CHAPTER – VII

ADDITIONAL STUDIES, RISK ASSESSMENT & DISASTER MANAGEMENT REPORT

The proposed project for the manufacturing of Synthetic Organic chemicals (Bulk Drugs & Intermediates) by **VENSAR LABORATORIES PVT.LTD.**is covered under **Category- A** of the EIA Notification – 2006.Public Consultation was conducted for this project on 29.05.2009

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
- Occupational Health
- Disaster management plan

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&CC for Environment Clearance (EC).

The study has been carried out with a view to comply all TOR points

RISK ASSESSMENT & DISASTER MANAGEMENT

RISK ASSESSMENT

7.1. INTRODUCTION TO RISK ASSESSMENT

VENSAR LABORATORIES PVT.LTD.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.

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.

It provides basis for**:**

- The type and nature of its on-site and off-site emergency plan
- The types of safety measures required.

7.2. IDENTIFICATION OF HAZARDS

- Hazard identification is carried out to ascertain the controls required and available in order to mitigate the risk of exposure to the hazards. This would substantially help in overcoming costly errors and prolonged delays that may be caused due to the design changes that may be required on a later date.
- Hazard assessment is carried out at the equipment design stage and the control / mitigation measures are put in place overcome them to avoid costly errors at a later stage.
- Hazard assessment in our plant is carried out examining the, material storage, type of operations, locations to find out the facilities in place to overcome the risks of exposure to the hazards.

- After a critical analysis of the chemicals used, stored, defined safe operating procedures and the different manufacturing processes, the following table lists the safety measures / installations in place and mitigation measures to overcome the hazards.

Following are the Hazards identified in project activities**:**

- Fire Hazards
- Spillage of chemicals
- Explosion Hazards
- Toxic gas release
- Noise

TABLE: 7.1.AREA WISE IDENTIFIED HAZARDS, PRECAUTIONS TAKEN WITH MITIGATION MEASURES.

S.NO	AREA	IDENTIFIED HAZARD	SEVERITY & NO. OF PERSONS EXPOSED	PRECAUTIONS TAKEN	MITIGATION MEASURES
1]	RM Storage area	Spillage of chemicals	Low to medium 4 persons	1. Approved layout as per legal / GM requirements. 2. Flame proof electrical fittings installed 3. Chemicals stored in safe Containers with secondary containment to prevent spillages. 4. Storage quantity is limited 5. Storage area is well ventilated by a forced air ventilation system. 6. Material accessed only by authorized personnel using mechanized systems 7. Double door entry to ensure a clean atmosphere. 8. Body provided showers for decontamination.	1. Area is cordoned off. 2. Emergency control center is Informed. 3. Information is given to the declarer of emergency on the scale of leakage. 4. Emergency Response teams are kept on alert for swift response. 5. All hot works being carried out in the surrounding areas are stopped 6. Personnel working in the area are evacuated.

S.NO	AREA	IDENTIFIED HAZARD	SEVERITY & NO. OF PERSONS EXPOSED	PRECAUTIONS TAKEN	MITIGATION MEASURES
				9. Personnel are provided with full body protection suits and nose masks to prevent exposure to chemicals. 10.Fire hydrant system with hydrant points with hose reels and nozzles installed to mitigate fire hazards 11.Fire extinguishers deployed adequately 12. Fully fledged medical center /arrangements 13. Periodical occupational health checks to personnel working in the area to assess health effects, if any.	7. Spilled powders are collected in vacuum cleaners. 8. The spillage is cleared and the area is made fit work

S.NO	AREA	IDENTIFIED HAZARD	SEVERITY & NO. OF PERSONS EXPOSED	PRECAUTIONS TAKEN	MITIGATION MEASURES
2]	Solvent drums Storage area	Fire & Explosion	Medium to Low 2 persons	1. Storage facility located in isolated area 2. Natural ventilation for supply of fresh air 3. No electrical fittings in the area to prevent any fire hazard. 4. No electrical gadgets or items capable of generating static electric charges permitted inside the area. 5. Personnel are trained about Do's & Don'ts during emergency. authorized personnel on 6. No heat sources are permitted near the facility. 7. Hot work is controlled through a work permit system 8. Room kept under lock and key with access to authorized personnel only.	1. Area is cordoned off. 2. Hot work being carried out in the vicinity is stopped to prevent accidental spread of fire. 3. Personnel working in the area are evacuated 4. Emergency control center is informed 5. Information is given to the declarer of emergency on the scale of leakage. 6. Emergency Response teams are kept on alert for swift response. 7. The spillage is cleared and the area is made fit work

S.NO	AREA	IDENTIFIED HAZARD	SEVERITY & NO. OF PERSONS EXPOSED	PRECAUTIONS TAKEN	MITIGATION MEASURES
				9. Storage quantity is limited and material is handled by trained and authorized personnel. 10. Mechanical foam type fire is provided to mitigate fires 11. Fire hydrant system with hose reels are provided in the vicinity	

S.NO	AREA	IDENTIFIED HAZARD	SEVERITY & NO. OF PERSONS EXPOSED	PRECAUTIONS TAKEN	MITIGATION MEASURES
3]	Production Block	Spillages / Fire /Explosion	Low to medium 8 persons	1.Flame proof electrical fittings installed 2. Freight lift installed for movement of material 3. Material stored at production blocks in safe containers for batch charging with secondary containment to prevent spillages. 4. Earthing and bonding carried out for all reactor vessels and pipelines 5.Nitrogen lines are provided to reaction vessel to create inert atmosphere inside the reactor to avoid fire and explosion 6. Work permit system implemented for hazard assessment in case of any hot work / height work . 7. Work permit system implemented for hazard assessment in case of any hot work / height work.	1. Area is cordoned off. 2. Power supply is cut off to the area to prevent accidental fire. 3. All hot work carried out in the vicinity is stopped. 4. Emergency control center is informed. 5. Information is given to the declarer of emergency on the scale of Leakage / Accident 6. Emergency Response teams are kept on alert for swift response. 7. Personnel working in the area are evacuated. .

S.NO	AREA	IDENTIFIED HAZARD	SEVERITY & NO. OF PERSONS EXPOSED	PRECAUTIONS TAKEN	MITIGATION MEASURES
				8. Manufacturing area is ventilated by a forced air ventilation system. 9. Fire hydrant system with hydrant points with hose reels and nozzles installed to mitigate fire hazards 10. Fire extinguishers deployed adequately 11. Emergency exit glass door with glass breaking hammer provided for safe escape in case of any emergencies. 12. Eye wash fountain / Body shower provided for decontamination.	

S.NO	AREA	IDENTIFIED HAZARD	SEVERITY & NO. OF PERSONS EXPOSED	PRECAUTIONS TAKEN	MITIGATION MEASURES
4]	Boiler House	Fire / Explosion	Low to medium Approx 2	1. All requirements specified under Boiler Act and Boiler licensed is adhered to. 2. All electrical fittings are of flame proof type. 3. Entry restricted only to trained and authorized personnel to work in the area. 4. Fire extinguishers are positioned at different locations in case of any emergencies. 5. No material storage is permitted in the area.	1. Shutting down the plant, declaring the emergency. 2. Electrical supply is isolated. 3. Type of emergency is informed to the emergency declarer/ central authority. 4. Emergency response teams are kept on alert for swift action. 5. Movement of personnel and vehicles are prohibited.

S.NO	AREA	IDENTIFIED HAZARD	SEVERITY & NO. OF PERSONS EXPOSED	PRECAUTIONS TAKEN	MITIGATION MEASURES
				6. Area is well ventilated and illuminated for safe working. 7. 24 x 7 manning of the area for monitoring the operation. 8. All maintenance /repair works are carried out after issuing work permits and under constant supervision of experts. 9. Periodical cleaning of soot in furnace to prevent formation of explosive mixtures. 10. Monitoring the boiler operational parameters and periodical cleaning 11. Checking of boiler internals to prevent accidents. 12. Signages are displayed to inform personnel about the hazards present in the area	6. Area is well ventilated and illuminated for safe working. 7. 24 x 7 manning of the area for monitoring the operation.

S.NO	AREA	IDENTIFIED HAZARD	SEVERITY & NO. OF PERSONS EXPOSED	PRECAUTIONS TAKEN	MITIGATION MEASURES
5]	Diesel Generator	Noise & Fire	Low to medium 1-2 persons	1. Noise abatement thru' modular acoustic paneling of D.G sets 2. Secondary containment to prevent Diesel leakage from day tanks. 3. Adequate no. of fire extinguishers is kept to handle emergency . 4. Entry access to the area controlled	1. Information is given to Emergency control center. 2. Power supply is cut off to the storage area to prevent accidental fire. 3. All hot work around the area is stopped and the area is cordoned off . 4. The concerned maintenance personnel carry out repairs to mitigate the leakages. 5. Emergency Response Team is kept on alert for swift response. 6. Periodical occupational health checks to personnel working in the area to assess exposure to noise.

S.NO	AREA	IDENTIFIED HAZARD	SEVERITY & NO. OF PERSONS EXPOSED	PRECAUTIONS TAKEN	MITIGATION MEASURES
6]	Electrical sub stations	Electric shock / fire	Low to medium 2 persons	1. Layout confirm to legal requirements specified under Indian Electrical Rules. 2. Entry restricted to licensed and authorized personnel only. 3. Earthing provided for leakage of stray currents. 4. Electronic mimic panels installed for fault indication at the entry of the sub-station. 5. Insulating rubber mats confirming to IS 15652:2006 provided in front of all electrical switchgear. 6. Periodical inspection and maintenance carried out to ensure good health of the equipment. 7. CO2 / DCP fire extinguishers deployed to handle emergency fires	1. Information is given to Emergency control center. 2. Power supply is cut off from incoming source. 3. Electricity supply company is alerted for cut off power supply in case of major risks 4. All hot work around the area is stopped and the area is cordoned off. 5. The concerned maintenance personnel carry out repairs to restore normalcy. 6. Emergency Response Team is kept on alert for swift response

S.NO	AREA	IDENTIFIED HAZARD	SEVERITY & NO. OF PERSONS EXPOSED	PRECAUTIONS TAKEN	MITIGATION MEASURES
7]	Hazardous waste storage room	Fire	1Person	1. Storage shed in an isolated location. 2. Conditions specified in hazardous waste authorization issued by SPCB implemented. 3. Compatible wastes are stored in separate enclosures 4. Layout provides adequate ventilation and illumination 5. Secondary containment provided to prevent leakages / spillages 6. Storage quantity is limited. 7. Periodical disposal of accumulated waste to authorized landfills. 8. Flame proof electrical fittings installed to prevent fire / explosion hazards	1. Information is given to Emergency control center. 2. Power supply is cut off from incoming source. 3. All hot work around the area is stopped and the area is cordoned off. 4. The concerned maintenance personnel carry out repairs to restore normalcy

S.NO	AREA	IDENTIFIED HAZARD	SEVERITY & NO. OF PERSONS EXPOSED	PRECAUTIONS TAKEN	MITIGATION MEASURES
				9. Eye wash / body shower is provided for decontamination in case of spillage on body parts. 10. PPE box is equipped with gum boots, splash proof safety goggles, aprons for use during handling of chemicals. 11. Access to the area restricted to authorize personnel only. 12. Fire hydrant point with hose reels provided for fire mitigation	5. Emergency Response Team is kept on alert for swift response. 6. Support of external agencies is sought in case situation poses major risks and is not controllable by in-house infrastructure

TABLE: 7.2.RAW MATERIALS INVENTORY

[RAW MATERIALS - MAXIMUM INVENTORY, MODE OF STORAGE, HAZARDS, HANDLING PRECAUTIONS & HAZARD MITIGATION PLAN [EMERGENCY PREPAREDNESS]

S.NO	NAME OF THE CHEMICAL	PHYSICAL STATE	MODE OF STORAGE	MAX. INVENTORY IN TONS.	NATURE OF HAZARD
1	9H-Carbazol-4-ol	Solid	Fibre Drums	1.500	Harmful
2	(Chloromethyl) oxirane	Liquid	HDPE Drums	2.000	Corrosive
3	Sodium sulfate	Solid	Fibre Drums	0.200	---
4	(2-methoxyphenoxy)ethylamine	Liquid	HDPE Drums	1.000	Flammable
5	Sodium chloride	Solid	PP Bags	0.200	Irritant
6	5-Cyanophthalide	Solid	Fibre Drums	1.000	Toxic
7	4-fluorophenylmagnesium chloride	Liquid	HDPE Drums	0.500	Flammable
8	(Dimethylamino)propyl magnesium chloride	Liquid	HDPE Drums	0.500	Flammable
9	Hydrochloric acid	Liquid	HDPE Carboys	2.000	Corrosive
10	Hydrogen bromide	Liquid	HDPE Carboys	0.250	Corrosive
11	5-chloro-2-benzoylpyrrole	Liquid	HDPE Drums	0.500	Corrosive
12	Methyl-gama-methoxy butanonate	Liquid	HDPE Drums	0.500	Flammable
13	Sodium hydroxide	Solid	PP Bags	0.500	Corrosive
14	Tromethamine	Solid	Fibre Drums	0.500	Corrosive

S.NO	NAME OF THE CHEMICAL	PHYSICAL STATE	MODE OF STORAGE	MAX. INVENTORY IN TONS.	NATURE OF HAZARD
15	2-(1-carboxy-ethylamino)-4-phenyl-butyric acid ethylester	Solid	Fibre Drums	1.000	Corrosive
16	(cis,endo)-octahydro-cyclopenta[b]pyrrole-2(s)-carboxylic acid hydrochloride	Solid	Fibre Drums	1.000	Corrosive
17	Triethylamine	Liquid	HDPE Drums	1.500	Flammable
18	5% Pd/Activated carbon	Solid	Fibre Drums	0.020	Flammable
19	4-(3,4-dichlorophenyl)-3,4-dihydro-N-methyl-1(2H)-naphthalenimine	Solid	Fibre Drums	1.000	Harmful
2	Sodium boro hydride	Solid	MS Drums	0.100	Flammable
21	D(-) Mandelic acid	Solid	Fibre Drums	0.300	Corrosive
22	Dimethylnaphthalen -1-yl amine	Liquid	HDPE Drums	0.500	Flammable
23	1-Chloro-6,6-dimethylhept-2-en-4-yne	Liquid	HDPE Drums	1.000	Flammable
24	Potassium carbonate	Solid	PP Bags	0.500	Irritant
25	Dimethylamine .hydrochloride	Solid	Fibre Drums	2.000	Corrosive
26	Formaldhyde	Liquid	HDPE Drums	1.500	Corrosive
27	Magnesium	Solid	Fibre Drums	0.250	Combustible
28	m-Bromoanisole	Liquid	HDPE Drums	0.500	Flammable
29	2-Dimethylaminomethyl-cyclohexanone	Solid	Fibre Drums	1.000	Flammable

SOLVENTS

S.NO	NAME OF THE SOLVENT	PHYSICAL STATE	MODE OF STORAGE	MAX. INVENTORY IN TONS.	NATURE OF HAZARD	NFPA RATING
1	Methanol	Liquid	MS Tank	15.000	Flammable	H: 1 F: 3 R: 0
2	Ethyl acetate	Liquid	HDPE Drums	4.000	Flammable	H: 1 F: 3 R: 0
3	THF	Liquid	MS Drums	4.000	Flammable	H: 2 F: 3 R: 0
4	Acetone	Liquid	MS Tank	15.000	Flammable	H: 1 F: 3 R: 0
5	Ethanol	Liquid	HDPE Drums	3.000	Flammable	H: 2 F: 3 R: 1
6	IPA	Liquid	HDPE Drums	4.000	Flammable	H: 1 F: 3 R: 0
7	Toluene	Liquid	MS Tank	15.000	Flammable	H: 2 F: 3 R: 0

TABLE: 7.3.LIST OF FINISHED PRODUCTS
LIST OF PRODUCTS

S.NO.	PRODUCT NAME	PHYSICAL STATE	QUANTITY IN KGS /MONTH	MODE OF STORAGE	NATURE OF HAZARD
1	Carvedilol	Solid	5000.00	Fibre Drums	Harmful
2	Citalopram Hydro Bromide	Solid	2000.00	Fibre Drums	Harmful
3	Ketrolac tromethamine	Solid	5000.00	Fibre Drums	Harmful
4	Ramipril	Solid	5000.00	Fibre Drums	Harmful
5	Sertraline Hydrochloride	Solid	5000.00	Fibre Drums	Harmful
6	Terbinafine Hydrochloride	Solid	4000.00	Fibre Drums	Harmful
7	Tramadol Hydrochloride	Solid	5000.00	Fibre Drums	Harmful

Above products will be manufactured on campaign basis, only two products will be in production at any given time

HANDLING PRECAUTIONS OF CHEMICALS

- Use in a closed system under argon or nitrogen.
- Do not get in eyes, on skin or clothing.
- Do not breathe vapors or mist.
- Store in a cool place. Keep container closed.
- Keep away from sources of ignition, water, air, acids and oxidizing agents
- In case of fire, do not use water or carbon dioxide

EMERGENCY PREPAREDNESS

- OSEP
- Training & Awareness

7.3. SAFE PRACTICES [HANDLING, STORAGE, TRANSPORTATION AND UNLOADING OF CHEMICALS]

Drums

Solvents will be transferred from the drums to the day tank situated at the production block with the help of leak proof drum pumps / AOD pumps /Vacuum through pipe lines. From day tank to reaction vessel unloading by gravity.

Storage Tanks

Solvent will be transferred to the day tank situated at the production block with the help of mechanical seal pump through pipe lines from the tank, from day tank to reaction vessel unloading by gravity.

Tank is connected to chilled water circulated condenser with reflux system

Measures to Avoid Evaporation

Keep containers tightly closed.

Keep away from heat, sparks, and flame

Keep away from sources of ignition

Store in a cool, dry, well ventilated area away from incompatible substances

Safety Systems

- Designated areas with proper indication & safety sings
- Double earthling systems
- Flame arrestor to the vent
- Flame proof transferring pumps
- Handling precautions/sop protocol
- Pressure Gauges
- Level indicators
- Flame proof lighting to storage yard

TRANSPORTATION / UNLOADING

Highly inflammable chemicals will be transported by road. Therefore, adequate safety precautions for transportation are followed. During transportation of hazardous chemicals, MSDS & TREM card will be provided to driver. As per Motor Vehicle Rules, PESO rules and Factory Rules all safety precautions will be followed during transportation of hazardous chemicals.

The following safety precautions are suggested during transportation of toxic, inflammable and corrosive chemicals in tankers, while loading and unloading, transportation and meeting the emergencies arising out of leakages and spillages of hazardous materials:

- Park the vehicle at designated place.
- Stop the engine.
- Check-up spark arrester.
- Provide earthing to tanker securely.
- Ensure that fireman is available near the place with proper equipment‘s.
- Connect the piping properly
- Before start unloading, check that, there should not be any leakage.
- In case of leakage, immediately attend the leakages & rectify it.
- After unloading is over, close the lid properly.
- Vehicle to be started only after removal of all pipelines connected with tanker.

7.4. SAFETY INSTRUCTIONS FOR TRANSPORTATION OF HAZARDOUS MATERIALS

- The name of the chemical along with pictorial sign denoting the dangerous goods should be marked on the vehicle and the packing material.
- The name of the transporter, his address and telephone number should be clearly written on the road tanker and on the vehicle.
- The tanker or vehicle should not be used to transport any material other than what is written on it.
- Only trained drivers and cleaners should transport hazardous chemicals.
- The transporter and the manufacturer must ensure the safe transportation of the material.
- The Tanker / Vehicle should be checked for its fitness and safe condition before loading.
- During loading and unloading, the tanker/vehicle should be braked and isolated against any movement, while loading/unloading, use safety appliances.

- The tanker / vehicle should not be overloaded beyond the weight permitted by R.T.O.
- Check for leakages from the line connections / containers before starting and Stopping the filling operations.
- Drive the vehicles carefully, especially in crowded localities and on Bumpy roads.
- Do not apply sudden break.

The tanker / vehicle should not be parked for long time on the way and especially in crowded places. Park the vehicle away from residential areas

7.5. SPILL CONTROL

- For all plants spill control procedures will be displayed. Spillage shall be controlled as per concerned spill control procedure.
- Unprotected personnel up wind will be kept up wind.
- Like any spilled materials to contain. Absorb spilled liquid by dry absorbent clay or sawdust.
- Collect most of the contaminated absorbent with shovel for further disposal/incineration.
- If spill of material directly on the ground, dig up and remove saturated soil for disposal/incineration.
- Inactivate poisonous chemical with suitable method.

7.6. IDENTIFICATION OF HIGH RISK AREAS

It is observed that the storage areas pose fire/explosion hazards which may lead to major accident event. In the process areas it is observed that inventories of chemicals are very low & so there are not deemed to pose major off-site hazards. Thus, the quantitative risk assessment studies are limited to unit and some extent in vicinity.

7.7.1 MODES OF FAILURE

Storages system can fail in different ways depending on the materials stored, storage conditions & may involve systems in their vicinity. Conditions such as over filling, over pressure, missile, lightening or bomb attack, earthquake & resultant replier or release scenarios have been identified. Outcomes of such incidents are

determined by presence of ignition either immediate or delayed. As can be seen depending upon modes of failure different scenarios are possible viz:

1. Continuous release
2. Instantaneous release

This may be of gas / liquid depending upon type of material stored/released & its characteristics. More examples, a liquid boiling at ambient conditions, will immediately be converted to gas upon exposure to atmosphere.

An instantaneous release is any release occurring for a period less than 15 seconds. Failure mode responsible for instantaneous releases may be catastrophic failure of chemical storage tank / drum. For an instantaneous gas release important parameters are release height & quantity released whereas for instantaneous liquid release, important parameters are amount spilled, spill area & pool temperature, evaporation rate, vapour mass etc. Continuous release occurs when the material is released over a period greater than 15 seconds. For a continuous gas release, important parameters include height of leak above ground, emission rate & total time of release. For continuous liquid release important parameters are spill rates, duration, area & pool temperature, evaporation rate and vapor mass or Gas mass.

7.7.2 MAXIMUM CREDIBLE ACCIDENT ANALYSIS AND ITS MITIGATION MEASURES

A Maximum Credible Accident (MCA) can be characterized as the worst credible accident. In other words: an accident in an activity, resulting in the maximum consequence distance that is still believed to be possible. A MCA-analysis does not include a quantification of the probability of occurrence of the accident. Another aspect, in which the pessimistic approach of MCA studies appears, is the atmospheric condition that is used for dispersion calculations. The Maximum Credible Loss (MCL) scenarios have been developed for the Facility. The MCL cases considered, attempt to include the worst “Credible” incidents-what constitutes a credible incident is always subjective. Nevertheless, guidelines have evolved over the years and based on basic engineering judgment, the cases have been found to be credible and modeling for assessing vulnerability zones is prepared accordingly.

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 Consequence analysis, geographical location of the source of potential release plays an important role. Consideration of a large number of scenarios in the same geographical location serves little purpose if the dominant scenario has been identified and duly considered.

The Consequence Analysis has been done for selected scenarios by ALOHA

The details of software used for MCA analysis are described below.

- The mathematical model is based on the Emergency Response Planning Guidelines (ERPGs) which gives Toxic Levels of Concern (LOCs) to predict The area where a toxic liquid concentration might be high enough to harm People.

ALOHA models key hazards-toxicity, flammability, thermal radiation (Heat), and over pressure (expansion blast force)-related to chemical releases that result in toxic gas dispersion, fire and/or explosion

7.7.3. CONSEQUENCES ANALYSIS

From the solvents toluene have been taken for the consequences analysis considering their hazardous nature. Storage condition and threshold value of Toluene and other properties are given in **tables**

TABLE: 7.4. STORAGE DETAILS OF SOLVENTS

S.NO	SOLVENT NAME	PHYSICAL FORM	TYPE OF STORAGE	SIZE OF STORAGE UNIT	MAXIMUM STORAGE CAPACITY	STORAGE PRESSURE KG/CM$_2$	STORAGE TEMP. ºC
1	Acetone	Liquid	Tank	20KL	15 TONS	ATM	RT

7.7.4. POSSIBLE ACCIDENT SCENARIO

Different possible ways of occurrence of any accidents due to storage/usage of above solvent is prescribed here below

SITE DATA

Building Air Exchanges Per Hour: 10

CHEMICAL DATA

Chemical Name: **ACETONE**

Molecular Weight: 58.08 g/mol

AEGL-1 (60 min): 200 ppm

AEGL-2 (60 min): 3200 ppm

AEGL-3 (60 min): 5700 ppm

LEL: 26000 ppm

UEL: 130000 ppm

Ambient Boiling Point: 56.3° C

Vapor Pressure at Ambient Temperature: 0.13 atm

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)

Wind: 1.5 meters/second from se at 3 meters

Ground Roughness: open country

Air Temperature: 41^0 C

Relative Humidity: 50%

SOURCE STRENGTH

Leak from hole in vertical cylindrical tank

Flammable chemical is burning as it escapes from tank

Tank Diameter: 2 meters

Tank Length: 6.5 meters

Tank Volume: 20.4 cubic meters

Tank contains liquid

Internal Temperature: 35° C

Chemical Mass in Tank: 15000 kilograms

Tank is 95% full

Circular Opening Diameter: 2 inches

Opening is 1 feet from tank bottom

Max Flame Length: 10 meters

Max Burn Rate: 93 kilograms/min

Total Amount Burned: 5,477 kilograms

Note: The chemical escaped as a liquid and formed a burning puddle.

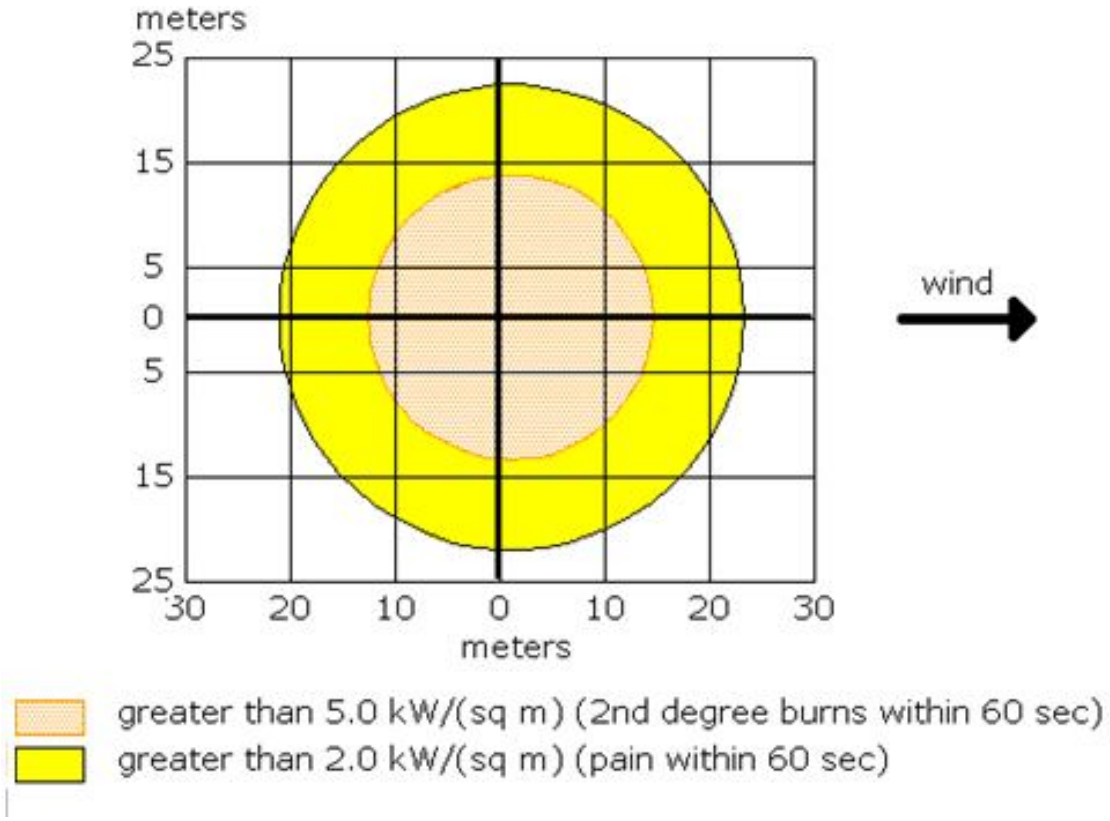
The puddle spread to a diameter of 6.2 meters.

THREAT ZONE

Threat Modeled: Thermal radiation from pool fire

Orange: 15 meters --- (5.0 kW/(sq m) = 2nd degree burns within 60 sec)

Yellow: 23 meters --- (2.0 kW/(sq m) = pain within 60 sec)



7.8. OCCUPATIONAL HEALTH

Hazardous and toxic substances are defined as those chemicals present in the work place which are capable of causing harm.

[In this definition the term chemicals include dust, mixtures and common materials-solvents.]

- For handling hazardous chemicals and to take care of employee's health, and predictive maintenance looking to the nature of hazardous chemicals

being handled/processed. All the equipments in the plant areas shall be inspected / tested by an outside agency.

- The various safety equipments like breathing apparatus and critical instrumentation provided on various equipments are inspected and tested frequently to ensure their operability all the time. Besides, all the first aid, fire fighting devices are also being inspected, tested and maintained by a competent third party and kept all the time in ready to use condition.
- Health of all the employees in plant area is regularly monitored by outside physician. If any abnormality is found necessary treatment is also being given time to time. Necessary history cards, records are also be maintained which is up-dated time to time.

Common Hazards

- Physical such as ventilation, poor illumination, noise, extreme temperature, humidity and radiation.
- Biological such as variety of pathogenic bacteria and parasites.
- Chemical due to hazardous gases and dusts.
- Ergonomic.

Industrial Hygiene Monitoring

- Industrial hygiene monitoring is to located and identify source of exposure in the workplace so that they can be corrected and to quantify the exposure of employees to chemicals in the air.
- Air monitoring is conducted by industrial hygienists or other trained personnel.

Occupational Health Monitoring System

A. Air samples

Locations of samples – air samples are generally collected in one or three locations:

- At the breathing zone of the worker [Personal sample]
- In the general room air [Area sample]
- At the operation which is generating the hazardous substance [Area sample]

Lengths of samples – Air samples are generally collected for two lengths of time.

- Grab samples [instantaneous] measure conditions at one moment in time and can be likened to a still photograph. They give only a picture of conditions at one place at one instant in time.
- Continuous Samples [range from twenty minutes to 8 – 10 Hours].These is used to evaluate all day exposure by a series of continuous samples. Continuous samples may be thought of as like a motion picture since they record activity taking place in various places over a period of time. They provide an average of conditions over a period samples.

B. Other sampling methods

Bulk samples

Bulk samples are collected from settled dust in the work place or from drums or bags of chemicals. Their purpose is to analyze and identify the substances present. For example, bulk samples are used to analyze the percent of asbestos in insulation or dust. Usually, a substance which is greater than one percent of bulk sample is considered a concern.

Wipe Samples

Wipe samples are used when skin absorption or ingestion is a suspected rote of exposure. The purpose is to show whether skin, respirators, clothing, lunch rooms, lockers, etc. are contaminated.

It can show which surfaces are clean and which are contaminated. It can also show if some surfaces are more contaminated than others.

Sampling Devices

The general principle of sampling is to collect an amount of a contaminant onto a medium from a known quantity of air.

Air samples are collected using small pumps to suck air from the workroom. The pump is attached by tubing to a sampling device which contains the sampling medium; for example a glass tube containing charcoal.

The sampling method used depends on the physical from of the substance:

- DUSTS –The sampling device is a filter of plastic or paper in s holder:
- VAPORS –The sampling device is a glass tube containing activated charcoal as a medium.

- GASES –The sampling device is a bubbler containing a fluid medium to dissolved or react with the gas

The collected sample are sent to a laboratory where the amount of the substance on the sampling medium [filter, tube, etc.] is measured.

In some cases air monitoring is conducted by using direct reading instrument such as a monitoring for carbon monoxide these instruments can measure the amount of a contaminant in the air immediately without being sent to a laboratory.

- **PEL**s [**P**ermissible **E**xposure **L**imits] – these are legal's limits which have been established by OSHA.
- Recommended **PEL**s – also reference to as **REL**s [**R**ecommended **E**xposure **L**imits] often these values are based on more recent scientific information than the legal PELs enforced by OSHA.
- **TLV**s [**T**hreshold **L**imit **V**alues] – These are exposure limits put out by a nongovernmental group, the **ACGIH** [**A**merican **C**onference of **G**overnmental **I**ndustrial **H**ygienists]. Many of these were adopted as legal requirements. Revised TLVs are often based on the most recent and accurate scientific information.
- **IDLH** [**I**mmediate **D**angerous to **L**ife or **H**ealth] limits are prescribed by **NIOSH [N**ational **I**nstitute **of O**ccupational **S**afety and **H**ealth]
- **AEGL** [Acute Exposure Guideline Levels]

SOLVENT / CHEMICAL EXPOSURE LIMITS & EMP FOR THE OCCUPATIONAL SAFETY & HEALTH HAZARDS

TABLE: 7 .5. SOLVENT / CHEMICAL EXPOSURE LIMITS

S. No	SOLVENT NAME	Exposure Standards		
		ACGIH [TLV]	OSHA [PEL]	NIOSH [IDLH]
1	Methanol	200	200	6000
2	Ethyl acetate	400	400	2000
3	THF	200	200	2000
4	Acetone	500	750	2500
5	Ethanol	1000	1000	3300
6	IPA	400	400	2000
7	Toluene	50	100	500

Notes:

- All the above Values are in **ppm**
- PPE Means Personal Protective Equipment like Helmets, Safety Google, Breathing apparatus, Nose Masks, Gloves, Gum Shoes etc.,

NOTE: Medical testing reports of the Employees are enclosed

EMP for the Occupational Safety & Health Hazards so that such exposure can be kept within permissible exposure level (PEL) / Threshold Level value (TLV) so as to protect health of workers.

1. It is proposed to formulate and implement an EMP for Occupational Safety and Health with following aim

- To keep air-borne concentration of toxic (if available) and hazardous chemicals below PEL and TLV.
- Protect general health of workers likely to be exposed to such chemicals
- Providing training, guidelines, resources and facilities to concerned department for occupational health hazards
- Permanent changes to workplace procedures or work location to be done if it is found necessary on the basis of findings from workplace Monitoring Plan.

2. It is proposed that this EMP be formulated on the guidelines issued by Bureau of Indian Standards on OH&S Management Systems: IS 18001:2000 Occupational Health and Safety Management Systems.

3. Proposed EMP will be incorporated in Standard Operating Procedure also

4. The proposed EMP will also include measure to keep air-borne concentration of toxic and hazardous chemicals below its PEL and TLV, like…

- Leak Surveys
- Separate storage for toxic chemicals
- Exhaust Ventilation
- Proper illumination
- On-line detectors toxic chemical like Anhydrous Ammonia
- Close processes to avoid spills and exposures
- Atomization of process operations to hazards of manual handling of chemicals

- Supply of proper PPEs like Air mask, Berating canisters, SCBA sets, On-line breathing apparatus at the places where there is possibility of presence of toxic chemicals
- Decontamination procedure for empty drums and carboys.
- Regular maintenance program for pumps, equipment, instruments handling toxic and corrosive chemicals
- Display of warning boards
- Training to persons handling toxic and corrosive chemicals

5. Workplace Monitoring Plan

- It is proposed that a Workplace Monitoring Plan to be prepared & implemented in consultation with FMO and industrial hygienists.
- Each workplace must be evaluated to identify potential hazards from toxic substances or harmful physical agents. Air-borne concentration of toxic chemicals will be measured and record will be kept.
- The current state-of-the-art exposure measurement model is as follows: For purposes of measuring worker exposure across a single shift it is sufficient to place a reasonably accurate exposure measuring device near the worker's area, within the worker's breathing zone, and have it operate for nearly the full shift. Client has been proposed to study the exposure data when the plant is operative.

6. Health Evaluation of Workers

- It is proposed that management will devise a plan to check and evaluate the exposure specific health status evaluation of workers.
- Workers will be 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. Basic examinations like

1. Liver Function tests,
2. Chest X-ray,
3. Audiometry,
4. Spirometry Vision testing (Far & Near vision, color vision and Any other ocular defect)
5. ECG, etc. will be carried out.

However, the parameters and frequency of such examination will be decided in consultation with Factory Medical Officer and Industrial Hygienists.

- While in work, all the workers will be periodically examined for the health with specific reference to the hazards which they are likely to be exposed to during work. Health evaluation will be carried out considering the bodily functions likely to be affected during work. The parameters and frequency of such examination will be decided in consultation with Factory Medical Officer and Industrial Hygienists. Plan of monthly and yearly report of the health status of workers with special reference to Occupational Health and Safety, will be maintained.

7.9. TREATMENT OF WORKERS AFFECTED BY ACCIDENTAL SPILLAGE OF CHEMICALS

[Interim First Aid for General Injuries & Wounds]

Interim First Aid is essential in many injuries while injured waits for trained personnel to arrive.

BLEEDING

- Apply direct pressure on the wound with a clean dressing.
- If bleeding continues and you do not suspect a fracture, elevate the wound above the victim's heart and continue to apply direct pressure.
- If bleeding continues, apply pressure at a pressure point.
- Maintain body temperature.
- Do not use a tourniquet unless this is a serious amputation.

BREATHING PROBLEMS

- Move victim to fresh air if smoke or dangerous gases are present.
- Otherwise, do not move victim.
- If victim loses consciousness, call doctor
- Never enter into a room with toxic gases released -call without protection

UNCONSCIOUS VICTIM

- Move victim to fresh air if smoke or dangerous gases exist.

- Begin rescue breathing- is First Aid trained ahead of time! Instead.
- Never enter into a room with toxic gases released- call without protection

CHEMICAL BURNS

- Have victim remain under a safety shower or flush skin with an available water source for 15-30 minutes.
- Remove all contaminated clothing and jewellery.
- Cover burns with dry, loose dressings.
- Wash all clothing thoroughly before wearing it again.

ACID BURNS

- In case of acid burn, the operator should with all possible speed get under a safety shower and use the full flow of water - the more water the better. A small amount of water will incase severity o f the burn Water should be used until all traces of acid have been washed from the burn. Alkaline solutions are not needed; if used at all they should be used only after all acid has been washed from the burn, it may to treat in the same manner as a heat burn.

CHEMICAL INGESTIONS

- Never enter into a room with toxic gases released without protection
- Do not give victim any food or liquids without specific advice from physician.

EYE INJURIES FROM CHEMICALS

- Get victim to a safety shower or eye wash immediately.
- Never enter into a room with toxic gases released- call without protection
- Flush eye for 15-30 minutes with both lids held open. Keep the injured eye lower than the uninjured eye.
- Keep the eyelids open hold fingers at top and bottom of the eyeball. Wrap a bandage loosely around both eyes.

7.10. SAFE OPERATING PROCEDURES

- Safe operating procedures will be available for mostly all materials, operations and equipment.

- The workers will be informed of consequences of failure to observe the safe operating procedures.
- Safe operating procedures should be formulated and updated, specific to process & equipment and distributed to concerned plant personnel.
- Safety procedures shall be prepared and displayed meticulously in Telugu and English languages.

7.11. FIRE PROTECTION

- Well-designed pressured hydrant system comprising with jockey pump, electrical & diesel pumps, hydrant, monitor etc. will be installed at the plant.
- The fire fighting system and equipment will be tested and maintained as per relevant standards.
- Heat and smoke detectors will be provided at the plant and shall be calibrated and maintained properly.

7.12. STATIC ELECTRICITY

- All equipment and storage tanks/containers of flammable chemicals shall be bounded and earthed properly.
- Electrical pits shall be maintained clean and covered.
- Electrical continuity for earthing circuits shall be maintained.
- Periodic inspections shall be done for earth pits and record shall be maintained.

7.13. COMMUNICATION SYSTEM

Communication facilities shall be checked periodically for its proper functioning.

7.14. SAFETY INSPECTIONS

The system shall be initiated for checklist based routine safety inspection and internal audit of the plant. Safety inspection team shall be formed from various disciplines and departments.

7.15. PREDICTIVE AND PREVENTIVE MAINTENANCE

Predictive and preventive maintenance schedule shall be followed in religious manner.

7.16. ELECTRICAL SAFETY

- Insulation pad at HT panels shall be replaced at regular interval.
- Housekeeping in MCC room shall be kept proper for safe working conditions.

7.17. COLOUR CODING SYSTEM

Colour coding for piping and utility lines shall be followed in accordance with IS: 2379:1990.

DISASTER MANAGEMENT PLAN

- ONSITE EMERGENCY PLAN
- OFFSITE EMERGENCY PLAN

7.18. ONSITE EMERGENCY PLAN

The details of Disaster management system are discussed in the following sections

DEFINING THE NATURE / LEVEL OF EMERGENCY

The levels of emergency can be classified in three categories

LEVEL-1

The leakage or emergency, which is confinable the plant, premises. It may be due to-

- Small fire in the plant
- Low toxic gas release for short duration.
- Collapsing of equipment that do not affect outside premises.

LEVEL-2

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

- Major fire inside the factory premises.
- Medium scale explosion confined to the factory premises.
- Heavy toxic/flammable gas leakage for short duration.

LEVEL-3

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

- Explosion of high magnitude affecting the adjacent area
- Heavy/profuse leakage of toxic/flammable gases for a long duration.

7.18.1 STRUCTURE OF EMERGENCY MANAGEMENT SYSTEM

The company will develop an emergency management team. The management structure includes the following personnel

- Site main Controllers
- Incident Controllers and Deputy Incident Controllers
- Key Personnel
- Essential Workers

The other elements of Disaster management plan are

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

7.18.2 EMERGENCY MANAGEMENT SYSTEM – ROLES & RESPONSIBILITIES

Roles and responsibilities of the responsible persons are described.

SITE MAIN CONTROLLER [SMC]

PLANT HEAD will be the site main controller. In absence of PLANT HEAD, EHS HEAD 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 shall:

- Immediately on being informed of the emergency and its location, will arrive at the scene and handle the situation.
- Relieve the incident controller from responsible of the main controller
- Co-ordinate to avail services from external agencies like fire brigade, hospitals etc. is called for, following the declaration of major emergency. If necessary, major installations in the vicinity may also be informed of the situation.
- Exercise direct operational control of the unaffected section of the plant.
- In consultation with the advisory team, expedite the shutting down of loading/unloading operations of tankers and if necessary, instruct the supervisor/security/personnel to evacuate tankers.

- Ensure that all employees are evacuated from the affected area and the casualties, if any, are given necessary medical attention. Instruct P&A Assistant/security for rushing casualties to hospitals if required.
- Liaise with fire and police officials, pollution control board officials and other statutory bodies and advise them of all possible consequence effects outside the premises.
- Arrange for relief of personnel when emergency is prolonged
- Issue authorized statement or press release to the news –media
- Ensure preservation of evidence for enquiries to be conducted by statutory authorities.
- Authorize the sounding of **"All Clear"** and **"Evacuation Siren"**
- Arrange for obtaining the head-count of all personnel within the premises and cross-checking with the data from records available for no. of persons within the premise.

INCIDENT CONTROLLER/ DEPUTY INCIDENT CONTROLLER

Role of Incident Controller [Plant Manager/Shift in Charge].He is the shift supervisor of the plant. Assume the role of the incident controller and take charge of the situation. Keep the SMC informed of the situation from time to time.

1. Proceed to the scene of emergency and assess the situation
2. Direct all operation within the affected area with the following priorities
   - Safety of personnel
   - Minimize damage to property and loss of material
   - Arrange for rescue of trapped workers and those in a state of shock
   - Get all non-essential persons safely evacuated after stopping all the engineering/hot jobs.
   - Set up a communication system with the main control center at the main security gate through telephone or messenger system.
   - Pending arrival of the main controller, direct the shutting down and evacuation of the site
   - Report all developments to the main controller
   - Preserve all evidence for use in the subsequent enquiry.
   - Intimate to the Emergency Control Center (Main Security Gate) the head count of plant.

KEY PERSONNEL

- Key Personnel are required to provide and to implement the decisions made by the SMC in the light of information received on the developing situation at the time of emergency.
- As necessary, they will decide the actions needed to shut down plants, evacuate personnel, carryout emergency engineering work, arrange for supplies of equipment, 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 shall report to the ECC.
- They shall be available at any time on duty or on call or on oil duty or holiday.

ESSENTIAL WORKERS

A task force of essential trained workers [Expert's team] is available to get the work done by the Incident controller and the SMC. Such work will include:

- Fire fighting and spill control till a FIRE BRIGADE takes the charge
- To help FIRE BRIGADE and MUTUAL AID teams, if it is so required
- Shuting down plant and making it safe
- Emergency engineering work e.g. isolating equipments, 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 causalities reception areas to record details of causalities.
- Assistance at communication centers to handle outgoing and incoming 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 for visitors, contractors and other traffic arriving at the works.
- Informing surrounding factories and the public as directed by the Site Main Controller.
- Any special help required.

7.18.3. OTHER ELEMENTS OF DMP

There are some other elements of DMP which are described as follows:

ASSEMBLY POINT

Assembly points are those locations where the persons who are not connected with emergency operations can await either for further instructions or for rescue transport and rehabilitation. Presently outside the plant area is considered as such assembly points, taking into consideration of the size of the plant facilities. As the location of security gate is far off the **Assembly Point** is not vulnerable for emergencies.

- 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 Points are located at a safe place, 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 have been also 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.

EMERGENCY CONTROL CENTER

The emergency Control Center is the place or room from where the operations to handle the emergency are directed and coordinated. Main Control Room has been earmarked / identified as the Emergency Control Room. Fire Control Room shall be earmarked / identified as the alternative Emergency Control Room to be operated in case of unfavorable wind direction. Adequate Telecommunication System is available in the Emergency Control Room.

The ECC center has been equipped with the following facilities.

1. Internal and external telephone including STD facility
2. Telephone directory
3. Factory layout plan
4. Map of the area
5. Employee blood group and their address
6. Messengers / Runners for sending messages
7. Adequate numbers of PPE'S
8. Telephone nos. of mutual aid centers

7.18.4. FIRE SERVICES

Fire Fighting, Gas leak Control and Rescue operation

A] Role of Manager (Fire and Safety/shift in-charge [Fire and Safety]

- Manager [EHS] shift in-charge [EHS] will be the only person to direct the fire fighting and emergency operation.
- Keep the constant touch with the chief emergency controller.
- Direct the crew members to the scene of emergency and arrange replenishment of man power/equipment/extinguishing media etc.

B] Fire and Safety officer. [EHS Officer]

- On being notified about the location of fire/gas leakage immediately proceed to the scene of incident with fire tender and crew.
- Position the fire tender in upwind direction.
- Decide his line of action in consultation with incident controller and take appropriate measures to handle the emergency.

- Assessing the severity of the incident immediately report to emergency controller about the gravity of the situation.
- He will assess the extra requirement required if any from the neighboring industry.

C] Fire Crew Members

- On hearing fire alarm, emergency siren they shall immediately report to control room and proceed to the scene of emergency and work under the direction of shift fire & safety officer.
- The personal availability at the scene of incident to be made optimize.

D] Emergency Squad Members

- On hearing Emergency Siren ,they shall immediately report to site main controller, safety in charge or incident controller
- They shall combat the emergency situation as per the direction of site main controller, Safety In- charge or Incident controller
- They shall help for safe evacuation

7.18.5. MEDICAL SERVICES

A] Role of Chief Medical Officer/Medical Officer [Medical Assistance]

- He will contact immediately to chief emergency controller
- He will render necessary treatment as first aid center and hospital.
- He will arrange for hospitalization and treatment at outside hospitals if required.
- He will mobilize extra medical assistance from outside if necessary.
- He will make arrangement for treating public if necessary.

B] Role of other Medical staff

- As directed by medical officers.

7.18.6. SECURITY SERVICES

Role of H.O.D. (Security) / Security Officers.

- Receive message from the observer
- Initiate the emergency siren to declare the emergency
- Announce on the public address system

- Arrange to close all the gates and stop traffic
- Keep vehicle/ambulance ready and keep track of casualty sent to hospital during off hours
- Ensure that unauthorized persons/vehicles do not enter the premises\
- Organize the positioning and transport of vehicles near the main gate
- Depute security guard for controlling traffic at the scene of emergency
- Call up for additional help from the outside agency like fire brigade, hospitals during off hours

Role of Security Guard

- On hearing emergency siren contact security officer and work under his directions

7.18.7. MUTUAL AID

In emergency situations, resources over and above those available at the works may be needed. Emergency Coordinator would be contacting neighboring factories for help. A survey of industries who can come to help and also the help, they can extend is done as mentioned below.

- The help would be in the form of technical manpower, medical aid, transport for rescue and Rehabilitation, fire fighting, additional special protective wear or any other help as the case may be.
- Manager – Safety who is Emergency Coordinator is assigned with this responsibility and he would maintain liaison during non-emergency period and ensure co-operation
- Similarly, the help required from civil administration, in respect of medical aid, transport, law and order, rehabilitation etc. are identified and liaison is established with Mandal Revenue Officer and Police Officials.

7.18.8. EMERGENCY RESPONSE

Concept of operations deals with the possible steps associated with an emergency response assuming the most severe emergency scenario. This includes:

- Accident initiation and rising of alarm
- Accident evaluation and emergency declaration
- Off site and external agency notification

- Implementation of onsite response actions
- Implementation of protective actions and evacuations
- Co-ordination of response action with external agencies
- Management of emergency resources
- Recovery and facilitate re-entry procedures

7.18.9. EMERGENCY CAPABILITIES

The primary emergency response facilities comprise with emergency control center upon declaration of emergency, the main security gate office will become the emergency control center [ECC].The ECC is located in a low /minimal risk zone of the plant. It is manned round the clock

7.18.10. EMERGENCY HANDLING PROCEDURES

Action plan

- On hearing emergency declaration siren and announcement on public address system, all key persons will rush to their nominated location and start actions.
- The main controller will continuously assess the situation by taking feedback from the incident controller. He will consult the advisory team members to get essential information if required but if does not required to take help from advisory team; he can assign other jobs to advisory team.
- Once the emergency is brought under control, Main Controller will inform to security to give **"ALL CLEAR"** siren and announce on Public Address System about termination of emergency.

In the case the emergency assumes off site dimensions and cannot be controlled, then if the chief controller with his advisory team decides to evacuate the plant, he will instruct the security to sound "**EVACUATION SIREN"**

Procedure in case emergency tends to have off site implications

- As per the sire plan and wind direction at the time of emergency, the likely affected area will be identified and population within will estimated.

- The police will be informed so that in-coming traffic on highway can be controlled from both the ends. The police force will be helpful in evacuation of villages, factories or other public places in the vicinity
- The fire brigade will be informed and ambulance will be called and kept ready to meet any eventuality.
- Neighboring factories will be communicated for sending help.
- Statutory authorities such as factory inspector, district collector and others concerned to be intimated.

Procedure for salvage operations

- The salvage operation will be carried out under the guidance of the main controller, his advisory team and incident controller.

They will conduct accident investigation; assess the damages-the clock by security supervisors.

During emergency, the main controller and his advisory-team will confirm

- Master plan of facility and 5kms surrounding area-displayed on wall
- Layout of facility, equipment and storages, displayed on table and wall
- Availability and location of personal protective equipment
- Self-contained breathing apparatus sets and the spare cylinders
- External telephone with direct dialing and STD facilities
- Internal telephone
- List of important internal and external telephone numbers displayed on table and wall.
- Transport facility
- Extra copies of plant layout for marking during emergency
- Telephone directory both local and surrounding district
- General stationary like paper, pencil etc.
- Nominal roll and address of all employees with contract telephone no's and blood group
- List of first aiders and emergency squad members
- Details of all contractors and their employees.

- Details of meteorological information during different seasons such as wind speed, direction, temperature, humidity etc.

The location of ECC, Assembly points, availability of first aid boxes, fire extinguishers, PPE should be marked onsite.

7.18.11. MITIGATION OF ENVIRONMENTAL IMPACT DURING FIRE EMERGENCY

- In case of fire, cut of contact of fire with flammable material or prevent of fire by other means
- Use water or suitable fire extinguisher to extinguish fire
- Contain the contaminated water or any other liquid to prevent it going to soil or drain and divert it to ETP storage tank. If required treat it before sending to ETP tank.
- Any solid waste generated should be collected, stored and send to TSDF site.
- During fire emergency use necessary PPE.
- Bottom valve failure: mitigation of environment impact during failure of between valves or tank failure.
- In case of material coming out of the bottom valve shall be contained inside the dyke wall and will be transferred to HDPE plastic drum by help of pump/piping.
- In case of acid spillage after pumping shall be neutralized and waste shall be cleaned with help of water and send the water to ETP.
- The failed bottom valve shall be replaced or repaired and restart. After tank is empty valve will be repaired, or replaced. In case of leakage form tank body tank will be repaired.
- Preventions of failure: preventive maintenance of bottom value shall be carried out as per schedule. To prevent any leakage from tank body, thickness checking shall be same as per schedule.
- In case of bottom value failure or heavy leakages from tank body material in the tank shall be transferred to the HDPE drums, by running the pump.

- Preventions of failure: preventive maintenance of bottom valve shall be carried out as per schedule. To prevent any leakage from tank body, thickness checking shall be same as per schedule.
- In case of any material leaching the soil it shall be neutralized and washed with water.

7.18.12. RAISING THE ALARM

- Emergency alarm shall be raised in the event of an emergency.
- Any person noticing an unusual occurrence, fire, Ammonia leakage, toxic or corrosive substance leakage etc. shall inform the concerned department/section head/shift in charge immediately and try to control/contain the incident.
- Departmental head/shift in charge will immediately go to the site of incident, assess the situation and initiate the action to “blow the emergency Alarm” by telephoning the main gate to security officer/Asst, security officer/Security supervisor.
- In case of telephone failure a messenger will be sent running to main gate to inform.

Details of siren are given below

Siren codes

- Declaration of emergency:-A long short wailing siren for one minute will mean that there is an emergency within the premises.
- All clear siren: - A long siren for two minutes will mean that the emergency declared is under control, i.e. all clear. This siren code will mean All clear, normal condition.
- Evacuation siren:-A long short wailing siren for 3 [three] minutes, will mean that emergency declared cannot be controlled. Hence all persons in the premises will evacuate as per the plan.

7.18.13. DECLARING MAJOR EMERGENCY

Major emergency may be declared after sufficient thought because it activates many agencies. The nominated persons to declare major emergencies.

7.18.14. TRANSPORT AND EVACUATION ARRANGEMENTS

- Arrangements shall be made for the transport and evacuation of persons in case of any emergency situation arises in the factory.
- Those employees who have own vehicles will make arrangements to shift the injured.

7.18.15. PLANT OPERATIONS

1. Role of HOD

- He will take plant related decisions, which will facilitate the fire fighting operation.

2. Plant Employees

They shall:

- On heaving the siren, report to plant supervisor
- Do as directed by plant supervisor
- Stop all hot works
- Remove unwanted persons from the affected area to the “Assembly Point “near main security gate viz visitors, guests
- Stop all non-essential operations

3. Non-plant Employees

On hearing the siren, shall stop their work assemble at “Assembly Point” near main security gate along with guests and visitors.

7.18.16 TELEPHONE MESSAGES

Telephone operator has to pay vital role in case of emergency. After hearing the siren/hooter, he/she should inform to all key personnel immediately on phone. He/she should receiving be very sharp, precise, attentive and quick in & noticing the message.

7.18.17 MOCK DRILL

In spite of detailed training, it may be necessary to try out whether, the OSEP works out and will there be any difficulties in execution of such plan. In order to evaluate the plan and its effectives of meeting the objective of the OSEP, occasional mock drills are contemplated. After a few pre- informed mock drills, few un-informed mock drills would be taken. All this is to famiarize the employees with the concept and

procedures and to see their response. These scheduled and unscheduled mock drills would be conducted during shift change, public holidays, in night shifts etc, to improve preparedness. Emergency Coordinator [EHS] is responsible for organizing planned and unplanned mock drills.

Two types of Mock drills are in practice. They are

1. Announced-Once in 3 months
2. Unannounced –Once in 6 months.

Mock drill observation

Mock drill observation team [ERT members] is constituted and they note down the action of various coordinators in chronological order. The time of arrival of each coordinator and their duties are detailed in a note. Immediately after mock drill, the advisory team and emergency coordinators meet and review the mock drill records in chronological order and take note of corrective action. The record of this meeting note is circulated for compliance of concerned.

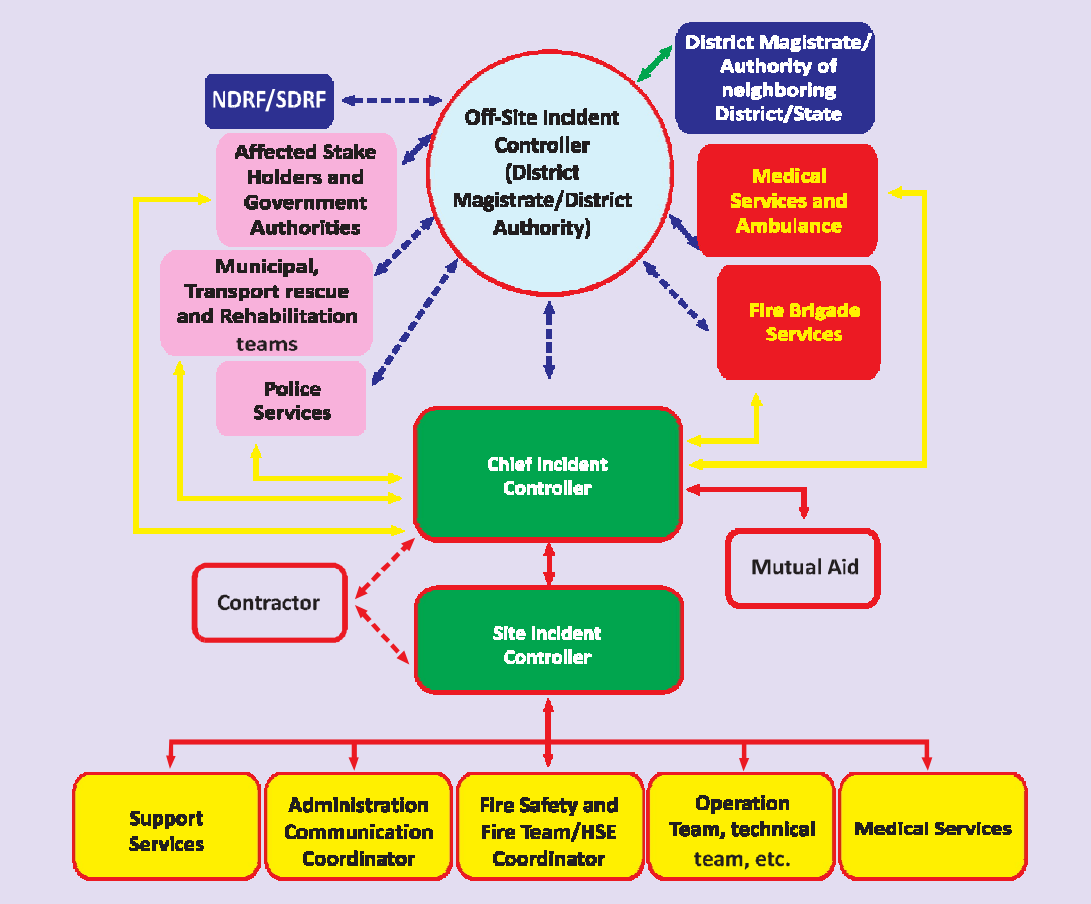
Role of Mock drill observers

- Note readings of plant instruments
- Meteorological conditions
- Time of emergency declaration and time when the personnel responded / reported
- Ambulance reported and time when additional vehicles reported
- Collect information description of the event, estimated quantity of the gas release, fire, contamination and effected levels at various locations, injuries and equipment damage.

7.19. OFFSITE EMERGENCY PLAN

"If the accident is such that its affects inside the factory are uncontrollable and it may spread outside the factory premise, it is called "as **OFFSITE EMERGENCY**

FLOWCHART FOR OFFSITE EMERGENCYPLAN



The Offsite emergency plan is made based on events, which could affect people and Environment outside the premises. The off site plan is largely a matter of ensuring the co-ordination of proposed services and their readiness as far as possible, for the specific hazards and problems, which may arise in as incident. Briefly two main purposes of the plan are as under:

To provide the local district authorities, police, fire brigade, doctors etc. the basic Information of risk and environmental impact assessment and 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 major emergency. To assist the district authorities for preparing the offsite emergency plan for the district or particular area. We have made our key personnel and other fully aware about this aspect. The function of the offsite plans are as under:

Structure of the offsite emergency plan includes the following:-

- Organizational set up-Incident controller /Site main controller, Key personnel, etc
- Communication facilities - List of important telephones
- Specialized emergency equipment - Firefighting equipment
- Specialized Knowledge - Trained people
- Voluntary Organization - Details of organization
- Chemical information - MSDS of hazardous substances
- Meteorological information - Weather condition, Wind velocity etc
- Humanitarian arrangement - Transport, First aid, Ambulance

ROLE OF THE FACTORY MANAGEMENT

The onsite and offsite plans are come together so that the emergency services are call upon at the appropriate time and are provided with accurate information and a correct assessment of situation.

ROLE OF LOCAL AUTHORITY

Generally the duty to prepare the off-site plan lies with the local authority. They may have appointed an emergency planning officer (EPO) to prepare whole range of different emergency within the local authority area.

ROLE OF FIRE AUTHORITY

The control of a fire is normally the responsibility of the senior fire brigade officer who would take over the handling of fire from the Incident Controller on arrival at the site.

ROLE OF POLICE

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 emergency include protection of life and property and controlling traffic movements.

ROLE OF HEALTH AUTHORITIES

Health authorities, including doctors, surgeons, hospitals, ambulances etc. have a vital role to play following a major accident and they should form an integral part of the emergency plan. Major off site incidents are likely to require medical equipments and facilities in addition to those available locally.

ROLE OF THE "MUTUAL AID" AGENCIES

Some types of mutual aids are available from the surrounding factories, as per need, as a part of the onsite and offsite emergency plan.

THE 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. Unit maintains the records of details of emergency occur, corrective preventive measures taken and in future the same practice will be continued. Unit has displayed the details like list of assembly points, name of the persons involve in the safety team like site controller, incident controller etc.