CHAPTER – 6

RISK ASSESSMENT

ADDITIONAL STUDIES

In order to support the environment impact assessment and environment management plan, following additional studies have been included in this report.

- Risk Assessment
- Onsite and Offsite Disaster (natural and manmade) Preparedness and Emergency Management Plan
- Occupational Health Programme

6.1 SCOPE OF THIS STUDY:

The QRA study in this report has been conducted considering the Terms of References (TORs) given by Expert Appraisal Committee of MoEF for Environment Clearance (EC).

The study has been carried out with a view to comply the following TOR points:

Part A. Std. TOR No.: 3.9: Hazard identification and details of proposed safety systems.

Part A. Std. TOR No.: 7.13 Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.

Part A. Std. TOR No. 8: Occupational Health (i to iv)

Specific TOR No. 13: Risk assessment for storage and handling of hazardous chemicals /solvents. Action plan for handling & safety system to be incorporated.

Specific TOR No. 14: Arrangements for ensuring health and safety of workers engaged in handling of toxic materials.

6.2 METHODOLOGY OF RISK ASSESSMENT

M/s. Aarti Industries Ltd. (Organic Division) handles various chemicals, some of which are hazardous in nature by virtue of their intrinsic chemical properties or their operating temperatures or pressures or a combination of them. Fire, explosion, toxic release or combinations of them are the hazards associated with industrial plants using hazardous chemicals. More comprehensive, systematic and sophisticated methods of Safety Engineering, such as, Hazard Identification and Qualitative/Quantitative Risk Assessment have been developed to improve upon the integrity, reliability and safety of industrial plants, the same has been discussed in detail under their respective headings.

6.2.1 OBJECTIVES OF RISK ASSESSMENT

Risk analysis follows an extensive hazard analysis. It involves the identification and assessment of risks the neighboring populations are exposed to as a result of hazards present. This requires a thorough knowledge of failure probability, credible accident scenario, vulnerability of population etc. Much of this information is difficult to get or generate. Consequently, the risk analysis is often confined to maximum credible accident studies.

Risk assessment is carried out with the following objectives:

1. To identify hazard and risk resulting from the hazards
2. To study and foresee the effects of such risks on the workers, public, property and environment and to find out necessary control measures to prevent or minimize risk.
3. To comply the legal requirement by various safety and environment laws of the country like…
    - The Factories Act, 1948
    - The Gujarat Factories Act, 1963
    - The Environment Protection Act and Rules, 1986
    - Hazardous waste (Management & Handling) Rules, 1989
    - Public Liability Insurance Act & Rules,1991
    - Chemical Accident, (Emergency, planning, preparedness and response) Rules,1996
4. To get the necessary information for Emergency planning and evacuation.

6.2.2 DETAILS OF STORAGE FACILITIES

The storage facilities for **major hazardous chemicals** have been marked on the company layout given below:

FIGURE: 6.1

HAZARDOUS CHEMICAL LOCATION IN COMPANY LAYOUT

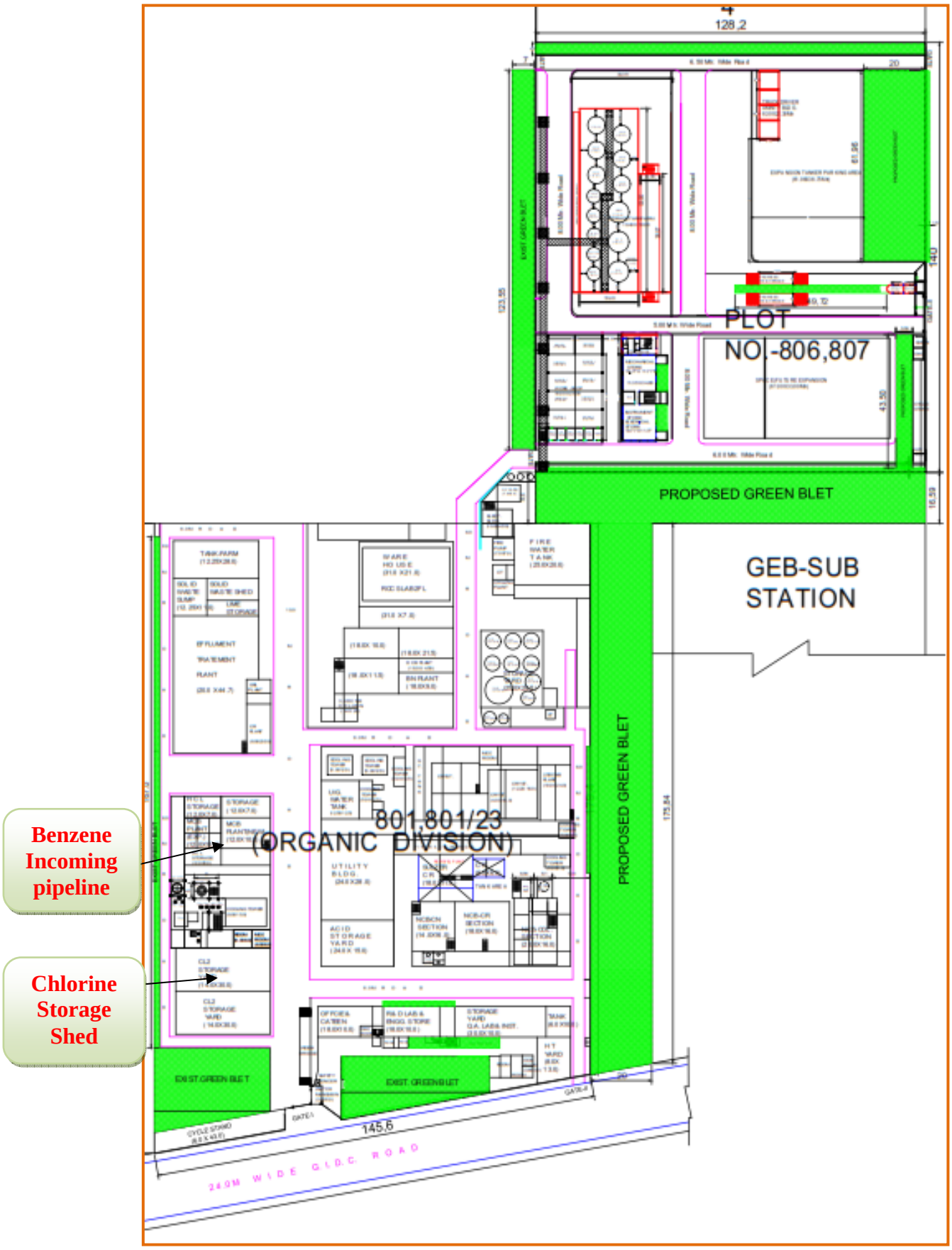


TABLE: 6.1

DETAILS OF HAZARDOUS RAW MATERIALS

Sr. No.	Name of Raw Material	Mode of storage & Material of Construction	Capacity of container	Storage Location	Hazards	Control Measures Provided
1	Benzene	Pipeline	-	Benzene Storage Yard	• Flammable	✓ Proper storage area is provided. ✓ Suitable PPEs are used. Eye wash station is provided.
2	Chlorine	Tonner	900kg	Chlorine Shed	✓ Toxic	✓ Self-contained breathing apparatus are used ✓ PPEs like Splash goggles, Full suit, Vapor respirator or self-contained breathing apparatus, Gloves etc., are used while handling this chemical.

NOTES:

- ✓ Size of the biggest storage tank is 15 KL and dyke of sufficient capacity i.e. 10% extra than tank capacity is provided.
- ✓ The unit is classified as MAH unit as the quantity of these chemicals being stored within the factory premises, are above the threshold storage quantity as per schedules of Manufacture, Storage & Import of Hazardous Chemicals (MSIHC) Rules of major hazardous chemicals.

TABLE 6.2

PROPERTIES OF HAZARDOUS RAW MATERIALS

Sr. No.	Chemical	Physical State	FP oC	BP °C	SP. GR @ 20°C	Vapour Density (Air=1)	Vap. Pr. mm Hg @ 25°C	LEL %	UEL %	LD50 ORAL (Rat)	LD50 DERMAL	LC50 (Rat)	IDLH Value by ACGIH/ NIOSH	STEL by OSHA	TLV-TWA by OSHA (PPM)
1	Benzene	Liq	-11.1	80.1	0.878	2.8	10	1.2	7.8	930	9400	10000	2000	2.5	10
2	Chlorine	Gas	N.A	-34	2.47	2.5	5168	NA	NA	NA	NA	293 ppm	10 ppm	1 ppm	0.5 ppm

6.3 RISK ASSESSMENT

Identification of hazards in the proposed project activity is of primary significance. Hazard states the characteristics of system/plant/process that presents potential for an accident. All the components of a system/plant/process needs to be thoroughly examined to assess their potential for initiating or propagating an unplanned event/sequence of events, which can be termed as an accident.

HAZARDS IDENTIFICATION AND DETAILS OF PROPOSED SAFETY SYSTEMS

At M/s. Aarti Industries Limited (Organic Division), Vapi major risks have been identified for the following areas:

- ✓ **Chlorine Storage Area**
- ✓ **MCB New Plant**

As a conservative approach, we have analyzed the risk qualitatively and quantitatively both, as mentioned below.

In this study, the Storage & Handling of MCB has been considered for Quantitative Risk Assessment (Consequence Analysis). Their storage location has been shown in Figure-6.1. Hazardous properties of these chemical have been summarized in Table 6.1B.

And, Storage & Handling of Toxic Chemicals, Flammable Chemicals, and Acids has been considered for Qualitative Risk Assessment.

6.3.1 QUALITATIVE RISK ASSESSMENT

Many a times Risk involved in various processes / process equipments cannot be addressed completely by Consequence Analysis. As a conservative approach, these risks have been considered separately under this topic. The approach is to identify hazards associated in operation of equipments as well as in processes, assessing its impacts, ranking the risk posed by it and finally to propose remedial actions/mitigation measures such that the risk is minimized to tolerable level.

The Risk Matrix presented below should be referred in evaluating this assessment.

In Qualitative Risk Assessment, risk has been analyzed using methodology called HIRA-Hazards Identification & Risk Assessment. In HIRA, major manual activities carried out by plant personnel as well as contract labors have been considered.

For the following areas, Qualitative Risk Assessment has been carried out to identify the risk, ranking them as per their severity & probability, identifying the existing mitigation measures and finally to propose recommendations, if existing measures are not enough.

- ✓ Storage & Handling of Solid Chemicals

- ✓ Storage & Handling of Mono Chloro Benzene
- ✓ Storage & Handling of Acid (Like Dilute H_2SO_4, HCl)

TABLE: 6.3

RISK MATRIX FOR QUALITATIVE RISK ASSESSMENT

LIKEHOOD/ PROBABILITY		**SEVERITY**				
		Catastrophic (Death/ System Loss)	Major/ Critical (Serious injury/ Illness)	Moderate (Less Serious Injury/ Illness)	Minor/ Marginal (Minor Injury/ Illness)	Insignificant/ Negligible (No injury/ illness)
		1	2	3	4	5
Almost Certain	E	**H**	**H**	**H**	**M**	**M**
Likely	D	**H**	**H**	**M**	**M**	**L**
Possible	C	**H**	**M**	**M**	**M**	**L**
Unlikely	B	**M**	**M**	**M**	**L**	**L**
Impossible	A	**M**	**M**	**L**	**L**	**L**

TABLE: 6.4

RISK RANGE & ACCEPTABILITY CRITERIA

Risk Range	**Risk Acceptability Criteria**	**Remarks**
H	Unacceptable / High	Management's Decision/Action Plan Required. Potential off-site Impact.
M	Medium	Generally Minor Impact. Acceptable with Management's Review. Specific monitoring or SOP to be followed.
L	Low	Acceptable without Review. Manage through Routine Procedure.

6.3.1.1 STORAGE AND HANDLING OF SOLID CHEMICAL

TABLE: 6.5

RISKS AND RECOMMENDATIONS FOR SOLID CHEMICALS

Sr. No.	Process Or Activity	Associated Hazards	Health & Safety Impact (Risk)	Initial Risk			Existing Measures	Residual Risk			Additional Recommendations
				Severity	Likelihood	Risk		Severity	Likelihood	Risk	
1.	Handling Chemical bags	✓ Chemical Exposure	✓ Skin/Eye irritation.	4	C	M	✓ Chemicals are stored in isolated storage rooms having provision for natural & forced ventilation. ✓ Certified Dust respirator is used. ✓ Suitable protective clothing and other PPEs are used.	4	B	L	✓ Operators/Workers to be trained for Safe Work Practices. ✓ Chemical handling bags to be labeled and segregated properly.
2.	Cleaning of Chemical Spillage.	✓ Fumes Inhalation. ✓ Dust Exposure.	✓ Severe irritation to eyes, skin. ✓ Inhalation.	2	C	M	✓ Certified Dust respirator is used. ✓ Suitable protective clothing, gloves, boots are	4	B	L	

							used. ✓ Spillage is cleaned or neutralized with suitable media. ✓ Chemicals are stored in isolated storage rooms having provision for natural & forced ventilation.				

6.3.1.2 STORAGE AND HANDLING OF ACIDS

TABLE: 6.6

RISKS AND RECOMMENDATIONS FOR ACIDS

Sr. No.	Process Or Activity	Associated Hazards	Health & Safety Impact (Risk)	Initial Risk			Existing Measures	Residual Risk			Additional Recommendations
				Severity	Likelihood	Risk		Severity	Likelihood	Risk	
1.	Acids Loading & Unloading.	✓ Exposure to acidic fumes due to leakage in pipe/container/ valves etc. ✓ Spillage of acids.	✓ Skin/Eye irritation. ✓ Toxic Vapour inhalation etc.	4	C	M	✓ Dyke Wall is available. ✓ Loading & Unloading activity is carried out in well-ventilated area. ✓ Periodic Inspection of flanges/ferrule joints is carried out. ✓ Neutralization media is made available in areas where acids are stored/handled/used. ✓ Ppes used	5	B	L	✓ Operators/Workers to be trained for Safe Work Practices. ✓ Allied facilities to be inspected on periodic basis. ✓ Health checkup of the concerned personnel to be carried as per the plan.
2.	Working in Storage	✓ Exposure to Acidic Fumes.	✓ Severe irritation	4	C	M	✓ Storage area is well ventilated.	5	B	L	

	Area.		to eyes, skin. ✓ Body burns.				✓ Acid proof flooring is available. ✓ Neutralization is done immediately with soda ash/lime or spill is absorbed in sand or by suitable adsorbent. ✓ PPEs like face mask, gloves etc. are worn by concerned person.				
3.	Tank overflow/leakage from joints etc.	✓ Exposure to Acidic fumes.	✓ Severe irritation to eyes, skin.	3	C	M	✓ Level Indicator is provided. ✓ Other relevant measures are same as above.	4	B	L	Tank overflow/leakage from joints etc.

6.3.2 QUANTITATIVE RISK ASSESSMENT

Quantitative Risk Assessment (QRA) is a structured approach to identifying and understanding the risks associated with Storage and Handling of flammable/toxic chemicals. The assessment starts by taking into account an inventory of hazardous chemicals stored, likelihood of leakage/spillage associated with it and selecting the worst case scenario for consequence estimation.

Finally, suggesting the measures to minimize or mitigate risks to meet appropriate acceptability criteria. The planning for emergency evacuation has been in mind whilst interpreting the results.

6.3.2.1 CONSEQUENCE ANALYSIS

In a plant handling hazardous chemicals, the main hazard arises due to storage and handling of hazardous chemicals as mentioned above. If these chemicals are released into the atmosphere, it may cause damage due to resulting fires or vapour clouds. Blast Overpressures depend upon the reactivity class of material between two explosive limits.

6.3.2.2 DAMAGE CRITERIA

In Consequence Analysis studies, in principle three types of exposure to hazardous effects are distinguished:

- ✓ Heat radiation, from a jet, pool fire, a flash fire or a BLEVE.
- ✓ Explosion
- ✓ Toxic effects, from toxic materials or toxic combustion products.

In the next three paragraphs, the chosen damage criteria are given and explained as per the Guidelines for QRA – Phast (Micro) Software (DNV) & Purple Book for QRA released by Centre for Chemical Process Safety (CCPS).

Heat Radiation

The consequence caused by exposure to heat radiation is a function of:

- ✓ The radiation energy onto the human body [kW/m^2];
- ✓ The exposure duration [sec];
- ✓ The protection of the skin tissue (clothed or naked body).

In this report following damage criteria has been considered for the effects due to Fire/Explosion.

TABLE: 6.7

EFFECTS DUE TO INCIDENT RADIATION INTENSITY

INCIDENT RADIATION – kW/m^2	**TYPE OF DAMAGE**
37.5	Immediate ignition of wood (without flame Contact). 100 % fatal.
25	Minimum Energy required for igniting wood (Without flame contact). 100 % fatal in 1 min. Significant injury in 10 sec.
12.5	Minimum heat required to ignite wood (With flame contact). 1 % fatal in 1 min. First degree burn in 10 sec.
4	Pain after 20 sec. Blistering unlikely.
2	No discomfort for long exposure.

Explosion

In case of vapour cloud explosion, two physical effects may occur:

- ✓ A flash fire over the whole length of the explosive gas cloud;
- ✓ A blast wave, with typical peak overpressures circular around ignition source.

As explained above, 100% lethality is assumed for all people who are present within the cloud proper.

The following damage criteria may be distinguished with respect to the peak overpressures resulting from a blast wave:

TABLE: 6.8

EFFECTS DUE TO PEAK OVER PRESSURE

PEAK OVERPRESSURE	**TYPE OF DAMAGE**
0.40 bar	Ear Drum Rupture to humans 50 % probability of fatality inside 15% probability of fatality in open
0.21 bar	Structural Damage to buildings 20% probability of fatality to personnel inside

PEAK OVERPRESSURE	TYPE OF DAMAGE
	0% probability of fatality in the open
0.13 bar	Minor Structural Damage to near by structures 10% probability of fatality to personnel inside 0% probability of fatality in the open
0.02 bar	Glass Damage
0.01 bar	Minor Damage

Intoxication

In this report, LC_{50} concentration and IDLH concentrations have been considered for Consequence Analysis.

6.3.2.3 ASSUMPTIONS FOR CONSEQUENCE ANALYSIS

For Consequence Analysis, assumptions regarding Meteorological, Pasquil Stability Classes, Wind velocity, Ambient Temperature, Relative Humidity, Inventory, Ground Roughness, Model used etc. are very important. In this report, the following assumptions have been considered.

i. Meteorological Paste other tables

- ✓ Atmospheric Conditions: No Inversion
- ✓ Ambient Temperature: 35^0C has been considered as MCA approach.
- ✓ Relative Humidity: As the site is not in rainy zone RH of 50% has been considered.

ii. Pasquil Stability Classes

- ✓ Pasquil Stability category D/F is considered as conservative approach.

iii. Other assumptions:

- ✓ Ground Roughness: Ground Roughness has been considered as 0.3 M.
- ✓ Dispersion model of both Heavy Model and also Gaussian distribution have been used as applicable/appropriate.
- ✓ Inventory: Release of 100% of the inventory has been considered. For this, failure of the container has been considered from the bottom.
- ✓ Storage conditions: Storage conditions have been considered as they are practically stored at site.

Following Weather data has been used for the study:

TABLE: 6.9

WEATHER DATA USED FOR THE STUDY

WIND SPEED (M/S)	PASQUILL STABILITY
1.5	F
1.5	D
5	D

6.3.2.4 SOFTWARE USED FOR CALCULATIONS

- ✓ PHAST MICRO

6.3.2.5 SCENARIOS CONSIDERED FOR CONSEQUENCE ANALYSIS

1. In this study, the scenarios for consequence analysis have been selected considering:

- The physical and chemical properties of hazardous materials,
  - Storage conditions & Modes of Storage (Barrels & Carboys),
  - Hazards ranking by NFPA,
  - Guidelines by OSHA (29 CFR),
  - Operating and storage conditions of handling and storage of hazardous chemical.

2. This report considers the worst case scenario which is possible during any set of operation variable and production methodologies. The objective of the study is emergency planning, hence only holistic & conservative assumptions are used for obvious reasons. Hence though the outcomes may look pessimistic, the planning for emergency concept should be borne in mind whilst interpreting the results.

In this regard, the failure cases which may lead to release of hazardous chemicals are as under:

- ✓ Failure of unloading arm of the ISO tanker during unloading of solvents,
- ✓ Leakage from Flange/Ferrule Joints,

3. In this study, results of consequence analysis has used for;
   a. Emergency Planning
   b. Deciding Evacuation Routes
   c. Deciding Location of Assembly Points and ECC
   d. Resource Allocation for mitigation

TABLE: 6.10

SCENARIOS IDENTIFIED FOR CONSEQUENCE ANALYSIS

Scenarios	Description of Scenario	Storage Pressure & Temp.	Scenarios considered
FIRE SCENARIOS			
1	Release of Benzene	Ambient	Flash Fire, UVCE, Late Pool Fire
TOXIC GAS RELEASE SCENARIOS			
2	Release of Chlorine	Ambient	Maximum Concentration

Considerations Made:

- ✓ In Case of **Benzene** we have considered the maximum worst case scenario as:
- ✓ Full Bore Rupture of Pipeline diameter of Incoming Pipeline.
- ✓ 10% of pipeline Diameter.
- ✓ In **Case of Dispersion for Chlorine,** we have considered the following scenarios:
- ✓ Leak from hole for LC_{50} (293 ppm) concentration for 600 sec.
- ✓ Leak from hole for IDLH (10 ppm) concentration for 600 sec.

Note: Release of above chemicals from process equipments like Reactor is not possible as these chemicals will be in diluted/intermediate form in all process equipments and not in pure form.

Selection Criteria of Scenarios:

- As per the relevant guidelines for consequence analysis, we have considered the **maximum credible scenarios** for all the above mentioned chemicals, for a period of 600 secs leakage duration, which is the representative of all kinds of minor/major leakages.
- Modeling has been carried out for dispersion up to LC_{50} concentration and IDLH concentration, in case of toxic chemical. Evacuation should be carried out in less than 30 min from the area covered under IDLH in case of relevant leakage scenario. The purpose is to avoid irreversible health effects to persons inside the area of IDLH concentration.
- Based on the above considerations and the input parameters considered for worst case scenarios, the risk contours are plotted on the plant layout map clearly showing which of the facilities would be affected in case of an accident taking place. Based on the same the safety measures/recommendations are proposed and On-Site & off-Site emergency plan is prepared as mentioned under the section 6.6 & 6.7.

FLAMMABLE CHEMICAL RELEASE SCENARIOS

TABLE: 6.11

SCENARIO#1 – RELEASE OF BENZENE

Basis: Release/Leakage of Benzene due to failure of :

Full Bore Rupture of incoming Pipeline

Input Data

Leak Size considered	50 mm
Release Rate	4716.33gms/sec
Leak Duration	270.51secs
Pressure	Ambient
Temperature	35 deg C
Weather Condition	1.5/F, 1.5/D, 5/D
LFL	12000 ppm
UFL	80000 ppm

CASE:1 FLASH FIRE

			Distance (m)		
			Category 1.5/F	Category 1.5/D	Category 5/D
Furthest Extent	6000	ppm	34.8826	42.4328	28.4494
Furthest Extent	12000	ppm	27.0094	31.2091	17.7504

CASE:2 VAPOUR CLOUD EXPLOSION (OVERPRESSURE RESULTS)

			Maximum Distance (m) at Overpressure Level		
			Category 1.5/F	Category 1.5/D	Category 5/D
Overpressure	0.02068	bar	90.7316	98.9815	49.7286
Overpressure	0.1379	bar	45.7249	55.2718	27.6975
Overpressure	0.2068	bar	42.1676	51.8169	25.9561

CASE:3 LATE POOL FIRE (EFFECTS OF RADIATION LEVEL)

			Distance (m)		
			Category 1.5/F	Category 1.5/D	Category 5/D
Radiation Level	4	kW/m2	40.4997	40.3782	45.8274
Radiation Level	12.5	kW/m2	18.2752	18.2757	23.4709
Radiation Level	25	kW/m2	12.0991	12.0062	11.8726
Radiation Level	37.5	kW/m2	Not Reached	Not Reached	Not Reached

FIGURE: 6.2

RISK CONTOURS FOR FLASH FIRE

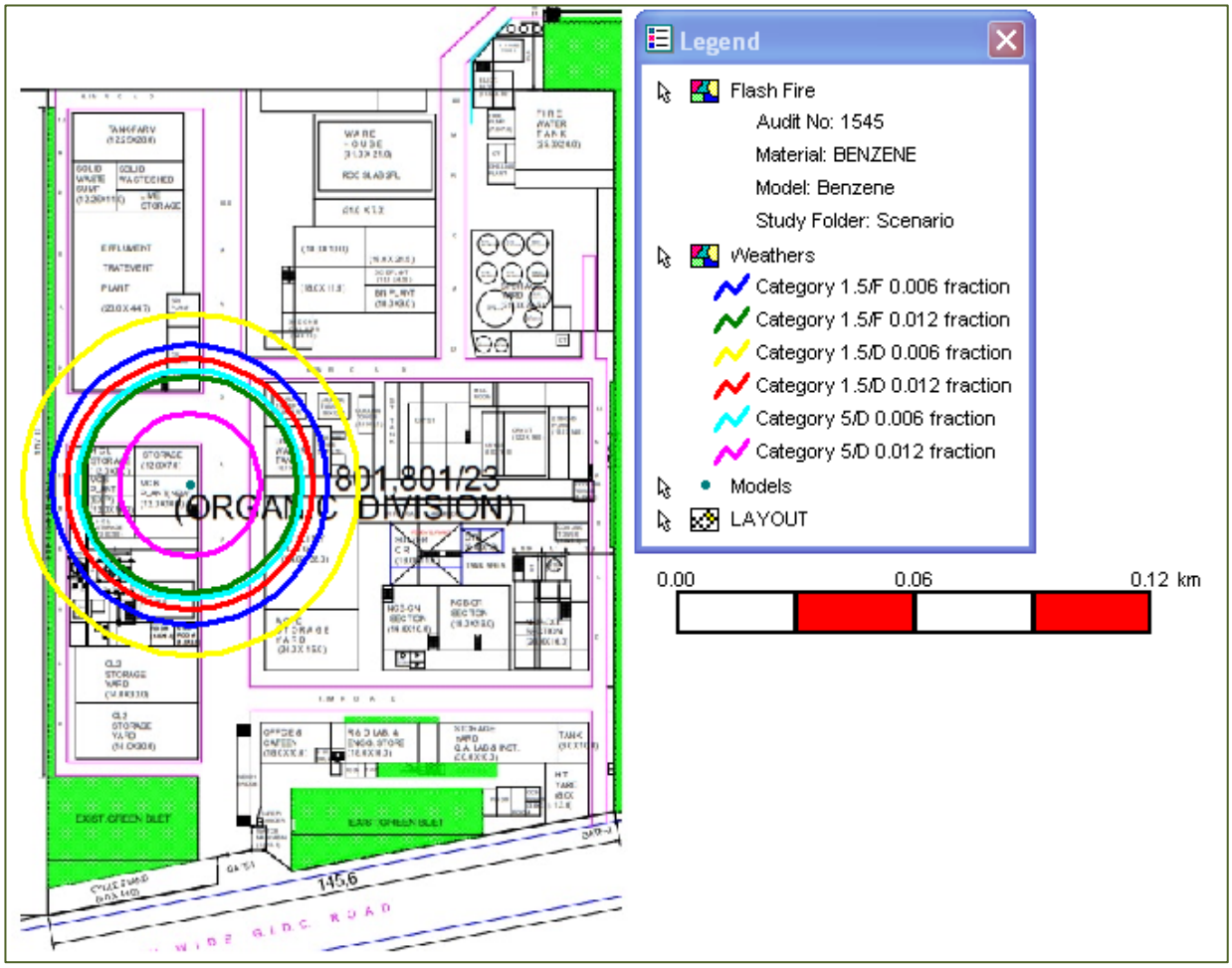


FIGURE: 6.3

RISK CONTOURS FOR OVERPRESSURE

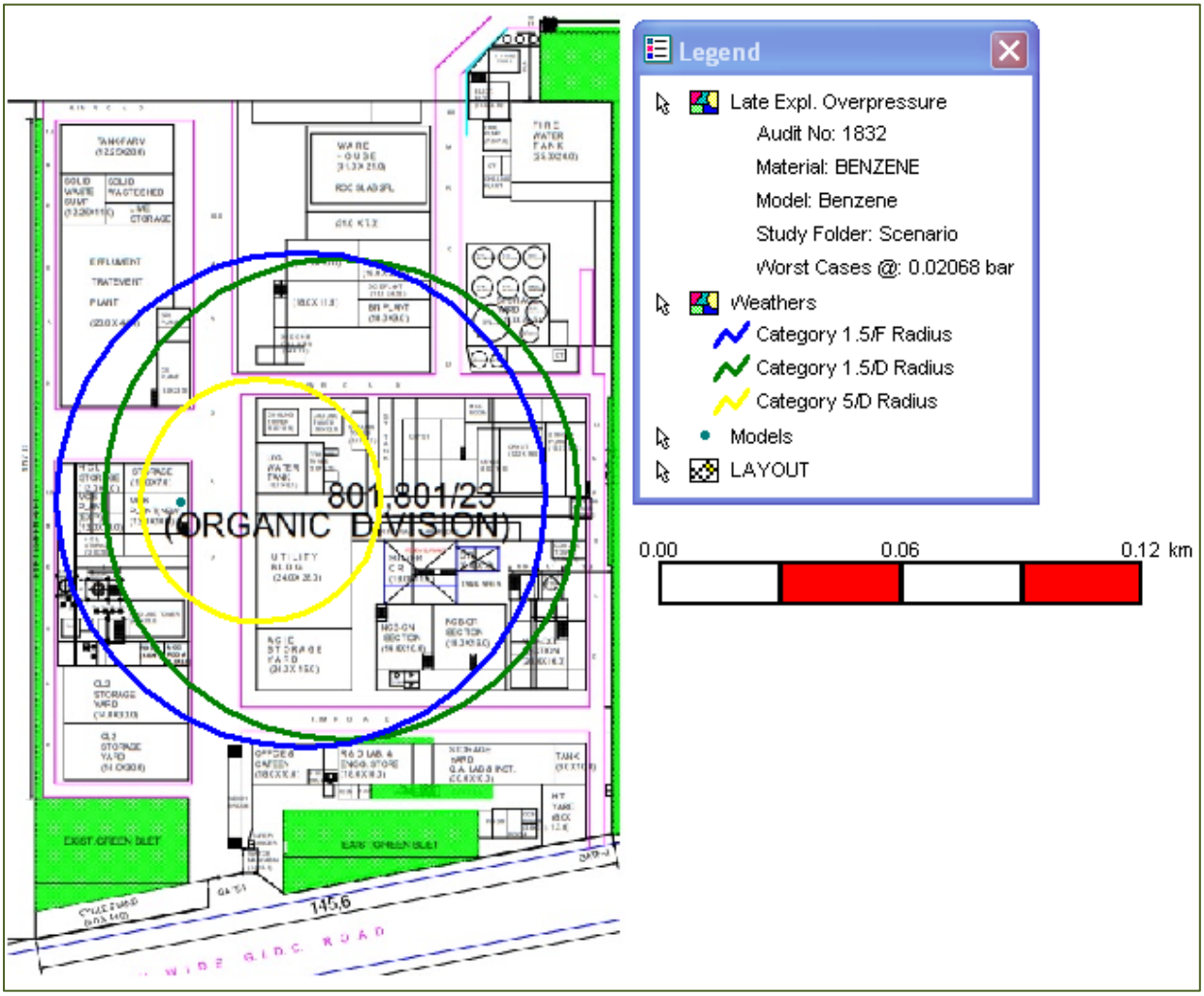


FIGURE: 6.4

RISK CONTOURS FOR LATE POOL FIRE:

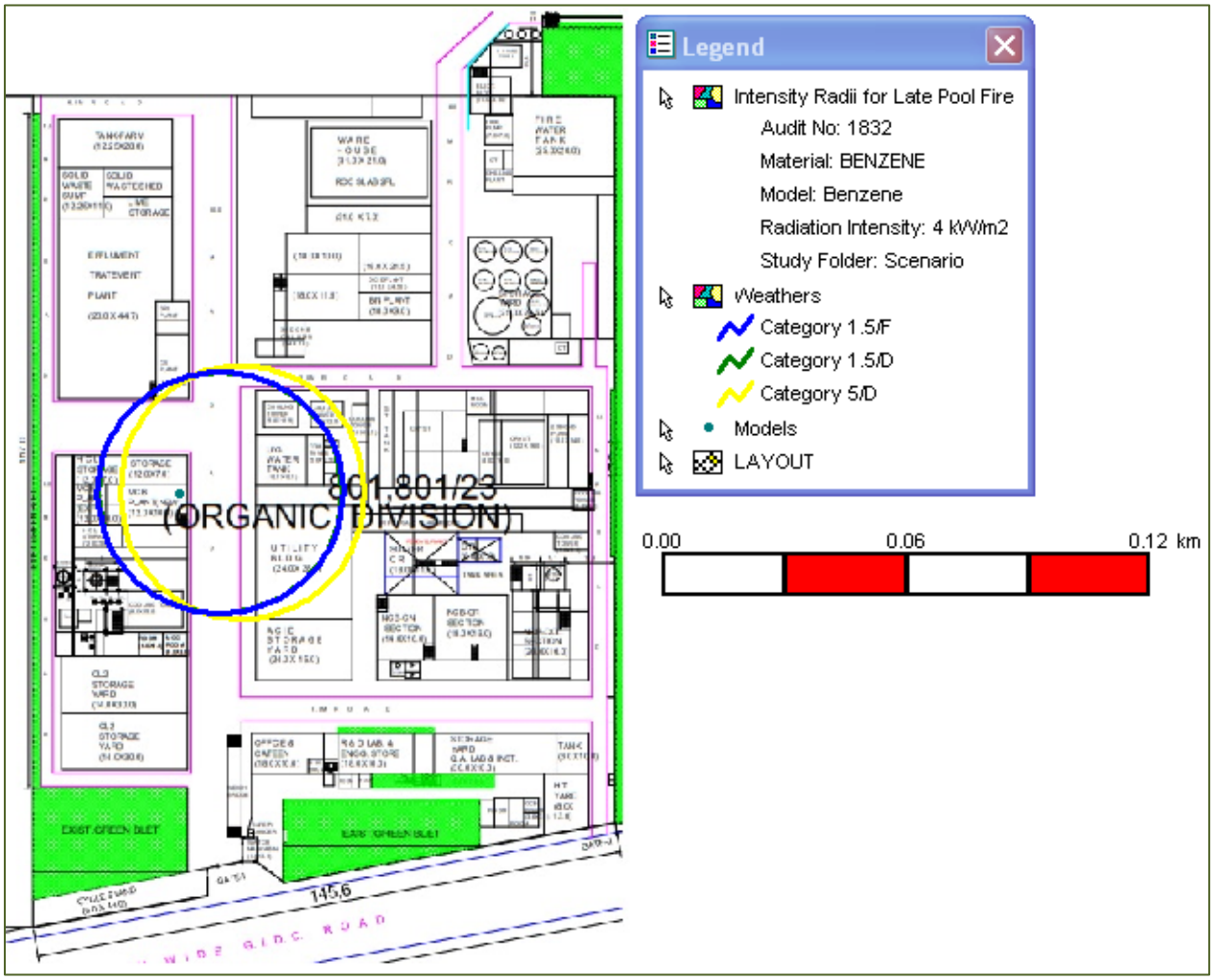


TABLE: 6.12

SCENARIO#2 – RELEASE OF BENZENE

Basis: Release/Leakage of Benzene due to failure of :

10% of Full Bore Rupture of Incoming Pipeline

Input Data

Leak Size considered	5 mm
Release Rate	4716.33gms/sec
Leak Duration	600secs
Pressure	Ambient
Temperature	35 deg C
Weather Condition	1.5/F, 1.5/D, 5/D
LFL	12000 ppm
UFL	80000 ppm

CASE:1 FLASH FIRE

			Distance (m)		
			Category 1.5/F	Category 1.5/D	Category 5/D
Furthest Extent	6000	ppm	8.74125	8.47183	2.98245
Furthest Extent	12000	ppm	5.26796	3.46861	2.34351

CASE:2 VAPOUR CLOUD EXPLOSION (OVERPRESSURE RESULTS)

Not Reached

CASE:3 LATE POOL FIRE (EFFECTS OF RADIATION LEVEL)

			Distance (m)		
			Category 1.5/F	Category 1.5/D	Category 5/D
Radiation Level	4	kW/m2	22.3871	22.3929	23.313
Radiation Level	12.5	kW/m2	13.5733	13.8741	16.3736
Radiation Level	25	kW/m2	8.19984	8.673	11.7488
Radiation Level	37.5	kW/m2	5.67905	6.20333	7.94853

FIGURE: 6.5

RISK CONTOURS FOR FLASH FIRE:

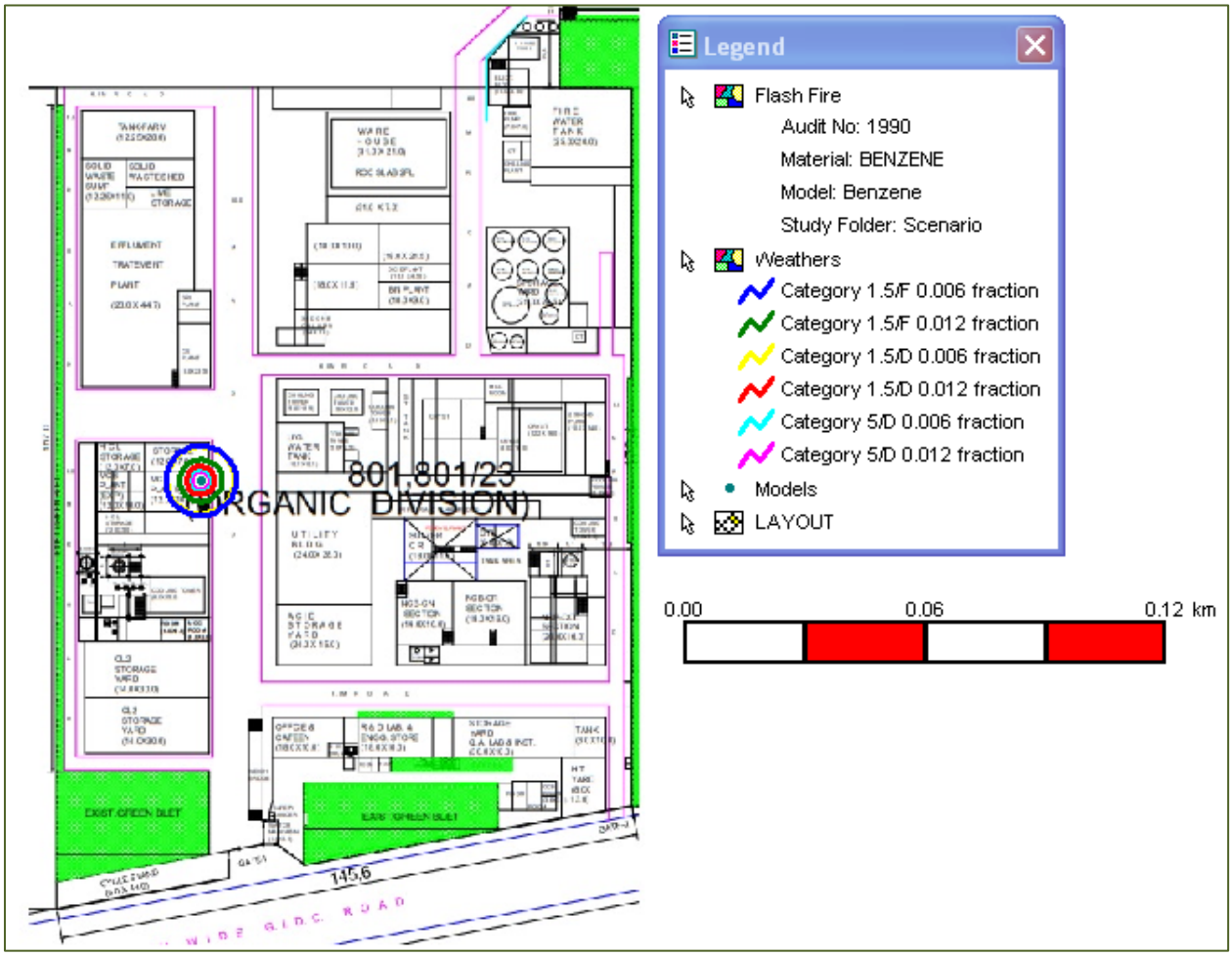
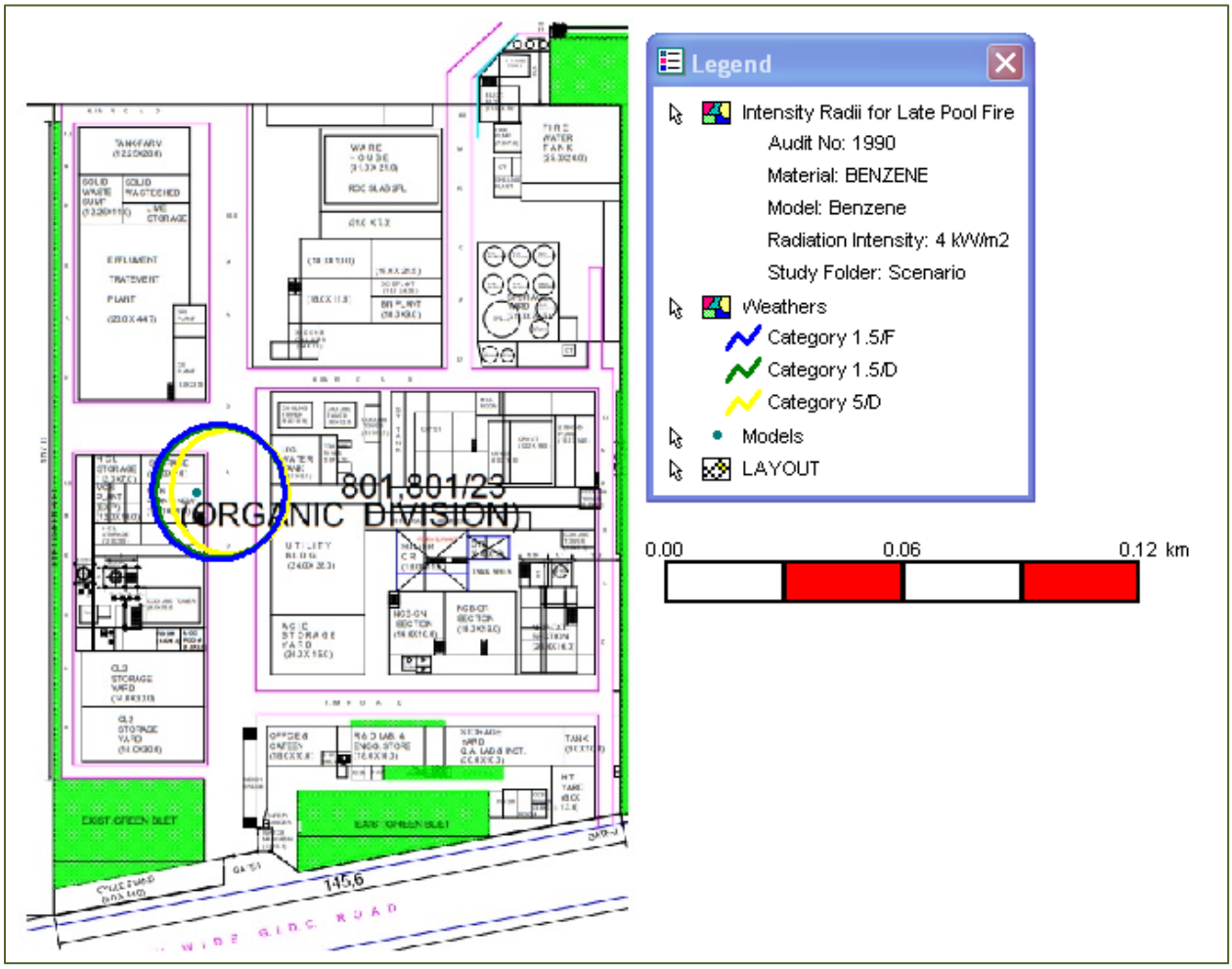


FIGURE: 6.6

RISK CONTOURS FOR LATE POOL FIRE:



TOXIC CHEMICAL RELEASE SCENARIOS

TABLE: 6.13

SCENARIO FOR RELEASE OF CHLORINE

Basis: Release/Leakage of Chlorine from : ✓ Filling line ✓ Flange/Ferrule Joint	
Input Parameters considered for Worst Case Scenario:	
Duration of Leak considered	600 secs
Gas release rate from leak	1.6 kgs/sec
Temperature Considered	35 deg C
Pressure Considered	7bar
Weather Condition	1.5/F,1.5/D,5/D
LC_{50}	**293 ppm**
IDLH	**10 ppm**

RESULTS:

SR. No.	**ntration**	**Downwind Distance (meters)**		
		Category 1.5/F	**Category 1.5/D**	**Category 5/D**
1	LC_{50} (293 ppm)	19.69	No Hazard	No Hazard
2	IDLH(10 ppm)	87.53	37.83	17.09

✓ **88 meters in downwind direction is considered as evacuation area.**

FIGURE: 6.7

RISK CONTOURS FOR IDLH CONCENTRATION:

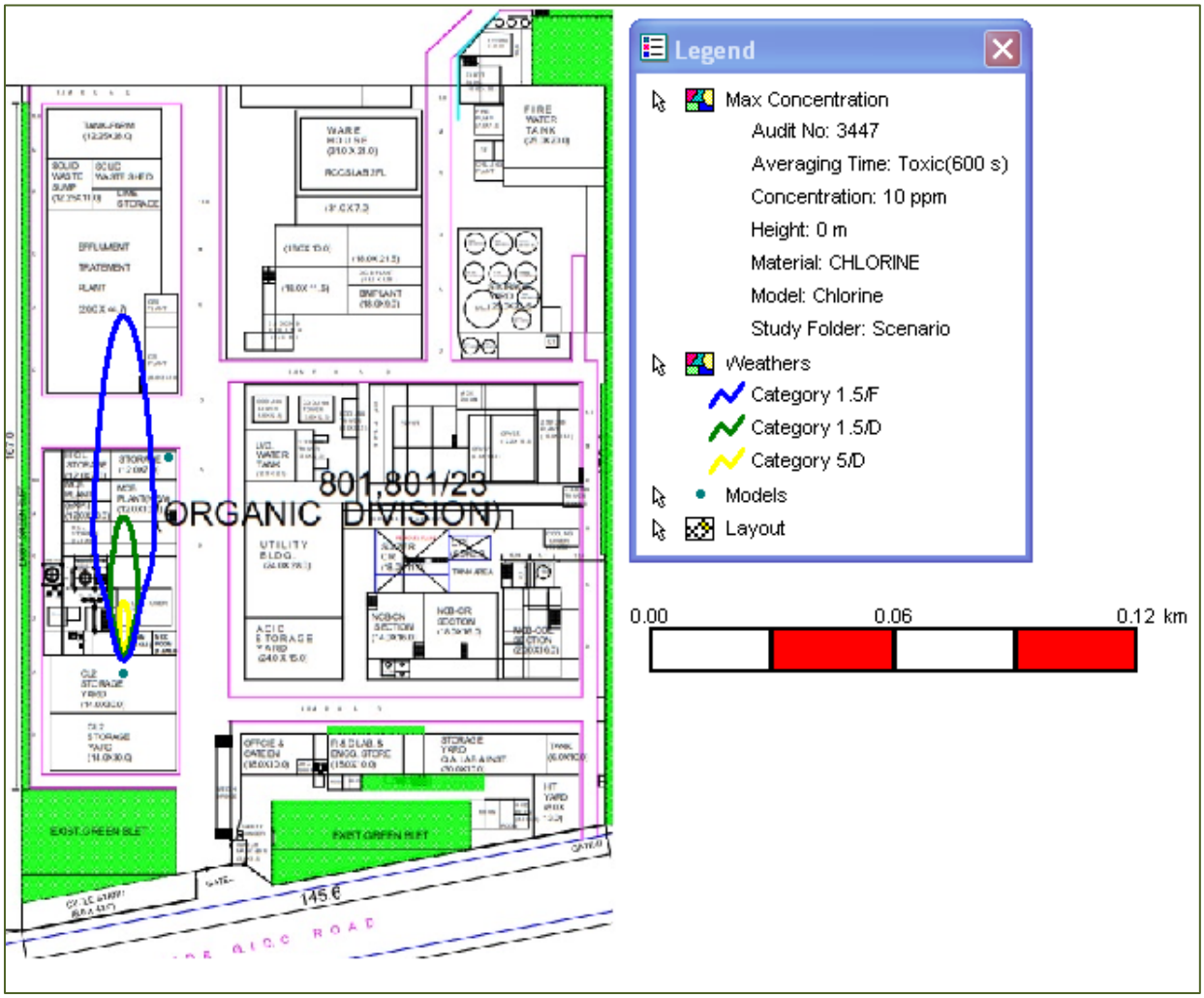
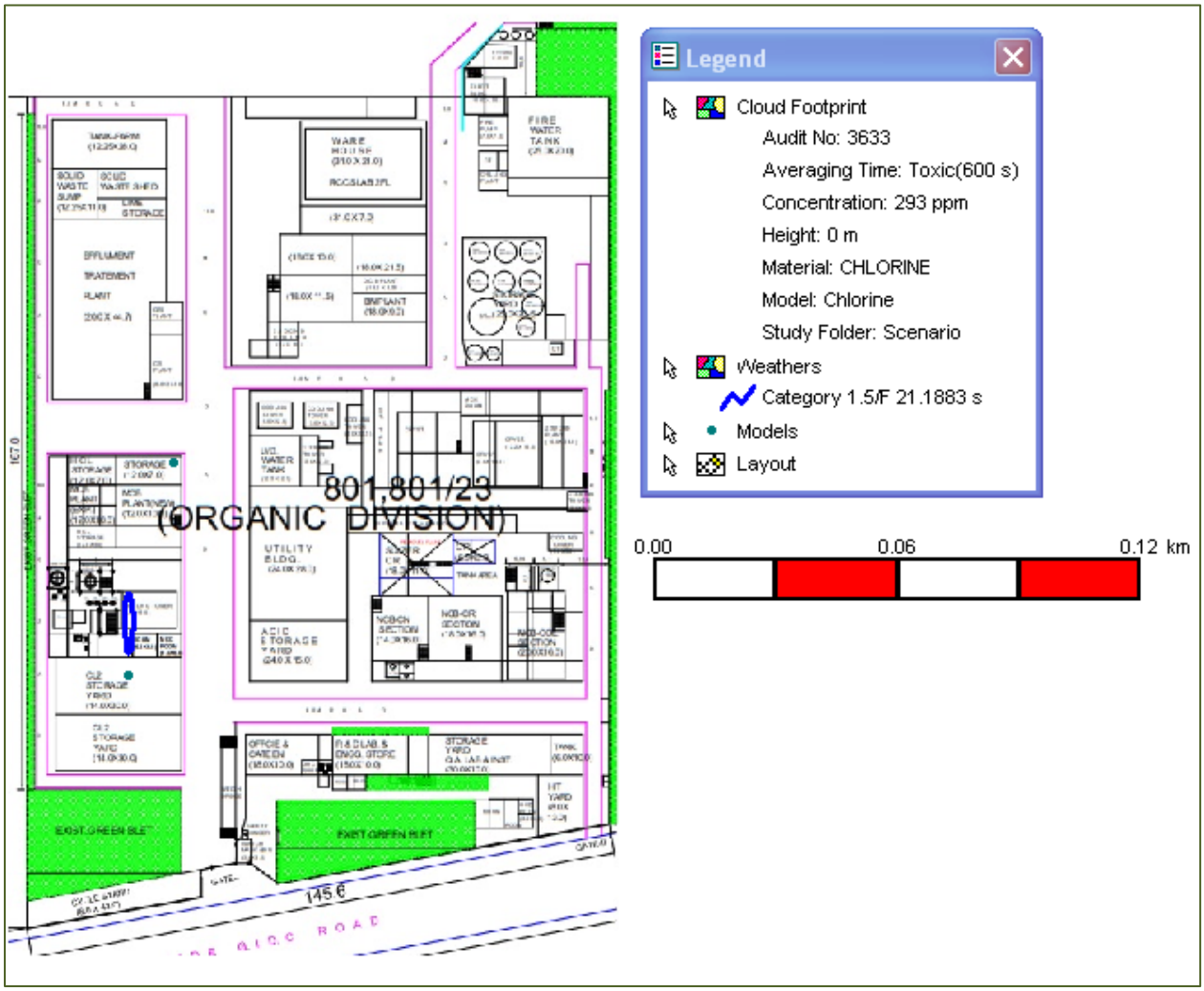


FIGURE: 6.8

RISK CONTOURS FOR LC_{50} CONCENTRATION:



6.3.2.6 CONSEQUENCE ANALYSIS SUMMARY

TABLE: 6.14

FLASH FIRE SCENARIOS

Sr. No.	Scenario	Concentration (ppm)	Distance (meters)		
			Category 1.5/F	Category 1.5/D	Category 5/D
1	Release of Benzene (FBR)	LFL Frac.6000	34.88	42.43	28.44
		LFL. 12000	27.00	31.20	17.75
2	Release of Benzene (10% of pipeline Dia.)	LFL Frac.6000	8.74	8.47	2.98
		LFL. 12000	5.26	3.46	2.34

TABLE: 6.15

LATE POOL FIRE SCENARIOS:

Sr. No.	Scenario	Radiation Level (KW/m2)	Downwind Distance (meters)		
			Category 1.5/F	Category 1.5/D	Category 5/D
1	Release of Benzene	4	40.49	40.37	45.82
		12.5	18.27	18.27	23.47
		25	12.09	12.00	11.87
		37.5	NR	NR	NR
2	Release of Benzene (10% of pipeline Dia.)	4	22.38	22.39	22.31
		12.5	13.57	13.87	16.37
		25	8.19	8.67	11.74
		37.5	5.67	6.20	7.94

TABLE: 6.16

EXPLOSION OVERPRESSURE SCENARIOS:

Sr. No.	Scenario	Overpressure (Bar)	Downwind Distance (meters)		
			Category 1.5/F	Category 1.5/D	Category 5/D
1.	Release of Benzene	0.02068	90.73	98.98	49.72
		0.1379	45.72	55.27	27.69
		0.2068	42.16	51.81	25.95

2	Release of Benzene (10% of pipeline Dia.)	0.02068	NR	NR	NR
		0.1379	NR	NR	NR
		0.2068	NR	NR	NR

TABLE: 6.17

TOXIC RELEASE SCENARIOS

Sr. No.	Concentration	Downwind Distance (meters)		
		Category 1.5/F	Category 1.5/D	Category 5/D
Chlorine				
1	LC50 (293 ppm)	19.69	No Hazard	No Hazard
2	IDLH(10 ppm)	87.53	37.83	17.09

6.4 CONSEQUENCE ANALYSIS

6.4.1 COMMENTS / RECOMMENDATIONS BASED ON CONSEQUENCE ANALYSIS

Flash Fire and UVCE Scenarios:

- ✓ The Scenarios considered above, vapor travels to a maximum distance of 42.15 m in case of FBR release of Benzene in 1.5/D weather condition. If it gets a source of ignition within this radius, it may create UVCE (Unconfined vapor cloud explosion, the effects of overpressure distance is 98.98 m.
- ✓ It can be seen from the summary table above that 5/D weather condition is safer (contours of vapor dispersion extends to shortest distance).

Late Pool Fire Scenarios:

- ✓ The risk of late pool fire is highest in case of release of Benzene (Sull Bore Rupture) (45.82 meters.) in 1.5/D weather condition for 4 KW/m^2 radiation level.

Toxic Release Scenarios:

- ✓ In case of toxic release scenario for Chlorine, (87.53 mtrs) IDLH Concentration covers more distance in 1.5/ F weather condition.
- ✓ Evacuation plan to be designed considering the above mentioned worst case scenario.
- ✓ Thus, the category 1.5/F is the limiting one to decide for evacuation plan.

6.5 ARRANGEMENTS FOR ENSURING HEALTH & SAFETY OF WORKERS ENGAGED IN HANDLING OF HAZARDOUS MATERIALS.

6.5.1 Following Safety Precautions are considered during Transportation, Unloading, Handling & Storage of Solvents and also for Toxic Chemicals, etc. for its existing facilities, the same shall be updated to cover the new facilities, if required:

TABLE: 6.18

SAFETY PRECAUTIONS

Sr.No	ACTIVITY	SAFETY PRECAUTIONS
1.	Transportation of Solvents/ chemicals by road tanker.	✓ Training is given to driver and cleaner regarding the safe driving, hazards of chemicals, emergency handling and use of SCBA sets. ✓ TREM card is kept with TL. ✓ SCBA set is kept with TL. ✓ Fire extinguishers are kept with TL. ✓ Flame arrestor is provided to TL exhaust. ✓ Instructions are given not to stop road tanker/truck in populated area. ✓ Hazard Identification symbol and emergency telephone number are displayed as per HAZCHEM CODE. ✓ Appropriate PPEs are kept with TL.
		In case of leak or spill: ✓ Source of leakage are checked. ✓ Damaged containers or spilled materials are not attended without wearing appropriate protective clothing. ✓ Leak is stopped, if possible to do so without risk. ✓ Water sprays are used to reduce vapors (but do not put water directly on leak, spill area or inside container). ✓ Combustibles (wood, paper, oil, etc.) are kept away from spilled material.

2.	Unloading Activity	✓ Priority is given to Tanker to immediately enter the storage premises at site and is not kept waiting near the gate. ✓ Security person checks License, TREM CARD, Fire extinguisher condition; SCBA set condition, Antidote Kit, required PPEs as per SOP laid down. **Following precautions are taken during unloading:** ✓ Wheel stopper is provided to TL at unloading platform. ✓ Static Earthing is provided to road tanker. ✓ Flexible SS hose connection is done at TL outlet line. ✓ All TL valves are closed in TL. ✓ Only day time unloading is permitted.
3.	Solvents Storage safety.	✓ Pipes and equipment are inspected at regular intervals. ✓ All storage areas are isolated from all sources of open flame and well posted with' NO SMOKING' signs and provided with adequate fire fighting/extinguishing systems. ✓ Spark-resistant tools are used. ✓ Water spray is used to reduce vapors (but do not put water directly on leak, spill area or inside container). ✓ Combustibles (wood, paper, oil, etc.) are kept away from spilled material. ✓ Fire fighting facilities (along with foam attachment) are available as mentioned below: ✓ Sand Buckets are available. ✓ FLP type pumps are provided. ✓ Double static earthing is provided to storage tank, as per the requirement. ✓ Double Jumper clip is provided to all solvent handling pipeline flanges. ✓ Curb wall is available for pumps. ✓ Pumps are guarded properly.

4.	Solvents transfer from storage to process plant.	✓ Double mechanical seal type FLP type pump are provided. ✓ Double on / off switch is provided at tank farm and process area near day tank. Pump auto cut off with day tank high level is provided. ✓ Flame arrestor with breather valve is provided on vent line. ✓ Lightening arrestor is provided on the top of the tallest tank. ✓ Over flow system is provided for additional safety and it is connected to main storage tank. ✓ NRV's are provided on pump discharge line. ✓ Double Jumper clip is provided to all solvent handling pipelines. ✓ Double static earthing is provided to day tank.

6.5.2 MEASURES FOR FUGITIVE EMISSION CONTROL

Control Techniques for Fugitive Emissions are in the following order:

(1) First preference: Engineering Controls

(2) Second preference: Administrative / Management Controls

(3) Last resort: Personal Protective Equipment (PPE).

Fugitive Emissions occurs or may occur during

(1) Charging of Raw Materials.

(2) Leakage from Flanges, joints etc

(3) Tanker loading & unloading

Mitigation Measures

- ✓ Regular monitoring of plant area is conducted and records are maintained. At strategic point of the plants, online detectors are provided for detection of such emissions.
- ✓ Lines of such hazardous chemicals are tested periodically and such tests are recorded.
- ✓ All lines carrying toxic liquid are continuous welded and are provided with proper slopes and special tongue and groove joints to avoid liquid stagnation and leakage.
- ✓ In the process area, all the strategic pumps are of submerged type so as to eliminate leakages from glands.
- ✓ Safe Operating Procedures and EMERGENCY RESPONSE PROCEDURES are followed strictly.
- ✓ Concerned personnel are trained about the safe working practices.

- ✓ Dyke wall is provided to storage tanks.
- ✓ Level transmitter is also available with low level/high level auto cut-off provision.
- ✓ Adequate and relevant PPEs are available.

6.5.3 FIRE CONTROL PLAN

M/s. Aarti Industries Limited (Organic Division), Vapi has considered fire prevention measures at the project planning stage to avoid any outbreak of fire. But the chances of outbreak of fire cannot be totally ignored. Hence to tackle such a situation, company has planned to develop a well- resourced and adequate fire protection system/fire fighting network. The same facilities shall be updated to cover the expansion facilities also, if required.

Other details on Fire Control Plan:

- ✓ Fire load calculation has been carried out and fire fighting facilities comprising of main pump, stand by pump, jockey pump and fire water reservoir has been installed as per the GFR and TAC guidelines, the same shall be updated after the expansion of new facilities, if required.
- ✓ Fire Extinguishers like DCP, Carbon Dioxide & Foam types have been provided as per the GFR and TAC guidelines, at conspicuous locations.
- ✓ Other Fire fighting facilities like, fire monitor, foam trolley, fire hose boxes with hose pipe, sand buckets, fire blanket, ambu bags, Water Jell Fire Blanket, etc. have been provided within the company at conspicuous locations.
- ✓ Working staff is given training to operate DCP and CO2 extinguishers.
- ✓ The Fire Hydrant Network has been installed; capacity of the same shall be updated after the expansion of new facilities, if required.
- ✓ Emergency Action Team members are working round the clock in all shifts.
- ✓ First aiders are available round the clock in all shifts of all plants / sections.
- ✓ Rescue kits with SCBA sets are available at site to treat with any kind of chemical emergencies.
- ✓ Volume level indication with alarm and trips for high level are provided for vessels containing flammable materials.
- ✓ DG Sets is available for power backup.

TABLE: 6.19

DETAILS OF FIRE HYDRANT

Sr. No.	Description	AIL, Vapi
1	Fire Water storage at Site (M3)	2250
2	Main Electrical Pump-1 Capacity (M3/hr.)	410
2.1	Main Electrical Pump-2 Capacity (M3/hr.)	NA
3	Diesel Operated Pump Capacity (M3/hr.)	410
4	Jockey Pump-1 Capacity (M3/hr.)	65
4.1	Jockey Pump-2 Capacity (M3/hr.)	65
5	Hydrant Ring Main line Size (in inches)	6
6	Trailor Pump & Capacity (Yes / No)	120
7	Hydrant Points (Nos.)	88
8	Fixed Foam Monitors (Nos.)	11
9	Mobile Foam Trolleys (Nos.)	5
10	Hand Foam Monitors (Nos.)	1
11	Fire Jet Nozzles (Nos.)	12
12	Fire Fog nozzles (Nos.)	4
13	Mayur Water Curtains (Nos.)	8
14	Hose Boxes (Nos.)	26
15	Fire Hoses (Nos.)	81
16	Hose Reels with nozzles (Nos.)	26
17	Water Sprinklers on flamable storages (Nos.)	1
18	Water Sprinklers on explosive storages (Nos.)	1
19	Foam for hydrant (in Lit.)	2080
20	Safety Showers with eye washes (Nos.)	51
21	Sand pits with loose and dry sand (Nos.)	1
22	Fire Blankets (Nos.)	8
23	Fire Proxy Suits (Yes / No)	2
24	DCP type Fire extinguishers (Nos.)	145
25	ABC type (stored pressure) fire extinguishers (Nos.)	13
26	Mechanical Foam fire extinguishers (Nos.)	15
27	CO2 type fire extinguishers (Nos.	185
28	Nos. of Fire Fighter per shift.	6
29	Nos. of Emergency Team Members.	60
30	Emergency Control Centres (Yes / No)	YES
31	Assembly Points (Nos.)	5
32	Wind Soks installed.(Nos.)	11

6.5.4 SAFETY PRECAUTIONS FOR CHLORINE TONNER STORAGE

Following Mitigation Measures shall be followed in case of Chlorine Leakage:

- ✓ Evacuate the area in down wind direction: Evacuate area in down wind direction up to 88 meter.
- ✓ Do not direct water at spill or source of leak.

- ✓ Use Chlorine Emergency Kit to attend the leak.
- ✓ Absorb the fumes through Chlorine Hood with blower.
- ✓ Only Trained workers are allowed to work in this area.

Following Safety Measures shall be made available to avoid Emergencies related to Chlorine Leakage:

- ✓ Chlorine handling area shall be well ventilated.
- ✓ Chlorine Emergency Kit shall be kept ready at chlorine shed.
- ✓ Chlorine Hood with blower shall be provided with scrubbing arrangement.
- ✓ SCBA sets shall be kept ready at chlorine handling area.
- ✓ Empty & Filled cylinders shall be stored separately.
- ✓ Oxygen Cylinder shall be available.
- ✓ Safety Shower and eye wash shall be available in Chlorine shed area.
- ✓ Online Cl_2 Gas detectors shall be installed at conspicuous locations inside the plant. Alarms shall be configured for detection of chlorine in office area and control room.
- ✓ Breathing air network shall be available in entire operational area.
- ✓ Full body protection suite and other PPEs shall be kept ready.
- ✓ Safe Operating Procedures and EMERGENCY RESPONSE PROCEDURES shall be followed strictly.
- ✓ Only trained workers and employers shall be allowed to work in this area.
- ✓ Regular worksite inspection shall be carried out.

6.6 ON SITE DISASTER PREPAREDNESS & EMERGENCY MANAGEMENT PLAN

M/s. Aarti Industries Limited (Organic Division), Vapi has prepared the Disaster Management Plan which is linked with District Disaster Management Plan. This plan has been prepared based on the risk contours plotted on the plant layout map clearly showing the facilities that would be affected, in case an accident takes place.

The purpose of this plan is to provide **M/s. Aarti Industries Limited (Organic Division),** Vapi with the means to effectively utilize all the resources at its disposal for the protection of life, environment and property. The same DMP shall be updated after expansion to cover new plants or facilities, if required. The details of the same are discussed in the following sections.

6.6.1 DEFINING THE NATURE/LEVEL OF EMERGENCY

THE LEVEL OF EMERGENCY CAN BE CLASSIFIED IN THREE CATEGORIES:

LEVEL - 1:

The leakage or emergency, which is confinable within the plant/area, it may be due to:

a) Small pipe/valve rupture or similar leakages that do not affect outside premises.
b) Release of toxic chemicals for short duration.
c) Small fire in the plant.

LEVEL - 2:

The emergency, which is confinable within the factory premises, it may arise due to -

a) Leakage of toxic chemicals for long duration.
b) Medium scale explosion confined to the factory premises.
c) Medium scale fire inside the factory premises.

LEVEL - 3:

The emergency, which is not confinable within the factory premises and general public in the vicinity are likely to be affected. It may arise due to -

a) Heavy / Profuse leakage of toxic / flammable gases for a long duration.
b) Explosion of high magnitude affecting the adjacent area.
c) Major fire inside the factory premises.

6.6.2 OBJECTIVES OF EMERGENCY MANAGEMENT SYSTEM

The objectives of the emergency management system are summarized as under.

- ✓ To define and assess emergencies, including risk and environment impact assessment.
- ✓ To control and contain incidents.
- ✓ To safeguard employees and people in vicinity.
- ✓ To minimize damage to property or/and the environment.
- ✓ To inform employees, the general public and the authority about the hazards/risks assessed, safeguards provided, residual risk if any and the role to be played by them in the event of emergency.
- ✓ To be ready for ‘mutual aid’ if need arises to help neighboring unit. Normal jurisdiction of an OEP is limited to the own premises only, but looking to the time factor in arriving the external help or off-site plan agency; the jurisdiction must be extended outside to the extent possible in case of emergency occurring outside.
- ✓ To inform authorities and mutual aid centers to come for help.
- ✓ To effect rescue and treatment of casualties. To count injured.
- ✓ To identify and list any serious injuries and or fatalities.

- ✓ To inform and help relatives.
- ✓ To secure the safe rehabilitation of affected areas and to restore normally.
- ✓ To provide authoritative information to the news media.
- ✓ To preserve records, equipment etc, and to organize investigation into the cause of the emergency and suggest preventive measures to stop its recurrence.
- ✓ To ensure safety of the works before personnel re-enter and resume duty.
- ✓ To work out a plan with all provisions to handle emergencies and to provide necessary inputs for emergency preparedness and the periodical rehearsal.

6.6.3 STRUCTURE OF EMERGENCY MANAGEMENT SYSTEM

M/s. Aarti Industries Limited (Organic Division), Vapi has developed an emergency management team. The management structure includes the following personnel's;

- ✓ Site Main Controllers
- ✓ Incident Controllers and Deputy Incident Controllers
- ✓ Key Personnel's
- ✓ Essential Workers

The other elements of Disaster Management Plan are:

- ✓ Assembly points
- ✓ Emergency control center
- ✓ Fire control arrangements
- ✓ Medical arrangements
- ✓ Other arrangements

6.6.3.1 SITE MAIN CONTROLLER

General Manager and FM are deputed as Site Main Controller. In absence of SMC's, Safety or Shift in Charge will act as a SMC. His task will be to co-ordinate all internal and external activities from the Emergency Control Centre at Main Security Gate from where all operations will be directed. He has:

- ✓ Relieve the incident controller of responsibility for overall main control.
- ✓ In consultation with the incident controller decide whether major emergency exists an on declaration of a major emergency ensure that the outside emergency services and mutual help are called, the off side-plan activated and if necessary, nearly factories and population are informed.
- ✓ Ensure the key personnel are called.
- ✓ Exercise direct operational control of those parts of the work outside the affected area.

- ✓ Continuously review and assess possible development to determine the most probable causes of event.
- ✓ Direct the safe close down and evacuation of plants in consultation with the incident controller and key personnel. If necessary arrange for evacuation of neighboring population.
- ✓ Ensure that causality is receiving adequate attention. Arrange for hospitalization victims and additional help if required. Ensure that their relatives are informed.
- ✓ Informed and liaison with police services instruct emergency authority and the factory inspectorate and expert on health and safety provide advice on possible effect on are outside the factory.
- ✓ In the cases of prolonged emergencies involving risk to outside area by wind blow materials contact meteorological office to receive early notification of impending changes in weather condition.
- ✓ Ensure the accounting for personnel and rescue of missing persons.
- ✓ Control traffic movement within the factory.
- ✓ Arrange for a chronological record of the emergency to be maintained.
- ✓ Where the emergency is prolonged arrange for relief of personnel and the provision of catering facilities.
- ✓ Issue authorized statement to the news media where necessary inform head office.
- ✓ Ensure that proper consideration is given to the preservation of evidence Arrange for photographs / video.
- ✓ Control rehabilitation of affected areas and victims on cessation of the emergency. Do not restart the plant unless it is ensured safe to start and authorized the sounding the. All Clearance siren which will be one continuous longs siren for one minute".

6.5.3.2 ROLE OF INCIDENT CONTROLLER AND DEPUTY INCIDENT CONTROLLER

As our factory is running 24 hrs, so each Dy. Managers, Officer, Supervisors, Engineers, etc. from different depts. (like production, stores, P&A, engineering, R&D, etc.) are nominated as I.C and they will be always available in the shift and can take charge till the arrival of SMC. Any one has available in each shift & on holiday on call.

His primary duties are to take charge at the scene of the incident. In the initial stage he may be required to take decisions involving the operation of the other plants or to stop or continue any process and to take technical decisions to control the incident. The deputy incident controller

should take the charge of incident controller, if he is not available due to any reason. Supervisors & Shift Incharge are deputed as DIC.

RESPONSIBILITIES/DUTIES OF INCIDENT CONTROLLER AND DEPUTY INCIDENT CONTROLLER:

All shift In-charges of respective plant / Officer (Production).

Duties / Function: Immediately on being aware of the emergency and its location he will proceed to the scene on arrival he will take charge of accident and operate from scene as well as plant control.

He will:

- ✓ Assess the scale of emergency and decide if a major emergency exists or is likely. On his decision he will active the on - side emergency plan and if necessary the off- side emergency plan.
- ✓ Inform side main controller and perform as side main controllers till his arriving and he will depute his Dy. incident controller on the scene and he will go the emergency control center. Particularly he will:
  - ✓ Direct the shutting down and evacuation of plant and areas likely to be affected by the emergency.
  - ✓ Ensure that emergency services including mutual aid have been called in.
  - ✓ Ensure that key personnel have been called in.
- ✓ Direct all operations within the affected area with the following priorities.
  - ✓ Secure the safety of the personnel.
  - ✓ Minimize damage to plant property and the environment.
  - ✓ Minimize loss of material.
  - ✓ Direct rescue and firefighting operation unit the arrival of the outside fire brigade.
  - ✓ Search for casualties.
  - ✓ Evacuate non essential worker to the assembly points.
  - ✓ Set up a communication point and established telephone messenger contact appropriate with the emergency controller center.
  - ✓ Give advice and information as requested to the head of the fire brigade and other emergency services.
  - ✓ Brief the site main controller and keep informed of development.

- ✓ Preserved evidence that will be necessary for subsequent inquiry into the cause of the emergency and concluding preventive measures.

6.6.3.3 KEY PERSONNELS

Senior officers of various departments like Fire, Security, Safety, Administration, Engineering, Project, Production, Transport, Pollution control, Technical Services and Stores are nominated as Key Personnel in their respective fields. As necessary, they decides the actions needed to shutdown plants, evacuate personnel, carryout emergency engineering work, arrange for supplies of equipments, utilities, carryout environment monitoring, provide catering facilities, liaise with police, fire brigade and other local authorities, relative of casualties, hospital, press & neighboring industries, action at assembly points, outside shelters and mutual aid center under the direction of the SMC. All the key personnel and other called in so to assist, has report to the ECC. They are available at any time on duty or on call or on holidays.

6.6.3.4 ESSENTIAL WORKERS

Essential workers are those who are trained in Fire Fighting, First Aid, Rescue & Salvage. Supervisors, operators & technicians from production dept. are designated as E.W.'s & are supposed to report at EMERGENCY SITE to take instructions from I.C. or Dy. I.C. Such work instructions will include:

- ✓ Fire fighting and spill control till a Fire Brigade takes the charge.
- ✓ To help the Fire Brigade and mutual aid teams, if it is so required.
- ✓ Shutting down plant and making it safe.
- ✓ Emergency engineering work e.g. isolating equipment, material process, providing temporary by-pass lines, safe transfer of materials, urgent repairing or replacement, electrical work, etc.
- ✓ Provision of emergency power, water, lighting, instruments, equipments, materials, etc.
- ✓ Movement of equipment, special vehicle and transport to or from the scene of the accident.
- ✓ Search, evacuation, rescue and welfare.
- ✓ The injured is given First Aid.
- ✓ Moving tankers or other vehicles from area of risk.
- ✓ Carrying out atmospheric test and pollution control.
- ✓ Manning of assembly points to record the arrival of evacuated personnel. Manning for outside shelters and welfare of evacuated persons there.
- ✓ Assistance at casusalities reception areas to record details of casusalities.

- ✓ Assistance at communication centers to handle out going and in coming calls and to act as messengers if necessary.
- ✓ Manning of works entrances in liaison with the police to direct emergency vehicles entering the work, to control traffic leaving the works and to turn away or make alternative safe arrangements for visitors, contractors and other traffic arriving at the works.
- ✓ Informing surrounding factories and the public as well as directed by the Site Main Controller.
- ✓ Any special help required.

OTHER ELEMENTS OF DMP:

6.6.3.5 ASSEMBLY POINT

In affected & vulnerable plants, all nonessential workers (who are not assigned any emergency duty) will be evacuated from the area & they shall report to specified Assembly Points. Assembly Point is located near main gate, well away from area of risk and least affected by the down wind direction.

To ensure that workers do not have to approach the affected area to reach the Assembly Point, proper location and numbers have been marked at Assembly Points. Each Assembly Point is manned by a nominated person to record the names and dept. At each Assembly Point, duties of Assembly point In-charge are displayed in brief. Before reaching an Assembly point or subsequently, if it is required to pass through an affected area or due to presence of toxic substances, suitable PPE's including respirators, helmet etc., are issued & made available with workers.

6.6.3.6 EMERGENCY CONTROL CENTER

The Emergency Control Center is the place or room from where the operations to handle the emergency are directed and coordinated. A room near Security Gate has been earmarked /identified as the Emergency Control Room.

Telephone and other facilities required with necessary documents are displayed in ECC for ready reference. ECC has been operated by Site Main Controller, key personnel and Senior Officers of the Fire, Police, Factory Inspectorate, District Authorities and Emergency Services.

The ECC center is equipped with the following facilities.

- ✓ Internal and external telephone including STD facility
- ✓ Telephone directory/ Telephone nos. of mutual aid centers

- ✓ Factory Layout showing evacuation plan, fire fighting arrangements, emergency control centre, location of assembly points, etc.
- ✓ First Aid
- ✓ Gate pass book
- ✓ Muster roll of Workers
- ✓ Work permit book
- ✓ Identicard register
- ✓ Copy of ON SITE/ OFF SITE PLAN
- ✓ Stationeries like- note book, pen, pencils etc
- ✓ SCBA Sets
- ✓ Sand Buckets & Hydrant Network
- ✓ Adequate numbers of PPE's (like dust mask, safety dress, PVC hand gloves, Full Face piece respirator with 3M cartridge, helmet, goggles, etc)

6.6.3.7 FIRE CONTROL ARRANGEMENTS

(FIRE FIGHTING, GAS LEAK CONTROL AND RESCUE OPERATION)

A) Role of Manager (Fire and Safety) / Shift In-Charge (Fire & Safety)

1. Incident Controller directs the fire fighting and Emergency operation. His duties include…
   a. Keep the constant touch with the SMC / Incharge - EHS.
   b. Direct the crew members to the scene of emergency and arrange replenishment of Manpower / equipment / extinguishing media etc.

B) Role of EHS Representative:

1. On being notified about the location of fire/ gas leakage, he immediately proceeds to the help.
2. Decides his line of action in consultation with Incident controller and takes appropriate measures to handle the emergency.
3. Assessing the severity of the incident, immediately report to emergency controller about the gravity of the situation.
4. He assesses the extra requirement required if any, from the neighboring industry.

C) Fire crew members

- ✓ On hearing fire alarm, emergency siren they immediately reports to control room and proceed to the scene of emergency and work under the direction of IC/ Dy. IC.
- ✓ The personal availability at the scene of incident to be made optimize.

D) Emergency Squad Members

- ✓ On hearing Emergency Siren, they immediately reports to site main controller, safety in charge or incident controller.
- ✓ They have combated the emergency situation as per the direction of site main controller, safety in charge or incident controller.
- ✓ They help for safe evacuation.

6.6.3.8 MEDICAL SERVICES

The roles of Medical officers are as follows;

(a) He will report immediately to the SMC/IC.

(b) He will render necessary treatment, at Occupational Health Center.

(c) He will arrange for Hospitalization and Treatment at outside hospitals, if required.

(d) He will mobilize in getting the services of External medical agencies, other Para –medical services etc. and transportation services etc.

(e) He will arrange for extra medical assistance/antidotes, from out, if required.

(f) He will arrange for first-aid trained volunteers for necessary help.

(g) He will liaise with the Government Health Authorities for treatment of the affected persons nearby.

6.6.3.9 ROLE OF SECURITY IN-CHARGE (SECURITY OFFICER)

- ✓ On hearing the emergency siren, he has find out the location of the incident (fire / gas leak / spill / explosion) and inform the location of the same to the key personnel coming to the plant.
- ✓ He will depute the security guards for managing gates and traffic control at the incident site & send remaining guards to the site of incident.
- ✓ He will prevent unauthorized entry in to the site
- ✓ He will render assistance as demanded by the safety in-charge.
- ✓ He will mobilize additional security force for help, if required.
- ✓ He will direct ambulance(s) and emergency vehicle(s) to the scene of incident.
- ✓ He will help evacuate persons within the scene of incident.
- ✓ As directed by the site main controller, he may be required to address the public of surrounding villages for warning / evacuation.

6.6.3.10 ROLE OF MUTUAL-AID MEMBERS

- ✓ Company has Mutual Aid with various nearby factories (UPL, Ganesh Polychem Limited, Alchemie, BILAG Industries Ltd., Nascent Chemical industries Ltd., Micro Inks Ltd., VECC) and GIDC fire station & Aarti Industries Ltd., etc.
- ✓ On receiving the call, they has proceed immediately with fire squad & fire tenders.
- ✓ They will be guided to the place of the incident by the main gate security guard.
- ✓ The fire squad in-charge will report to the safety in-charge of the unit in which the incident has occurred.

6.5.3.11 OTHER ARRANGEMENTS

Other arrangements include external transport (transport centre), heavy vehicles (sarigam), lift/cranes (sarigam), Utilities, generator sets to supply emergency power, environment monitoring equipment, special instruments/equipments, rescue items etc. is made available from sarigam or near by locations, when available resources do not meet the requirements.

STANDARD OPERATING PROCEDURE (FOLLOWED DURING EMERGENCY)

- ✓ As soon as emergency alarm is heard, all essential workers have report to IC or SMC.
- ✓ They have carefully listen to the instructions given by IC or SMC
- ✓ According to the type of emergency/accident, they have got equipped with PPE/Fire fighting equipment and devices.
- ✓ The runner among the workers has informed SMC/IC and key personnel if they are not at site.
- ✓ The messenger amongst the workers has deliver messages to nearby units as per the instructions of SMC/IC.
- ✓ The in-charge of medical arrangements has prepared first-aid and other required facilities for the injured.
- ✓ The other essential workers try to control the emergency as per the instructions given to IC.
- ✓ IC would keep SMC informed about the status of control measures being taken at the site and ask for other requirements e.g. Mutual aid, equipment etc., if he find necessary.
- ✓ SMC would co-ordinate with outside agencies regarding control measures being taken, need for external help, evacuation, medical treatment etc.

6.6.4 COMMMUNICATION SYSTEM

Communication System is a Crucial Factor while handling emergency. Company has quick & effective Communication System through which, any situation, which can lead to emergency, can be informed or known to…

i. All persons working inside the plant.

ii. Key Personnel outside during normal working hours & during off-duty hours.

iii. Outside emergency services, Statutory and Local Authorities and

- ✓ Neighboring facilities and public leaving in vicinity.

Each and every section, Plant & Department of the Factory is connected by internal telephones with SMC, Supervisor or IC's. External Phone at Office and Residence is also being made available with Key Personnel and top executive of the factory. The Communication System has begins with raising the alarm declaring the emergency, Telephone messages and Procedure to communicate the emergency to other persons & General Public.

List of external telephone nos. of important agencies like: District Collector & Magistrate, Police Commissioner, Director of Industrial Safety & Health, GIDC Fire Brigade, Vapi Emergency Control Centre, Vapi Industries Association, L.G. Haria Rotary Hospital, Janseva Vapi, Surya Vapi, Pant Eye Hospital - Vapi, Usha - Vapi, etc. is made available to be used in case of an emergency.

6.6.4.1 RAISING THE ALARM

As soon as incident takes place inside the factory and is noticed by someone, the first step has to raise the nearest manual emergency bell to alert the nearby people. Next, he/she has informs the security persons to raise the emergency siren.

The siren system is available to warn neighbouring factories about major toxic release. Sirens are tested daily to check its readiness. UPS power is available to siren incase of power failure. The security personnel sound the siren.

The alarm sound informs the I.C and the S.M.C that an emergency has been created and emergency organization is to be activated. The I.C. rush to the site and have takes charge of the scene.

6.6.4.2 DECLARING THE MAJOR EMERGENCY

Major emergency is declared after sufficient and thorough check because the declaration of major emergency puts many agencies on action and it may disturb the running system, which may be Costly at, time or its Consequence may be Serious. Therefore, major emergency must not

be decided on whims or immature judgment or without proper thought. Looking to all the above, we have nominated the persons (SMC: Director & Production Manager) who can declare the emergency; we have selected them on the basis of their knowledge & experience. These persons are technically qualified and experienced. The decision about major emergency is taken as early as possible and without wasting time so that control action can be started immediately.

6.6.4.3 TELEPHONE MESSAGES

A Telephone operator who is precise, sharp, attentive and quick in receiving and noting the message and subsequently effective in further Communication, has been appointed. A form to record emergency telephone calls is available with telephone operator or Person available in Emergency Control Center, who records such calls during emergency. Telephonic messages are given out by the telephone operator to Site main Controller and key personnel as per the instructions of the Incident Controller. Telephonic messages are also given to authorities and external agencies to describe the type of emergency. All details of emergency are collected/delivered according to this format, available with the telephone operator.

6.6.4.4 COMMUNICATION OF EMERGENCY & STATUTORY INFORMATION

COMMUNICATION OF EMERGENCY

An effective system to communicate emergency has been made to communicate about the emergency situation as mentioned below:

- Inside the factory i.e. workers including key personnel and essential workers, on duty & inside during normal working hours.
- To key personnel and essential workers not on duty and outside during normal working hours.
- To the outside emergency services and the Government authorities.
- To the neighboring factory & the General Public in the vicinity.

STATUTORY INFORMATION

a) Information to Workers: Set of Statutory information regarding types of hazards and their prevention and control as directed in the Factories Act is prepared by the unit. This information is printed in the local language and given in the form of booklet to all workers including contract workers.

b) To the outside emergency services and District Emergency Authority

Statutory information in the form of booklet is given to outside emergency services and authorities, if required.

c) To neighboring firms, general public & Factory Inspectorate

Statutory information in the form of booklet is given to neighbouring units and the general public of the villages in the vicinity of the unit, if required.

6.7 OFF SITE EMERGENCY PLAN

NEED OF THE EMERGENCY PLAN:

A major accident is a sudden, unexpected, unplanned event, resulting from uncontrolled developments during an industrial activity, which cause or has potential to cause:

Serious adverse effects immediate or delayed (death, injuries, poisoning or hospitalization) to a number of people inside the installation and / or to persons outside the establishment.

ii) Significant damage to crops, plants or animals or significant contamination of land, water or air OR

iii) An emergency intervention outside the establishment (e.g. Evacuation of local pollution, stopping of local traffic) OR

iv) Significant changes in the process operating conditions, such as stoppage or suspension of normal work in the concerned plant for a significant period of time OR

v) Any combination of above effects.

MAIN PURPOSES OF THE OFF-SITE EMERGENCY PLAN ARE:

- ✓ To provide the local/district authorities, police, fire brigade, doctors, surrounding Industries and the public, the basic information of risk and environmental impact assessment
- ✓ To appraise them of the consequences and the protection/prevention measures and control plans and to seek their help to communicate with the public in case of a major emergency.
- ✓ To assist the District Authorities to: preparing the Off-site emergency (contingent) plan for the district or particular at area and to organize rehearsals from time to time end in corrective actions based on the lessons learnt.

An in-charge of the on-site emergency plan or the Site Main Controller will keep liaison, for this purpose, with the District Authorities.

ROLE OF THE FACTORY MANAGEMENT (Occupier & Technical Experts)

The on – site and off – site plans should dovetail, so that the emergency services are summoned at the appropriate time and are provided with accurate information and a correct assessment of the situation. The responsibility for this will be with the Site Main Controller.

The Site Main Controller will provide a copy of this on- site and off- site emergency plan to the District Authorities, the Factory Inspectorate and the Emergency services, so that from

information from the various annexure, such authorities will make their emergency preparedness to formulate and execute the district / area off- site emergency plan. On their advice, necessary modifications may also be made to make the plan more perfect.

ROLE OF THE EMERGENCY CO-ORDINATION OFFICER (ECO)

The various emergency services will be coordinated by an emergency coordinating officer (ECO) who is likely to be a senior police officer but, depending on the circumstances, could be a senior fire officer. The ECO will liaise closely with the site main controller. Again depending on local arrangements, for very severe incidents with major or prolonged off-site consequences, the external control may pass to a senior local authority administrator or even an administrator appointed by the central or state government.

The Emergency Control Centre of the factory or/and any other control centre may be utilized by the ECO to keep liaison with the Site Main Controller.

ROLE OF THE LOCAL AUTHORITY

Generally, the duty to prepare the off-site plan lies with the local authorities. We have appointed an emergency planning officer (EPO) to carry out this duty as part of the EPO's role preparing for a whole range of different emergencies within the local authority area. The EPO will need to liaise with the works to obtain the information to provide the basis for the plan. This liaison will need to be maintained to ensure that the plan is continually kept up to date.

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

ROLE OF THE FIRE AUTHORITIES

The control of a fire is normally the responsibility of the senior fire brigade officer, who would take over the handling of the fire from the incident controller on arrival of the site. The Sr. Fire Brigade Officer may also have a similar responsibility for other events, such as explosions and toxic releases. Role of Fire Authorities have been defined in On-site Emergency Plan.

ROLE OF THE POLICE AND EVACUATION AUTHORITIES

The overall control of an emergency is normally assumed by the police, with a senior officer designated as emergency coordinating officer. Formal duties of the police during an emergency include protecting life and property and controlling traffic movements.

An early decision will be required in many cause on the advice to be given to people living " within range " of the accident in particular whether they should be evacuated or told to go indoors. In the later case, the decision can regularly be reviewed in the event of an escalation of the incident. Consideration of evacuation has been prepared.

ROLE OF THE HEALTH AUTHORITIES

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

POLLUTION CONTROL BOARD

- ✓ Project likely areas to be polluted.
- ✓ Carry out pollution assessment at suspected locations including soil, river and air assessment
- ✓ Ensure controlling of long-term pollution damage
- ✓ Identify unidentified substances, chemical releases, if any
- ✓ Transport Fleet Owners Including State Transport
- ✓ Act on the direction of DEA or Police
- ✓ Ascertain the extent of transport required with pick-points, routes and destinations to transport people
- ✓ Promptly arrange for dispatch of vehicles with sufficient fuel for evacuation purposes
- ✓ Arrange vehicles to transport water and other provision to camps set up

TRANSPORTERS OF HAZARDOUS CHEMICAL

- ✓ Possess up-to-date copy of Off-site Emergency Plan
- ✓ Communicate promptly, any foreseeable disaster during transportation to the DEA, Police, Fire Service and Inspector of Factories in-charge of the District
- ✓ Communicate new assignments, newly added routes or other changes that may require inclusion or suitable modification in the off-site plan to the DEA (Maintenance Officer) of the Plan.

ELECTRICITY BOARD

- ✓ Arrange for uninterrupted power supply to the plant, as required
- ✓ Arrange for lighting; at temporary medical camps etc
- ✓ Arrange for switching off power supply on request from District Authorities
- ✓ Take care of electrical equipment within the damaged zone

TELECOMMUNICATION DEPARTMENT

- ✓ Ensure working of communication lines to enable effective communication between various responder agencies

CIVIL DEFENSE

- ✓ Co-ordinate with Police authorities
- ✓ Extend help in evacuation
- ✓ Arrange for round the clock security arrangements in the affected and evacuation areas
- ✓ Safeguard the properties and belongings of evacuees

NATIONAL DISASTER RESPONSE FORCE

- ✓ Carry out tasks for disaster mitigation as required

LOCAL GOVERNMENT BODIES

- ✓ Mobilize necessary resources in emergency mitigation
- ✓ Provide for community halls, town halls for evacuees

ROLE OF THE '' MUTUAL AID '' AGENCIES

- ✓ Various type of mutual aid available from the surrounding factories and other agencies will also be utilized as per need, as a part of the onsite and off- site emergency plan.

PUBLIC WORKS DEPARTMENT

- ✓ Ensure adequate water supply for fire- fighting.
- ✓ Arrange for drinking water for evacuated persons at rallying posts, parking yards and evacuation centers. Arrange water for cattle.

WATER SUPPLY BOARD

- ✓ Arrange for supply of water to evacuees and all others involved in emergency control operations.

CIVIL SUPPLIES DEPARTMENT

- ✓ Arrangement to provide food and clothing as necessary, to the evacuees and all others involved in emergency controlling operations.

REGIONAL TRANSPORT AUTHORITY

- ✓ To investigate into the cause of road accident involving hazardous goods carrier and take necessary action

ROLE OF THE FACTORY INSPECTORATE

In the event of an accident the factory inspector will assist the district emergency authority for information and help in getting mutual aid from surrounding factories.

In the after math, factory inspectors will ensure that the affected areas are rehabilitated safety. In addition, they may require items of plant and equipment essential for any subsequent investigation to the impounded for expert analysis and may also want to interview witnesses as soon as practicable.

6.8 OCCUPATIONAL HEALTH & SAFETY

M/s. Aarti Industries Ltd. (Organic Division), Vapi has prepared the Occupational Health Surveillance Programme for its existing facility. The same programme shall be updated (if required) after the expansion, to cover new plants or facilities. The details of the existing programme are described in the following sections.

6.8.1 OCCUPATIONAL HEALTH

Occupational health needs attention both during construction & erection and operation & maintenance phases. However, the problem varies both in magnitude and variety in the above phases.

6.8.2 HOSPITAL FACILITIES

Company has made formal agreements with nearby hospital having facilities to attend fire and toxic effect cases for attending the affected persons in the emergency arising out of accidents, if any.

One ambulance is available round the clock in the factory to transport the victim/injured person from the factory to the nearby hospital. Ambulance is equipped with Stretcher, First aid box, Oxygen Cylinder, Mask, etc.

6.8.3 FACTORY MEDICAL OFFICER/OHC

A qualified doctor has been appointed as FMO on retainer ship basis. Apart from him, Paramedical Staff has also been employed. Adequate no. of employees is trained in First aid.

6.8.4 PLAN FOR PERIODIC MEDICAL CHECKUP

Periodic Medical Examination is being conducted as per the following schedule;

Workers employed are examined by a Qualified Medical Practitioner/ Factory Medical Officer, in the following manner:

(a) Before employment, to ascertain physical fitness of the person;

(b) During employment, once in a period of 6 months, to ascertain physical fitness of the person to do the particular job;

A medical examination is then documented in Form no.: 32 & 33 and maintained.

6.8.5 DETAILS OF OCCUPATIONAL HEALTH IMPACTS AND SAFETY HAZARDS

Occupational Hazards

- ✓ Exposure to Toxic Chemicals.
- ✓ Exposure to Flammable Solvents.
- ✓ Fire due to Static charge generation
- ✓ Slip/trip, fall, electric shock, etc.
- ✓ Spillage/leakage,
- ✓ Overflow,
- ✓ Exposure to Corrosive Chemicals.

Occupational Health Impacts

- ✓ Toxication, Irritation,
- ✓ Fall Injury, Electrocution,
- ✓ Body Injury, Burns, Skin sensitization,
- ✓ Severe irritation to eyes & skin,
- ✓ Respiratory disorder,
- ✓ Damage to nearby equipments,
- ✓ Fatality, etc

Mitigation measures/Safety Measures proposed to avoid the human health hazards are mentioned under section 6.5. Personal protective equipments like Helmet, Safety shoes/ Gumboots Hand gloves, Gas Mask / Nose Mask, PVC apron, SCBA Set, PVC pressure suit, Bobble hood are also provided to the required personnel.

6.8.6 MEASURES ADOPTED BY COMPANY TO KEEP AIR BORNE CONCENTRATION OF HAZARDOUS CHEMICALS BELOW PEL:

- ✓ Each workplace is evaluated. Air-borne concentration of toxic chemicals is measured and records are kept. It has been found that, the exposure levels air borne concentration of hazardous chemicals are below PEL.
- ✓ For purpose of measuring worker exposure across a single shift, a reasonably accurate exposure measuring device (Alarms will be configured at TLV value) has been placed within the worker's breathing zone, and have it operates for the full shift. Company studies the exposure data when the plant is operative.
- ✓ To avoid mixing of hazardous chemicals in air; leak surveys are conducted every 15 days. LDR (Leak Detection and Rectification) program has been designed for early detection of leakages of hazardous chemicals and to rectify leakages.
- ✓ Flange/Ferrule joints, pipelines, transfer lines, etc. are checked on regular basis for maintenance purpose.

- ✓ Regular maintenance checks up are carried out for pumps, equipment, instruments handling toxic and corrosive chemicals.
- ✓ PPEs like Air mask, Berating canisters, SCBA sets and on-line breathing apparatus are kept available at the places where there is possibility of presence of toxic chemicals.
- ✓ The ambient monitoring devices (portable) with alarm for leakage of hazardous chemicals are available.
- ✓ Third party environment monitoring is in practice.
- ✓ Explosive meter and Oxygen meter are also available.
- ✓ Noise meter is also available.
- ✓ There is volume level indication with alarm and trips for bulk toxic storages.
- ✓ The interlocks, alarms and trip systems are tested on quarterly basis.

6.8.7 WORKZONE MONITORING ARRANGEMENTS FOR HAZARDOUS CHEMICALS

Work zone monitoring report is carried out by unit every month. Records are kept in Form No. 37 as per Gujarat Factories Rules is attached as annexure-XVIII. Location for samplings shall be identified. Samples are analyzed for Air borne concentration of hazardous chemicals in ppm. Following information is incorporated in the format for maintaining records of work zone monitoring:

- Location/Operation monitored
- Identified contaminant
- Sampling instrument used
- Number of Samples
- Range of contaminant concentration as measured in sample
- Average concentration
- TWA concentration of contaminant (As given in Second Schedule of Factories Act)
- Reference method used for analysis
- Number of workers exposed at the location being monitored
- Signature of the person taking samples
- Other relevant details

6.8.8 HEALTH STATUS EVALUATION OF WORKERS (EXPOSURE SPECIFIC)

- ✓ Management has device a plan to check and evaluate the exposure specific health status evaluation of workers.
- ✓ Workers are checked for physical fitness with special reference to the possible health hazards likely to be present, where he/she is being expected to work before being employed for that purpose. Complete medical examinations including PFT, Urine and Blood examination, Liver Function tests, chest X-ray, Audiometry, Spirometry Vision testing, ECG, etc. is carried out. However, the parameters and frequency of such examinations are decided in consultation with Factory Medical Officer and Industrial Hygienists and the details of the same are maintained in record.
- ✓ While in work also, all the workers are periodically examined for the health with specific reference to the hazards which they are likely to be exposed to, during work. Again, the parameters and frequency of such examination are decided in consultation with Factory Medical Officer and Industrial Hygienists. Monthly and yearly report of the health status of workers with special reference to Occupational Health and Safety is maintained.
- ✓ Annual report of heath status of workers is attached as Annexure – XX-B.

6.8.9 ACTION PLAN FOR SAFE HANDLING & SAFETY SYSTEM

ACTION PLAN FOR SAFE HANDLING OF HAZARDOUS CHEMICALS:

- ✓ Manual Handling is eliminated or replaced by fork lifts, cranes, hoists, Pallet trucks, etc.
- ✓ Appropriate PPEs are used.
- ✓ Lifting tools & tackles are used, wherever required.
- ✓ Do’s and Don’ts for strengthening the safety system is being practiced.
- ✓ SOPs, work instructions are followed.
- ✓ Training is being provided to relevant staff, operators, workers for the risk associated with handling of hazardous chemicals, ways to overcome those risk, etc.

ACTION PLAN FOR SAFETY SYSTEM:

Following action plan for Safety System has been implemented:

SAFETY ORGANIZATION/COMMITTEE

Qualified and experienced safety officers are appointed together constitute a safety committee and meetings are held at least once in a quarter. Safety Saturday meeting is also organized sometimes to share the problem or suggestions, if any. The responsibilities of the committee

include identification of the hazardous conditions and unsafe acts of workers and advice on corrective actions, conduct safety audit, organize training programs and provide professional expert advice on various issues related to occupational safety and health.

Safety organization is responsible to ensure compliance of Safety Rules/ Statutory Provisions. Safety Organization organizes Safety contests like Safety Slogan, Quiz, Safety Poster, safety Speech by individual, Safety Exhibition, etc. to educate the staff, workers, operators on safety aspects. Employees, contractor employees and their representatives are properly informed of their rights and process hazard analyses.

SAFETY CIRCLE

In order to fully develop the capabilities of the employees in identification of hazardous processes and improving safety and health, safety circle is also constituted. The circle would consist of about three to four employees. The circle normally meets for about an hour every week.

SAFETY TRAINING

Company has made a policy of identifying the Safety Training Needs at different positions/levels. Safety trainings are arranged by Safety department in consultation with the plant/area in-charge and the Occupier and sometimes external faculty is also deputed for the same. One day training on safety induction is arranged for each category of new employee.

In addition to regular employees, limited contract labours are also allowed to attend safety training. To create safety awareness, safety films are shown to workers and leaflets are distributed. Training programmes cover plant safety rules and hazard communication, safety aspects, BBS, etc. Bulletins on health awareness are circulated through mails. Visits to safety institutes / organizations are also arranged. The man days and man-hours used in safety training are recorded. Safety training calendar is devised for one year. It is also ensured that the given training works in the proper safe direction.

6.8.10 PLAN AND FUND ALLOCATION TO ENSURE THE OCCUPATIONAL HEALTH & SAFETY OF ALL CONTRACT AND CASUAL WORKERS

Company has prepared Safety Plan and implemented for the existing project activity. Also, management has allotted enough funds to ensure the occupational health &safety of all contract & causal workers and also allotted a special budget for employee appreciation for proactive and rescue operations .The same shall be followed for the expansion facilities also. Details of the same are as follows:

- ✓ To allocate sufficient resources (like PPEs) to maintain safe and healthy conditions of work;
- ✓ To take steps to ensure that all known safety factors are taken into account in the design, construction, operation and maintenance of plants, machinery and equipment;
- ✓ Daily briefing/ safety instructions are given by security at main gate,
- ✓ Daily checking of helmet and shoes is done by security at gate,
- ✓ Tool Box Talk by plant personnel before start up of work, like informing employees about materials, equipment or processes used in their work which are known to be potentially hazardous to health or safety;
- ✓ To keep all operations and methods of work under regular review for making necessary changes from the point of view of safety in the light of experience and up to date knowledge;
- ✓ To provide appropriate facilities for first aid and prompt treatment of injuries and illness at work;
- ✓ To provide appropriate instruction, training, retraining and supervision to employees in health and safety, first aid and to ensure that adequate publicity is given to these matters;
- ✓ To ensure proper implementation of fire prevention methods and an appropriate fire fighting service together with training facilities for personnel involved in this service;
- ✓ To organize collection, analysis and presentation of data on accident, sickness and incident involving people injury or injury to health with a view to take corrective, remedial and preventive action;
- ✓ To organize safety programs, celebrating safety week, safety competitions during safety week, etc.;
- ✓ To promote through the established machinery, joint consultation in health and safety matters to ensure effective participation by all employees;
- ✓ To publish/notify regulations, instructions and notices in the common language of employees;
- ✓ To prepare separate safety rules for each type of occupation/processes involved in a plant; and
- ✓ To ensure regular safety inspection by a competent person at suitable intervals of all buildings, equipments, work places and operations.

6.8.11 ARRANGEMENTS FOR ENSURING HEALTH AND SAFETY OF WORKERS ENGAGED IN HANDLING OF TOXIC MATERIALS

As discussed in previous clauses, company has made various plans & arrangements to ensure health and safety of workers engaged in handling of toxic materials. Summary of the same is as follows:

- ✓ Each workplace is being evaluated for the existing work conditions.
- ✓ Unsafe Act & Unsafe Practices are identified.
- ✓ Unsafe equipments, unsafe areas, etc., are identified.
- ✓ First Aid Injuries are minimized to zero
- ✓ Environmental Incidents & Chemical exposures are minimized.
- ✓ Area is checked for proper Ventilation and Illumination.
- ✓ Air-borne concentration of toxic chemicals is measured, mitigation measures are followed to keep them under PEL and the same is documented.
- ✓ Periodic Medical checkup & Health evaluation is being done.
- ✓ Adequate funds are allotted for the Safety Management System.

6.8.12 MOCK DRILLS

To evaluate the effectiveness of emergency preparedness and to spread the awareness among employees mock drill is carried out at the interval of every three months.

After completion of the mock drill, summary report is made and corrections are made if any weakness has been observed.

FREQUENCY OF MOCK DRILLS:

- ✓ On-site emergency : Once every 6 months
- ✓ Off-site emergency : Once every year