7.2 RISK ASSESSMENT

7.2.1 Consequence Analysis

Key issues in Risk Assessment (RA) of the proposed project are discussed in this chapter. The risk assessment process is intended to identify probable hazards in the work environment and all operations, to quantify the hazards and to assess the risk levels of those hazards in order to prioritize those that need an immediate attention.

In the unlikely event that an abnormal consequence has occurred, the disaster management will be activated. This includes prescribing the procedures pertaining to a number of issues such as communication, encounter, rescue, rehabilitation and further steps to prevent recurrence of such consequence in future. These issues are addressed in the disaster management plan.

Both, the RA and DMP are living documents and need to be updated whenever there are changes in operations, equipment or procedures.

7.2.2 Methodology of Risk Assessment

The methodology includes,

- Hazard identification;
- Selection of potential loss scenarios;
- Simulation of release source model on DNV's PHAST 7.1;
- Plotting the damage contour on site map.

These steps undertaken to carry out risk assessment for this project are described in the below sections.

7.2.3 Hazard Identification

The project description, and other project related data provided by DCM have been comprehensively reviewed to identify the hazardous operations. Also the information on the hazardous properties of all the materials / chemicals handled at the site has been reviewed to identify the hazards associated with the same.

At present DCM Shriram Ltd (DCM) proposes development of modernization & expansion in Power Plant from 125.3 MW to 141 MW. The main risk prone priority zones for the proposed project are high pressure boiler, high pressure steam pipelines, extra high voltage electrical equipment/system, acid, base & chlorine storage facilities, coal handling plant / storages and light diesel oil storage facilities.

Amongst these key hazardous inventories include the following:

- Solid Fuel Storages: Coal;
- Liquid Fuel Storages: Light Diesel Oil;
- Other Hazardous Chemical: Chlorine Cylinders.

Coal Storage & Handling

Coal, as a primary fuel, must meet several requirements in order to be explosive. These requirements are volatile ratio, particle size, and quantity. The volatile ratio is a value established by the former United States Bureau of Mines to evaluate the explosibility of coals based on large-scale tests in the Experimental Coal Mine. To calculate the volatile ratio, a proximate analysis must be performed in the laboratory on a sample of the coal. This analysis determines the volatile matter and fixed carbon quantities of the coal along with moisture and ash. The volatile ratio is defined as the volatile matter divided by the summation of volatile matter and fixed carbon of the coal. This method for calculating the volatile ratio produces a value independent of the natural or added incombustible in the coal. It has been determined that coals with a volatile ratio exceeding 0.12 present a dust explosion hazard. Since the proposed coal has a volatile ratio of 0.45 (volatile matter is 18% and fixed carbon is 22%) it does pose a dust explosion hazard, and therefore appropriate precautions would be provided by the designers.

Another important requirement of the fuel is related to particle size. Experiments have shown that bituminous coal particles passing through a U.S. standard 20-mesh sieve can participate in a coal dust explosion. A 20-mesh sieve allows particles up to 841 microns or about 0.03 inch to pass and these are the largest particles that contribute to a coal dust explosion. As the particle size is reduced even further, a more severe explosion hazard is realized. Typically, in pulverized-fuel systems, the coal is reduced to a particle size where more than 85% will pass a U.S. standard 200-mesh sieve with openings of 74 microns or about 0.003 inch. These coal dust particles require less energy or temperature to ignite and, since heat transfers more quickly between smaller particles, the pressure and rate of pressure rise during an explosion are accentuated.

The third requirement for explosibility is related to the quantity of coal dust available, known as the minimum explosive concentration (MEC). This is the minimum quantity of dust in suspension that will propagate a coal dust explosion and generate sufficient pressure to cause damage. The MEC for bituminous coal is approximately 0.10 ounce per cubic foot or 100 grams per cubic meter. When pulverized coal dust at the MEC was dispersed in an entry, a cap lamp ~3.0m within the cloud was not visible to observers standing in front of the dispersed dust. A layer of pulverized coal dust at the MEC deposited on the floor of the Experimental Coal Mine in Bruceton, Pennsylvania, averaged 0.125 mm thick. This thickness is almost unobservable. In other words, if footprints are visible in coal dust on the floor or the coal dust is seen on the walls of a plant, then there is enough coal dust at that particular location to propagate an explosion. The upper explosive limit is not well-defined and experiments have shown that a coal dust loading of ~3.9 kg/m3 would propagate a low-velocity explosion and that 5.0 ounces per cubic foot loading would quench itself within 10 feet of ignition. The presence of other flammable dusts or gases can lower the MEC of the coal, which increases the hazard. On the other hand, the hazard can be lessened with the addition of ash, rock dust, inert gas, and any other inert material. It is therefore noted that the higher ash quantity may therefore inhibit dust explosions.

Considering the above information, the following safeguards are proposed with respect to proposed plant equipment.

Raw Coal Stockpile

The raw coal for a pulverized fuel system is limited to a size of approximately 250 mm or smaller. This raw coal is stored on an outside stockpile where it is moved around by front end loaders. The fire and explosion hazards associated with this stockpile will be usually limited to spontaneous combustion. Therefore hot material must never be loaded into the pulverized-fuel system. There is a possibility of an explosion occurring within the pulveriser, however, in case all sides of the explosion pentagon could occur simultaneously. It is therefore recommended that hot materials be removed from the coal stockpile and spread until cooled.

Raw Coal Storage Bin

If there are no hot spots in the coal, the front-end loader will load the coal onto a conveyor belt, which feeds a coal storage bin. There will also be an emergency chute for unloading the bin in the event of a problem inside the bin. Coal in the bin may be susceptible to spontaneous combustion; however, some airflow is required to provide the oxygen necessary for heating. The raw coal empties from this bin onto a weigh scale. The weigh scale is a short conveyor belt that monitors the weight and the feed rate of the raw coal to the pulveriser. When any problems are detected in the system, the coal feed to the pulveriser is stopped completely.

Coal Pulveriser

Under normal operating conditions, coal is dropped from the weigh scale into a rotary airlock before it enters the pulveriser. The rotary airlock allows the coal and its inherent moisture to enter the pulveriser, but prevents any outside air from entering the system. Generally, the outside air has higher oxygen content than the air circulating in the system and this additional oxygen could lead to completion of the explosion pentagon and potential disaster. Coal that passes through the rotary airlock falls on the grinding table inside the pulveriser. The coal feed rate and the size of the grinding table are variable. The coal is ground between the rollers and the rotating grinding table

and is thrown outward by centrifugal force. It is typical for a mill to pulverize the coal to where 85-97% of the coal will pass a U.S. standard No. 200-mesh sieve. The finer the coal, the greater would be the explosion hazard. As the coal is being ground, hot air enters the bottom of the pulveriser and passes up through the pulveriser. The air is used for its drying and conveyance abilities. This hot air can come either from the clinker cooler or can come from the kiln hood. However, hot air from the clinker cooler is generally around 200°C as opposed to hot air from the kiln hood which is normally between 480°C and 650°C. These elevated temperatures can lead to heating in any coal that has deposited along internal surfaces. The main explosion hazard associated with a pulveriser is related to start up and shutdown procedures. When a system goes down under load, all the coal falls out of suspension. The internal surfaces are at elevated temperatures and the process of spontaneous combustion begins immediately. If the system is then restarted without full knowledge of internal conditions, an explosion could occur when the hot particles are suspended. Therefore due care will be exercised in start up and shut down activities.

Dust Cyclone

After the coal has been pulverized to a fine enough size, the circulating air lifts it out of the top of the pulveriser and through a classifier. When these fine coal particles pass out of the classifier, they may be transported through a duct leading to a dust cyclone. The coal-dust-laden air stream enters the cyclone where separation of the pulverized coal and circulating air is accomplished. The cyclone is designed such that the pulverized coal falls into the bottom of the cyclone, while the clean circulating air is allowed to pass out of the top of the cyclone. However, the cyclone is capable of removing most of the coal fines from the circulating air. Remaining coal fines will pass out of the top of the cyclone and continue through the system fan. Hence, a limited amount of coal is stored in the base of the cyclone for a short period of time. The rotary valve then feeds the coal into the air stream of the primary air fan. It has been reported by an operator of a semi-direct system that only about 11.4 kg of fine coal dust would be in the cyclone at any time. Without any bulk storage of pulverized coal in the system, a shutdown of the pulveriser will stop the continuing coal feed into the boiler.

Bag house

The air that passes out of the top of the cyclone, with the coal dust, is transported to a bag house. This bag house is designed with many filter-type bags hanging vertically, which are capable of removing the remaining coal dust from the circulating air. In the bag house, all the coal dust is captured in filter type bags and the air circulating from the system fan is vented to the atmosphere. The primary advantage is twofold: first, all coal dust can be used as fuel; secondly, the air vented to the atmosphere carries high-moisture content and is not recirculated through the system. The moisture content of this air is lower than that which is vented to the atmosphere from the bag house because it is not involved in coal drying until it enters the pulveriser.

LDO & Chlorine Storage

The proposed project involves storage of some of the chemicals / fuel at the site which can lead to uncontrolled release of hazardous material causing hazard. On the basis of this, the important hazards that can lead to accident in the proposed project are described in ***Table 7-3.***

Table 7-3: Important Hazardous Events

Type of Event	Explanation
BLEVE	Boiling Liquid Evaporating Vapor Explosion; may happen due to catastrophic failure of refrigerated or pressurized gases or liquids stored above their boiling points, followed by early ignition of the same, typically leading to a fire ball
Deflagration	Is the same as detonation but with reaction occurring at less than sonic velocity and initiation of the reaction at lower energy levels
Detonation	A propagating chemical reaction of a substance in which the reaction front advances in the unreacted substance at or greater than sonic velocity in the unreacted material
Explosion	A release of large amount of energy that form a blast wave
Fire	Fire

Type of Event	Explanation
Fireball	The burning of a flammable gas cloud on being immediately ignited at the edge before forming a flammable/explosive mixture.
Flash Fire	A flammable gas release gets ignited at the farthest edge resulting in flash-back fire
Jet Fire	A jet fire occurs when flammable gas releases from the pipeline (or hole) and the released gas ignites immediately. Damage distance depends on the operating pressure and the diameter of the hole or opening flow rate.
Pool Fire	Pool fire is a turbulent diffusion fire burning above a horizontal pool of vaporizing hydrocarbon fuel, where the fuel has zero or low initial momentum
Spill Release	'Loss of containment'. Release of fluid or gas to the surroundings from unit's own equipment / tanks causing (potential) pollution and / or risk of explosion and / or fire
Structural Damage	Breakage or fatigue failures (mostly failures caused by weather but not necessarily) of structural support and direct structural failures
Vapor Cloud Explosion	Explosion resulting from vapor clouds formed from flashing liquids or non-flashing liquids and gases

Hazard and Damage Assessment

Toxic, flammable and explosive substances released from sources of storage as a result of failures or catastrophes, can cause losses in the surrounding area in the form of:

- Toxic gas dispersion, resulting in toxic levels in ambient air;
- Fires, fireballs, and flash back fires, resulting in a heat wave (radiation), or;
- Explosions (Vapors Cloud Explosions) resulting in blast waves (overpressure).

Consequence of Fire /Heat Wave

The effect of thermal radiation on people is mainly a function of intensity of radiation and exposure time. The effect is expressed in terms of the probability of death and different degree of burn. The consequence effects studied to assess the impact of the events on the receptors are provided in ***Table 7-4.***

Table 7-4: Damage due to Radiation Intensity

Radiation (kW/m^2)	Damage to Equipment	Damage to People
4.0	-	Causes pain if duration is longer than 20 sec. But blistering is unlikely.
12.5	Minimum energy to ignite wood with a flame; melts plastic tubing.	1% lethality in one minute. First degree burns in 10 sec.
37.5	Severe damage to plant	100% lethality in 1 min. 50% lethality in 20 sec. 1% lethality in 10 sec.

Consequences of Overpressure

The effects of the shock wave vary depending on the characteristics of the material, the quantity involved and the degree of confinement of the vapor cloud. The peak pressures in an explosion therefore vary between a slight over-pressure and a few hundred kilopascals (kPa). Whereas dwelling are demolished and windows and doors broken at overpressures as low as 0.03- 0.1 bar. Direct injury to people occurs at greater pressures. The pressure of the shock wave decreases rapidly with the increase in distance from the source of the explosion. The overpressure damage is shown in ***Table 7-5.***

Table 7-5: Overpressure Damage

Overpressure (bar)	Damage
0.02068	Limited minor structural damage

Overpressure (bar)	Damage
0.21	Corrugated asbestos shattered; corrugated steel or aluminium panels, fastenings fail, followed by buckling, wood panels (standard housing) fastenings fail, panels blown in
1	Fatality

Source: CCPS Consequence Analysis of Chemical Release

Consequences of Toxic Release

The effect of exposure to toxic substance depends upon the duration of exposure and the concentration of the toxic substance.

Short-term exposures to high concentration give Acute Effects while long term exposures to low concentrations result in Chronic Effects.

Only acute effects are considered under hazard analysis, since they are likely credible scenarios. These effects are:

- Irritation (respiratory system, skin, eyes);
- Narcosis (nervous system);
- Asphyxiation (oxygen deficiency);
- System damage (blood organs).

7.2.4 Selection of Maximum Credible Loss Scenarios (MCLS)

Following important points were considered for the selection of release scenarios:

- Flammability and the flash point of the material;
- Phase of material i.e. liquid or gas;
- Threshold quantity of the chemicals as prescribed in MSHIC Rule;
- Operating temperature and pressure of the material;
- Total inventory of the material.

On the basis of study of chemical properties (MSDS) of the chemicals those are selected for simulation are presented in ***Table 7-6.***

Table 7-6: Storage Details of Hazardous Material

S. No.	Containment (Vessel)	Flash Point (°C)	IDLH (PPM)	Max. Storage Capacity (KL)	No. of Storage Vessels	Total Storage Capacity (KL)	Dyke		Pressure	Temperature
							Height, m	Area, m^2		
1	Chlorine Cylinder	NA	10	900 kg	7	~6,300 kg	-	-	10	-7
2	LDO	66	-	50	2	100	-	-	Atmospheric	Ambient

On the basis of the information provided in ***Table 7-6,*** and as discussed over failures sceneries given in publications like World Bank Technical Paper 55 and TNO Purple Book and the experience of the consultant, MCLS which may take place are presented in ***Table 7-7.***

Table 7-7: Scenario Selected for Simulation

S. No.	Containment (Vessel)	Types of Failure Possible	Consequences Studied
1	Chlorine Cylinder	1 mm dia hole leak in tank, 2 mm dia hole leak in tank	Maximum Concentration due to toxic
2	LDO Tank	10 mm dia hole leak in tank, 25 mm dia hole leak in tank, catastrophic rupture in tank	Jet Fire, Pool Fire & Late Explosion

Failure Rates

A leak or rupture of a tank, release some or all of its content, can be caused by brittle failure of the tank wall, welds or connected pipework due to use of inadequate materials, combined with loading such as wind, earthquake or impact. Failure rates for selected MCLS' are provided in ***Table 7-8.***

Table 7-8: Failure Frequency for Storage Tanks

Categories	Catastrophic Rupture Frequency (per tank per year)	Leak Frequency (per year)
Refrigerated Storage Tank (Single Wall)	2.3×10^{-5}	1.0×10^{-5}
Refrigerated Storage Tank (Double Walled)	2.5×10^{-8}	1.0×10^{-5} (for primary containment)
Atmospheric Storage Tank	3.0×10^{-6}	2.8×10^{-3}
Pressure Vessels	4.7×10^{-7}	1.2×10^{-5} (for Hole Size 3 to 10 mm)
		7.1×10^{-6} (for Hole Size 10 to 50 mm)

Reference: International Association of Oil & Gas Producers (OGP); Report No. 434-3, March 2010

Also, the risk assessment is considered using certain internationally recognized yardsticks for measuring risk. These first need to be explained, and this is done as ***Table 7-9.***

Table 7-9: Broadly Accepted Frequency

Annual Fatality risk level per year	Conclusion
10^{-3}	Unacceptable to everyone. Immediate action shall be taken to reduce the hazards
10^{-4}	Willing to spend public money to control hazards, such as traffic signs, fire departments etc
10^{-5}	People still recognize. Safety slogans have precautionary rings. Such as never swim alone, never point a gun
10^{-6}	Not of great concern to everyone. People are aware of these hazards but feel that they cannot happen to them. Such as Lightning Never Strikes twice an Act of God.

7.2.5 Simulation of Release and Development of Contours

As the MCLS were developed for the selected set of chemicals, the next step is to carry out the consequence analysis. The consequence analysis results along with their contours are presented in the following sections.

Chlorine Cylinder

The Maximum concentration effect distance are presented in ***Table 7-10.***

Table 7-10: Maximum concentration Effect Distance due to Release of Chlorine

Chemical (Storage Tank)	Failure Scenario	Met Data	Effective Distance in meter to Toxic Level			
			EPRG 1 (1 ppm)	EPRG 2 (3 ppm)	EPRG 3 (20 ppm)	IDLH (10 ppm)
Chlorine Cylinder	1 mm leak	2.0/B	244.3	136.9	52.1	102.5
		3.0/E	737.1	400.3	128.2	288.8
		5.0/D	335.8	179.9	60.6	131.1
	2 mm leak	2.0/B	577.3	329.9	129.9	249.3
		3.0/E	1,754.2	947.2	320.8	691.5
		5.0/D	801.3	435.1	146.6	319.3

The contours for effect distance generated for the release of Chlorine are presented in ***Figure 7-1 & Figure 7-2.***

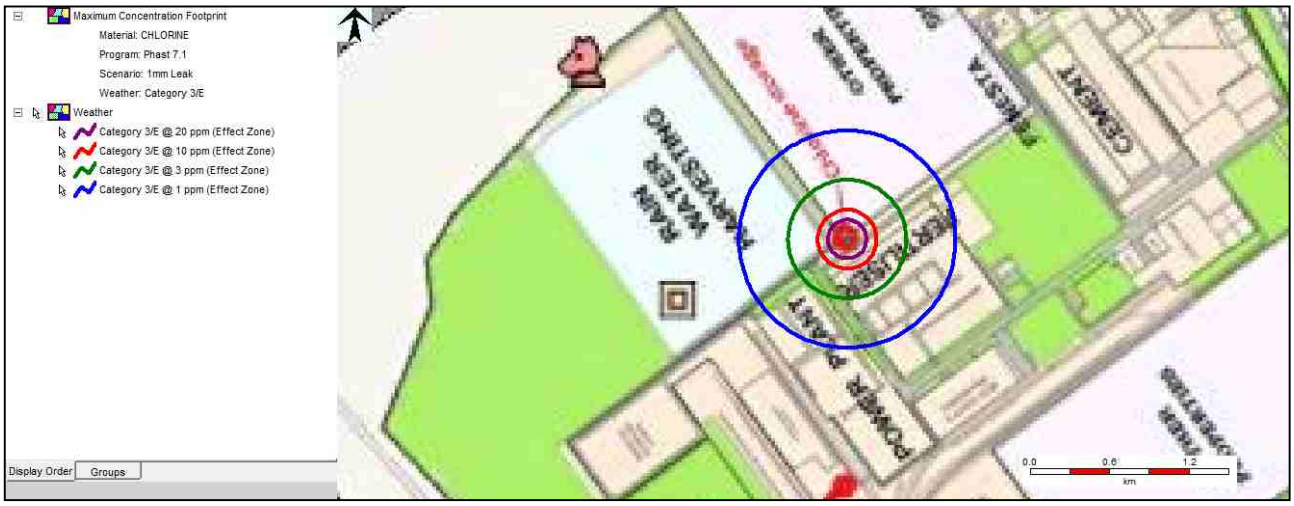


Figure 7-1: Toxic Consequence Contour of Chlorine – (1 mm Leak at WC 3.0/E)

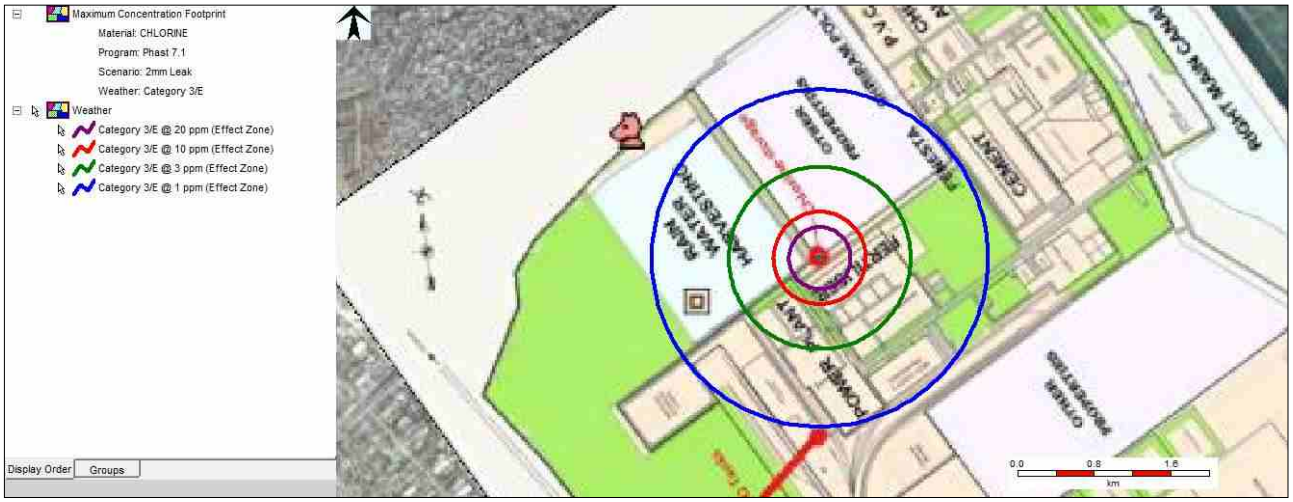


Figure 7-2: Toxic Consequence Contour of Chlorine – (2 mm Leak at WC 3.0/E)

LDO Tank

Radiation level and effect distance due to the release of LDO are presented in ***Table 7-11,*** the overpressure effect distance due to the release of LDO are presented in ***Table 7-12*** & the Flash fire effect distance due to the release of LDO are presented in ***Table 7-13***.

Table 7-11: Radiation level & Effect Distance due to Release of LDO

Chemical (Storage Tank)	Failure Scenario	Consequence	Met Data	Effective Distance in meter to Radiation Level		
				4 kW/m²	12.5 kW/m²	37.5 kW/m²
LDO	10 mm leak	Jet fire	2.0/B	6.2	4.5	NR
			3.0/E	5.8	4.2	NR
			5.0/D	5.4	3.9	2.7
		Late Pool Fire	2.0/B	41.7	20.6	11.8
			3.0/E	43.6	22.4	11.7
			5.0/D	44.6	25.3	11.6
	25 mm leak	Jet fire	2.0/B	13.9	10.9	8.8
			3.0/E	13.1	10.1	8.2

Chemical (Storage Tank)	Failure Scenario	Consequence	Met Data	Effective Distance in meter to Radiation Level		
				4 kW/m²	12.5 kW/m²	37.5 kW/m²
			5.0/D	12.3	9.4	7.5
		Late Pool Fire	2.0/B	62.7	25.3	NR
			3.0/E	67.9	26.2	NR
			5.0/D	72.1	27	NR
	Catastrophic Rupture	Late Pool Fire	2.0/B	398	211.09	NR
			3.0/E	420.5	211.3	NR
			5.0/D	450.2	211.5	NR

Table 7-12: Overpressure Effect Distance due to Release of LDO

Chemical (Storage Tank)	Failure Scenario	Consequence	Met Data	Overpressure Distances in Meters		
				0.02	0.13	0.20
LDO	10 mm leak	Late Ignition	2.0/B	18	12	11
			3.0/E	18	12	11
			5.0/D	-	-	-
	25 mm leak	Late Ignition	2.0/B	41.9	24.3	21.7
			3.0/E	41.9	24.3	21.7
			5.0/D	45.7	25.1	22.0
	Catastrophic rupture	Late Ignition	2.0/B	348.6	187.6	177.0
			3.0/E	324.2	161.8	153.7
			5.0/D	243.7	129.3	123.7

Table 7-13: Flash Fire Effect Distance due to Release of LDO

Chemical (Storage Tank)	Failure Scenario	Consequence	Met Data	Effective Distance in meter	
				0.5 LFL	LFL
LDO	10 mm leak	Flash Fire	2.0/B	16.80	10.00
			3.0/E	15.50	9.18
			5.0/D	9.18	4.40
	25 mm leak	Flash Fire	2.0/B	29.1	18.0
			3.0/E	26.1	16.0
			5.0/D	23.9	13.3
	Catastrophic Rupture	Flash Fire	2.0/B	199.5	113.1
			3.0/E	174.0	94.0
			5.0/D	170.2	83.0

The contours for effect distance generated for the release of LDO are presented in ***Figure 7-3 to Figure 7-8.***

Figure 7-3: Late Pool Fire Consequence Contour of LDO – (10 mm Leak at WC 5.0/D)

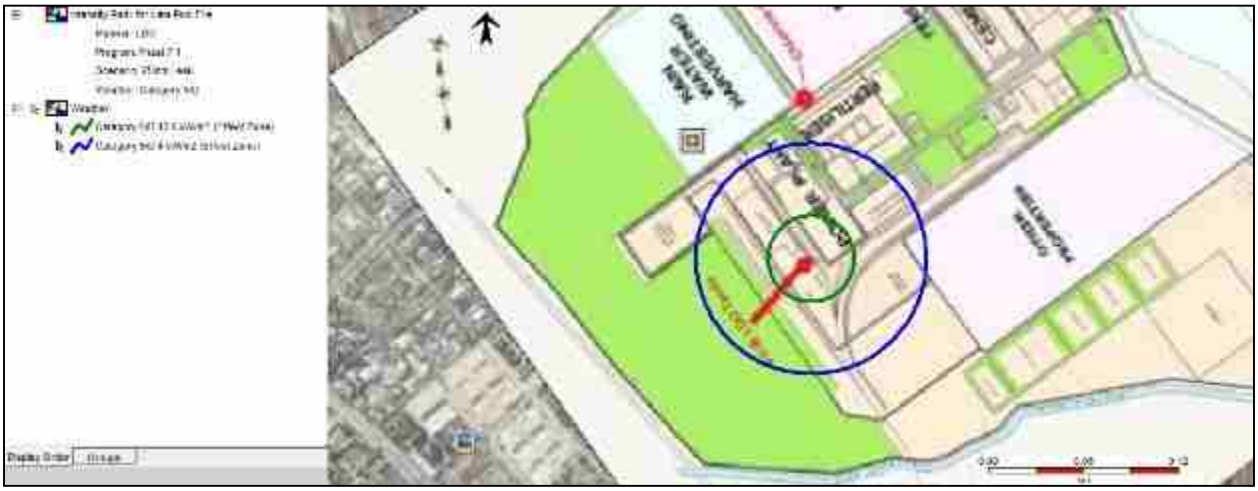


Figure 7-4: Late Pool Fire Consequence Contour of LDO – (25 mm Leak at WC 5.0/D)

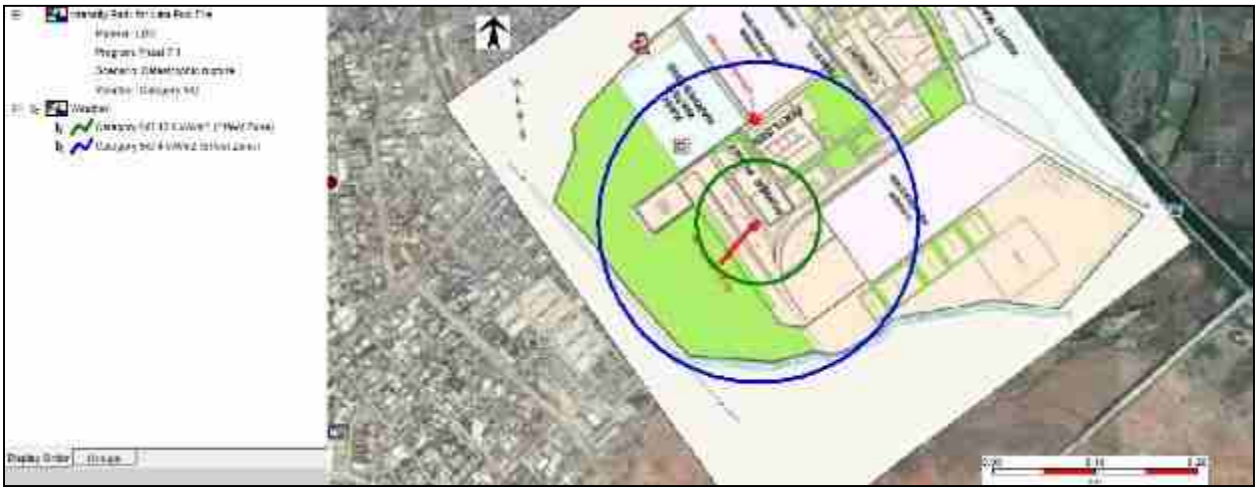


Figure 7-5: Late Pool Fire Consequence Contour of LDO – (Catastrophic Rupture at WC 5.0/D)

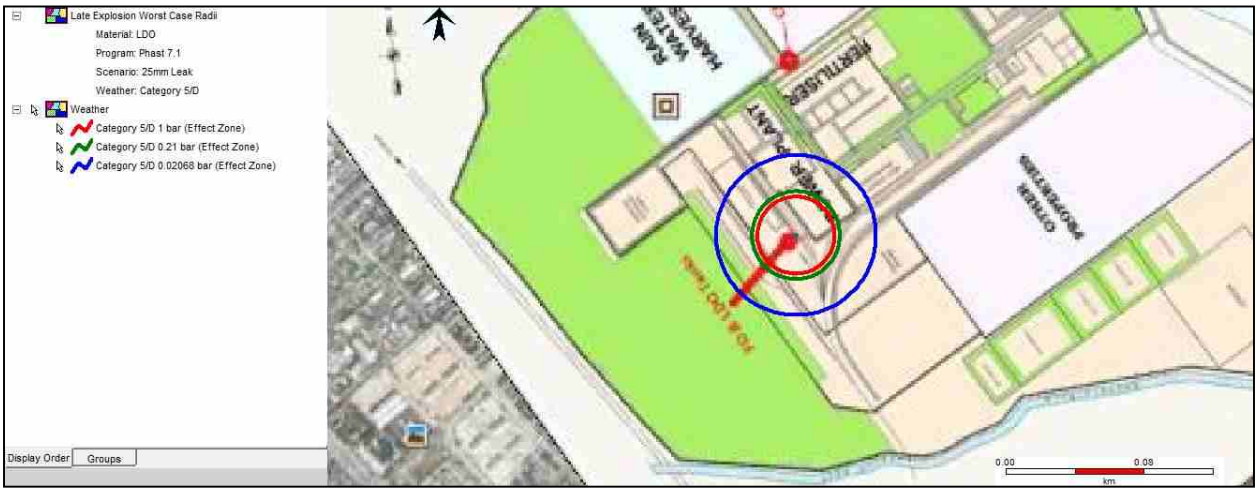


Figure 7-6: Late Explosion Effect Consequence Contour of LDO – (25 mm Leak at WC 5.0/D)

Figure 7-7: Late Explosion Effect Consequence Contour of LDO – (Catastrophic Rupture at WC 2.0/B)

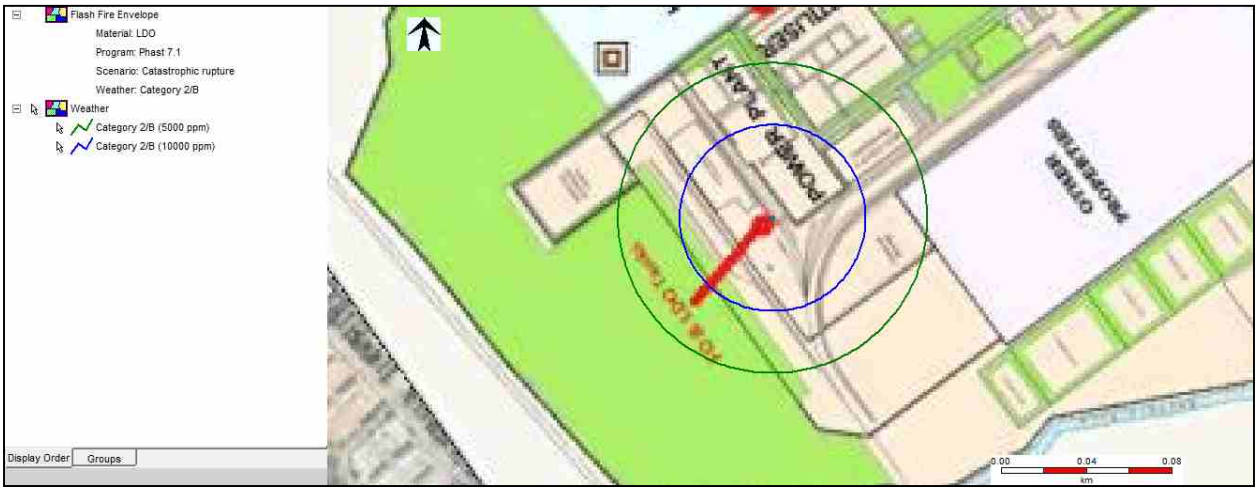


Figure 7-8: Flash Fire Effect Consequence Contour of LDO – (Catastrophic Rupture at WC 2.0/B)

7.3 TREATMENT AND CONTROL

After examining the high priority risks, a prime consideration is given to the potential to reduce or eliminate the risk by using the hierarchy of controls. This assists in establishing methods to reduce risk. The desirability of control plans (with reducing effectiveness) is as follows;

- Elimination: Take step to eliminate the hazard completely;
- Substitution: Replace with less hazardous material, substance or process;
- Separation: Isolate hazard from person by guarding, space;
- Administrative: Adjusting the time or conditions of risk exposures;
- Training: Increasing awareness, improving skills and making tasks less hazardous to persons involved;
- Personal protective equipment: Use appropriately designed and properly fitted PPE.

Control measures can reduce either the likelihood or consequence of the event or both. Depending on the level of reduction of the hazard, there could still be a residual risk that needs to be monitored so that a secondary prevention process can be initiated when trigger points are reached.

The control measures and action will be adopted by M/s DCM to minimize the risk present in the facility for the hazardous event are summarized in ***Table 7-14.***

Table 7-14: Event Consequences, Treatment and Control

Hazardous Event	Possible Consequences	Treatment and Control
Loss of containment Rupture / leak in storage tanks	Fire, explosion and toxic hazards release	Gas detectors, Dyke wall provision, Level indicator, Earthing, flame arrestor & visual observation, Ready availability of fire extinguishers and fire hydrant system

7.3.1 Precautions to be taken during Transportation

Following are some precautions which will be taken during the loading and unloading of material in plant premises:

- Before the tanker enters the industry premises, the tanker is to be inspected for authorized entry and safe & sound condition of the tanker, its contents and that of the prime mover. Flammable material carrying tankers entering plant are to be fitted with spark arresters on their exhaust;
- Static charge will be neutralized;
- The quality of the chemical in the tanker should be ascertained before unloading to avoid contamination of chemical already at storage;
- Coupling used for connecting hose to tanker must be leak proof;
- For flammable chemicals, the tanker and the hose are to be properly earthed before starting unloading operation;
- Unloading should be done under personal supervision of responsible staff authorized by the management;
- Provision of sample quantity of water / neutralizing medium to take care of leakage / spillage must be made. Also steam and inert gas hose stations must be available at unloading point;
- Fire alarm and firefighting facility commensurate with the chemical should be provided at the unloading point;
- Use of PPE will be ensured.

7.4 DISASTER MANAGEMENT PLAN FOR DCM SHRIRAM, KOTA COMPLEX

7.4.1 Objective

The objectives of the plan are as follows;

- Controlling the emergency, localize the emergency and eliminating the hazard;
- Welfare of persons managing the disaster;
- Head-Count and rescue operations;

- Rescue of personnel;
- Treatment of injured personnel;
- Safeguarding others by steps including evacuation;
- Minimizing damage to property and environment;
- Informing and assisting relatives;
- Informing and collaborating with statutory authorities;
- Informing the News Media;
- Preserving records and organizing investigation;
- Ensuring safety of the workers before personnel re-enters and resumes work;
- Investigating & taking steps to prevent recurrence;
- Restoring normalcy.

7.4.2 On-site emergency response plan

Introduction

An Emergency Response Program (ERP) envisages developing an emergency response plan, training to the employees as per the plan and establishing standard operating procedures for handling, identified emergencies to ensure that the loss to human life & property is minimal.

At DCM Shriram Ltd., Kota Complex, the company is engaged in multiple industrial activities. The processes vary and also associated potential hazards vary from facility to facility. Scenario changes are occurring in situations both – natural and human cause. These changes pose a new challenge and accordingly the response plans are required to be put in place.

Key components of this emergency plan identify the following:

- Pre emergency planning including coordination with outside stakeholders;
- Appreciation of situations;
- Response plan for natural and human caused emergencies;
- Roles, lines of authority, training and communication;
- Site security and control;
- Safe evacuation;
- First-aid and emergency medical treatment;
- Emergency equipment;
- Post emergency management plan.

7.4.3 Emergency Response Policy

At DCM Shriram Ltd., Kota Management is committed to operate at the highest standard to protect the health and safety of our workers, the public, and the environment. Therefore as part of an emergency preparedness program, the employees as well other stakeholders including contract workmen will develop and maintain emergency plan in compliance with applicable statutes and industry standards including the Factories Act to ensure timely and appropriate response to the potential emergencies.

Objective

The objective of the Emergency Response Plan is:

- To appreciate emergency situations having the potential of major harm to employees and property and/or the effect of which may travel beyond the area of occurrence;
- To lay down steps to handle such emergencies;
- To lay down arrangements for first aid/ medical help for the affected persons;
- To nominate trained manpower to mobilize for handling of emergency

- From within the factory;
- From outside sources;

- To appreciate and designate likely area of influence and lay down actions for warning and evacuation of employees/ public at large, if required;
- To identify officials from District Administration / Civil Authorities responsible for execution of off-site emergency plan including relief operations.

Flow chart showing Emergency Response plan during fire at DCM Shriram, Kota Complex is provided in ***Figure 7-9***. Similar flow charts for toxic emergency, emergency – bomb / IED explosion, earthquake & flash flood are also available.

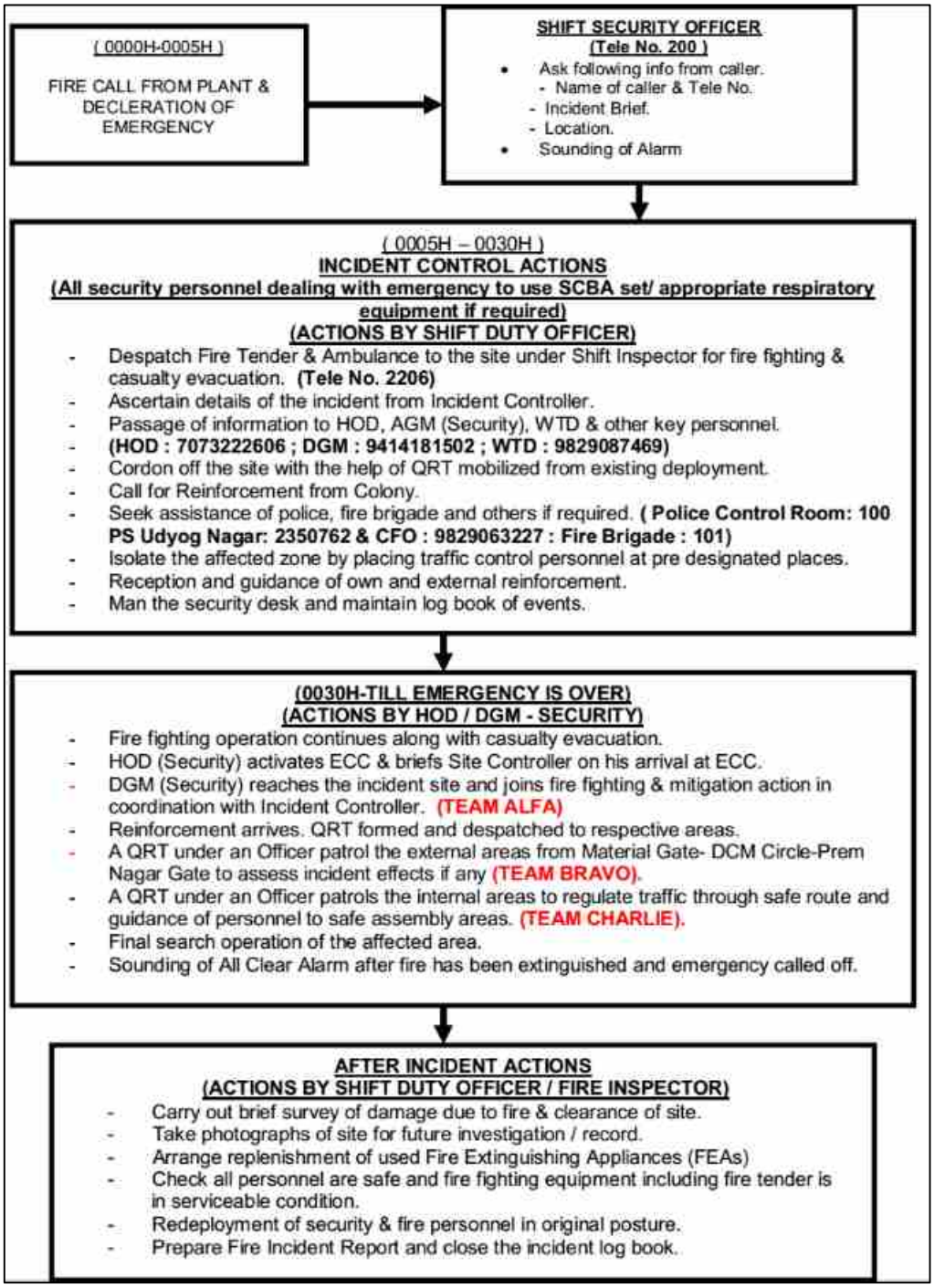


Figure 7-9: Flow Chart for Fire Emergency Response Plan

7.4.4 Industrial Activities at DCM Shriram Ltd, Kota

In the DCM Shriram Ltd., Kota complex - comprising Shriram Fertilizer & Chemicals (SFC), Shriram Vinyl & Chemical Industries (SVCI), Shriram Cement Works (SCW) Shriram Axiall and Fenesta Building Systems (FBS) - the following industrial activities are carried out.

Shriram Fertilizers & Chemicals (SFC):

Manufacture of 3.79 Lacs TPA of Urea having Ammonia as intermediate product and Naphtha and LNG as raw material. Urea prills are packed in Urea Bagging plant. A captive thermal Power plant of 125 MW is also installed in this unit.

Shriram Vinyl & Chemical Industry (SVCI):

Manufacture of 0.70 Lacs TPA of PVC resin using Acetylene and Hydrochloric acid as raw materials. Acetylene is produced in Calcium Carbide plant (producing 1.08 lacs TPA of Calcium Carbide) and Hydrochloric acid is produced in Chlor alkali plant (producing 1.13 lacs TPA of caustic soda). Other products of Chlor alkali plant are: Liquid Chlorine and Stable Bleaching Powder (SBP – 9900 TPA).

Shriram Cement Works (SCW):

Manufacture of 4.0 lacs TPA of Cement, using lime stone and coal as main raw materials. Hydrated lime sludge (waste product of Calcium Carbide plant) is also used as one of the inputs.

Shriram Axiall (SA):

Manufacture of 23,400 TPA of PVC compounds using PVC resin and other chemicals.

Fenesta Building Systems (FBS) Extrusion Plant:

Manufacture of UPVC profiles for window and door frames using PVC resin and other chemicals.

Facility Zones

For prompt and efficient execution of emergency response plan the entire complex has been divided into following zones.

Zone I

- Power Plant including all power generating units, Coal handling, DM plant and Rain water reservoir;
- Fertilizer plant including Ammonia, Urea and Urea Bagging plants and Coal railway siding and LNG gas station;
- Engineering. Depts. (Fert. & Power) to include Mechanical Work shop, Electrical, Electrical Sub- station and Instrument office;
- Fert. Works block;
- Railway siding to include Cement siding, urea siding and loco shed;
- Waste Disposal Area;
- Fert. Canteen.

Zone II

- Stores;
- Material Gate office and Vehicle waiting areas;
- Cement plant including the crushing section, Cement packing section, Cement stores, Cement sales liaison, Cement Weigh Bridge, Cement canteen and parking area.

Zone III

- Shriram Axiall;
- PVC plant including VC tanks, VC gasholder and Maintenance area;
- Caustic Soda plant including Cell House, Liquid Chlorine plant, Chlorine bottling section, Fusion House and SBP Godown;
- Calcium Carbide plant including Furnaces, Acetylene Generators, Acetylene Gasholder, Carbide packing section and 132 KV Sub-station;
- EHS Block: Env. & Safety Deptt. , OHC, Instt. (V), CAG office;
- Vinyl Canteen.

Zone IV

- Administration Block;
- Accounts Block;
- ISD and Plastic Commercial;
- Employees shop and STC;
- Security, HRD, Contractor Cell, ICICI Bank;
- Guest House and Kala Mandir.

Updating and Control of Emergency Response Plan

The Environment & Safety Department will be responsible to update necessary information from time to time. Plan will be quarterly reviewed by a designated team to include any changes, modifications in the hardware or practices after due approval of Whole Time Director.

A soft copy of this document will be available on DSL Intranet. Environment & Safety Department will ensure that only the latest soft version is available on the Intranet. The users at their end can print hard copies, if necessary.

Measurement & Monitoring

To test the preparedness level as per the plan, mock drills will be conducted once in six months in each of the following business groups:

- Fertilizer & Power Group (SFC);
- Plastic Group (SVCI);
- Chlor-Alkali Group (SVCI).

Environment & Safety Department (ESD) will coordinate for the mock drills and prepare feedback on the response collected through independent observers and submit the same to all concerned. This report may include major/ minor deviations, if any, and recommendations for necessary rectification. The compliance of the recommendations are ensured by the concern plant HOD and records are maintained.

7.4.5 Appreciated Emergency Situations & Vulnerable Areas

Appreciated Emergency Situations

Table 7-15: The details of Appreciated Emergency Situations and their consequences with probability

S.N	Potential situation	Consequences	Probability	Risk Category
Natural				
1	Earthquake (Sufficient to impact site, process and people)	Process disruptions leading to toxic release, fire, explosion, structural collapse, disruption in infrastructural facilities like communication & electricity including movement.	Unlikely	Critical (Permanent disability, severe injury or illness)

S.N	Potential situation	Consequences	Probability	Risk Category
2	Wind Cyclone/ dust storm	Structural damage, especially to temporary infrastructure, Flying of shrapnel, disruption to power supply and communication links	Likely	Marginal (injury or illness not resulting in disability, life loss etc.)
3	Flash floods and heavy rains	Disruption in people movement, Water logging, short circuiting and breach occurrence in Water harvesting reservoir	Likely	Negligible (Treatable first aid injuries)
Human Caused				
4	Toxic release Chlorine gas (Max. storage 1,230 MT i.e. 5x30 MT in tanks and 1,200 x 0.9 MT in tonners.) Max. (Single storage 30 MT tank and one additional tank of similar capacity kept empty all the time.	Create scary situation leading people running for cover, temporary process disruption, effect to habitat outside the facility in case of heavy release leading to involvement of offsite responders	Likely	Critical/ Marginal (Severe illness, temporary disability and illness). Lead to focus on public, media, government agencies
5	Toxic release-Ammonia gas (Max. storage in two Horton spheres is 1,000 MT – 50% of the installed storage capacity)	Create scary situation leading people running for cover, temporary process disruption, effect to habitat outside the facility in case of heavy release leading to involvement of off-site responders	Likely	Marginal (Severe illness, temporary disability and illness). Lead to focus on public, media, government agencies
6	Bomb Threat, Improvised Explosive Device (IED) threat and Sabotage	Multiple explosions leading to process disruptions, critical equipment failure, fire & explosion, toxic release, abrupt effect on human life leading to chaos and scary situation in general. Effect on major public events organized in the facility (Ramlila and Janmashtami)	Possible	Catastrophic/ Critical/ depending upon the type of IED, location and first effect of single or multiple blasts. (Death, fatal injuries, permanent disability and injuries including treatable first aid injuries) Lead to focus on public, media, govt. agencies
7	Civil unrest including strike/ agitation/ unforeseen situation during major public events organized in the facility (Ramlila and Janmashtami)	Property damage and temporary disruption in movement and due to boycott to man the facility may lead to temporary breakdowns.	likely	Negligible (Treatable first aid injuries)

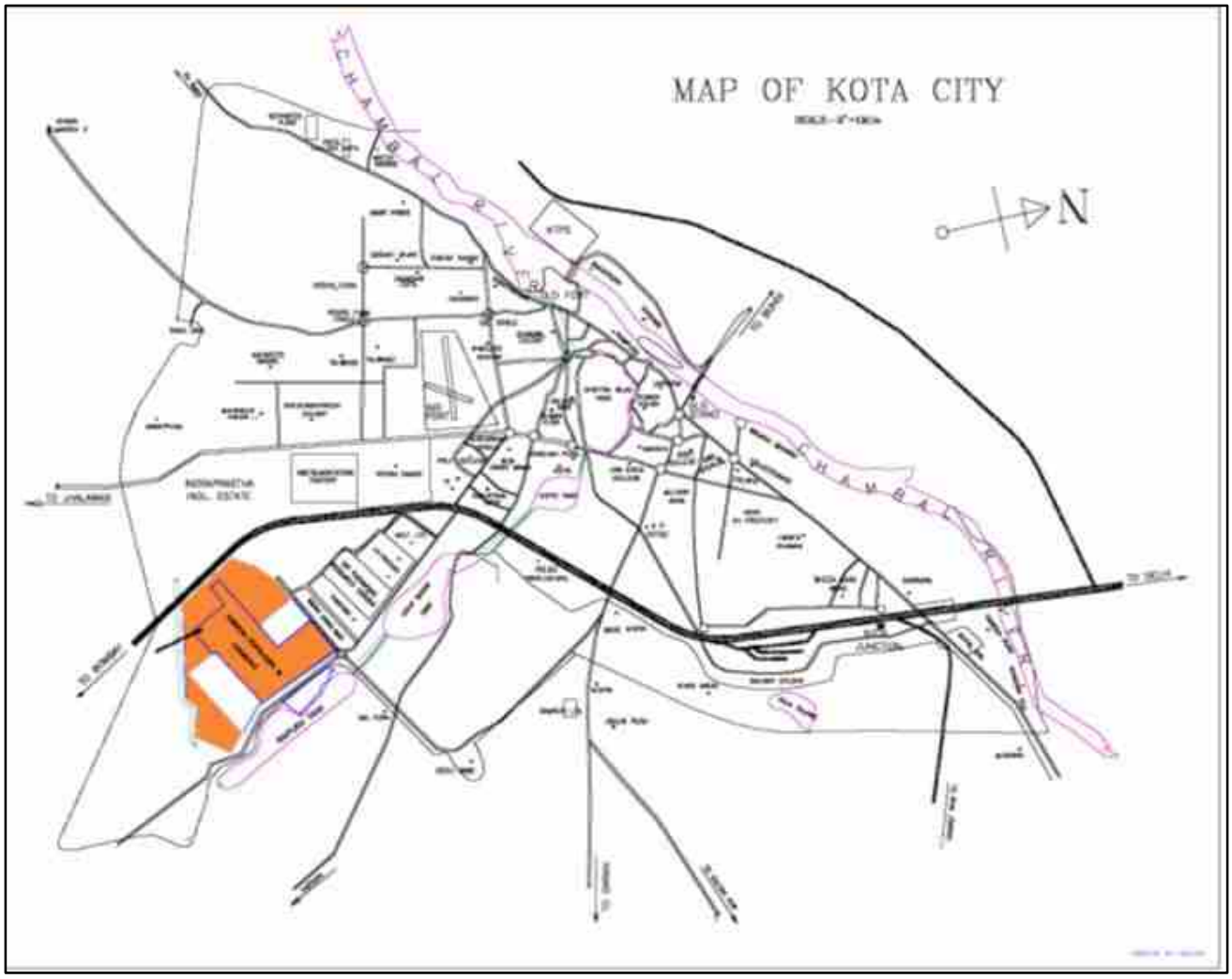
Vulnerable Areas (Outside):

In case of spillage/ heavy leakage of Chlorine from the containment the vulnerable zone can extend up to 5 KM towards East, North, North East, South and South West depending upon the wind velocity/ direction. It will cover the following areas which are shown in the below ***Map 7-1.***

- Shriram Nagar
- Vigyan Nagar
- Raipura
- Premnagar
- Talwandi
- Rajnagar
- Kansua
- Mahavir Nagar
- Dhakar Kheri
- Indira Gandhi Nagar

- Anand Pura
- Deoli Arab
- JK Colony
- Govind Nagar
- Ram Nagar
- Bhamashah Mandi
- Borkhera
- Ummed Ganj
- Indraprasth Indl. Area
- Kanwarpura
- Sanjay Gandhi Nagar
- Hanut khera Rangbari Mali pura
- Ganesh pura Thegda

Map 7-1: Map of Kota City



7.4.6 Hazard Details and Outlined Response Plan

Release of Chlorine

Likely credible scenarios related to Chlorine can be due to release of the gas from:

- One of the five storage tanks of 30 MT capacity each in CAG;

- One of the 1,200 tonners of 0.9 MT capacity each;
- Pipelines of liquid and/or gaseous chlorine (300 Kg. of liquid and 10 Kg. of gaseous chlorine).

To address the situation of Chlorine release, following guidelines are laid down:

- Warning inside the complex and outside depending upon severity and wind direction as per details given in subsequent paragraphs;
- Taking mitigating actions by CAG plant such as process control, containment actions, plugging of leaking tonners and safe evacuation of manpower in affected zone as per detailed SOP worked out by the concerned under over all charge of V.P. (CAG);
- Cordoning off the affected zone by Security;
- Evacuation of causalities;

Release of Ammonia

Maximum Credible scenario will comprise of release of Ammonia stored in two Horton spheres of 1,000 MT capacity each, located at Urea Plant. However maximum available Ammonia is 1,000 MT (50% of the installed storage capacity). It will be caused due to rupture/ collapse of Horton sphere led by any of the triggers mentioned above in para 7 of chapter II. To address the situation of Ammonia releases following guidelines are laid down:

- Warning inside the complex and outside depending upon severity and wind direction;
- Taking mitigating actions by Fertilizer plant such as process control, containment actions and safe evacuation of manpower in affected zone as per detailed Standard Operating Procedures (SOP) worked out by the concerned plant and approved by Addl. VP (Fert.) and concerned HODs;
- Cordoning off the affected zone by Security;
- Evacuation of causalities.

Fire and Explosion

Fire & explosion involving VC gas, Acetylene, Hydrogen and as per fire risk assessment (carried out by plants/ depts.) shall be addressed as per following guidelines:

- Warning in the plant by available alarm systems;
- Triggering of the process control measures to cut off the supply of the involved fuel and Oxygen as per SOP worked out for various situations in all the plants under over all charge of respective HODs;
- Simultaneously start firefighting operations through designated & trained fire responders available in all the shifts with the help of the portable and fixed firefighting systems available at their disposal;
- Simultaneously call for support of fire tender and fire fighters from Shift Security Officer;
- Safe evacuation of personnel especially trapped in fire/ smoke zones through identified fire escape routes and exits;
- Evacuation of causalities;
- Cordoning off affected area due to explosion so that all routes of ingress are sealed off by Security;
- Immediate rescue of trapped personnel in debris or collapsed structures;
- Arranging of heavy duty recovery equipment like cranes, dozers, drills, cutters dumpers, if required, to be coordinated by HOD (Mech.)

Earthquake

Kota typically does not fall in Seismic category warranting a noticeable earthquake scenario. Kota zone has been considered under seismic zone-2. In our complex main plant buildings are constructed with columns and beam structure, as such, is unlikely to fall during low scale earthquake. However the masonry wall and loosely mounted equipment, false ceiling may fall and may cause damage. The colony, Shriram Hostel and other such areas may be affected. Guidelines to deal with such situations are as follows:

- Top most priority will be given to rescue operation to take out any victims from debris while simultaneous casualty evacuation is organized;
- It is appreciated that first-aid capabilities should be made available to cater for a strength of about 50-75 persons. Medical Officer will plan and put in place necessary medical arrangements including resources available at Shriram Polyclinic and different private hospitals;
- Shift in-charge will advise non-essential persons to reach for an open space and lie down on ground away from structures;
- Those required to be on shop floor should take position in a corner preferable near a door in stand up position and keep away from electrical equipment;
- An earthquake of high magnitude will leave behind a scenario of major damage with or without casualties hence evacuation of casualties will be organized as in case of other emergency situations;
- It may cause bursting of cylinders, gas leakage and spillage of hot molten material from Carbide furnaces requiring actions detailed in respective sections earlier. Earthquake may also result in electrical short circuit, power disruption which should be immediately attended so as to restore the power supply. Till restoration, emergency electrical back up should be taken in line especially for emergency exits and escape routes;
- After earthquake affected area(s) will be cordoned off and detailed survey undertaken for damage assessment and searching of missing persons, if any.

Wind Cyclone/Dust Storm

Kota does not have a history of wind cyclones and dust storms of high magnitude. However, a cyclone developing from coastal Gujarat and Maharashtra has chances of inflicting towards Kota when atmospheric changes in terms of pressure difference force it to. Further tsunami experience in India reinforces the necessity for alertness.

Guidelines to deal with such situations are as under:

- Based on the weather predictions/ warnings which normally will be available through media/ city administration, the facility will be put on high alert and all key personnel will remain present in the complex to arrange necessary preventive measures in their respective work areas so as to minimize the damage;
- ECC shall be operational and manned by Security staff till arrival of designated management representative(s);
- Administration Dep't under HOD is responsible for monitoring and making available update on the scenario through District Administration;
- HOD (Security) shall remain in constant touch with Civil Defense Control Room, Police and Army;
- Integrated teams of Mechanical Engineering, Civil Engineering and Electrical Engineering Departments shall remain in ready position to respond to impending situations along with necessary equipment and tools;
- Representatives of Env. & Safety Dep't. During high alert period shall carry out a walk through inspection of all the areas and ensure that all hot jobs, jobs at height are stopped and in general personnel are in safe mode.
- Security will get all loading/unloading areas in the plants vacated and vehicles marshaled outside material gate for the duration of high alert;
- When the site is in the grip of cyclone/ wind storm all plants should be operated in safe mode;
- During the above situation people movement should be suspended. Security surveillance teams will be deployed at pre-selected safe locations with secured radio communication facility;
- After the event necessary survey of the site shall be undertaken by HOD with priority towards searching of casualties, evacuation of the same and general restoration of normalcy;
- Whole Time Director will be kept abreast with the information of plants/ departments by the concerned HODs;
- To cater for communication failure (P & T Landlines, mobile and PABX) radio sets will be used of Security surveillance personnel deployed at Power Plant entrance, Ammonia/ Urea Control room, PVC control room and CAG–Cell house entrance. Radio sets available with ISD, Power plant and movement control can be borrowed during high alert phase for internal plant emergency communication.

Flash Floods & Heavy Rains

Continuous rains for a period of 48 to 72 hours may cause abrupt rising of levels an over power the drainage system for accumulated rain water from catchments areas south of Kota. Right Main Canal (RMC) which is running parallel to our complex only has some threat potential, though unlikely. Main facility essentially of plants due to its geographical location (Slope of 1.3 M from South to North) provides a natural cover against accumulation of rain water and any effect of rise in the level in RMC. Continuous rains will result in the rise of water level in rain water harvesting reservoir.
This will, however be regulated through controlled discharge of excess water. In our case, timely preventive measures and surveillance assumed importance on-site and effects of heavy rains in Kota city will affect the movement of employees.

Some of the guidelines for flash floods/ heavy rains are as under:

- Timely positioning of surveillance staff especially at rain water harvesting reservoir will be ensured by Security Department and checks maintained by Power Plant;
- During this period HOD (Admn.) will arrange continuous flow of information with regards to water levels of Gandhi Sagar and Jawahar Sagar dams which are feeder link to Chambal River and through that RMC;
- Security Department will organize mobile patrolling in city and areas around the complex to know movement conditions/ choke points to divert our internal traffic and for employee movement;
- In case of continuous heavy rains plants and other concerned departments under guidance of HOD will initiate preventive measures related to process, electrical systems and other physical conditions to safeguard against obvious hazards as mentioned earlier;
- In case of disruption of people movement, Administration Department will arrange for heavy vehicles to be deployed at pre-selected junction points to ferry employees on site.

Bomb and Improvised Explosive Device (IED) threat

It is appreciated that the threat is more from an IED (Improvised Explosive Device) in different capsules, rather than a bomb. Essentially an IED has explosive in crude form ranging from chemicals like Gelatin, Ammonium Nitrate to High end gas cylinders with blast capabilities. Such explosive is charged through a detonator which may be manual or sophisticated controlled by items like mobile telephone. The combination is either connected through wires or wireless mechanisms.

For such threats prime area of importance is timely detection and neutralization to avoid their effects. However, if goes undetected, their potential of damage will vary according to the composition of IED. Some of the vulnerable facilities at our site resulting in considerable loss both in terms of lives and property as well provide sensational newsbyte are as under:

- Bulk Naphtha storage tanks;
- Horton spheres storing Ammonia;
- Chlorine storage tanks;
- VC storage tanks and VC reactors;
- Canteens during peak concentration;
- Kala Mandir during public functions.

Detection of IED/ bomb

Most likely planting of an Improvised Explosive Device (IED) is a preferred option in soft targets like industries than a conventional bomb. Timely detection can avert a major incident and thus assumes importance. An IED duly assembled is generally placed near vulnerable areas and mostly where detection is not easy.

Response guidelines in case of such situations are as under:

- Presence of any unidentified and unattended material/ object should be immediately reported to Security;

- The area where such suspicion has occurred should be immediately evacuated and all personnel directed to safe places by announcement under shift in-charge;
- Likely impact area should be cleared off any vehicles and combustible material by section in-charges and subsequently by Security;
- Security on arrival will cordon off the area and isolate likely impact area;
- Safe shut down procedures should be exercised in case the suspicious object/ material is placed in vicinity of critical zone storing highly toxic/ flammable/ explosive materials like VC tanks, VC reactors, Horton sphere, Urea reactors, Bulk Naphtha tanks, Chlorine storage tanks and tonners, carbide furnace etc;
- Security teams will carry out preliminary scanning of the area and in case of doubt, in consultation with the Incident and Site Controllers, necessary steps will be taken to arrange assistance of police and district administration;
- Also throughout the complex a visual search will be conducted to look out for such type of material/ object especially in critical areas to pre-empt multiple threat;
- Security is responsible for reception, guidance and briefing to external assistance teams like dog squad, explosive detection teams, fire brigade and other specialists at the site;
- ECC will be activated and all controls on movement will be exercised at various entry/ exit points by Security;
- Area will be cleared only when clearance is given by the experts after disarming action for IED are completed

Response action for IED/ Bomb Blast

Worst case scenario can be simultaneous blasts/ explosions at more than one facility/ critical area. Depending on type of IED/ crude bomb, the magnitude of blast will lead to smoke, flying of craters, puncture critical equipment, destabilize structures and cause collateral damage on human beings as well as property. Electrical and instrumentation cables, as well communication lines may get affected causing electrical failure, disruption of communication, abrupt effect on running plant and machinery besides casualties. Such a situation demands high level of cool headed approach and expertise leadership to handle it. Response in case of such situation will consist of the following:

- Security should be informed as soon as possible by available means including sending message by runners;
- In case Security on its own comes to know of such adverse situation immediately available personnel, fire tender with crew, ambulance and shift S.O. led team along with necessary equipment will reach to the site;
- Simultaneous action on process safeguarding and evacuation of casualties will be the first priority;
- In case of multiple blasts available Security's own resources will be distributed till arrival of reinforcements;
- If the situation demands immediately Police Control room and Udyog Nagar Police station will be informed for necessary assistance by Security;
- The first brief of situation to be provided to external agencies (including media) would include timing, site of occurrence, details of fatalities, if any, and action in line;
- All control measures as applicable in any other emergency shall be put in to place, in addition to specific control measures for toxic release and spillage of acids etc;
- Restoration of the situation shall be undertaken after preliminary actions of sanitization of the area, evacuation of casualties and safe operational mode of the processes.

Sabotage

Sabotage instances can occur due to internal dissent as well as by external means. Whereas internal instances can be tracked by proper intelligence systems, externally supported sabotage due to any reason can be more severe in nature. Other than sabotage incidence directly affecting health of the employees (by means of poisoning of water sources etc.) the other affected aspects would be almost the same as identified earlier. For the health related sabotage preventive systems in place would be adequate where as to deal with process and other sabotages including fire and explosion, responses will be as applicable to that particular situation.

Response to unforeseen situations

Unrest/ demonstration/ incident during public functions

As all such public functions including Ramlila and Janmashtami are organized after prior information to police and with heavy police force deployment, any incidence will be dealt by under the direction of senior most administrative functionary including police. However following own resources shall be made available:

- Fire tender and fire crews including portable equipment;
- Ambulance, attendance of doctor/ paramedical staff and proper first-aid facilities;
- Transport and any other arrangements, as needed for assistance.

Unpredictable Incidences

Any unpredictable incident will be dealt with (responses listed already) which may have relevance to plant, process, people movement and our environment. Such incidents may lead to multiple effects like simultaneous emission of toxic gases and fire at other locations etc. Incidence like an avian influenza pandemic would primarily require counselling to own workmen to guard against as it would affect the entire city.

7.4.7 Emergency Management

Detection and Communication Systems

Detection Systems

Gas Detection System

Table 7-16: Gas sensors are provided at strategic locations, to give alarm at designated control rooms

Sensor Type	Location	Alarm In
Chlorine Gas Sensor	Cell House, HCl, Liquid Cl_2 , Brine & SBP Sections in CAG Plant	Respective Control Room
	Near Cooling Towers of 10 MW Power Plant P10	Respective Control Room
	Near Cooling Towers of 40 MW Power Plant P40	Respective Control Room
	Near Clarifier in DM Plant	Respective Control Room
	Near Cooling Towers in Ammonia Plant	Respective Control Room
	Boundary wall towards road to Shriram Rayons	
	Near Main Entrance Gate	
	Behind Employee's Shop	
Ammonia Gas Sensor	Ammonia / Urea Plants, Ammonia Storage	Respective Control Room
	Rayons Wall Side	Respective Control Room
	Monomer section in PVC Plant	Respective Control Room
	Behind Employee's Shop	ECC
	Near Material gate	
	Cement Corner	
	Fertilizer ACO	

These gas alarms are tested on monthly basis for their smooth functioning.

Fire Detection Systems

Manual call points are located at critical locations to give early warning for fire. In addition fire detection sensors are installed at plants, Server rooms & Administrative areas. At critical locations e.g. Server room (location – Cement Plant) these detectors are connected to automatic fire control systems.

Manual Detection

Plant personnel and Security surveillance guards will provide early warning through telephones and/or mobile equipment of detection of fire, Chlorine gas leaks.

Communication System

Alarm/siren Systems

Siren to declare emergency at the complex level is installed at Security block The same is also connected through P & T line with District Emergency Center (Civil Defence) having actuation facility with them. All plants have independent electric siren systems within their respective areas. For Administrative areas/ store sirens are installed at Admn. Block, Accounts & Purchase and Main store. At plants, in addition to electrical sirens, manual hooters are also available. Where excessive ambient noise level exists non-audible visual methods are prevalent. The plant alarm systems are tested on weekly basis between 11.00 AM and 11.15 AM.

Line Communication

Details of important telephone numbers are as under:

- Main ECC;
- Alternate ECC;
- Fire – 200;
- Shift Security Desk;
- Twenty-four (24) P & T telephone lines are available at SFC telephone exchange. Between 8.30 AM and 5.50 PM all internal telephones can be connected with these lines. However beyond this duration, 13 (thirteen) of these lines are;
  connected to thirteen different internal telephones at strategic locations;
- Incoming calls can be directed to all internal lines through a computerized system by punching the internal extension number.

Radio Communication

- Walkie-talkie radio sets with base stations are also available as means of emergency communication system. These are available with Security, ISD and plants;
- Security Department has mobile base station fitted in light motor vehicle (Gypsy) which can communicate with other base stations at Security Control room, other LMVs and walkie-talkies. This Gypsy vehicle can be used as mobile control room, if required.

Mobile Communication

All key personnel have been equipped with cell phones so that information can be passed on quickly.

Communication through Messengers

In case all the systems listed above fail, messengers will be used as means of communication.

Emergency Control Centre (ECC) & Alternate ECC

Main Emergency Control Center will function from Security Office ECC room. Alternate ECC will operate from Ammonia/ Urea Control Room. In addition, a vehicle based mobile ECC with radio equipment, can be made operational if the need arises. Main ECC is 18' x 14' in size and has communication provisions both – radio and line as well as arrangements for necessary emergency equipment. At alternate ECC of 20' x 15' size, similar arrangements are catered for. The responsibility of provisioning, maintenance, information updates at main ECC is of HOD (Security) and similarly of Alternate ECC the responsibility lies with HOD (Ammonia)/ Addl. VP (Fert.).

Locations of designated ECCs are marked in Enclosure-I. During emergency, operations will be directed and controlled from these ECCs.

As main ECC is located at Main Entrance of the complex, guidance and reception shall be the responsibility of Security staff. For movement to Alternate ECC at main gate, necessary direction of the route shall be provided depending upon the wind direction, emergency location and availability of approach routes. Main identified routes to Alternate ECC are:

Red Route

Main gate (ECC) → Fusion House (CAG) → Fenesta Turning → Link road astride SR boundary wall → Power Plant Turning → Entrance at 100 Section of Ammonia Plant leading to Alternate ECC (Vehicles to be parked at Power plant parking).

Green Route

Material Gate → Store crossing→ Urea Plant Entrance → Alternate ECC (Vehicles to be parked at F & P Commercial Block parking).

Amber Route

DCM circle → Shriram Rayons → Over bridge entrance of the estate → track astride rain water reservoir leading to gate at Naphtha Tank road→ Power Plant Turning →Entrance at 100 Section of Ammonia Plant leading to Alternate ECC (Vehicles to be parked at Power plant parking).

Equipment and Documents at ECC

At ECC, following documents and equipment will be kept at all times.

- Safety Policy;
- Site plan of Works showing Assembly points, OHC and Location of hazardous materials;
- Copy of Emergency Response Plan;
- Fire hydrant layout of different plants;
- Nominal roll of employees;
- List of key persons and their addresses with telephone numbers;
- List of Vulnerable areas;
- Spare Gas masks and Breathing apparatuses for Chlorine;
- Public Address system and loud speakers;
- Portable Emergency Lights;
- Note pads, pencils, felt pens etc. to record message received and any instructions to be sent though runners;
- A tape recorder for recording details of incident and action being taken and progress.

In addition to above facilities at ECC, spare gas masks have also been placed at AECC (Ammonia/Urea Control Room).

Emergency Management Group

Emergency Management Group along with outline responsibilities of key personnel is shown in ***Figure 7-10***.

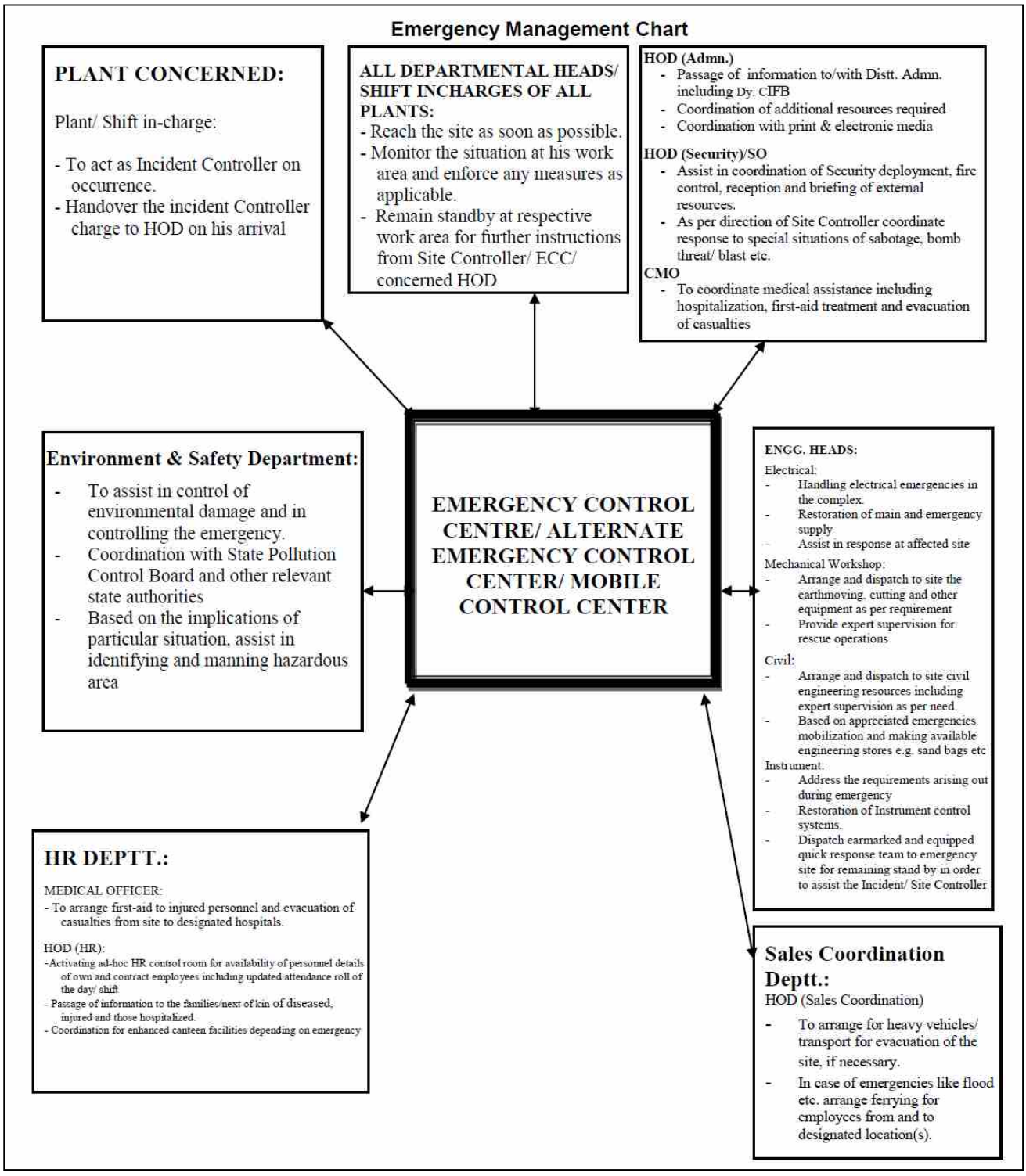


Figure 7-10: Emergency Management Chart

Declaration of Emergency and Communication Flow

Detection of emergency

The emergency can be detected and/or communicated as under:

- Toxic gas leakages detected by sensors in the plants and the audio-visual alarm is received in the control room;

- Anybody who observes any toxic leak/fire communicates the same from nearest telephone/ paging instrument to control room;
- He should also start shouting suitably in local language informing type of emergency, e.g.-"fire, fire" or "gas leak, gas leak" etc. so that the nearest control room gets informed.

Declaration of the emergency

After detecting the emergency the shift in-charge will assess the situation and in consultation with his HOD (if HOD is present at site) he will declare the emergency by sounding the emergency siren of his plant and simultaneously inform security telephonically, if required. The HOD will act as Incident Controller (IC), but in his absence the shift in-charge will discharge the responsibility of the IC. It may be noted that depending upon the situation the activities of informing the HOD, declaring the emergency and taking mitigating measures, the shift in-charge will follow the practical approach.

To declare the emergency the push button will be pressed for 10 seconds for three times giving a 10 seconds gap in between each hoot. To be clearer, it will be 10 seconds on and 10 seconds off, again 10 seconds on and 10 seconds off and finally 10 seconds on. For convenience the person can have an idea of ten seconds by counting from 1 to 10 in normal speed. Emergency will be called off by giving a 15 second hoot.

Communication flow

The IC (Incident controller) will arrange to inform Shift Security Officer (SO) / HOD Security telephonically about the nature of emergency to seek help giving details of type of emergency (fire, explosion, toxic release etc.), affected area, details of injured, if any and any other relevant details considered necessary for arranging assistance. The IC will also inform his HOD, Business Head as well as concerned Engineering Department Heads (Elec / Mech / Civil / Instrument). The SO / HOD Security will further communicate telephonically to the Site Controller (SC) i.e. Whole Time Director or his alternate (in case the former is not available), Occupier and concerned key personnel (Safety / OHC / HR / Admin / Sales Coord).

Attending the affected employees

- The employees affected by the emergency will be rendered first aid at the concerned plant site by first aiders or at OHC by paramedical/medical staff;
- To provide proper treatment to serious cases Factory Medical Officer/ Chief Medical Officer (Polyclinic), HOD (Administration) will liaison with appropriate hospital / nursing home under the guidance of Site Controller;
- Ambulance/ vehicles will be arranged by Security to ferry affected persons to appropriate hospital/nursing home. For the purpose other vehicles will be arranged within the complex as per need by Security/ administration;
- As directed by the concerned Incident Controller / Site controller, appropriate person(s) / welfare officer will accompany the affected person(s) to the hospital / nursing home;
- Welfare officer/other designated person will arrange informing the family member(s) of the injured person(s);
- It will be ensured by the concerned Plant HOD /Admn. Deptt. that requirements at the hospital/nursing home are taken care off.

Assembly Points

Keeping in view the likely emergencies, wind direction, dispositions and availability of safe evacuation routes fourteen (14) Assembly Points have been identified in the entire complex. Depending upon the type of emergency, its effects/ areas/ personnel required to be evacuated shall be directed to respective Assembly Point. Based on the emergencies identified, the routes leading to these Assembly Points are marked and emergency / escape lighting provided.

The responsibility of maintenance and upkeep of Assembly Points, signage and emergency lighting is that of the respective HOD. All Assembly Points are checked /maintained by Environment & Safety Department.

Table 7-17: The details of Assembly Points are as under

Assembly Point No.	Location
1	In front of Admn. Block
2	Parking for Purchase ISD
3	Vinyl canteen corner
4	Security post behind Employee's shop
5	Storage shed for Chlorine tonners
6	Near PVC parking
7	Near entrance of new cell house (CAG)
8	Garden opposite Cement ACO
9	Near parking outside of Stores
10	Near fire hydrant opposite to F&P Technology block
11	Turn in front of Mech. W/shop's back door (behind P-40 C/ tower)
12	At the entrance of Power Plant
13	On the road to Naphtha siding across clarifier (Cl_2 tonner shed)
14	Old parking behind Fenesta Building Systems

Actions at Assembly Points

- Respective Incident Controller / Shift In-Charge in affected operating area will organize proper roll call and accounting of own employees, contract workmen and visitors;
- Any individual requiring first-aid/ medical assistance shall be immediately attended to by Emergency Wardens designated by respective Incident Controller;
- If the situation demands evacuation of personnel to some other site(s) necessary transport will be made available at these points.

7.4.8 Responsibilities of Key Personal

Site Controller (SC)

Whole Time Director / Business Head will take overall charge as Site Controller for any emergency. In his absence next senior most incumbent will act as Site Controller. Responsibilities of Site Controller are:

- Direct emergency response operations after due assessment of the situation and necessary control measures required;
- Continuously monitor the situation in consultation with Incident Controller and other key personnel to coordinate availability of response resources;
- Assess impact of an emergency in a particular plant on other operations and accordingly coordinate control measures as per need;
- Based on the magnitude and impact of the emergency order evacuation of personnel from area(s) to safer locations;
- Direct and monitor intra-plant coordination to mitigate the emergency situation;
- Coordinate mobilization of external resource like fire tenders, cranes, earthmoving equipment, assistance of police etc;
- Communicate to state authorities of impact of emergency, if any, beyond own site that will have effect on local habitat;
- Advise Off-Site Emergency Controller on possible effects of toxic releases on areas outside the factory premises for execution of off-site emergency response;
- Management of electronic and print media;

- Coordinate necessary clean-up operations to remove hazardous substances, health hazards and contaminated materials.

Incident Controller (IC)

HOD of the affected plant is designated as Incident Controller. In his absence next senior most operations incumbent will act as Incident Controller. Till the arrival of HOD, shift in-charge will assume the responsibility of Incident Controller.

The functions and responsibilities of IC are as under:

- Act as Incident Commander and direct all operations viz. engineering, administrative and fire control measures within the affected area to ensure safety of personnel, minimization of damage to environment, the plant and property;
- Communicate information to all concerned including Env & Safety Dept. and coordinate mobilization of additional resources i.e. fire tender etc., as per need;
- Coordinate briefing and deployment of outside plant resources to include Security, fire crew, paramedical staff and others;
- As per standard operating procedure of the plant to tackle particular type of emergency, execute and coordinate necessary response by utilizing specialist, trained responders and skilled support personnel. Search of areas for any casualties and arrange medical help;
- Evacuation of personnel from the affected area to safe locations/ appropriate assembly points as per prevailing wind direction;
- Report all significant developments to Site Controller;
- Preservation of evidence as far as possible without affecting the emergency mitigating procedures to facilitate any subsequent inquiries into the causes and circumstance which lead to the emergency;
- Systematic execution of de-contamination procedures.

Shift In-charge

The shift in charge of concerned plant will have following functions during emergency:

- Assess the scale of a situation and if it warrants declare emergency by sounding alarm/ siren and accordingly employ necessary engineering control measures as soon as possible;
- Inform his HOD, Business Head & concerned Engineering Head telephonically of the situation and control measures being taken;
- Inform Shift Security Officer relevant details of the incident and support required;
- Mobilize skilled personnel and specialists to support mitigation;
- Monitor and progress various control measures keeping in mind the following priority:
  - Safety of personnel;
  - Evacuation to assembly points, as per prevailing wind direction;
  - Minimize damage to plant, property and the environment;
  - Minimize loss of materials;
- Act as Incident Commander till the arrival of HOD and subsequently hand over charge of operations to him.

Shift Security Officer (SSO)/ HOD (Security)

On getting information from the concerned plant regarding emergency situation, SSO will discharge following responsibilities, till the arrival of HOD (Security):-

- Dispatch quick reaction team of Security, Fire Tender with crew and Ambulance to the incident site;
- Arrange sounding of siren / alarm at Security if the zone of emergency is likely to extend beyond DSL complex;

- Pass on the information telephonically about the emergency to the Site Controller and other designated key personnel (Safety / OHC / HR / Admin / Sales Coord). The information to be passed on should contain the following:
  - Brief regarding incident (Fire, explosion, toxic release etc.);
  - Details of injury, if any;
- Cordon off the site with the help of quick reaction team;
- Organize mobilization of additional manpower, reporting to the police authority, access control and traffic management across the complex and necessary deployment outside the complex;
- Assist Incident Controller in evacuation of personnel from plant and those of casualties;
- Organize reception, briefing and guidance to the external agencies like Fire Brigade and Police coming for assistance;
- Advise Site Controller in handling typical situations like Bomb Blast, Fire &Explosion, earthquake and other challenging disasters;
- Activation of Main ECC;
- Maintain incident log.

Factory Medical Officer/ Occupational Health Center (OHC)

Responsibilities of Medical Officer are as under:

- Organize reception of casualties at OHC and provide necessary treatment;
- Attend to severe casualties at site and arrange immediate evacuation to the identified hospital/ nursing home;
- Coordinate further treatment of the casualties sent at the concerned hospitals;
- Arrange for blood according to the requirement.

HOD (Administration)

Responsibilities of HOD (Administration) are as under:

- Function as liaison officer with state authorities, media and Factory Inspectorate;
- To ensure that casualties receive adequate attention, arrange additional help if required;
- To arrange additional fire tenders ambulance and other transport in case of requirement;
- Be part of emergency management group at ECC and render necessary advice to Site Controller;
- Coordinate roll call information of the personnel at incident site and various assembly points to update Site Controller;
- Coordinate issue of press release duly approved by Site Controller;

Engineering Dep't. Head

- HOD (Electrical):
  - Dispatch earmarked and equipped quick response team to emergency site for remaining stand by in order to assist the Incident/ Site Controller;
  - As per need, arrange safe power supply cut off in the affected area
  - Arrange restoration of emergency power supply, if needed by laying fresh cables;
  - Arrange for temporary lighting in the affected area(s), as per requirement;
  - Handling emergencies involving electrical installation.
- HOD (Mechanical):
  - Dispatch earmarked and equipped quick response team to emergency site for remaining stand by in order to assist the Incident/ Site Controller;
  - Availability of earthmoving equipment, cranes, bulldozers, as per need;
  - Organize mechanical engineering efforts in rescue operations. This includes structural clearances and recovery operations.
- HOD (Civil):

- Dispatch earmarked and equipped quick response team to emergency site for remaining stand by in order to assist the Incident/ Site Controller;
- Make available civil engineering resources including earth moving equipment and labor to clear off the debris from the site;
- As per need provide civil engineering stores/ implements along with skilled manpower.

- HOD (Instrument):
  - Address the requirements arising out of the emergency in tandem with Electrical engineering department;
  - Restoration of Instrument control systems in case of typical emergency like fire, explosion and blast in control room;
  - Dispatch earmarked and equipped quick response team to emergency site for remaining stand by in order to assist the Incident/ Site Controller.

HOD (Environment & Safety)

Responsibilities of HOD (Environment & Safety) are as under:

- Depute Safety Officers to the site(s) to ensure that emergency response operations are conducted in safe manner;
- Arrange measurement of concentration level and possible effects of the released toxic gas in & around the premises and keep the Incident and Site Controller informed about the same;
- Record, maintain and provide necessary details about the incident and its effects to State Pollution Control Authorities / representative reached on site;
- Assist in removal of hazardous substances, health hazards and contaminated materials.

HOD (HR)

Under Head of the department, a control cell drawing in-charges of Contractor cell, IR and ACO will be established to coordinate and monitor the following:

- Attendance of own and contract employees at the time of emergency;
- Coordination with concerned contractor to extend assistance in case of casualties/ fatalities of his workman;
- Extend support to the families of the injured/ diseased as per need;
- Make available enhanced canteen facilities keeping in view the type of emergency.

HOD (Sales Coordination Dep't.)

Responsibilities are as under:

- In case of mass evacuation from the site/ off site arrange transport;
- In case of emergencies like flood etc., arrange transport for ferrying employees from and to designated location.

Other Departments

The plants/ departments which are not falling directly under the influence of emergency are required to be vigilant and monitoring situation. If emergency elsewhere has any impact on their operations, necessary control measures shall be exercised. Primarily proactive posture is required.

Some of the specific responsibilities are as under:

- Be prepared to assist the affected plant in mitigating the emergency situation;
- Maintain operations and over all control within own facility;
- In case of toxic release, ensure safety, proper dispersal and if required arrange to provide first-aid to affected;
- In case of fire at other facility, monitor progress of fire control operations there and if there are even remote chance of fire spreading towards own facility take proactive preventive measures;

- Bomb/ IED blast will give rise to rumors and tendency of rushing near the place of incidence. Personnel should be counseled to remain calm and attend to their own business;
- At DCM Shriram Ltd., Kota complex, operations are power intensive. Emergency at one plant may disturb power availability to other plants and hence will be required to be handled appropriately to avert any process disruptions giving rise to another emergency;
- Natural emergency like earthquake will have simultaneous effect on many facilities, therefore under such a situation an integrated response approach has to be thought of, planned and executed.

7.4.9 Emergency Services and Equipment

Fire Control Operations

The plants have fixed and portable fire control systems. In addition services of central fire cell are available. Fire first aid will commence immediately at the plant / site by the fire responders of the concerned plant.

At all times under security department two fire tenders and fire crew is available. On receipt of information of fire Shift Security Officer shall immediately dispatch fire tender with crew to the site to augment fire control operations.

Medical Services

Occupational Health Center (OHC)

OHC at the Works operates round the clock and services of a qualified Doctor are available. Medical attendants are available in rotating shifts. OHC is equipped with adequate stocks of emergency medicines, other required medical equipment. Details of emergency medical facilities available within the complex are given below. Ambulance services are provided by dedicated ambulance in the complex.

Emergency Medical Facilities Available At DCM Shriram Ltd., Complex

Occupational Health Centre inside the factory premises is facilitated with:

- One qualified Medical Officer in General Shift;
- At least one qualified Compounder in each Shift;
- Equipment and medicines to handle and deal with the emergencies;
- Materials available for First-aid treatment
    - Stretcher - 5 Nos.
    - Oxygen Cylinders with flow meter, pressure gauge and mask for administering O2 - 12 Nos.
    - Blood Pressure measuring equipment - 4 Nos.
    - Stethoscope - 3 No.
    - Nebulizer - 1 No.
    - Anti-Tetanus injections - 100 ampules
    - Bandages - Sufficient quantity.
    - Cotton rolls
    - Adhesive Plaster
    - Tablets for soothing of throat (Halls) - 2000 Nos.
    - Nasal drops
    - Eye drops like Locula and Pyrimone
    - Antiseptic lotions like 'Dettol'
    - Antibiotic ointment
    - Anti anaphyllatic and lifesaving Inj. like Inj. Avil and Inj. Decadron, Inj. Adrenalin
    - Bronchodilators tablets and injections
    - Analgesic tablets and injections
    - I.V. glucose

- I.V. drip set
- I.V. drip stand
- Disposable syringe with needles
- Surgical spirit
- Liquid Paraffin
- Glucose powder
- Emergency Shower

First-Aid Facilities

Thirty per cent of own employees are qualified first-aiders at each plant/ department level. It is ensured that the qualified first-aiders in sufficient strength are available during shifts.

At designated locations fifty nine (59) First-Aid boxes are placed. Sufficient necessary first-aid medicines and material as per laid down instructions is maintained in these boxes at all times.

Casualty Evacuation and treatment

In case of emergency, casualties will be evacuated as fast as possible. In addition to available ambulance in case of need evacuation will also be done by company cars/ transport pool (Five cars/ LMV) available at all times to designated hospitals. Details of specialist facilities their contact details, number of beds and availability of ambulance of identified medical centres are given in ***Table 7-18***.

Table 7-18: Identified Hospitals and Contact Details

Sr. No.	Hospital	Tel. No.	Ref. Doctor	Beds for Emergency	Ambulance Availability	Remarks
1	MBS Hospital (8 Kms)	2450123, 2326000	Duty Doctor/ CMO	5	Yes	General/Government Hospital
2	Govt. Medical College	2470477, 2471150	Duty Doctor/Principal	5	Yes	General/Government Hospital
3	Bharat Vikas Parishad Hospital (7 Kms)	2504501, 2504503	Duty Doctor	3	Yes	General with Cardiology department
4	Sudha Hospital (6.5 Kms)	3010004, 9928027601, 2436028	Dr. RK Agrawal	2	Yes	General/Private
5	Maitri Hospital (6.5 Kms)	2427359	Dr. Mamraj Agrawal	2	Yes	General/Private
6	ESI Hospital (6 Kms)	2427946, 2501100	Duty Doctor	5	Yes	General/Government Hospital
7	Alok Hospital (6 Kms)	2423838, 2431920	Dr. Alok Garg (94141- 88838)	5	No	Burns & plastic surgery
8	SN Pareek Hospital (7.5 Kms)	2402770, 3202932	Dr. K.K. Pareek	2	Yes	General/Private
9	Jaiswal Hospital (6.5 Kms)	2433232, 2423232	Dr. Sanjay Jaiswal - 9414183889	2	Yes	Neuro Centre/ Private
10	Aakanksha Hospital (6 Kms)	2421369, 2432656	Dr. Mohan Mantri	2	No	Orthopedic Centre/ Private
11	Kota Trauma Hospital (7.5 Kms)	2500540,	Dr. M. Iqbal (98290- 37940)	2	No	Orthopedic Centre/ Private

Sr. No.	Hospital	Tel. No.	Ref. Doctor	Beds for Emergency	Ambulance Availability	Remarks
12	Kota Heart Institute (6.5Kms)	9829037860, 9829038175, 9352605286	Emergency Dr. Rakesh Jindal, Dr. Saket Goyal	30	Yes	Cardiology Department
13	Suvi Eye Hospital	2433575, 9351412449	Dr. Suresh Pandey	-	Yes	Eye Hospital
14	Kota Blood Bank (7.5 Kms)	2402010, 2402020, 3293837	-	-	No	-

These medical centres have been identified keeping in view type of casualties likely to occur and specific medical treatment to be provided i.e. burn cases, victims of toxic release and other appreciated symptomatic aspects. CMO is responsible to maintain liaison and coordination with these centres.

Guidelines and training for first-aid treatment for toxic gases

It is appreciated that during any emergency own employees, contract workmen and visitors are most vulnerable to toxic release of Chlorine. Therefore all personnel should be provided adequate training and should be well versed with characteristics, effects of these gases and medical management for the same. Guidelines for first-aid and medical management from these gases are given at below:

- First-aid and medical management for chlorine
  - Skin Contact
    - Remove the victim from the affected area immediately;
    - Take him to the nearest shower as early as possible;
    - Remove contaminated clothes;
    - Wash skin with large amounts of normal running water;
    - Dust the affected area with powdered sodium bicarbonate; wash the affected area again with normal running water;
    - Dry the skin very gently using a clean and soft towel;
    - Do not apply oil or only ointment without doctor's advice;
    - In case of burns, apply a dry sterile dressing;
    - Keep the victim warm using a blanket;
    - Immediately take him to the nearest hospital.
  - Eye Contact
    - Immediately remove the victim from the affected area;
    - Take him to the nearest eye wash or shower;
    - Flush eyes immediately with normal water for at least 15 minutes or longer, keeping his eyelids open;
    - If the pain remains, repeat washing the eye for 15 minutes or longer;
    - Do not try to neutralize with chemicals;
    - Do not use any oil or oily ointment without doctor's advice.
  - Inhalation

    If the victim is conscious and inhalation is mild:
    - Remove the victim from the affected area and take him to well-ventilated area;
    - Loosen the clothes and remove shoes;
    - Keep him warm using a blanket;
    - Place the patient on him back with head and back elevated;
    - Rest is a must;
    - If the victim coughs a great deal, make him inhale a gauze pad soaked with a little ethyl alcohol or a few drops of ether. Cough syrups like LINCTUS CODEINE etc. and common throat lozenges such as VOX, VICKS, and HALLS etc. can be given for smoothening the throat irritation;

- Milk, Butter Milk, Lime Juice, Fresh Water may be given.

If the victim is unconscious but breathing has not ceased:

- Place the patient in a comfortable position with head and trunk elevated to 45o position;
- Remove artificial dentures;
- Keeps the patient warm using a blanket;
- Administer medical oxygen under low pressure;
- Do not give him anything to drink.

If breathing has ceased:

- Immediately remove him from the affected area;
- Immediately: Loosen his clothes, Lay him down on his stomach, Begin artificial respiration;
- Immediately administer medical oxygen under low pressure;
- Call a physician immediately;
- As the victim begins to breathe unaided or to move, lay him down with his body raised and continue to administer medical oxygen;
- The physician will keep the victim under medical supervision for at least 48 hours as acute pulmonary edema or microbial infection may be caused.

Alternate source of Power Supply for operation of sensitive Equipment / Fire Pumps

It is possible to operate all sensitive equipment on dual power supply from two independent sources i.e., RSEB and own generation.

A diesel operated pump is available in addition to dual power source operated motor pumps for fire hydrant system in Fertilizer Plant & PVC Plant Portable fire pump and fire tender may also be used in case of emergency.

Safety equipment

Following emergency equipment are available at strategic locations for use in emergencies:

- Self-Contained Breathing Apparatus - 25 sets
- Airline breathing apparatus - 15 Nos.
- Canister and cartridge gas masks - Sufficient Nos.
- Safety shower - 28 Nos.
- Acid-alkali proof overalls - 08 Nos.
- Search torch - 01 Nos.
- High beam search light -04 Nos.
- Fencing tape - Sufficient
- Safety goggles - Sufficient Nos.
- Gum boots and hand gloves
- Fire proximity suit - 04 Nos.
- Safe guard Rescue Stretcher - 01 Nos.
- Rope Ladder 30 Meters - 01 Nos.
- Life Jackets - 04 Nos.
- Lifebuoy - 02 Nos.

Emergency Support from District Authority/ Industry (Mutual Aid)

Based on the impact of the emergency situation necessary support from district authorities will be organized. In addition necessary assistance from neighbouring and other industries will be sought for as per mutual aid scheme. The details of industries are as under:

- Shriram Rayons, Shriram Nagar, Kota

- Chambal Fertilizers & Chemicals Ltd., Gadepan, Dist.- Kota
- Kota Super Thermal Power Station
- Rajasthan Atomic Power Station, Rawatbhata.
- National Thermal Power Corporation, Anta
- Hindustan Petroleum LPG bottling plant, Mandana
- S. B. P. Chem Pvt. Ltd., Jhalawar Road , Kota

Post– Event Recovery Management

Immediately after an emergency following step to be taken to resume the operations:

- After calling off the emergency, incident controller will coordinate the Post event recovery actions in consultation with site controller. All engineering functions like Mechanical W/Shop, Electrical, and Instrument etc. will provide necessary supports to restart the plant operation/Process safely including restoration of auxiliaries like electricity, water and telephone etc.
- Conduct an employee's briefing.
- Assess remaining hazards and maintain security at the incident scene.
- Keep detailed records. Audio recording all decisions taken. Take photographs of or video-tape the damaged.
- Necessary communication to employee's families, all neighboring plants and residential areas of nearby vicinity for normalizing the activities of emergency handling.
- Removed smoke, water and debris. Restore sprinkler systems.
- Segregated damaged from undamaged property. Keep damaged goods on hand until insurance adjuster has visited the premises.
- Take an inventory of damaged goods.
- Administration department, Security, Sales Coordination and HR will provide necessary supports for post recovery activities.
- Maintain contact with customers and suppliers and key stake holder.

7.4.10 Conclusion

Contingency planning

The Emergency Response Plan is generic in nature and covers all types of identified emergencies. However there is a necessity of applying this plan in developing contingency plans for specific emergencies and their impact to the respective plant. Accordingly specific procedures and flow charts are required to be developed by plants and departments based on which drills and training should be imparted as stipulated. While developing such specific procedures a rapid yet thorough situation assessment is essential to ensure that appropriate and sufficient resources are brought to bear on the emergency.

Activation of Emergency Plan

The key aspects of activation of an emergency plan is timely detection and dissemination of information while simultaneously all engineering control measures, fire control measures and administrative control measures are put in place. The safety of employees (own and that of contractors) and visitors at site is of critical importance. A safe and rapid evacuation is necessary to ensure that casualties are avoided during an emergency. Evacuation routes and procedures at plant levels should be established and implemented through signage and sustained training.

Resource mobilization

After an initial assessment of the need for personnel and equipment have been made and key personnel alerted, resources required to tackle the emergency need to be mobilized in a coordinated manner. In this context it is important to designate persons or positions who will be responsible for the mobilizing personnel, equipment and

other technical resources available within the complex and from outside. Flexibility in approach of using the resources of each other will enhance our capabilities to tackle any emergency situation.

Plan Testing

Periodic testing of the plan formulated for specific emergencies at plant level besides training also provides an opportunity to validate plans made and also inputs for improvement.

Unpredictability

Emergencies are not a planned event and responses will be tailor made. It is of essence that preparedness levels should be so high that any unpredictable situation can be faced keeping in view the guidelines provided in this plan. Ultimately a cool headed approach along with timely resource mobilization will remain the key.

Remember

The guidelines are only indicative and based on these; detailed Standard Operating Procedures will be integrated. An innovative and practical approach along with these guidelines would ensure safety of our workers, the public and the environment. Till the time an emergency is called off, there should be no hurry to restart the plant/ operations if closed. The tendency of rushing to restart should be avoided.

7.4.11 Off-Site Out Lined Emergency Response Plan

Introduction

Emergencies especially related to toxic release of Chlorine gas can at times be uncontrolled and therefore the release would spread in the identified vulnerable areas outside the battery limits of DCM Shriram, Kota complex. Wind direction in particular, will dictate the area(s) likely to be affected and thus timely warning, organizing efforts and resources of local administration would play a critical role.

Site Controller who is in the command of internal situation, at appropriate time will advise/ communicate district administration the likelihood of an on-site emergency turning in to an off-site one. Accordingly, necessary resource mobilization and activation of Off-Site Emergency Plan of the District Crisis group under the command of District Collector/ designated authority will be executed.

It is therefore necessary to keep monitoring progress of mitigating measures at the site and provide all necessary inputs to the local Administration like possible effects of gases, engineering control measures being undertaken and other such soft information.

Objective

Main objective of the Off-Site Emergency Response Plan (ERP) is to acquaint all concerned with the broad mechanics of handling such emergencies so that effects to public, property and environment are minimized.

Potential Hazards

Hazards whose effect will be felt beyond DCM Shriram complex primarily are release of Chlorine Gas. However effect of any other emergency as listed in the 7.4.5 cannot be ruled out.

Broad mechanics – Off-site response (by District Authority)

The off-site emergency response would include the following:

- Warning to general public/ affected area by designated agency like Police etc;
- Mobilization of fire brigade and other available firefighting facilities in and around Kota;
- Cordon/ isolation of affected area;
- Safe evacuation of public from affected area(s) till the normalcy is restored;

- Providing medical assistance including evacuation of casualties;
- Mobilization of resources of state, private agencies and other industries required for the mitigation;
- To regulate/ divert traffic, as required;
- Restoration of disrupted civil services;
- To maintain law and order in the affected area(s).

Establishing ECC (District Authority)

The District Emergency Authority will activate District Emergency Control Centre located in Home Guards (Civil Defence) office at Collectorate.

Mobilization of Essential resources

District Emergency Centre (Central Control Room) will mobilize, on need basis, essential resources required to carry out mitigating tasks from all concerned departments, industries and other civilian agencies. Depending on the magnitude of
the emergency Army/ para military forces will be requisitioned.

Emergency Procedures

Emergency Response Plan formulated at District level will be executed by the state authorities.

Mutual-Aid Scheme

As per mutual aid plans and MOU necessary intra-industries assistance in terms of heavy engineering/earthmoving equipment, recovery equipment, fire fighting arrangements and any other facility will be available and organized. Coordination for the same shall be carried out by Site controller (DCM Shriram Ltd.) and District authorities.

Role of DCM Shriram Ltd in Off-site Emergency

An off-site emergency will result from an on-site emergency which has potential or threat to affect populace outside the boundary limits of DCM Shriram Ltd. However the control on toxic releases will be the prime responsibility of Site Controller. All necessary and possible measures will be taken. In addition necessary assistance, as required, will be provided to state authorities.

Conclusion

Success of combating any emergency lies in coordinated approach of District Authorities and concerned industry. The objective is to control the adverse situation as soon as possible with minimum loss of life and property. Therefore communication, periodic liaison, integrated drills carried and knowledge of each other's capacities will play a vital role. A situation can occur in any industry; hence we too should be prepared to come forward in the manner we expect from others.