

Thermal Load kW/m ²	Distance from edge of the pool (m)	Remarks
25.8	1	
17.0	4	
9.0	10	
4.0	21	1 st degree burn
2.0	31	
1.1	40	

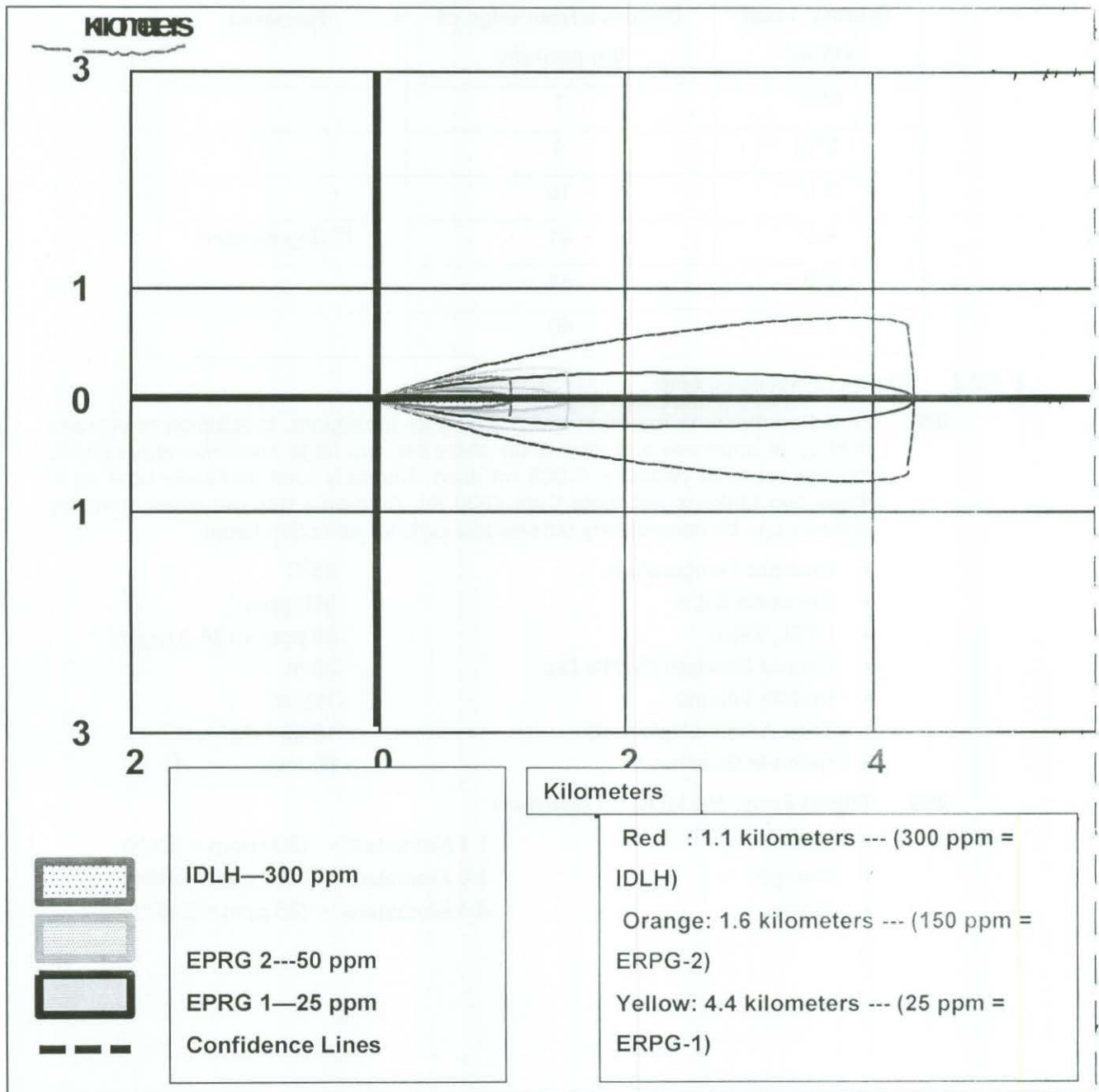
6.6.2.3 Failure of Ammonia Line

385. Liquid ammonia is the main raw material for urea plant. In addition to process hold up in ammonia and urea plant, there are two large ammonia atmospheric storage tanks of capacity- 5,000 mt each. Normally total ammonia hold up in these two tanks is not more than 4000 mt. Ammonia has got odour and any leakage can be immediately noticed and calls for an action taken.

- Ambient Temperature : 35^oC
- Ammonia IDLH : 300 ppm
- STEL Value : 30 ppm or 24.3 mg/m³
- Source Strength Puddle Dia. : 20 m
- Puddle Volume : 100 m³
- Total Amount Released : 10,531 Kg
- Release Duration : 60 min.

386. **Threat Zone:** Model Run - Gaussian

- Red : 1.1 kilometers --- (300 ppm = IDLH)
- Orange : 1.6 kilometers --- (150 ppm = ERPG-2)
- Yellow : 4.4 kilometers --- (25 ppm = ERPG-1)



6.6.2.4 Chlorine Cylinder Leakage

387. Chlorine is used as biocides in cooling water system and water purification. Chlorine is highly toxic (IDLH – 10 ppm) Any leakages in the system will cause toxic release which will spread in down wind direction. The dispersion due to 1 cm (dia) leakages are considered for modeling as below:

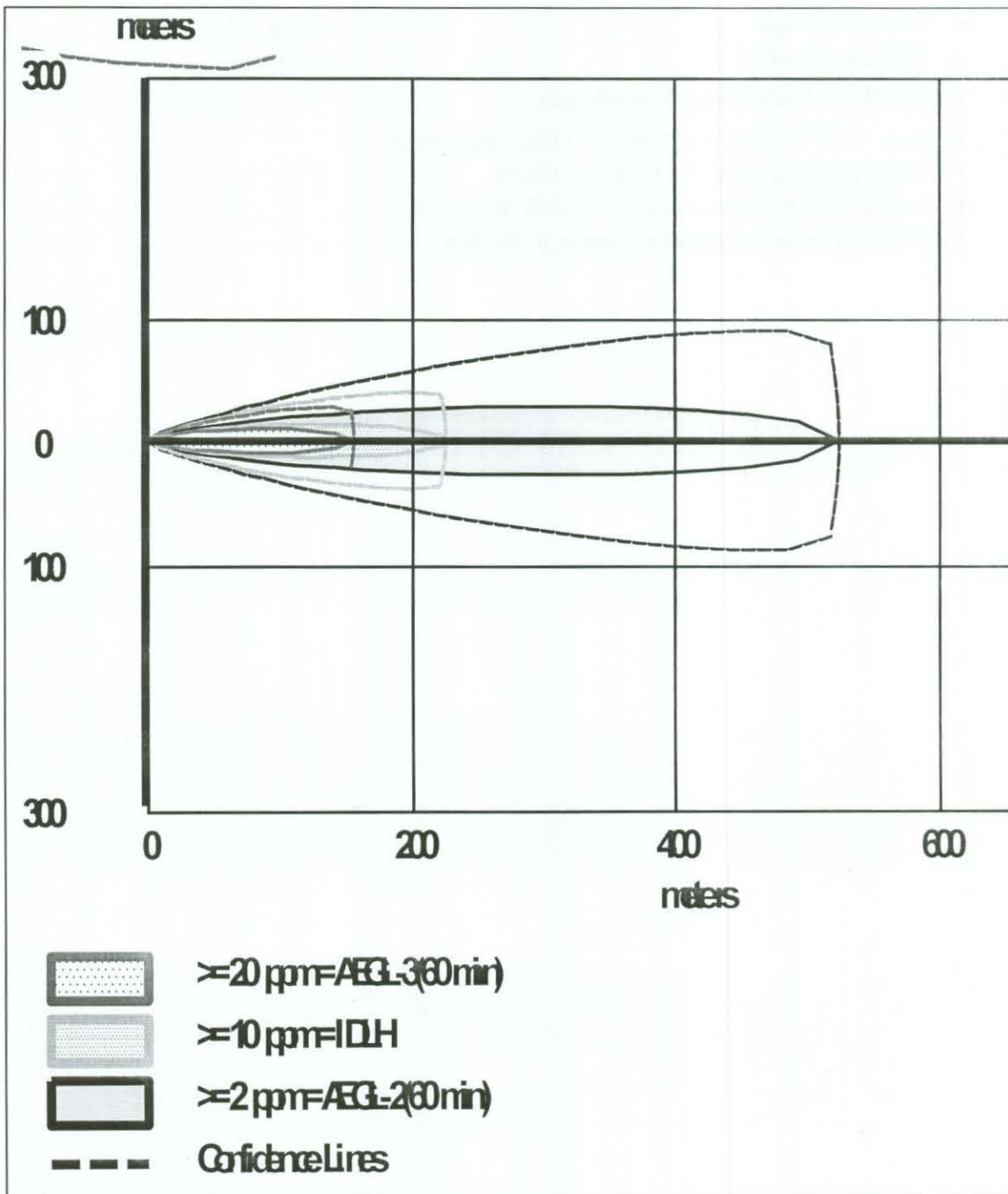
- Ambient Temperature : 35^oC
- Chlorine IDLH Value : 10 ppm

- Source Strength : ~ 2 kg / min
- Release Duration : 60 min.

388. **Threat Zone:** Model run with heavy gas

- Red : 157 meters --- (20 ppm = AEGL-3(60 min))
- Orange: 226 meters --- (10 ppm = IDLH)
- Yellow: 526 meters --- (2 ppm = AEGL-2(60 min))
- Acute* Exposure Guideline Levels, or **AEGLs**





6.7. General Control Measures

389. Since some of the substances in use at CFCL are hazardous with severe fire and explosion potential and also toxic in nature, it is necessary to use appropriate control measures recommended for such substances:

6.7.1. Flammable Gas Fires

390. Fire control generally consists of directing, diluting and dispersing the inflammable gas/vapor to prevent contact with persons, to prevent it from infiltrating structures if the leak is out door, and to avoid its contact with ignition sources while, if possible, simultaneously stopping the flow of gas. NG is lighter than air it will go up in the atmosphere once its momentum due to pressure gets dissipated. Gas direction, dilution and dispersion require the use of a carrier fluid, and air, water and steam have proven to be practical carriers. Water in the form of spray, applied from hoses or monitor nozzles or by fixed water spray system may act as a good carrier fluid for inflammable vapors/gases.

6.7.2. Protection against BLEVE

391. A basic BLEVE safeguard is to reduce the chance of the thermal (fire) exposure to the container. During a fire exposure the application of water is a basic safeguard to prevent a BLEVE or a compressed gas container failure. Automatic sprinkler protection can greatly limit pressure rise from heat and high metal temperatures from fire exposures.
392. All pressure vessels and tanks should be periodically inspected for leakage from vessels and its appurtenances. Gas detection instruments/ acoustic gas leak detectors are invaluable help in detecting the leakages.
393. Over pressure protection devices, namely, relief valves, rupture discs, alarms, etc. are to be regularly checked and calibrated if required.

6.7.3. Commonly Recommended Control Measures

394. A number of preventive control measures for hazardous occurrences have been analyzed and discussed above. Some more salient points are enumerated below:
- All storage tanks in the tank farm should be dyked. Other operation and maintenance features shall be based on established best safety practices.
 - Ammonia has got odour. Always look for wind direction while moving in ammonia prone area. Move / approach across or up wind direction. Ammonia is highly soluble in water. A wet handkerchief / cloth are helpful in such a case. While planning a job in such area keep breathing apparatus / gas mask/ water hose ready for emergency.
 - Concentration detectors for hazardous chemical vapors (e.g. Ammonia, Chlorine, Hydrocarbon etc.) fire Smoke / heat detectors and fire alarm should be installed at all strategic locations in the plant.
 - A schedule for preventive maintenance including health survey of all plant equipment should be adhered to as far as possible.
 - Ensure the absence of ignition sources in Naphtha / HSD / Ammonia storage area.
 - Ensure placement of fire fighting facilities, such as, carbon dioxide, dry chemical powder and foam type fire extinguishers in addition to fire hydrant system, at strategic locations. Spill control measures, such as, removal of all ignition sources from the spill area and ventilating the area as well as soaking the spilled material with paper, towel or mud and letting the volatile substance evaporate slowly in a safe area.
 - Compulsory use of protective clothing, non-sparking tools and warning signs during critical operations and maintenance.

- Training / refresher courses on safety information's / norms.
 - Eyewash and showers should be put up at strategic places for use during emergencies.
395. A group of plant personnel should be trained in first aid, rescue, fire fighting and emergency control measures. These personnel will form core group/emergency squad who will fight the emergency and also act as rescue and first aid team.
396. In order to ensure communication from isolated places/locations Walkie-Talkie be made available to persons working in these areas. This will considerably improve the effectiveness of emergency management.
397. There is no substitute for training-mock drills and these must be held at regular interval keeping the following objectives in mind:
- Real time mock-drill should be carried out for probable/likely hazardous situation.
 - Target to be set up for various tasks and events during an emergency.
 - Weak links should be marked and corrective action taken to improve effectiveness during emergency.
 - CFCL has already implemented most of the measures in the existing plants.

7. ON SITE EMERGENCY PLAN

7.1. Introduction

398. **Chambal Chemicals & Fertilisers Limited (CFCL)** fertilizer plant at Gadepan was commissioned in December, 1993. Subsequently a number of safety studies including Risk Analysis, Safety audits etc. have been carried out by various consultants. In addition CFCL also has an 'On Site Emergency Management Plan' and have submitted the same to Chief Inspector of Factories. CFCL carries "mock drills" on a regular basis and observations are recorded & corrective actions are taken immediately.
399. Admittedly, the best way of managing an emergency situation lies in its prevention. This is sought to be achieved by good engineering design and construction, use of latest technology and sophisticated equipment, reliable safety systems, careful personnel selection and training. Adequate knowledge of dangers and appropriate safety training ensures that all hazardous situations will be handled without any panic and controlled by rational actions. This is supplemented with repeated practices through real time exercises (mock drills) and noting the weak spots and taking needful corrective actions. Nevertheless, it is recognized that despite our best efforts, things can go wrong. Therefore, it is essential to plan and develop the support system, required in case an emergency arises.

7.2. Probable Hazards & Risk

400. From the preliminary risk assessment study presented in Chapter 6 of this report, some of the possible hazards have been identified. The most likely accident scenario identified is given below:

Table 7.1 : Probable Hazards

S. No.	Scenario	Vulnerability Zone	Remarks
1.	Rupture in NG line	Area close to leak / release	Isolate the line / area; Cool / drench / dilute the source point to prevent ignition.
2.	Hole in Naphtha line / tank	Area adjoining leak / tank farm	Isolate the line / area; Cover the spillage with foam / reclaim if possible to prevent ignition.
3.	Ammonia line leakage and spillage	Surrounding Area	Isolate the line / area. Approach with gas mask / lifeline. Reclaim if possible or dissolve in water and store and treat the water gradually.
4.	Chlorine Tonner Leakage	Surrounding Area	Isolate the line / area. Approach with gas mask / lifeline. Cover the cylinder with hood, take a vent line from hood to caustic scrubber.

401. Above mentioned hazard scenario can further aggravate into a much more serious incident if not attended in time. The fire in one of the tank of tank farm can spread to adjoining tanks and may result in explosion. The vulnerability zone will be considerably enlarged. The vapors of inflammable fluids if carried away by wind above LEL concentrations may further enlarge the vulnerability zone.

7.3. Objectives

402. The Emergency Management Plan (EMP) is developed to make the best possible use of the resources available at CFCL and the nearby agencies to provide help/assistance in case of an emergency in the plant. The activities will include:
- Rescue the victims and give them the necessary medical attention in the shortest possible time.
 - Safeguard other person (evacuate them to a safer place).
 - Contain the incident and control it with minimum damage to human and life and property.
 - Provide necessary information to families/relatives of affected persons, outside agencies including media and statutory bodies.

7.4. Emergency Management Plan

403. The organizational set-up necessary for chain of commands during emergency situation in the plant is as given below..
404. President (Operations) of the CFCL is the Chief Emergency Coordinator and he shall be the main guiding person directing the emergency operations. He shall be assisted by:

Chief Site Coordinator.	GM (Production) Coordinate and direct all the activities from Emergency site. In absence of GM (Prod.), DGM (Prod. I/II) will act as Chief Site Coordinator.
Chief Maintenance Coordinator	GM-Maintenance Coordinate all the maintenance activities from the Emergency Control Center. In absence of GM (Maint.), DGM (E&I)/DGM-(M & C) will act as Chief maintenance Coordinator.
Chief Technical Coordinator	GM (TS&P) Coordinate for all the Environment Monitoring, support for Safety & Fire Fighting.

	<p>In absence of GM (TS&P.), DGM (project) will act as Chief Technical Coordinator.</p>
Chief Service Coordinator	<p>DGM (HR)</p> <p>Coordinate with local administration take care of transport, medical, canteen arrangements, and evacuation of people if required.</p> <p>In absence of DGM (HR), SM (P&A) will act as Chief Service Coordinator.</p>
Chief Material Coordinator	<p>GM (Material)</p> <p>In absence of GM (Material), DGM (Material) will act as Material Coordinator.</p>
Chief Railway Traffic Coordinator	<p>GM (S&D)</p> <p>In absence of GM (S&D), SM (S&D) will act as Railway Traffic Coordinator.</p>
IR Coordinator	<p>SM (P&A)</p> <p>In absence of SM (P&A), Manager (IR) will act as IR coordinator.</p>
Maintenance Coordinator	<p>DGM (E&I) /DGM (M & C)</p> <p>In absence of DGM (E&I), DGM-(M & C) will act as Maintenance Coordinator for all maintenance activity.</p>
Operation Coordinator	<p>DGM (Prod-I) is the Incident Controller for Ammonia –I, Urea-I & O&U Plant. In absence of DGM (Prod-I), SM (Amm-I) / SM (Urea-I) will act as incident Controller for Amm-I and Urea-I & SM-O&U for O&U Plant respectively.</p> <p>DGM (Prod-II) is the Incident Controller for Ammonia –II, Urea-II & Bagging Plant. In absence of DGM (Prod-II), SM (Amm.-II) / SM (Urea-II) will act as</p>

- In charge Assembly Point No.3 Mgr. (IR)
- In charge Assembly Point No.4 SM/DyMgr (Planning)
- In charge Assembly Point No.5 Manager/DyMgr (Bagging)
- In charge Assembly Point No.6 DGM/Mgr (Material)
- In charge Assembly Point No.7 Manager - Ammonia-II / Urea - I
- In charge Assembly Point No.8 Dy Mgr. / AM (Security)
- In charge Assembly Point No.9 Incharge GAIL Terminal

406. Chief Service Coordinator shall contact the following senior officers stationed at Kota. & Anta as may be required

Telephone Numbers of the Authorities:

DISASTER MANAGEMENT			
KEY PERSONNEL - OFFSITE EMERGENCY RESPONSE			
OFFICERS	PLACE	OFFICE	RES.
DIVISIONAL COMMISSIONER	KOTA	2500853 /2500675	2450040
		FAX : 2500769	2450033
COLLECTOR & DISTRICT MAGISTRATE	KOTA	2451200 / 2323883	2451100
		FAX : 2450165	2450045
CITY MAGISTRATE	KOTA	2323165	2323885
DY.I.G. OF POLICE	KOTA	2350800	2350801
SUPDT.OF POLICE (CITY)	KOTA	2350700	2350701
SUPDT.OF POLICE (RURAL)	KOTA	2350601	2350602
POLICE CONTROL ROOM (CITY)	KOTA	100, 2350777	
		2350888 &	
POLICE CONTROL ROOM (RURAL)	KOTA	2350666	
POLICE STATION SIMLIYA	SIMLIYA	07455 - 264326	
DY CHIEF INSPECTOR OF FACTORIES	KOTA	2500660	2505989
EXECUTIVE ENGINEER (RPCB)	KOTA	2490873	2386898
RAJ. STATE POLLUTION CONTROL BOARD	KOTA	2490873	2386898
CENTRAL CONTROL ROOM (CIVIL DEFENCE)	KOTA	2327861/2320296-99	
FIRE BRIGADE, OLD KOTA	KOTA	101/2323101	
FIRE BRIGADE, NEW KOTA SRINATHPURAM	KOTA	2472355	

FIRE OFFICER K.M.C.	KOTA	2323101	2501386
HOME GUARD	KOTA	2327861/ 2320296 - 99	
STATION COMMANDER ARMY EXCHANGE	KOTA	2773998	
EXECUTIVE ENGINEER (B&R)	KOTA	2323038	2462047
C.M.H.O (Distt.)	KOTA	2329259	2500554
RAILWAY HOSPITAL (CHIEF MEDICAL SUPTD)	KOTA	2466772	2440256
CIVIL SURGEON (MBS HOSPITAL)	KOTA	2450241 / 2450242	
DIVISIONAL RAILWAY MANAGER (W.R.)	KOTA	2440298	2440787
RAILWAY CONTROL ROOM	KOTA	2440201	
WAGON REPAIR SHOP ADDNL.M.M.E	KOTA	2440041	
G.M.TELECOM/MANAGER	KOTA	2323000	2424000
REGIONAL MANAGER R.S.R.T.C.	KOTA	2327910	
R.T.O.	KOTA	2363316 FAX: 2364622	2340782
P.R.O.	KOTA	2450102	237268
SR.VICE PRESIDENT (SFC)	KOTA	2480991-9 / 2480011-5	
G.M.(SAMCOR)	KOTA	2450150-3	
RAJ. STATE POLLUTION CONTROL BOARD	KOTA	2490873	2386898, 9414182780
NTPC (EXCHANGE)	ANTA	07457 - 246046	
GM – NTPC	ANTA	07457 - 246000	246001
DGM – NTPC	ANTA	07457 - 246012	246013
CPM, NTPC	ANTA	07457 - 246014	246015
NTPC (FIRE STATION)	ANTA	07457 - 246053	246054

7.5. Responsibilities & Role of Key Personnel

7.5.1. Over all In-charge –President (Operation)

407. On getting the information about emergency from GM (Prod.) rush to incident site/ECC. Assess the over all situation and provide guidance in critical decision-making.

7.5.2. Chief Site Coordinator- GM (Prod.)

- On getting the information about emergency from SM (Concerned) Plant, inform over all In-charge P (O).
- Rush to the emergency site to assess the situation and decide to:
 - Declare emergency based on amount/extent of hazards and water/air analysis (toxic / flammable material release) and advise Incharge (F&S) for sounding emergency siren.
 - Review if plant shutting down is required to contain / control the hazard.
 - Review, evacuation from affected areas and sending the affected person to a safe place.
 - Advise Incident Controller and other key personnel to take necessary action.
 - He will interact with Chief Service Coordinator and advise him on possible effects on areas inside and outside the factory to initiate Off-Site Emergency Response Plan.
 - Remain in touch with Overall in-charge (P -O) and inform about the situation & actions being taken and seek his advice for the critical decisions.

7.5.3. Chief Maintenance Coordinator- GM (Maintenance)

- After getting information about emergency from manager concerned Plant. Inform DGM (E&I), DGM (M&C.), SM (FM & CM) and Manager (Civil).
- Rush to the ECC, assess the situation and facilitate Chief Site
- Coordinator-GM (Prod.), Maintenance support needed to tackle the emergency.
- Facilitate earth-moving equipment like Cranes, Dozers etc. required for handling the emergency through civil coordinator.
- Facilitate elect. isolation of the affected area, if required through DGM (E&I)
- Facilitate lighting arrangements at (a) affected locations and (b) Assembly points if required through DGM (E&I)
- Facilitate work-shop facilities with adequate manpower if required through DGM (M&C.), / SM (FM /CM).
- Remain in touch with Chief Site Controller and Operational Controller.

7.5.4. Chief Technical Controller & Environment Coordinator- GM (TS&P)

- Rush to the site of emergency on getting the information from SM (Concerned Plant), informs SM (Process) and identify the hazards.
 - Facilitate monitoring /analysis of the area inside and outside the factory if required through SM (E&QC) and keep informed Chief Site Coordinator about the results.
 - Remain in touch with Chief Site Coordinator / Incident controller and shift in charge for taking samples and rendering help to the plant personnel.
- Facilitate laboratory equipment for sampling analysis with in the range of 1-2 Km in the wind direction for accurate assessment with reference to offsite disaster if required through SM (E&QC).