
- Make necessary arrangements to send the affected persons for immediately medical attention through the medical officer.
- Search for the missing persons on the basis of role call taken by Auxiliary team leader (ATL).
- Give the feedback to the site incident controller (SIC) about the developments.

7.7.5 AUXILIARY TEAM LEADER

He is the communication manager for the crisis management. On being informed of the emergency, he should proceed to Emergency Control Room (ECR) and:

- Keep in constant touch with works main controller (WMC) and Site Incident Controller (SIC).
- Inform the Statutory Authorities and District Administration.
- Communicate to mutual Aid Partners, Fire service stations at Kharagpur.
- Send communications to District Hospital Kharagpur Road for rendering services.
- Inform the relatives of causalities and send them to their residence or hospital as the case may be.
- Take care of visit of the authorities to the Emergency site.
- Give feed back to work main controller (WMC) about the status with respect to his areas of activities.

Table 7.4 ACTION PLAN FOR ON-SITE EMERGENCY

STEP NO	INITIATOR	ACTION TO TAKE
1.	The person noticing the emergency	• Inform the Security Gate, Combat team leader and the concerned Shift-in –charge immediately.
2.	Combat team Leader (CTL)	• Inform site incident Controller (SIC) and rush to spot and organize his team. • Take charge of the situation, arrange for fire fighting and medical first-aid available at site. • To start combating, shut-down equipments, arrest the leakage of gas/fire.
3.	Site Incident Controller (SIC)	• Inform works main controller (WMC) and rush to emergency site. • Discuss with Combat Team Leader (CTL), assesses the situation and call the Rescue Team Leader (RTL) & Auxiliary Team Leader (ATL). • Organize the Rescue Team and Auxiliary Team and send the rescue Team to site. • Arrange to evacuate the unwanted persons and call for additional help. • Pass information to the works main controller (WMC) periodically about the position at site.
4.	Works main	• Rush to emergency site and observe the ongoing activities.

	Controller (WMC)	• Take stock of the situation in consultation with the SIC. • Move to Emergency Control Room. • Take decision on declaration of emergency. • Advise Auxiliary Team Leader to inform the statutory authorities and seek help of mutual aid from partners as required. • Decide on declaration of cessation of emergency. • Ensure that the emergency operations are recorded chronologically.
5.	Rescue Team (RTL)	• Consult with Site incident controller (SIC) and organize his team with amenities to arrest fire fighting and medical treatment. • Rush to Emergency Site through safe route along with the team members. • Arrange to set off the fire by fire fighting equipments and hydrant points to arrest the fire or to evacuate the area. • Shift the injured persons to hospital by ambulance after providing necessary first aid. • To inform the auxiliary team Leader for necessary help from mutual aid Partners.
6.	Auxiliary Team (ATL)	• On being directed by works main Controller (WMC) inform about the emergency to statutory authorities. • Seek help of Mutual Aid partners and Coordinate with Mutual Aid partners to render their services. • Arrange to inform the relatives of casualties. • Take care of visit of the authorities to the Emergency site.
7.	Team members	• Each of the team members should follow the instruction of concerned team leader to mitigate the emergency.

7.8 SILENT HOUR COMMAND STRUCTURE

- The Senior Officers/ Key Persons of the plant remain during day time i.e. 8am to 8 pm. Hence the timing of 8pm to 8am is considered as silent hour that to 10pm to 8am is the crucial time. Still each and every unit/section of the plant is headed by shift in charge in the rank of Officer, Engineer or Sr. Engineer or Asst. Manager, who shall be responsible for handling the emergency. The other supporting/services and emergency sections like Fire Service, Ambulance, Security, Personnel, Water Supply, Transport departments etc. are also running for 24 hours shift wise with shift in charge and crew to handle emergency during the silent hour till main command personnel arrive. However, most of the key persons of the main command structure reside in nearby area and can reach within minimum time.
- The command structure of the silent hour shall be same as during normal hour, however, during the silent hour, the operation Shift-in charge of the concerned area where the fire or leakage of gas has taken place, shall act as SIC-in – charge, till the arrival of actual designation members.

- Since WMC, SIC, CTL, RTL & ATL may not be available inside the plant; they shall be informed by the SIC-in-charge either by telephone or by sending special messengers to their residences.
- On receiving the information WMC, SIC, CTL, RTL & ATL shall reach the site immediately & simultaneously take actions to ensure the presence of their respective team members.
- Therefore the action plan as well as the role of key person shall be same as the normal hour execution of command structure.

7.9 ACTIVATION & CLOSING PROCEDURE FOR ON-SITE EMERGENCY

7.9.1 ACTIVATION PROCEDURE

The person noticing the incident of fire or leakage of gas, shall inform about the location & nature of fire to the combat team Leader (CTL), security Gate and concerned Shift-in-charge.

Combat team Leader (CTL) shall inform site incident controller (SIC) and shall rush to the site immediately. He shall arrange for fire fighting and first aid available at site. He shall arrange to take necessary steps to eliminate the root cause of fire.
Site incident controller (SIC) on getting information shall inform the WMC and reach the site at the earliest. He shall take over the charge and shall direct Rescue Team Leader (RTL)) to carry out rescue operations including fire fighting and medical attention. Site incident controller (SIC) shall co-ordinate with Combat team leader (CTL) to eliminate the root cause of fire.

- Work main controller (WMC), on arrival at site shall take stock of the situation from site incident controller (SIC) and then rush to emergency control room (ECR) to declare emergency on the basis of assessment made by (Site incident controller (SIC). He shall give direction to the security gate/ (Rescue team Leader) RTL to activate siren.
  Two Minutes with a pause of five seconds for 3 times for fire Accident.
  Three Minutes with a pause of five seconds for 5 times for leakage of gas.
- Rescue Team Leader (RTL) shall mobilize fire fighting and medical resources to site and shall assist (Site incident Controller) SIC.
- Auxiliary Team Leader (ATL) shall take charge of Emergency Control Room (ECR), shall ensure smooth operation of ECR and shall inform relatives of casualties. Informs mutual Aid partners and ensures their arrival at site if required.
- Auxiliary Team Leader (ATL) informs statutory authorities and district administration regarding emergency suitably and coordinates their visit at site.
- Works main controller (WMC) coordinates and keeps the track of all the activities at site and off the site and arranges the recording of the activities in a chronological manner for review of the Onsite emergency Plan.

7.9.2 FACILITIES AVAILABLE FOR ON-SITE EMERGENCY PLAN:

(a.) Assembly Point:

In any emergency it will be necessary to evacuate people from affected zones or the zones likely to be affected, to a safer place. Safer places are identified and designated as Assembly Points. Taking the area and hazard zones into consideration two assembly points have been marked in two different areas i.e. one near administrative building (Assembly Point-1) and other near the SMS Area (Assembly Point-2) Both the points are well connectable to the plant road and facilities like drinking water, temporary shelter and first aid is available there. This has been well marked in the lay out map as well as in the factory.

(b.) Escape routes:

Escape routes are those that, allow reasonably safe passage of persons from the work area to assembly point during emergency situation. These routes would be different depending on wind direction, Fire and explosion scenario. Escape routes are ear marked on the drawings as well as on the routes, showing escape direction in broad arrow marks on fluorescent paints, which will facilitate all for safe evacuation.

(c.) Emergency Control Room (ECR):

The emergency Control Room is a place from which all emergency management operation are directed and coordinated. Also it is the place from where all communication will be established, with outside agencies and district authority also.
Facilities Available at ECR:

a. Plant general Layout, ear marked with hazard zone, Assembly points and escape routes.
b. List of working personnel in various shifts and general shift.
c. Mobile telephone Nos., of emergency command structure personnel.
d. Emergency command structure.
e. Rhythmical siren code for different emergency situation.
f. Relevant material safety data sheet.
g. Emergency Control Room Register.
h. First Aid Box with antidotes.
i. Required personal protective equipments with self carrying breathing app.

7.10 FACILITIES AVAILABLE

- **Fire Hydrant System**
  Fire pumps are to be connected to main fire hydrant to maintain a pressure of 7Kg/cm^2. In case of temporary power failure, the fire pumps are to run through DG. An underground tank supply water to the fire main. A security jeep is stationed at main gate (main control) to meet the emergency.
- **Fire Extinguishers**
  Required types of fire extinguishers are to be provided at different locations of the plant.
  Fire Buckets
  Fire buckets filled with dry sand must be provided in differentlocations of the plant**.**

- **Fire Tender**
  The company may have a fire tender of its own for major firefighting operations.
- **Siren**
  Company must have Siren/ hooter arrangement, which can be activated manually during fire related emergency.
- **Communication**
  Public address system and EPABX telephone is available for effective communication inside the plant. Telephone directory is available in the entire department**.**
- **Dispensary**
  A well-equipped First-aid centre with ambulance, stretchers, oxygen cylinder etc. shall be located inside the factory. The First-aid centre is manned by one doctor, 4nos. pharmacists, 4 nos. attendants, and one Ambulance with driver. The first-aid center is manned round the clock. In the event of emergency, the doctors and staff attend the first-aid centre. The existing first-aid centre is to be strengthened to meet the emergencies. In case of requirement outside ambulance services are to be contacted.
- **First Aid Box**
  Company has provided First Aid boxes with required first aid medicines at different locations inside the plant for any event of injury. First aid boxes are checked by the pharmacists once in a month & and medicines are filled/replaced. The first aid boxes to be provided in the following locations:

  Blast Furnace, DRI, Coke Oven, Ferro Chrome, Power Plant, Electrical Substation, DG room, Administrative building, SMS, Rolling Mill and Security Office.

7.11 OBJECTIVE OF ONSITE EMERGENCY PLAN

The main objective of the plan is to take immediate actions to meet any emergency situation for speedy and efficient rescue and relief operations. The main steps in an onsite emergency plan is described below:

- Cordon and isolate the affected area for smooth rescue operation.
- Rescue and treat casualties and safeguards the rest.
- Minimise damage to persons, property and surroundings.
- Contain and ultimately bring the situation under control.
- Secure and safe rehabilitation of the affected area.
- Identify any dead and provide for the needs of the relatives.
- Provide necessary information to statutory agencies.
- Provide authoritative information to the news media.
- Ward off unsocial elements and prying onlookers.
- Counter rumor mongering and panic by relevant accurate information.

Industrial Safety and Fire Fighting

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

Provision of adequate personal safety appliances to workers engaged in hazardous installations

- Provision of detection and alarm system to allow a developing fire to be detected at an early stage.
- Provision of water spray fire extinguishing system and portable extinguishers using carbon dioxide or chemical powder.

Portable Fire Extinguishers

All plant units, office, buildings, stores, laboratories, etc. will be provided with adequate number of portable fire extinguishers to be used as first aid fire appliances. The distribution and selection of extinguishers will be done in accordance with the requirement of fire protection manual.