CHAPTER-7

CHAPTER - 7
OCCUPATIONAL HEALTH, RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN

7.1 Introduction

M/s. Everest organics Limited is located at Sy. No. 38, 38A, 39,40, 40 A & 45, Aroor (V), Sadasivapet (M)Sangareddy(D), Telangana state.

7.2 Site Location and Surroundings

M/s. Everest organics Limited is surrounded by Agriculture land on North side, National Highway on South side, private Company on East and Agriculture land on West side

The company is having following blocks/Areas in the plant

- Production blocks
- Ware House
- QC/QA laboratory
- Utilities Block
- Boiler room
- Generator Room
- Bulk Storage area
- Effluent Treatment Plant
- Cooling towers
- Purified Water system
- Admin block

7.3 Objectives and Scope

The production of synthetic organic chemicals involves usage of many chemicals which are both hazardous and non-hazardous in nature. Risk analysis has been carried out to identify the hazardous materials and quantify the hazards to arrive at safe disaster management plan and emergency preparedness plan for storage and handling of the potentiality hazardous materials. Also the purpose of carrying out risk assessment study for M/S Everest organics Limited is to obtain clearance from the Ministry of Environment and forests (MOEF) which calls for a study on nature of

hazards due to proposed location of process and storage units and also to study whether any accident, if occurs leads to any off-site disaster. In this endeavour, the study objectives are outlined here under.

i) Hazard identification and Visualization of Maximum Credible Accident Scenarios.

- To identify major hazards relating to fire, explosion and toxicity due to chemicals, processes and storages of the proposed units.

ii) Hazard Analysis and Risk Assessment

- Hazard analysis is the process of determining the release probabilities and quantities, emission or release rates, the routes/pathways by which the released substances could reach the receptors, the fate of the substances in environmental media through which they are transported or moved and the characteristics of the receptors at risk.
- **Disaster Management** To provide guidelines for Disaster Management Plan(DMP) for on-site emergencies and Emergency Preparedness Plan(EPP) for off-site emergency, based on above i) & ii) studies of proposed plant.

7.4 Production Details

The manufacturing capacities proposed after expansion are presented in **Table 7.1**

Table 7.1
Production capacity after expansion

S.No	Name of the Products	Quantity in TPM
1	Omeprazole	20.0
2	3- (chloro methyl)- 4-methoxy-3,5-dimethyl pyridine. Hydrochloride (Omeprazole chloro compound)	6.0
3	Esmoprazole Magnesium Trihydrate	10.0
4	Pantaprazole sodium	6.0
5	2-(chloromethyl)-3,4-dimethoxy pyridine hydrochloride (Pantaprazole Chloro compound)	2.0

6	Rabeprazole Sodium	3.0
7	2-(Chloromethyl-4-(3-methoxy propoxy)-3-methyl pyridine hydrochloride (Rabeprazole Chloro compound)	3.0
8	Lansoprazole	1.0
9	2-(chloromethyl)-3-methyl-4-(2,2,2-tri fluro ethoxy) pyridine hydrochloride (Lansoprazole chloro compound)	1.0
10	Pregabalin	5.0
11	Finofibrate	2.0
12	Sitagliptin	2.0
13	Vildagliptin	1.0
14	Lingagliptin	0.1
15	2- mercapto-5-Methoxy Benzimidazole	20.0
16	2- mercapto-5- DifluoroMethoxy Benzimidazole	5.0
17	Sumatriptan Succinate	0.5
18	Dexlansoprazole	1.0
19	Aripriprazole	0.5
20	Iso butyl glutaric acid	1.0
	Total	**90.1**
	By products	
1	Ammonium sulphate	197.4
2	Potassium acetate	2.8
3	Sodium sulphite	23.9
4	Potassium methyl sulphate	8.6

5	Di sodium phosphate	9.5
6	Sodium nitrite	8.8
7	Sodium acetate	5.3

7.4.1 Process Description

The details of process are given in **Chapter 2**

7.5 Hazard Analysis and Risk Assessment

7.5.1 Introduction

Hazard analysis is the process of determining the release probabilities and quantities, emission or release rates, the routes/pathways by which the released substances could reach the receptors, the fate of the substances in environmental media through which they are transported or moved and characteristics of the receptors at risk. The basis of risk estimation is to determine the dose-effect relationship between an indicator chemical and receptor. Estimation of risk follows only when the hazard analysis shows a frequency or occurrence, which is significant.

Risk evaluation is the process of identifying, whether the estimated level of risk is tolerable. Tolerable risk is not equated with acceptability; it refers to a willingness to live with a risk so as to secure certain risk benefits, and in the confidence that the risk is being properly controlled.

Hazard analysis involves the identification and quantification of the various hazards (unsafe conditions) that exist in the plant. On the other hand, risk analysis deals with the identification and quantification of risks, the plant equipment and personnel are exposed to, due to accidents resulting from the hazards present in the plant.

7.5.2 Common definitions

The common terms used in risk Assessment and Disaster Management are elaborated below:

"Risk" is defined as a likelihood of an undesired event (accident, injury or death) occurring within a specified period or under specified circumstances. This may be either a probability depending on the circumstances.

"Hazard" is defined as a physical situation, which may cause human injury, damage to property or the environment or some combination of these criteria.

"Hazardous substance" means any substance or preparation, which by reason of its chemical or physic chemical properties or handling is liable to cause harm to human beings, other living creatures, plants, micro-organisms, property or the environment.

"Hazardous process" is defined as any process or activity in relation to an industry which may cause impairment to the health of the persons engaged or connected therewith or which may result in pollution of their general environment.

"Disaster" is defined as a catastrophic situation that causes damage, economic disruptions, loss of human life and deterioration of health and health services on a scale sufficient to warrant an extraordinary response from outside the affected area are community. Disasters occasioned by man are factory fire explosions and release of toxic gases or chemical substances etc.

"Accident" is an unplanned event, which has a probability of causing personal injury or property damage or both.

"Emergency" is defined as a situation where the resources out pass the demand. This highlights the typical nature of emergency; it will be after experiences that enough is not enough in emergency situations. Situations of these kinds are avoidable but it is not possible to avoid them always.

In the sections below, the identification of various hazards, probable risks in a process industry manufacturing optical brighteners, maximum credible accident analysis, consequence analysis are addressed which gives a broad identification of risks involved in the plant.

7.5.3 Hazard Identification

Identification of hazards in the synthetic chemicals organic plant is of primary significance in the analysis, quantification and cost effective control of accidents involving flammable compounds. A classical definition of hazard

states that hazard is not in fact the characteristic of system/plant/storage that presents potential for an accident. Hence, all the components of a system/ plant/ process need 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.

Typical schemes of predictive hazard evaluation and quantitative risk analysis suggest that hazard identification step plays a key role in estimation of probability of an unexpected event and its consequences from the basis of quantification of risk in terms of damage to property, environment or personal. Therefore the type, quantity location and conditions of release of a toxic or flammable substance have to be identified in order to estimate its damaging effects, the area involved, and the possible precautionary measures required to be taken.

Some of the hazard identification procedures are as follows:

1. Fire Explosion and Toxicity Index(FETI) Approach;
2. HAZOP studies
3. Maximum Credible Accident and Consequence Analysis(MCACA);

7.5.3.1 Identification of Major Hazards from the unit

The Hazard identification process adopted is to identify hazardous chemicals as per the statutory requirements of Manufacture storage and import of Hazardous Chemical Rules, 1989

The identified chemicals for the risk assessment are presented in the following **Table 7.2**

Table 7.2

List of Raw materials and Inventory

S.No	Name of the Raw Material	Quantity (Tons)	Physical Form	Nature of Storage	CAS NO.
1	1,4-dibromo butane	0.29	Liquid	Drums	110-52-1
2	2,3-dichloroaniline	0.18	Solid	Bags	608-27-5

3	2,3-Lutidine	1.08	Liquid	Drums	583-61-9
4	2-mercapto benzimidazole	0.69	Solid	Bags	583-39-1
5	3,5-Lutidine	3.12	Liquid	Drums	591-22-0
6	3-chloro propionyl chloride	0.36	Liquid	Drums	625-36-5
7	3-Iso butyl Glutaric anhydride	1.37	Solid	Bags	185815-59-2
8	4-chloro 4-hydroxy benzophenone	0.28	Solid	Bags	42019-78-3
9	4-hydrazino-n-methylbenzinemethane sulfonamide HCL	0.21	Solid	Bags	88933-16-8
10	Acetic Acid	8.46	Liquid	Tank form	64-19-7
11	Acetic anhydride	2.48	Liquid	Bags	108-24-7
12	Acetone	36.26	Liquid	Tank form	67-64-1
13	Acetonitrile	0.07	Liquid	Drums	75-05-8
14	Acetyl chloride	0.26	Liquid	Drums	75-36-5
15	Activated carbon	0.05	Solid	Bags	7440-44-0
16	Aluminium chloride	1.0	Solid	Bags	7446-70-0
17	Aminol	0.13	Solid	Bags	10043-35-3
18	Aminonitrile-3	0.12	Solid	Bags	420-04-2
19	Amm. Sulphate	0.73	Solid	Bags	7783-20-2
20	Ammonia	8.98	Gas	Cylinder	7664-41-7
21	Ammonia solution	1.45	Liquid	Drums	7664-41-7
22	Ammonium persulphate	4.75	Solid	Bags	7727-54-0
23	ATP acid benzyl amine salt	0.42	Solid	Bags	112898-15-4

24	Tetra ethyl ammonium bromide (BETAC)	0.07	Solid	Bags	71-91-0
25	BZM	2.09	Solid	Bags	10043-35-3
26	C.S.Lye 48%	10.93	Solid	Bags	1310-73-2
27	Carbon	0.58	Solid	Bags	7440-44-0
28	Chloroform	11.58	Liquid	Tank Form	67-66-3
29	Conc. Hydrochloride	0.07	Liquid	Drums	7647-01-0
30	CS Flakes	1.63	Solid	Bags	1310-73-2
31	CS2	2.44	Liquid	Drums	75-15-0
32	Cumene hydro peroxide	1.76	Liquid	Drums	80-15-9
33	Cyanoacetamide	0.19	Solid	Bags	107-91-5
34	D(-) Diethyl tartarate	0.39	Liquid	Drums	13811-71-7
35	DFB	0.70	Solid	Bags	15332-10-2
36	Diisopropyl ethyl amine	0.06	Liquid	Drums	7087-68-5
37	Di isopropyl ether	0.23	Liquid	Drums	108-20-3
38	Diethanol amine	0.18	Solid	Bags	111-42-2
39	Diethyl tartarate	0.20	Liquid	Drums	87-91-2
40	Dimethyl formide	2.08	Liquid	Drums	68-12-2
41	DMAC	0.05	Liquid	Drums	127-19-5
42	DMS	3.96	liquid	Drums	77-78-1
43	DMSO	1.92	Liquid	Drums	67-68-5
44	Di sodium hydrogen ortho phosphate DSOP	0.03	Solid	Bags	7558-79-4

45	EDC	11.11	Liquid	Drums	107-06-2
46	Ethanol	1.10	Liquid	Drums	64-17-5
47	Ethyl acetate	1.66	Liquid	Drums	141-78-6
48	Ethyl chloroformate	0.81	Liquid	Drums	541-41-3
49	Formaldehyde(37%)	0.16	Liquid	Drums	50-00-0
50	Freon gas	0.76	Gas	Cylinder	75-45-6
51	H2O2 - 50%	1.68	Liquid	Drums	7722-84-1
52	Hydrochloric acid	9.58	Liquid	Tank form	7647-01-0
53	Hexane	1.04	Liquid	Drums	110-54-3
54	Hydrogen	0.03	Gas	Cylinder	1333-74-0
55	Hydrogen peroxide (50%)	3.37	Liquid	Drums	7722-84-1
56	Iso propyl alcohol	6.78	Liquid	Tank form	67-63-0
57	K2CO3	1.04	Solid	Bags	584-08-7
58	KOH (85%)	0.44	Liquid	Drums	1310-58-3
59	Magnesium chloride	0.74	Solid	Bags	7791-18-6
60	Maltol	1.22	Solid	Bags	118-71-8
61	MDC	71.72	Liquid	Tank form	75-09-2
62	Methanol	51.65	Liquid	Tank form	67-56-1
63	Methoxyproponal	0.69	Liquid	Drums	107-98-2
64	Methylene chloride	0.77	Liquid	Drums	75-09-2
65	MIBK	0.87	Liquid	Drums	108-10-1
66	NaHCO3	0.03	Solid	Bags	144-55-8
67	NaOH Flakes	2.79	Solid	Bags	1310-73-2
68	NH4OH (20%)	2.44	Liquid	Drums	1336-21-6
69	n-Hexane	4.83	Liquid	Tank form	110-54-3

70	Nitric Acid (70%)	12.47	Liquid	Drums	7697-37-2
71	2-3 di methyl 4-Nitro pyridine n-oxide (Nitro compound)	4.13	Solid	Bags	37699-43-7
72	Orthophosphoric acid	0.09	Liquid	Drums	7664-38-2
73	Oxalic acid	0.07	Solid	Bags	144-62-7
74	Palladium carbon	0.01	Solid	Bags	03-05-7440
75	Para Ansidine	3.33	Solid	Bags	104-94-9
76	Para Toluene sulfonyl chloride	0.61	Solid	Bags	98-59-9
77	Paracetamol	1.01	Solid	Bags	103-90-2
78	Piperdine	0.59	Liquid	Drums	110-89-4
79	POCl3	1.71	Liquid	Drums	10025-87-3
80	Potassium carbonate	1.57	Solid	Bags	584-08-7
81	Potassium hydroxide(85%)	0.61	Solid	Bags	1310-58-3
82	Sitagliptin base	0.29	Solid	Bags	654671-77-9
83	SMO soln.(28%)	1.59	Liquid	Drums	124-41-4
84	Sod. Hypo chlorite (4%)	5.42	Liquid	Drums	7681-52-9
85	sodium 4-chloro-1-hydroxy butane-1-sulfonate (BALD-II)	0.18	Solid	Bags	54322-20-2.
86	Sodium azide	0.61	Solid	Bags	26628-22-8
87	Sodium bicarbonate	0.14	Solid	Bags	144-55-8
88	Sodium boro hydride	0.04	Solid	Bags	16940-66-2
89	Sodium carbonate	0.34	Solid	Bags	497-19-8

90	Sodium chloride	1.27	Solid	Bags	7647-14-5
91	Sodium hydro sulphide (26%)	2.07	Solid	Bags	7775-14-6
92	Sodium hydroxide	2.71	Solid	Bags	1310-73-2
93	Sodium hypo chlorite(4%)	3.27	Liquid	Drums	7681-52-9
94	Sodium sulphate	0.12	Solid	Bags	7757-82-6
95	Sodium sulphide (60%)	4.67	Solid	Bags	1313-82-2
96	Sodium thio sulphate	0.03	Solid	Bags	7772-98-7
97	S-phenyl ehtyl amine	0.98	Liquid	Drums	64-04-0
98	Succinic acid	0.03	Solid	Bags	110-15-6
99	Sulphide	3.56	Solid	Bags	1313-82-2
100	Sulphuric Acid	18.63	Liquid	Drums	7664-93-9
101	Tetra Butyl Ammonium Bromide	0.02	Solid	Bags	1643-19-2
102	Thionyl chloride	3.89	Liquid	Drums	07-09-7719
103	Titanium isopropoxide	0.14	Liquid	Drums	546-68-9
104	Titanium-IV isopropoxide	0.22	Liquid	Drums	546-68-9
105	Toluene	125.15	Liquid	Tank form	108-88-3
106	Tri fluoro ethanol	0.46	Liquid	Drums	75-89-8
107	Triethyl amine	1.51	Liquid	Drums	121-44-8
108	Trifluoro ethanol	0.20	Liquid	Drums	75-89-8
109	Trifluoroacetic acid	0.10	Liquid	Drums	76-05-1

Table 7.3

List of hazardous chemicals (Listed in part II of schedule I of MSIHC Rules)

S.No	Raw material	Physical form	Type of hazard	Maximum Storage quantity (Tonns)	Threshold Quantity (Rule 5,7,9 and 13 &15	Threshold Quantity (Rule 10 to 12	Level of Hazard
1	Acetic acid	Liquid	Flammable	8.46	Not specified	Not specified	Level 1 Hazard
2	Acetic anhydride	Liquid	Non-Flammable	2.48	Not specified	Not specified	Level 1 Hazard
3	Acetone	Liquid	Flammable	36.26	7000T	7000T	Level 1 Hazard
4	Acetonitrile	Liquid	Flammable	0.07	350T	5000T	Level 1 Hazard
5	Aluminium Chloride	Solid	Non-Flammable	1.0	Not specified	Not specified	Level 1 Hazard
6	Ammonia	Liquid	Toxic, corrosive	1.45	50 t	500 t	Level 1 Hazard
7	Chloroform	Liquid	Toxic	11.58	Not specified	Not specified	Level 1 Hazard
8	Carbon disulphide	Liquid	Toxic	2.44	20T	200T	Level 1 Hazard
9	Dimethyl sulphate	Liquid	Flammable Toxic	3.96	Not specified	Not specified	Level 1 Hazard
10	Ethanol	Liquid	Flammable	1.10	Not specified	Not specified	Level 1 Hazard
11	Formaldehyde	Liquid	Flammable	0.16	5 t	50 t	Level 1 Hazard
12	Hexane	Liquid	Flammable	1.04	Not specified	Not specified	Level 1 Hazard
13	Ethylacetate	Liquid	Non-Flammable	1.66	Not specified	Not specified	Level 1 Hazard
14	HCl	Liquid	Non-Flammable	9.58	25T	250T	Level 1 Hazard
15	Iso Propyl	Liquid	Flammable	6.78	10000	10000	Level 1

	alcohol						Hazard
16	Potassium hydroxide	Solid	corrosive	0.61	Not specified	Not specified	Level 1 Hazard
17	Methanol	Liquid	Flammable	51.65	10000	10000	Level 1 Hazard
18	Methylene dichloride	Liquid	Toxic	71.72	Not specified	Not specified	Level 1 Hazard
19	MIBK	Liquid	Flammable	0.87	Not specified	Not specified	Level 1 Hazard
20	n- hexane	Liquid	Flammable	4.83	Not specified	Not specified	Level 1 Hazard
21	Nitric acid	Liquid	corrosive	12.47	Not specified	Not specified	Level 1 Hazard
22	Sodium Hydroxide	Solid	Non-Flammable	2.71	Not specified	Not specified	Level 1 Hazard
23	Sodium azide	Solid	Toxic	0.61	Not specified	Not specified	Level 1 Hazard
24	Sodium sulphide	Solid	Flammable	2.07	Not specified	Not specified	Level 1 Hazard
25	Sulphuric acid	Liquid	Non-Flammable	18.63	Not specified	Not specified	Level 1 Hazard
26	Toluene	Liquid	Flammable	125.15	Not specified	Not specified	Level 1 Hazard
27	Tri Ethyl Amine (TEA)	Liquid	Flammable	1.51	10000	10000	Level 1 Hazard
28	Thionyl chloride	Liquid	Corrosive	3.89	Not specified	Not specified	Level 1 Hazard

Note :

Level I Hazard: Chemical is listed in schedule of chemicals but threshold limit did not crossed 1st threshold or 2nd threshold limit as per the schedule I of MSIHC Rules 2016

The Physical properties of the key chemicals stored are presented in the following **Table 7.4**

Table 7.4
Physical properties & Hazard characteristics of Key Raw materials

S.No	Name of the Material	Boiling point °C	Flash Point in °C	Explosive Limits volume % in air	NFPA Rating		
					Health	Fire reactivity	Reactivity
1	1,4-dibromo butane	197	112	-	2	1	0
2	Acetic Acid	118.1	37.8-93.3	4-19.9	3	2	0
3	Acetic anhydride		49	2.7-10.3	2	2	1
4	Acetonitrile	81.6	2-5.6	4.4-16	2	3	0
5	Acetone	55.6	-17.8	2.5-12.8	2	3	0
6	Acetyl chloride	52	4.4	7.3	3	3	2
7	Chloroform	61	-	-	2	0	0
8	Carbon disulfide	46.3	-30	4.3-50	3	3	0
9	Di iso propyl ether	68.5	-28	1.4-7.9	1	3	0
10	Dimethyl formide	153	57.77-67	2.2-15.2	2	2	0
11	Di methyl acetamide	163	66-70	1.8-11.5	2	2	0
12	DMSO	189	89-95	2.6-28.5	1	2	0
13	Ethylene dichloride	84	13	6.2-16	3	3	0
14	Ethanol	78.5	12.78-	3.3-19	2	3	0
15	Formaldehyde	98	50-60	6-36.5	3	2	0
16	Hexane	68	-22.5	1.15-7.5	3	3	0
17	Methanol	64.5	12	6.7-36	2	3	0
18	MDC	39.75	-	12-19	2	1	0
19	Toluene	110.6	4.44	1.2-6.75	2	3	0

Following table gives the bulk storages of chemicals after expansion activity.

Table 7.5
Bulk Storages after expansion

S.No	Name of the Material	MOC	Above ground/ Below Ground	No. Of tanks	Diameter (m)	Height (M)	Total Capacity (KL)
1	Methanol	MS	Below Ground	2	2.4	3.57	40 KL
2	Acetone	MS	Above Ground	2	2.4	3.57	40 KL
3	Toluene	MS	Above Ground	2	2.4	3.57	40 KL
4	MDC	MS	Above Ground	1	2.4	3.25	15 KL
5	MDC	MS	Above Ground	1	2.15	2.75	10 KL

7.6 Fire& Explosion Index (F&EI):

7.6.1 Methodology

Dow Chemical Company issued a guideline for hazard determination and protection. By this method a chemical process unit is rated numerically for hazards. The numerical value used is the Fire and Explosion Index (F&EI) which is most widely used for hazard evaluation in chemical process industries.

The guide applies to process unit only and not to auxiliary units such as power generating stations, plant water systems, control rooms, fired heaters, structural requirements, corrosive nature of material handled and personal safety equipment. These are regarded as basic features that do not vary according to the magnitude of the fire and explosion hazard involved. The guide also does not cover the processing and handling of explosives such as dynamite, TNT etc.

7.6.2 Computation of F&EI

The computation of fire and explosion index of each unit is based on the material factor. This is a measure of the intrinsic rate of potential energy release from fire explosion of most hazardous material or mixture of

materials present in significant quantity, whether it is raw material, intermediate, product, solvent etc., by combustion or chemical reaction. "In significant quantity" here means such quantity that the hazard represented by the material actually exists. The Nationality Fire Protection Agency of USA (NFPA) have specified standard values for material factor which should be used for F&EI calculations and are available in DOW's hazard classification guide in case it is not readily available, it can be calculated using the heat of combustion, flammability indices etc.

General process hazard are factors that play a primary role in determining the magnitude of loss of incident. It takes into account the nature of the reaction, ventilation of the unit, accessibility of the unit, drainage facilities etc., special process hazards are factors that contribute primarily to the probability of a loss incident. They consist of specific process conditions that have shown themselves to be major causes of fire and explosion incidents. It takes into account toxicity of the material, operating pressure, operation near flammable range, quantity of material, joints and packing, use of hot oil exchange system etc., The F&EI calculated as a product of material factor, general process hazard factor, and special process hazard factor.

7.6.3 Hazard Ranking

The hazard ranking based on F&EI value is as follows

Table 7.6
Degree of Hazard for F&EI

F&EI Index Range	Degrees of Hazard
1-60	Light
61-96	Moderate
97-127	Intermediate
128-158	Heavy
159 & above	Severe

7.6.3.1 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 Consequence Analysis has been done for selected scenarios by ALOHA (version 5.4.7) of EPA. The details of software used for MCA analysis are described below.

- A computer based version ALOHA 5.4.7 is used to calculate toxic and explosive effect of the accidental release of liquid chemicals within the plant area.
- ALOHA (Areal Locations of Hazardous Atmosphere) is a computer program designed especially for use by people responding to chemical release as well as for emergency planning and training.
- ALOHA was jointly developed by the National Oceanic and Atmospheric Administration (NOAA) and the Environment Protection Agency (EPA).
- 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.

7.6.3.2 Heat Radiation & Vapour cloud Fire distances of Hazardous Storages

Out of the 5 bulk storages, 5 chemicals have Fire threat possibilities. The heat radiation distances in case of pool fire for flammable storage tanks are presented in the below **Table 7.7** below

Table 7.7
Heat Radiation Damage Distances for storage tanks – Tank farm

S.No	Name of Raw material	FEI Index	Storage Tank Details				Scenario Details(Pool fire – Leaking tank)			
			Tank Capacity (KL)	No.s	Diameter (m)	Height (m)	Release Rate (Kg/min)	Heat radiation damage distances in m for KW/m2		
								10	5	2
1	Methanol	68	20	2	2.4	3.57	23.5	<10	<10	10
2	Acetone	95	20	2	2.4	3.57	23.4	<10	<10	13
3	MDC	19	15	1	2.4	3.25	30.3	<10	<10	<10
4	MDC	19	10	1	2.15	2.75	30.1	<10	<10	<10
5	Toluene	100	20	2	2.4	3.57	24.5	<10	11	16
6	Isopropyl alcohol	90	6.78 Tones Drums storage				1.67	<10	<10	21
7	Ethyl acetate	94	4.97 Tones Drums storage				1.67	11	11	-

Note:

2 kW/(sq m) -- people will feel pain after 45 seconds and receive second degree burns after 3 minutes;

- **5 kW/(sq m)** -- people will feel pain after 13 seconds and receive second degree burns after 40 seconds; and
- **10 kW/ (sq m)** -- people will feel pain after 5 seconds and receive second degree burns after 14 seconds.

The storage is a small capacity facility and accordingly the F& E index value is found to be moderate reflecting the threshold limits as prescribed in MSHC rules. As can be seen, the heat radiation distances are confined to plant area only.

7.6.3.3 Toxic chemicals storage and toxic impact distances:

Following 5 chemicals are classified as toxic chemicals used by the company. Toxic influence distances are estimated using ALOHA model in case of Drum Leakages/Tank leakages and presented below

Table 7.8

Toxic threat zones on release of chemicals

S.No	Name of the chemical	Storage capacity In Tons		Scenario Details							
			Maximum drum capacity	Release rate Kg/min	AEGL-3 Red (m)	AEGL-3 Red (ppm)	AEGL-2 Orange (m)	AEGL-2 Orange (ppm)	AEGL-1 Yellow (m)	AEGL-1 Yellow (ppm)	IDLH Values
1	Acetone	20 KL	Tanks	18.4	20	5700	29	3200	172	200	2500 PPM
2	Chloroform	34.74	200Kg	15.1	19	3200	175	64	-	-	500 PPM
3	Ethyl acetate	4.97	100 Kg	15.1	11	10000	33	1700	41	1200	2000PPM
4	DMSO	5.76	100 kg	15.1	34	1800	101	290	143	150	-
5	Carbon di sulphide	7.33	100 kg	15.1	77	480	140	160	523	13	500 PPM

Note :

AEGL-1 (Yellow zone): The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 (Orange zone): The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL-3 (Red zone): The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life threatening health effects or death.

7.6.3.4 Analysis of quantitative risk assessment data:

Based on the above quantitative risk assessment, following conclusions can be made.

- Flammability threat zones and heat radiation zones for flammable chemicals are within the plant premises
- FEI index for flammable chemicals is moderate for all chemicals
- Storage quantities of flammable chemicals are well below the threshold quantities
- However Toxic threat zone Orange category and Yellow zone concentrations are well within IDLH values of the chemicals.

7.6.3.5 Health Hazards from exposure to hazardous substances and control measures.

Based on analysis 5 chemicals are identified as toxic chemicals in liquid form. Toxic concentrations distances are determined based on the modelling data and presented. Following table summarizes the health hazards, antidotes if any and PPEs recommended for people & other suggested measures to control the escape/leakage of chemicals.

Table 7.9
Safety precautions for handling of toxic chemicals

S.No	Chemical	Health Hazards	PPE's proposed	Antidotes if any suggested	Storage and handling precautions suggested
1	Acetone	Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).	Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certifi ed respirator or equivalent. Gloves.	No specific antidote	Storage: Store in a segregated and approved area (flammables area). Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Keep away from direct sunlight and heat and avoid all possible sources of ignition (spark or flame). Precautions: Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the

					container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, acids, alkalis. in closed condition
2	Chloroform	Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).	Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves	No specific antidote	Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Sensitive to light. Store in light-resistant containers Precautions: Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as metals, alkalis.

3	DMSO	Slightly hazardous in case of inhalation (lung irritant). Slightly hazardous in case of skin contact (irritant, permeator), of ingestion.	Splash goggles, Lab coat, Vapor respirator, Gloves.	No specific antidote	Storage: Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Hygroscopic. Sensitive to light. Store in light-resistant containers. Precautions: Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.
4	Ethyl acetate	Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator), of eye contact	Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certifi	No specific antidotes suggested	Storage: Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until

		(irritant).	ed respirator or equivalent. Gloves.		ready for use. Avoid all possible sources of ignition (spark or flame). Moisture sensitive. Precautions: Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, alkalis.
5	Carbon disulfide	Extremely hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Very hazardous in case of skin contact (permeator). Inflammation of the eye is characterized by redness,	Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certifi ed respirator or equivalent. Gloves	No specific antidotes suggested	Storage: Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment

		watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.			containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F). Precautions: Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

7.7. Specific recommendations based on site observations

S.No	Area	Site Observations	Specific recommendations
1	Production Area	➢ All the reactor and centrifuges are very neatly placed ➢ Earthing strips are provided ➢ Belt guards are provided to all motor driven equipment ➢ Safety valves are placed on all reactors ➢ Dip pipes are provided wherever solvents are charged ➢ Housekeeping is good	None
2	Clean Rooms	➢ Good housekeeping is maintained in clean rooms ➢ Change room and cross bench entry system is provided ➢ 150 paschal pressure is maintained inside the clean rooms ➢ Air handling unit (AHU) for supply and exhaust air are in placed ➢ Pharma reactors (2 numbers) are provided with safety vials ➢ Colour coding is well defined ➢ Direction of flow is marked on all connecting pipe lines	➢ The reactors with drive are to be connected with earth strips ➢ Double earthling is to be provided to tray driers (2Nos)
3	Centrifuges	➢ Centrifuges are under operation with lids in closed condition and feed line through the top nozzle ➢ Earth stripes are provided ➢ Vent lines are taken	None

		outside of the room ➢ Specific anti static belts only are used ➢ Suitable PPE are being used by operators	
	Liquid raw materials storage	➢ Underground tanks are provided for solvents ➢ Vent lines are connected with flame arrestors ➢ A spray nozzle system with water and foam is provided in tank form	➢ All the vent lines are to be connected with condensers and receivers to condense and collect the solvent vapours ➢ All the tankers are to be provided sparks arresters in the exhaust lines and to be earthed during transfer of solvents
7	Raw materials Stores	➢ Room is maintained neatly stranded weights, balance and vacuum cleaner for the dusting are in place Quarantine ➢ Approved materials are earmarked with green rope ➢ AHU are placed outside so that only filter air being supply in to stores	None

Other Recommendations

DRIER ROOMS

1. Alarm to indicate any excess temperature above the prescribed limit.
2. Fire suit may be made available for emergency use.
3. Double earthing is to be provided to the unit

BOILER HOUSE

- Safety valve on steam boiler is to be checked every day for its functioning
- Pressure guage to be monitored regularly.

CHILLING PLANT

- Thickness tests for NH_3 receivers Oil Separator, Condenser, Evaporator etc., should be conducted once in a year and maintain such record
- Auto tripping devices are to be provided for various components in the unit when the stipulated parameters vary.

7.7.1 RISK MITIGATION MEASURES

- All process reactors, wherever solvents are used shall be provided with nitrogen blanketing system
- All storage tanks of solvents are provided with Condensers
- All reactors handling solvents are provided with vent condensers with chillers
- All centrifuges are connected to condensers to avoid fugitive solvent emissions
- Material data sheets shall be available at user places.
- Engineering controls for leak detection and control of storage tanks
- Availability of neutralization agents to control impact of any leakages of chemicals
- Closed material handling system through pipes
- Spill control kits and procedures are established.
- Provide personal protective equipment (PPE) such as gloves, goggles and respirators.
- Operators training on control measures by on job training/induction training.
- Carry out practice drills for cleaning up spills
- Annual health checks shall be carried out for all employees who are exposed to chemicals
- Information to District authorities to tackle off-site emergency situations

- Ensuring availability of antidotes in the plant and nearby hospital where tie up is there for the company to tackle any off-site emergency situation

7.8 Hazard and Operability Study (HAZOP)

Safety and reliability of modern processing plant can be improved by using procedures that recognize and eliminate potential problems in the design stage. This is especially important because of the increasing need to operate the different units, for economic reasons, more closely to known risk situations. Hence, it requires refined methods like HAZOP study technique for identifying hazardous situations and problems and eliminating them at the design stage. Based on process reactions, a list of process reactions were identified for taking additional care precautions and presented in **Table 7.10**

Table 7.10
Hazardous processes and precautions suggested

Unit process	Chemicals involved	Equipment & utilities	Temp/ Pressure	Emissions	Safety measures
Product : Omeprazole					
Stage II Nitro compound (Nitration)	Sulphuric acid, Nitric acid	SSR, Scrubber Utilities Chilled water	90-95^{0}C	NO_2 gas	The gas is scrubbed in Water from vent, personal protective to be used by work force
Stage V Chloro (Chlorination)	Thionyl chloride, Stage IV hydroxy compound	GLR, Scrubber Utilities RT water, Brine water	5-40^{0}C	HCl gas	The gas is Scrubbed in +Caustic Water soda Lye solution from vent, Personal protective to be used by work force
Product : Lansoprazole					
Stage II Nitro compound (Nitration)	Sulphuric acid, Nitric acid	SSR, Scrubber Utilities Chilled water	90-95^{0}C	NO_2 gas	The gas is Scrubbed in Water from vent, Personal protective to be used by work force
Stage V Chloro (Chlorination)	Thionyl chloride, Stage IV hydroxy compound	GLR, Scrubber Utilities RT water, Brine water	5-40^{0}C	HCl gas	The gas is Scrubbed in + Caustic Water soda Lye solution from vent, Personal protective to be used by work force

Product : Rabeprazole					
Stage II Nitro compound (Nitration)	Sulphuric acid, Nitric acid	SSR, Scrubber Utilities Chilled water	90-95^{0}C	NO_2 gas	The gas is Scrubbed in Water from vent, Personal protective to be used by work force
Stage VI Chloro (Chlorination)	Thionyl chloride, Stage IV hydroxyl compound	GLR, Scrubber Utilities RT water, Brine water	5-40^{0}C	HCl gas	The gas is Scrubbed in + Caustic Water soda Lye solution from vent, Personal protective to be used by work force
Product : Pantoprazole					
Stage III					
(Chlorination)	$POCl_3$ (phosphorous oxychloride) Hydroxy compound chlorination	GLR, Scrubber Utilities RT water, Brine water	10–70^{0}C	HCl gas	The gas is Scrubbed in + Caustic Water soda Lye solution from vent, Personal protective to be used by work force
Stage V Chloro (Chlorination)	Thionyl chloride, Stage IV hydroxyl compound	GLR, Scrubber Utilities RT water, Brine water	5-30^{0}C	HCl gas	The gas is Scrubbed in + Caustic Water soda Lye solution from vent Personal protective to be used by work force

7.8.1 HAZOP WORK SHEETS

Typical hazop study for the proposed products is presented in the table below.

Table 7.11
HAZOP Study : Rabeprazole

S.No	Deviation	Causes	Consequences	Actions to be taken
1	More Charging of Sulphuric acid	1) Valve seating corroded or struck up in 'open' position 2) Faster addition	1) More By product -$(NH_4)_2SO_4$ is produced and yield is decreased	1) Valve is to be serviced/ replaced
2	No Charging of Sulphuric acid	1) No Sulphuric acid in M.T 2) Wrong indication of level indicator 3) Bottom valve struck up in closed position	1) Without addition of RM running of agitator, waste of power and time 2) If level shows less the yield will be less If level shows more, waste of Raw material and more by product formation 3) No material loss, but waste of time	1) Charging of Sulphuric acid from storage tank to day tank 2) Level indicator bottom & top valves rectification 3) Bottom valve servicing or replacement
3	Less Charging of Sulphuric acid	1) Pipe is partially closed 2) Valve is not properly opened 3) Damaged gasket coming in the way	1) Delay in the reaction 2) Waste of power	1) Choke to be removed 2) Valve to be serviced or replaced 3) Gasket replacement

7.8.2 Safety measures for Transportation, Storage & Handling of chemicals

- Solvent is proposed to be received by road tankers and stored in barrels.
- Solvent unloading standard procedure will in place and will be implemented for safe unloading of road tanker.
- Static earthing provision will be made for tanker unloading.
- Drum handling trolleys will be used for transportation of drums up to plant.
- Muffler on the silencer of the tanker during entering in factory premises.
- Display Boards will be provided on all storage tanks which includes the name of the chemicals, stored Material of construction and date of painting.
- Hazardous display board and national fire prevention association code will be displayed on storage area.
- On-site detectors for fire based on heat &/or smoke detection with alarm system will be provided as required.
- Fire extinguishers will be provided as required.
- First aids boxes will also be provided at different places wherever required.
- Water showering system will be provided to the flammable chemicals storage area, wherever required to avoid the vaporization due to increase in atmosphere temperature.
- Area will be declared as "NO SMOKE ZONE".

7.9 Occupational Safety and Health

The Bulk drugs industry involves handling of various chemicals. The manufacturing process may generate fugitive missions, which will pose hazards in the production area to the employees. The occupational safety and health plan shall follow the guidelines based on Factories Act 1948 and shall be finalized in consultation with the local factories inspectorate.

The occupational safety and health plan is prepared to identify the hazards due to the operations and process, with the

mitigation measures. The mitigation measures are mainly engineering controls, production area conditions, personal protective equipment and training and education.

7.9.1 Health Surveillance Plan

The health surveillance plan consists of medical check up on recruitment to ascertain the health status of the employees. The data to be obtained includes;

Baseline health data such as height, weight and Vital statistics, and detailed history of previous diseases and occupational exposures are recorded. The focus will be on previous lung problems and precious exposure to lung toxins such as silica, asbestos, irritant gases etc., A history of personal hobbies or activities that might involve exposures to potential toxicants, particularly those that might affect target organs of concern of metal species, Past history of any allergies, including asthma. Identification of personal habits (smoking, hygiene, alcohol consumption, fingernail biting) that may be relevant to work. Histories will be sufficiently detailed, complete physical examination with special attention to respiratory, the appropriate respiratory equipment (if any) that may be worn, X-ray, Blood tests and urine tests.

Annual health check up for all employees who are working in production areas and stores areas, including casual workers, is done through the hospital. It is suggested to including general health check up, lung function test, Liver function tests, urine and blood examinations & Records are maintained. It is suggested to maintain Antidotes as suggested for toxic gas hazards in the referral hospital always to meet any emergencies.

7.9.2 Tie up with Local Hospitals:

Government Hospitals and Private nursing homes are available in Sadasivpet and Sangareddy. We have occupational health centre for treatment and first aid activities. If any major injuries are

observed at that time we will admit in the authorised and approved insurance facility hospitals.

7.10 Disaster Management Plan

This Disaster Management Plan (DMP) has been designed based on the range, scales and effects of "Major Generic Hazards" described in the Risk Assessment Report just mentioned and on their typical behaviours predicted therein. The DMP addresses the range of thermal and mechanical impacts of these major hazards so that potential harm to people onsite and off-site, plant and environment can be reduced to a practicable minimum. The scenarios of loss of containment are credible worst cases to which this DMP is linked.

The project is in its formative stage and detail engineering is yet to be done, so the elements of the DMP are based on concepts.

The emergency plan envisaged will be designed to intercept full range of hazards specific to Pharmaceutical industry. In particular, the DMP will be designed and conducted to mitigate those losses of containment situations, which have potentials to escalate into major perils.

Emergency medical aids to those who might be affected by chemical spills and toxic exposure will be inherent in the basic capabilities. The most important capability of this DMP will be the required speed of response to intercept a developing emergency in good time so that disasters such as explosion, major fire etc. are never allowed to happen.

7.10.1 Disaster Control Philosophy

The emergency control philosophy of the plant is in line with its normal operational controls. The emergency control room will be the plant's Central Control Room, which will employ Distributed Control System (DCS). All emergency operations, which may involve shutdown of the plant, will be controlled from the Central Control Room by the same operator(s) using dedicated "Shut-Down Consoles". The consoles will send commands to

initiate the shutdown procedure. Plant shutdown system will be performed by DCS.

The principal strategy of DMP of the plant is "Prevention" of identified major hazards. The "Identification" of the hazards will employ one or more of the techniques [e.g. Hazard and Operability Study (HAZOP), accident consequence analysis etc.]. Since these hazards can occur only in the event of loss of containment one of the key objectives of technology selection, project engineering, construction, commissioning and operation is "Total and Consistent Quality Assurance". The Project Authority will be committed to this strategy right from the conceptual stage of the plant so that the objective of prevention can have ample opportunities to mature and be realised in practice

The DMP or Emergency Preparedness Plan (EPP) will consist of:

A. On-site Emergency Plan

B. Off-site Emergency Plan

Disaster Management Plan preparation under the headlines of On-site Emergency Plan and Off-site Emergency Plan is in consonance with the guidelines laid by the Ministry of Environment and Forests (MOEF), Govt of India."Occupier" of the facility is responsible for the development of the On-site Emergency Plan as per the guidelines given by the Government. The Off-site Emergency Plan should be developed by the Government (District Authorities).

7.10.2 ONSITE EMERGENCY PLAN

Objectives of Emergency Management Plan (On-Site)

Objectives of Onsite and offsite Emergency Plan

A quick and effective response during emergency can have tremendous significance on whether the situation is controlled with little loss or it turns into a major emergency therefore, the objectives of this onsite emergency plan (ONSEP)

- To localize, Contain & Control the emergency and, if possible

During Emergency:

- To localize the emergency and possible eliminate it
- To minimize the consequences of an emergency
- To prevent so reading of the damage in the other areas
- To mitigate the consequences of emergency
- To give necessary warning to plant personnel and neighbourhood
- To maximize the resources utilization and combined effort towards the emergency operations
- To mobilize the internal resources and utilize them in the most effective way
- To arrange rescue of persons, transport, treatment of affected persons and to rehabilitate
- To seek necessary help from industries in the neighbourhood or local authorities.
- To provided information government agencies and to provided information to public

During Normal Time:

- To keep the required emergency equipment in stock at right places and ensure their working condition;
- To keep in readiness, the concerned personnel fully trained in the use of emergency.
- Preserving records, evidences of situation for subsequent emergency etc, and upkeep of Onsite Emergency Plan, establishing protocol with mutual aid organizations and interact with them and plan & organize Mock Drills for On Site Emergency and arrange to evaluate such drills so as to improve preparedness.
- Participate on off Site emergency mock drill whenever organized by the District Emergency Authority.

7.10.3 Elements of onsite Emergency Plan

Important elements considered in this plan are:

- Identification of Onsite & Off site Emergency
- Emergency Organization

- Priority of protection
- Emergency Response Team(ERT)-Roles & Responsibilities
- List of ERT in Tabular Form
- Emergency Control Equipment, Facilities & Resources
- Procedures to Meet Emergency
- General Evacuation
- Emergency Procedures for various type of emergencies
- Emergency Procedure for Off-Site Emergencies
- Guidelines for safe Shutdown of Production Block
- Emergency Handling Guidelines Mutual Aid
- Help & Guidance from Civic Administration
- Mock Drill Planning & Procedure
- Training on Onsite & Off-Site Emergency Plan
- Review of Onsite & Off-site Emergency plan

7.10.4 Emergencies Identified

Based on the Chemical & flammable solvents used and stored and manufacturing processes being done, the various situations having emergency potential are indentified.

7.10.5 Emergency Organization

The responsibilities of key personnel for emergencies are clearly defined as follows

An emergency control room as the focal point has been earmarked. The control room flashes information to various agencies. This is located in an area of minimum risk and close to road. Security and Time office room is the emergency control point.

7.10.6 Emergency Facilities

a) Emergency Control Centre (ECC)

ECC is located at security office room at main gate. This is located in an area of minimum risk and close to Road. It is a location, where site controller, emergency and other emergency response team (ERT) members except Fire fighting, first aid and control team can assemble in the event of onsite Emergency and plan for emergency management. Most of the

operations are carried out at the emergency site. Necessary information is maintained at ECC.

The following Emergency Equipment & Information shall be provided in ECC.

- Lay out Plant indication locations like Utilities, Power Supply, Solvent Storage Tank yard etc
- One copy of OSEP
- List of Key personnel with Telephone numbers
- List of Govt. official/External Agency/Hospital etc personnel with Telephone numbers
- Material Safety Data Sheets(MSDS)
- Personal Protective Equipment(PPE)
- Self Contained Breathing Apparatus(SCBA)
- Spare fist aid box
- Rope Ladder
- Flame proof torches
- Barricade Tape Bundle
- Megaphone
- Tool Box containing tools like spanner, gasket, nut bolts, wench spanners, M Seal etc

b) Assembly Points

Assembly point is that location where the persons not connected with emergency operation and non essential persons can assemble or can await either for further instructions or for evacuation from the factory to a safe place, transport and rehabilitation.

Emergency control systems present

The following emergency control systems are in place in M/s. Everest organics Limited.

1. Lightening protection for all buildings and high raised chimneys.
2. Double Earthing & Bonding for electrostatic hazards for all reactors
3. Mobile earthing for drums while charging material
4. Closed arrangement for solvent transferring.
5. Pressure Relief system & Rupture Discs

6. Earth Rite system for road tanker loading and unloading.
7. FLP fittings at Flammable materials handling areas.
8. Product containment booth at raw material sifting.
   - Addressable fire detection system.
9. Fire protection systems :
   - Portable Fire Extinguishers
10. Fire Hydrant system covering all blocks
11. Wind Sock are located on production block 1- SE, Solvent recovery plant (SRP)- NE and SW
12. Occupational Health Centre.
13. Safe handling procedures.

11 Spill Control kits- 9 Nos.

12 Static discharge Touch pads- 4 Nos.

d) Location of First Aid Boxes

The first aid boxes are located at the following places Security main gate, QC, ware house, production block-1 (OP Bock), Production Block-2 (Pantaprazole), Pilot plant – Block-2, Block-4 (Nitro/BZM) and Ambulance and will be under the charge of EHS in-charge.

e) Fire protection system

An elaborate fire protection system is in place in M/s. Everest organics Limited. Fire Hydrant system is in place to cover the entire plant including manufacturing blocks, Bulk storage tanks and utility areas. Water storage of 100 KL is maintained in the fire sump to meet any emergency. Fire tenders are available at Sadashivapet. Fire station is 8 KM from the site. Details of fire fighting equipment's are given below.

FIRE HYDRANT SYSTEM

A self operated fire hydrant network with a separate fire water pump house is installed in the plant to take care of fire accidents independently in the incipient stage of fire to minimise the loss of property and life. The fire hydrant system contains the following main items:

S.no	Equipment description	Qty/No.s
1	Portable fire Extinguishers	93 NO.s
2	Hose reel Systems	9 Nos
3	Yard hydrant System- single hydrant	14 Nos
4	Fire hose Boxes- Double doors	8 Nos
5	Hose pipes – 15 m length- CP type	16 Nos
6	Hose pipe 15 m length – RRL Type	6 Nos
7	Manually operated Fire alarm MCP	6 Nos
8	Underground static water storage tank	246 KL
	Fire pumps	
1	Electrical pump- Main Pump	1 No. 200 KL/hr
2	Diesel Pump	1 No. 137 KL/ hr
3	Jockey pump	1 No. 80 KL/hr
4	Branch Nozzles	6 Nos
5	AFFF Solution	52 Nos. Cans, each of 20 Litre

Fire fighting equipment & system -Portable Fire

- Portable fire extinguisher of varying capacity and types are provided at strategic locations based on the nature of hazards
- DCP & CO2 type of fire extinguishers are provided near electrical installations like MCC/PCC panels, UPS battery rooms, HT yard, transformer yard etc.
- Foam type of fire extinguishers is provided near solvent tank yards, production blocks, RM stores etc.
- Modular type DCP Fire extinguishers, each of 10 Kg capacity have been installed in the production Blocks-I, II, IV. These type of Fire extinguishers have bulb which gets activated at 68^{O} C. In case of fire and powder is sprayed on fire. These modular type fire extinguishers have been placed in between two reactors- at 1^{st} floor and ground

floor. Modular type fire extinguishers have also been provided in RM stores which are place above Nitro compound.

- AFFF Foam trolleys of varying capacity from 50 liters to 135 liter have also been provided in production Blocks, solvent Storage tanks & in RM stores.

Emergency Personal protective equipment facilities in emergency control centre

S. No.	Item Name	Quantity
1	Rubber hand Gloves	10 pairs
2	Helmets	10 No's
3	Safety goggles	10 No's
4	Air Breathing Mask	2 No's
5	SCBA	2 sets
6	Full body Harness	4 No's
7	Full PVC Suit	2 Sets
8	Electric resistant hand gloves- 11 KVA	2 Pairs
9	Fire suits	2 sets
10	Fire Blanket	3 No's
11	Nitrile Hand gloves	6 Pairs
12	Acid vapour Respirator	4 Pairs
13	Full face mask with Multi vapour	5 No's

h) Emergency Escapes

Panic push bar type emergency exits or Emergency exits doors have been provided to areas in the production blocks and other blocks like Ware house, QC area, etc. Auto glows signage's for emergency exits have been displayed

EMERGENCY PROCEDURE FOR OFF SITE EMERGENCY

Emergency procedure fire/ spills during transport of hazardous waste on road

- Driver should immediately inform to the waste disposal owner and security/ safety in charge
- The driver and cleaner should cordon off the area so as to keep the public away from the site of incident

- Driver should inform to Local Police immediately for controlling the traffic
- The driver should extinguish the fire, if it is small
- The driver should take help of fire brigade for extinguishing of big fire.
- The drivers should use sand/ murram for containing the spills using hand gloves and safety goggle
- The waste disposal owner and EHS head or his deputy should inform State pollution control board officials about the nature of incident, area and extent of damage so as to take their help in containing an emergency
- TSPCB Officials and officials of Director of Factories will in turn will declare an offsite emergency and take action as per the District Level Emergency Crisis

7.10.7 ORGANISATION

Emergency organization is for effective management of situation in Emergency. This is based on general shift organization and shift organization. The plant is headed by Managing Director. The production and relevant activities are looked after by Technical director who is the Site head. He is supported by qualified and experienced officials such as GM- P&A, Head- Services & Maintenance, In charge- EHS, Head Safety, Production Manger, Plant shift in charge that are qualified and experienced.

7.11 MAN POWER

The plant works in 3 shifts round the clock in addition to general shift. The shift personnel are engaged, for the production, service & maintenance, safety and security, while general shift staff covers activities of the plant including administration

SHIFT TIMINGS

1st Shift	06 Hrs - 1400 Hrs
2nd Shift	14 Hrs – 2200 Hrs
3rd Shift	22.00 Hrs– 06.00 Hrs
General Shift	9.00 Hrs – 1730 Hrs

7.11.1 EMERGENCY ORGANISATION

An emergency organisation is drawn up to execute emergency operations. Technical Director is designated as the Site Controller. GM- P & A is designated as the Incident Controller. Maintenance- Head/ shift-In Charge is designated as Emergency controller.

Mockdrill

Mock Drills would be organization once in 3 months to evaluate the preparedness and efficacy of OSEP

- Mock Drills Initially, few informed mock drills (To familiarize with plan) and then uninformed mock drills (or rehearsals) for meeting emergencies.
- Such rehearsals would be carefully analyzed and shortcoming would be identified and necessary corrections would be taken up.
- In Charge-EHS/Site Head is responsible for planning and execution and evaluation of mock drills. Also information would be given to statutory authorities.
- The types of Mock drills are:
  -Evacuation Drill
  -Wet Drill
  -Fire Drill
  -Toxic Spill/release drill
  -Chemicals spillage control drill
- Mock drill observation team will be constituted they will note down the action of various coordinators in chronological order.
- The time of arrival of Emergency Reponse Team, Incident controller, each emergency coordinator and their duties will be detailed in note.
- Immediately after mock drill, the drill observer's team and emergency coordinators will meet and review mock drill records in chronological order and take note of corrective action.
- The record of this meeting note is compliance of concerned.

7.12 Review Of Onsite Emergency Plan

- OSEP would be reviewed whenever there is a major change in product route of manufacturing or use of new chemicals having high emergency potential large quantity or least once in three years.
- The OSEP shall be revised after the occurrence of a major accident/9incident/dangerous occurrence or major put-come of the risk assessment.
- The Emergency plan shall be reviewed periodically and as per the recommendation of mock drill observations of critical nature.
- Head-EHS/Site is responsible for such update, review and making available latest updated copy of Emergency plan to all concerned factory as well to the relevant authorities.

7.13 Off site Emergency Plan:

This is a brown field pharmaceutical unit. There are 28 chemicals which come under Manufacture, Storage and Import of hazardous Chemicals (MSIHC) Rules, 2016. No chemicals crossed the 1st or 2nd threshold limits prescribed in MSIHC Rules. Modelling data on potential hazards indicates that the impacts will be limited to plant premises. 6 Toxic chemicals are stored in liquid condition. Information on quantities of chemicals stored, emergency centre and mitigation will be submitted to Authorities under MSIHC Rules and chemical Accidents (Emergency Planning preparedness and response) Rules. The unit will also participate in mutual aid program with other units in the area to get help from other units and also to help other units in case of emergency situations. Accessibility to all bulk storages will be maintained without any obstructions and all chemical storages will be provided with dyke walls to contain any accidental spills or leaks. Unit will coordinate with District Administration to give information to public in case of any emergency situation.