

/aibhu Safety Consultants



Vaibhu Safety Consultants



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# **SECTION I**

#### **Executive Summary: -**

The industry named **M/s. Meghmani Organics Limited – Ankleshwar** is engaged in production of Agrochemicals and Intermediates manufacturing facility. Now the company desires to increase the production capacity of pesticide technical products along with addition of few more products to widen the range of products in Agrochemicals & intermediates within existing premises located at **Plot No. 5001/B, 5027 to 5034 & 5037, 4707/B & 4707/P, GIDC Estate, Ankleshwar, State: Gujarat, India.** 

Various hazardous chemicals are stored and handled at process area. Some chemicals are used in large quantity and stored in tank in tank farm area. Some chemicals are received in drums and stored in drum storage area separately as per its incompatibility and other properties like flammable, toxic, corrosive, and reactive.

Based on the data furnished and the study of the installation, Hazardous area have been identified and demarked it in red colour line in plant layout figure-2.2 and their consequences are modeled mathematically using **DNV PHAST SAFETI 8.22 and HAMSGAP** software. Mapping of various scenarios are with their hazardous distances and safe distances are drawn on site plan for easy understanding of the consequences of the accident/ incident.

The study indicates that possible hazards associated with the plant are confined to (a)Iso Butylene 10 MTBullet.(b) Hexane 10 MT Storage Tank. (c) Acetic Acid 10 MT Storage Tank. (d) Acetonitrile 10 MT Storage Tank. (e) Acrylonitrile 10 MT Storage Tank. (f) Tri Ethylamine 10 MT Storage Tank. (g) Thionyl Chloride 10 MT Storage Tank. (h) Hydrogen 7m<sup>3</sup>Gas Cylinder. (i) HCL 50 Kg Gas Cylinder (j) Boron Trifluoride 50 Kg Gas Cylinder (k) Coal Storage Yard (l) Drum storage area. Various hazardous scenarios have been identified for Risk Assessment and the consequences modeled.

The results of the analysis have been summarized as below.

## Jet Fire

As can be seen from the results of the summary of the Quantitative Risk Analysis study, the Fatality distance due to Scenario 2.1 Isobutylene 10 MT Bullet Short Pipeline Rupture of 20.61 meter at 37.5 Kw/M<sup>2</sup>-(Total Damage distance),25.56 meter at 12.5 Kw/M<sup>2</sup>-(First Deg. Burn), and 32.87 Meter at 4.0 Kw/M<sup>2</sup>-(Safe Zone).

#### **Pool Fire**

As can be seen from the results of the summary of the Quantitative Risk Analysis study, the Fatality distance due to Scenario 1.1 Isobutylene 10 MT Bullet Catastrophic Rupture at dispersion of **101.6 meterat37.5 Kw/M<sup>2</sup> -(Total Damage** 



# distance),190.3 meter at 12.5 Kw/M<sup>2</sup> -(First Deg. Burn), and 319.4 Meter at 4.0 Kw/M<sup>2</sup> - (Safe Zone).

# Flash Fire Cases

Flash Fire is usually dispersion case, where the extent of cloud until the flammability limits (LEL, UEL) is measured. The important factor in measuring the extent of cloud is atmospheric stability & wind speed. As the wind speed increases, the cloud tends to move further down & gets diluted which results in lower quantity of material in the flammability limits i.e. lower strength of flash fire. The highest damage distances for flash fire are for isolatable is Scenario 1.2 Isobutylene 10 MT Bullet Catastrophic Rupture at 1.5F weather condition. The maximum damage distance for Flash Fire is **164.5 meter(1.8% LEL)** &**223.2 meter (1/2 LEL)** – 1.5F of whether condition. UFL is defined as burning zone, which means people caught within the burning zone are exposed to a fatality rate of 100%.

## Late Explosion Worst case - UVCE

As can be seen from the results of the summary of the Quantitative Risk Analysis study, the Fatality distance due to Scenario 11.3 Triethylamine 10 MT Storage Tank Catastrophic Rupture dispersion of 160.1 meter at 0.2068 bar –(100% Damage), 173.5 meter at 0.1379 bar –(Ear Drum Rupture), and 424.8 meter at 0.02068 bar –(10% Glass Damage).

## Fireball

As can be seen from the results of the summary of the Quantitative Risk Analysis study, the Fatality distance due to Scenario 1.3Iso Butylene 10 MT Bullet Catastrophic Rupture dispersion of 97.22 meter at 37.5 Kw/M<sup>2</sup>- (Total Damage distance),174.6 meter at 12.5 Kw/M<sup>2</sup>- (First Deg. Burn), and 305.1 Meter at 4.0 Kw/M<sup>2</sup>- (Safe Zone).

## BLEVE

As can be seen from the results of the summary of the Quantitative Risk Analysis study, the Fatality distance due to Scenario 22.2 Drum Storage Warehouse Fire dispersion 10.06 meter at 0.2068 bar –(100% Damage), 13.06 meter at 0.1379 bar – (Ear Drum Rupture), and 50.09 meter at 0.02068 bar –(10% Glass Damage).

## Maximum Concentration Footprint

As can be seen from the results of the summary of the Quantitative Risk Analysis study, the Fatality distance due to Scenario 15.1 Chlorine Gas 900Kg Tonner Catastrophic Rupture toxic release dispersion of **57.56 meter** at **1060 ppm (LC 50 For Human)**, **499 meters** at **85 ppm (IDLH)**, **948 meters** at **35ppm (ERPG-2)**. and **2199.3 meters** at **10 ppm (ERPG-1)**.

Conclusion Based on the

- 1) Risk Analysis study and information regarding the layout plan and safety systems provided by the company management.
- 2) Discussions with company officials.



# CHAPTER II

# **OBJECTIVE, PHILOSOPHY AND METHODOLOGY OF RISK ASSESSMENT**

#### 2.1 Objective:

The main objectives of the Risk Assessment (RA) study is to determine damage due to major hazards having damage potential to life & property and provide a scientific basis to assess safety level of the facility.

The principle objective of this study was to identify major risks in the manufacture of chemical, agrochemical and intermediates products and storage of hazardous chemical at site and to evaluate on-site & off-site consequences of identified hazard scenarios. Pointers are then given for effective mitigation of hazards in terms of suggestions for effective disaster management, suggesting minimum preventive and protective measures & change of practices to ensure safety.

## 2.2 Philosophy:

This report is limited to the following:

- Identification of major risk areas.
- Hazard identification/Identification of failure cases
- Consequential analysis of probable risks / failure cases
  - Evaluation of heat radiation & pressure wave profiles for identified failure cases
  - $\circ\,$  Risk assessment on the basic of the above evaluation & risk acceptability
  - Minimum preventive & protective measures to be taken to minimize risks to maximum possible extent.
- Giving pointers for effective disaster management
- Suggesting other measures to further lower the probability of risk

## 2.3 Methodology

The procedure used for carrying out the Quantitative Risk Assessment Study is outlined below:

Identify Credible Loss Scenarios for the facility under the study by discussion with **M/s. Meghmani Organics Limited – Ankleshwar.** Simulate loss Scenarios to determine the vulnerable zones for toxic dispersion, pool fire, Drum storage area fire, Flash fire, Explosion over pressure, Vapour cloud Explosion, Ball fire using software packages **DNVPHAST SAFETI8.22 and HAMSGAP.** 

Suggest mitigating measures to reduce the damage, considering all aspects of the facilities. The flowchart of the methodology for the present study is shown in following page.

# RISK ASSESSMENT STUDY METHODOLOGY FLOWCHART





## **SECTION III**

**INTRODUCTION OF THE UNIT** 

# 3.1 COMPANY INTRODUCTION: -

M/s. Meghmani Organics Limited - Ankleshwaris located at Plot No. 5001/B, 5027 to 5034 & 5037, 4707/B & 4707/P, GIDC Estate, Ankleshwar, State – Gujarat, India.engaged in manufacturing of Agrochemicals and intermediates Facility. Now, company proposed to increase the existing production capacity Agrochemicals and intermediates.

The proposed expansion project is a brownfield project for increase in existing production capacity and addition of new products to existing Agrochemicals and Intermediates manufacturing facility. The technology to be used to manufacture of the proposed products will be totally proven and safe in all aspects.

M/s. Meghmani Organics Limited (MOL) was established in 1986, when Gujarat Industries was established as a partnership firm in Gujarat, India to manufacture pigments. High productivity and profitability transformed Gujarat Industries to a joint stock company, under the name of Meghmani Organics Limited, by 1995.

MOL has diversified its business interests to include a range of pesticides and other pigment products as well. The Agro Chemicals segment manufactures and distributes technical, intermediates and formulations of insecticides. The Basic Chemicals segment includes basic chemicals, which undergo processing in various stages before being converted into downstream Chemicals that are used by the agriculture sector and also by consumers.

The directors of the group are well qualified Engineers as also Management Graduates from USA and highly experienced in the business of manufacturing and marketing complex chemistry-based products. Mr. Karna Patel, Director of the company, is having very good business experience in the same field since last 10 years. The company is also supported by other senior personal including Mr. Vasant Patel (Vice President - Process) who has more than 25-year experience and overall controlled by the Executive Directors.





# 3.2 DETAILS OF UNIT: -

# **TABLE: 3.1**

Sr. No	Particula	Particulars						
	Full Name & Address of UnitM/s. Meghmani OrganicsPlot No. 5001/B, 50274707/B & 4707/P, GIDOState – Gujarat, India.					i <b>mited</b> to 5( Estate,	)34 & 5037, Ankleshwar,	
1.	Telepho	ne No.						
2.	List of D	irectors:						
	Sr. No		Name and addr	ess of the Directo	rs	Des	signation	
	1.	Mr. Karn 54, Mr.n Ambawa	a R. Patel athpark Society, di, Ahmedabad-	Bh. Manekbaug S 380 015.	ociety,	Chief Offic	Operating cer (COO)	
	2.	Mr. Anki 6-B, Ash Bopal Ro	t N. Patel ok Vatika No. 1, ( oad, Bodakdev, A	Opp. Ekta Farm, A hmedabad-380 0	mbli, 58.	Chief offic	executive er (CEO)	
	3.	Mr. Jaya 359, Lan Ahmeda	ntibhai M. Patel e No. 18, Satyagı ba	ahChhavani, Sate	elite Road,	Ex Ch	ecutive airman	
	4.	Mr. Ashi 246, Lan Ahmeda	shbhai N. Sopark e 13, SatyagrahC bad	ar Shhavani, Satelite	Road,	Managing Director		
	5.	Mr. Natu 6-B, Ash Bopal Ro	bhai M. Patel ok Vatika No. 1, ( oad, Bodakdev, A	Opp. Ekta Farm, A hmedabad	mbli,	Ma D	anaging irector	
	6.	Mr. Ram 54, Shree Ambawa	esh bhai M. Patel enathPark, B/h M Idi, Ahmedabad	l AanekBaug Socie	ty,	Ex D	ecutive irector	
	7.	Mr. Anar 53, Shree ManekBa	ndbhai I. Patel enathPark, B/h augSociety,Amba	awadi Ahmedaba	d	Ex D	ecutive irector	
3.	Man Pov	ver:						
		Total workers in all shifts						
	Status Existing Propos					1	Total	
			Male	300	350		650	
	Ке	gular	remale Total 1	<u>UI</u> 301	251		<u> </u>	
			Male	97	125		217	
	Cor	ntract	Female	0	0		0	
			Total-2	92	125		217	





# CHEMISTRY OF SUCCESS AT WORK 1/s. Meghmani Organics Limited – Ankleshwar

Sr. No	Particul	Particulars						
			Total (1 + 2)	393	476	869		
4.	License	&Approval	:-					
	Factory	Inspectora	te	Valid Lice	Valid License Number Available			
	GPCB/P	CB consen	t	Applied fo Clearance	Applied for obtaining environmental			
	Explosive license No:			PESO appr be availab	roved Petroleum Class le.	s A, B or C will		
	Solid wa	aste Dispos	al	Solid was consent.	te Disposal authority	as per GPCB		
5.	No. Of s	hift & Shift	timing	Will be on	Four Shift.			
	General			9:00 hrs. t	o 17:00 hrs.			
	First			6:00 hrs. t	o 14:00 hrs.			
	Second			14:00 hrs.	to 22:00 hrs.			
6	Third			22:00 hrs.	to 6:00 hrs.			
6.	Environ	s (Nearest	Facilities):					
	Sr. Particulars				Details			
	A. Nature and Size of the		Expansi	Expansion in existing Agrochemicals and intermediates manufacturing facility				
	B.	Location	L Details	meerme				
	1.	Area		Plot No. 5001/B, 5027 to 5034 & 5037, 4707/B & 4707/P, GIDC Estate, Ankleshwar				
	2.	Taluka		Anklesh	Ankleshwar			
	3.	District		Bharuch	1			
	4.	State		Gujarat				
	C.	Geograph	nical Co-Ordinates	Latitude Longitu	Latitude: 21°36'54.04" N, Longitude: 73°02'02.08" E			
	D.	Project C	ost for the Propose	ed Expansior	1			
	1.	Total Cos	t	Rs. 7.5 C	Crores			
	2.	EMS Cost	-	Rs.56 La	acs			
	3.	CSR Cost		Rs.34 La	acs			
	Ε.	Land Are	a Details					
		Total Lar	id Area	57,986 1	m <sup>2</sup>			
	Green belt Area			within a	23,194 m <sup>2</sup> (40%) (will be developed within and/or outside the premises)			
7.	Power &	& Fuel Conn	ection:					
	Des	cription	Source	е	Total power require proposed expa	ement after Insion		
	P requ	ower lirement	Dakshin Guj Company Ltd. (E	arat Vij OGVCL)	31,000 KV	Ϋ́Α		





# CHEMISTRY OF SUCCESS AT WORK 1/s. Meghmani Organics Limited – Ankleshwar

Sr. No	Particulars										
8.	D.G. S	et				Yes	, for	emergency u	ise only		
9.	Water	• Storage and S	Sourc	ce		Wat	ter t	hrough GIDC	water supply lin	ne	
10.	Water	· Consumption	Deta	ils:							
						Wate	er Co	onsumption (	KL/day)		
	Gr							Total after	Proposed Expan	sion	
	No. Description E		Exis	ting Propos		osed	(Fr Gl	1 <sup>st</sup> day resh water/ DC water)	Recycle water	2 <sup>nd</sup> day	
	Α	Domestic	2	20	1	0		30		30	
	В	Gardening	1	.6	0	4		20		20	
	С	Industrial	1								
	1.	Process	1	03	23	31		334		334	
	2.	Boiler	7	<b>'</b> 5	32	25		400		400	
	3.	Cooling	8	37	22	13		300	285	15	
	4.	Washing	6	64	5	2		116	15	101	
		Total (C)	3	45	8	)5		1150	300	850	
	To	otal (A+B+C)	3	65	83	35		1200	300	900	
11.	Waste	ewater Genera	tion I	Details	5:	Was	tew	ater Generati	ion (KL/dav)		
	Sr.			Existing Pr		TT GO	Total after				
	No.	Descriptio	n			g Proposed		Proposed	Remar	ks	
	A	Domestic		20\$		10		30	Will be tre effluent tr plant	eated in reatment	
	В	Industrial		•	•						
	1.	Process (High COD/TDS)		10	106			125	Will be tre MEE follow ATFD	eated in ved by	
		Low COD/T	DS					284	Will be tre	eated in	
	2.	Washing		64	ŀ	52		116	effluent ti plant	reatment	
	3. Boiler blow down		low	10	)	150		160	Will be treat	ed in RO	
	4. Cooling purge		ge	18	}	67		85	Plant		
	Total (B)		<b>(B)</b>	19	8	572		770			
		Total (A	+B)	21	8	582		800*			
	qua (	Net treated wa antity discharg GDC undergro drain	ater je to und lage	19	8	292 (272 20 <sup>\$</sup> )	+	490 (800*-300# 10 <sup>@</sup> )	*Total wa generation - # Recycle wa @MEE Rejec treated in AT	stewater ter t will be FD	



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CHEMISTRY OF SUCCESS AT WORK 1/s. Meghmani Organics Limited – Ankleshwar

Particulars	S							
				\$ Will be ETP after expansion domestic was being soak pit/s	treated in • proposed Earlier the wastewater g treated in eptic tank.			
Effluent T	reatment Plant	Primary	, Secondar	y and Ter	tiary water			
Floatrical	Forth nit	treatme	<u>nt plant will</u>	be provided.	and tasting			
Electrical	cartii pit.	record t	o be maintai	ned.	and testing			
Land Brea	kup Area:							
Sr. No.	Description			Area (m <sup>2</sup> )				
	Beschption		Existing	Proposed	Total			
1	Manufacturing process area		6,073.50	8273	14,346.50			
2	Storage (product)		900	0	900.00			
3	Storage (fuel)		2,134	0	2,134.00			
4	Storage (water)		503.25	0	503.25			
5	Storage (hazardous/solid was	ste)	1,525.93	575	2,100.93			
6	Storage (hazardous chemicals	s)	3,117.71	1,982.90	5,100.61			
7	Effluent Treatment Plant		3,663	290.8	3,953.80			
8	Utilities		2,477.76	2,011.82	4,489.58			
	Others							
0	a) Office(Administration + Se	ecurity)	3,985.33	0	3,985.33			
7	b) Parking		491.52	0	491.52			
	c) Open Land Area and Road		29,735.75	-29,116.27	619.48			
10	Green belt*		3,378.25	15,982.75	19,361.00			
	TOTAL L	AND AREA	57,986	0	57,986			
* <u>Note</u> : lt n MINISTRY LOCATED premises.	nay be noted that total gre 'S OFFICE MEMORANDUI IN CRITICALLY POLLU'	enbelt area M 31 <sup>st</sup> OC TED AREA	a will be 23,1 TOBER, 201 A) provided	194 m <sup>2</sup> (40 % 9 REGARDIN within/OR	AS PER THE G PROJECTS outside the			
Project Bo	untries :	I	T 1					
S.N.	Plot No.		21º 36' 55 1	e Lo	1' 58 54"			
B		$\vdash$	21° 36' 54.	91" 73	° 2' 2.16"			
С			21° 36' 54.	66" 73	° 2' 5.46"			
D	5001/B, 5027 to 5034 &	5037	21° 36' 53.	74" 73	° 2' 5.41"			
E			21° 36' 53.	79" 73	° 2' 4.01"			
G			21° 36' 51 21° 36' 51.	.9 73 74" 73	° 2' 5.21"			
	Particulars     Effluent Tr     Effluent Tr     Electrical     I     Sr. No.     1     2     3     4     5     6     7     8     9     10     9     10     Project Bo     S.N.     A     B     C     D     E     F     G	Sr. No.   Description     1   Manufacturing process area     2   Storage (product)     3   Storage (neal)     4   Storage (neal)     4   Storage (neal)     5   Storage (neal)     4   Storage (neal)     5   Storage (neal)     6   Storage (neal)     7   Effluent Treatment Plant     8   Utilities     6   Storage (nazardous/solid was     6   Storage (nazardous chemical     7   Effluent Treatment Plant     8   Utilities     0   Others     a) Office(Administration + See   b) Parking     c) Open Land Area and Road   Others     10   Green belt*     TOTAL L	Particulars     Effluent Treatment Plant   Primary treatment     Effluent Treatment Plant   Electric     Electrical Earth pit.   Electric record to record t	Particulars      Particulars     Image: Second and treatment plant will     Effluent Treatment Plant   Primary, Second and treatment plant will     Electrical Earth pit.   Primary, Second and treatment plant will     Electrical Earth pit.   Electrical earth pit     Image: Sr. No.   Description   Existing     1   Manufacturing process area   6,073.50     2   Storage (product)   900     3   Storage (nacardous/solid waste)   1,525.93     6   Storage (nacardous chemicals)   3,117.71     7   Effluent Treatment Plant   3,663     8   Others     3,0762   Storage (nacardous chemicals)   3,985.33     6   Storage (nacardous chemicals)   3,985.33     6   Storage (nacardous chemicals)   3,985.33     6   Storage (nacardous chemicals)   3,985.33 <th co<="" th=""><th>Secondary and Terp area   Secondary and Terp area     Effluent Treatment Plant   Primary, Secondary and Terreatment plant will be provided.     Electrical Earth pit.   Primary, Secondary and Terreatment plant will be provided.     Electrical Earth pit.   Electrical earth pit available record to be maintained.     Image: Secondary and Terreatment plant will be provided.     Image: Secondary and Terreatment plant will be provided.  Image: Secondary and Terreatment plant will be provided.     Image: Secondary and Terreatment plant will be provided.     Image: Secondary Area (m<sup>2</sup>)     Image: Secondary Area (m<sup>2</sup>)   <th <="" colspan="2" th=""></th></th></th>	<th>Secondary and Terp area   Secondary and Terp area     Effluent Treatment Plant   Primary, Secondary and Terreatment plant will be provided.     Electrical Earth pit.   Primary, Secondary and Terreatment plant will be provided.     Electrical Earth pit.   Electrical earth pit available record to be maintained.     Image: Secondary and Terreatment plant will be provided.     Image: Secondary and Terreatment plant will be provided.  Image: Secondary and Terreatment plant will be provided.     Image: Secondary and Terreatment plant will be provided.     Image: Secondary Area (m<sup>2</sup>)     Image: Secondary Area (m<sup>2</sup>)   <th <="" colspan="2" th=""></th></th>	Secondary and Terp area   Secondary and Terp area     Effluent Treatment Plant   Primary, Secondary and Terreatment plant will be provided.     Electrical Earth pit.   Primary, Secondary and Terreatment plant will be provided.     Electrical Earth pit.   Electrical earth pit available record to be maintained.     Image: Secondary and Terreatment plant will be provided.     Image: Secondary and Terreatment plant will be provided.  Image: Secondary and Terreatment plant will be provided.     Image: Secondary and Terreatment plant will be provided.     Image: Secondary Area (m <sup>2</sup> )     Image: Secondary Area (m <sup>2</sup> ) <th <="" colspan="2" th=""></th>		



MET	
EMISTRY OF SUCCESS AT WORK I/S. Meghmani Organics Limited – Ankleshwar	

Sr. No	Particula	ars		
	Н		21° 36' 48.44"	73° 2' 5.09"
	Ι		21° 36' 48.63"	73° 2' 1.96"
	J		21° 36' 48.76"	73° 1' 59.8"
	К		21° 36' 50.12"	73° 1' 59.84"
	L		21° 36' 50.26"	73° 1' 58.17"
	М		21° 36' 52.66"	73° 1' 58.34"
	1		21° 36' 55.49"	73° 2' 3.52"
	2		21° 37' 0.03"	73° 2' 3.93"
	3		21° 37' 3.65"	73° 2' 4.12"
	4	4707/B & 4707/P	21° 37' 3.48"	73° 2' 7.34"
	5		21° 36' 59.79"	73° 2' 7.12"
	6		21° 36' 55.15"	73° 2' 6.76"
	7		21° 36' 55.3"	73° 2' 4.98"

## **3.3 PROJECT SETTING:**

The proposed expansion project is a brownfield project for increase in existing production capacity and addition of new products to existing Agrochemicals and Intermediates manufacturing facility which is located at Plot No. 5001/B, 5027 to 5034 & 5037, 4707/B & 4707/P, GIDC Estate, Ankleshwar. Description of project location and its surrounding is also given in Chapter-1 and Chapter-3.

#### Need For the projects

The agrochemicals industry is expected to play a pivotal role in attaining food security for a populous country like India. With dwindling land under cultivation and a lower portion of that under irrigation, the need to increase farm productivity with efficient use of plant nutrients and protection is the need of the hour. India's agrochemical consumption is one of the lowest in the world with per hectare consumption being just 0.6 kgs as compared to the United States (5-7 kgs/hectare) and Japan (11-12 kgs/hectare). With the increase in awareness and market penetration, consumption is likely to improve in the near future. The project will help industrial development in the region.

[Source: Indian Agrochemicals Industry: Insights and Outlook published by CARE Ratings (February 2019)]

#### Justification for site selection

Since the proposed project expansion will be carried out within the existing premises, the said area already has following facilities,

- > Location within the established notified industrial estate.
- > Away from nearby villages / habitation.
- > Availability of common infrastructural facilities of the industrial estate.
- > Availability of good quality water supply in the industrial estate.

- > Effective wastewater discharge facility is available through pipeline up to sea by NCTL.
- > Availability of authorized solid waste disposal site in nearby area.
- > Availability of requisite skilled, semi-skilled and unskilled labor from local area.
- > Facilities such as power, water, communication etc. are easily available.

The proposed industrial activity is to be carried out within the existing premises of M/s. Meghmani Organics Limited. Plot allotment letters are attached as Annexure 3.2. The salient features of the project site are as given below:

 Meghanal Organis Linited
 American State

 Meghanal Organis
 American State

<t







Figure 3.2:Layout of industrial area indicating location of the unit



# Figure 3.3: Site layout map (existing and proposed activity area)



CHEMISTRY OF SUCCESS AT WORK I/S. Meghmani Organics Limited – Ankleshwar



# 3.4 LIST OF PRODUCTS:

# **TABLE: 3.2**

					Quantity, MT/Month	l
Sr.	Group	Name of Products	End Use	CAS No.	Existing	Total after
NO.					(As per CCA order No:	proposed
					AH-95/64 dated 4/11/2019)	expansion
1	GO	Zeta Cypermethrin		52315-07-8	0	-
2	GO	Alphamethrin		67375-30-8	0	
3	GO	Bifenthrin#	Incocticido	82657-04-3	30	450
4	GO	Cypermetrine	Insecticite	52315-07-8	0	430
5	GO	Lambda Cyhalothrin*		91465-08-6	20	
6	GO	Permethrin#		52645-53-1	30	
7	G01	Beta-Cypermethrin		52315-07-8	0	
8	G01	Beta-Cyfluthrin		68359-37-5	0	
9	G01	Deltamethrin	Insecticide	52918-63-5	0	100
10	G01	Transfluthrin		118712-89-3	0	
11	G01	Cyfluthrin		68359-37-5	0	
12	G1	Acetamiprid		135410-20-7	0	
13	G1	Imidacloprid *	Insecticide	138261-41-3	20	50
14	G1	Dinotefuran		165252-70-0	0	
15	G2	Lufenuron		103055-07-8	0	
16	G2	Novaluron	Incocticido	116714-46-6	0	
17	G2	Buprofezin	insecticité	69327-76-0	0	70
18	G2	Diafenthiuron *		80060-09-9	20	
19	G2	Ethephon	Plant growth	16672-87-0	0	



					Quantity, MT/Month	1
Sr. No.	Group	Name of Products	End Use	CAS No.	Existing (As per CCA order No: AH-95764 dated 4/11/2019)	Total after proposed expansion
			regulator			
20	G2	Propargite	Insecticide	2312-35-8	0	
21	G3	Ethiprole	Incocticido	181587-01-9	0	25
22	G3	Fipronil *	Insecticité	120068-37-3	20	23
23	G4	Chlorantraniliprole		500008-45-7	0	
24	G4	Tolfenpyrad		129558-76-5	0	
25	G4	Flonicamide	Incocticido	158062-67-0	0	100
26	G4	Spiromesifen	Insecticite	283594-90-1	0	100
27	G4	Thiocyclam Oxalate		31895-22-4	0	
28	G4	Flubendiamides		272451-65-7	0	
	-					
29	G5	Triclopyr Ester	Herbicide	64700-56-7	12.4	
30	G5	Chlorpyrifos Ethyl	Incocticido	2921-88-2	75	150
31	G5	Chlorpyrifos-Methyl	Insecticite	5598-13-0	0	
32	I1	Bifenthrin Alcohol	Intermodiate for	76350-90-8	0	
33	I1	Lambda Cyhalothric Acid (LC Acid)	Insecticide	72748-35-7	0	200
34	I1	Sodium Salt of HTCP	manufacture	37439-34-2	0	
35	12	2-(2'-2'-dichlorovinyl)-3-3- dimethylecyclopropane carboxylic acid	Intermediate for Insecticide manufacture	52314-67-7	122	350





					Quantity, MT/Month		
Sr. No.	Group	Name of Products	End Use	CAS No.	Existing (As per CCA order No: AH-95764 dated 4/11/2019)	Total after proposed expansion	
		chloride(CMAC)					
36	I2	High Trans – CMAC		52314-67-7	0		
37	I2	High Trans – CMA		59042-50-8	0		
38	12	Meta Phenoxy Benzyl Alcohol		13826-35-2	0		
				TOTAL	259.4	1495	

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# 3.5 DETAILS OF PRODUCTS WITH RAW MATERIAL.

**TABLE: 3.3** 

Sr. No.	Group	Name of Products	Name of Raw Materials	CAS No.	Quantity (Kg/MT)	Quantity (Kg/Month)
			Cypermethrin*	52315-07-8	1166	524700
			Acetic Acid*	<u>64-19-7</u>	1	450
1	GO	Zeta Cyper	Heptane	<u>142-82-5</u>	196	88.200
			Soda ash	497-19-8	92	41400
			Aliquote	63393-96-4	9	4050
			Cypermethrin*	52315-07-8	1475	663750
			Hexane*	<u>142-82-5</u>	150	67.500
			Triethyl Amine*	121-44-8	545	245250
2	GO	Alphamethrin	Sulphuric Acid*	7664-93-9	428	192600
			Sodium Hypo Chlorite	7681-52-9	190	85500
			Acetic Acid*	<u>64-19-7</u>	2	900
			Sodium hydroxide*	1310-73-2	286	128700
			L. C. Acid	72748-35-7	738	332100
			Thionyl Chloride*	7719-09-7	446	200700
			Dimethylformamide (DMF)	<u>68-12-2</u>	6	2700
2	CO	Difonthrin	Sodium hydroxide*	1310-73-2	384	172800
5	GU	Diferitin	Bifenthrin Alcohol	76350-90-8	507	228150
			Hexane*	110-54-3	110.0	49.500
			4-DMAP (Catalyst)	1122-58-3	6	2700
			HCL	7647-01-0	73	32850
			СМАС	52314-67-7	590	265500
			Meta phenoxy benzaldehyde (MPBD)	39515-51-0	485	218250
4	GO	Cypermethrin	NaCN*	143-33-9	145	65250
			PTC	103-85-5	6	2700
			Hexane*	110-54-3	45	20.250





Sr. No.	Group	Name of Products	Name of Raw Materials	CAS No.	Quantity (Kg/MT)	Quantity (Kg/Month)
			Sodium Hypo Chlorite	7681-52-9	1630	733500
			L. C. Acid	72748-35-7	640	288000
			Thionyl Chloride*	7719-09-7	384	172800
			Dimethylformamide (DMF)	<u>68-12-2</u>	5	2250
			Sodium hydroxide*	1310-73-2	130	58500
			Hexane*	110-54-3	205	92.250
			Soda Ash	497-19-8	15	6750
5			TEBA (Catalyst)	56-37-1	12	5400
	GO	0 Lambda Cyhalothrin	NaCN*	143-33-9	153	68850
			Meta phenoxy benzaldehyde (MPBD)	39515-51-0	475	213750
			Sodium Hypo Chlorite	7681-52-9	1630	733500
			Sodium Bicarbonate	144-55-8	7	3150
			Acetic Acid*	<u>64-19-7</u>	7	3150
			Isopropyl Alcohol*	67-63-0	85	38.250
			DIPA (Catalyst)	108-18-9	60	27000
			HCL (30% solution)	7647-01-0	225	101250
		0 Permethrin	MPB Alcohol	3951551-0	525	236250
6	GO		СМАС	52314-67-7	620	279000
			Soda Ash	497-19-8	40	18000
			Cypermethrin*	52315-07-8	1500	150000
			Isopropyl Alcohol*	67-63-0	190	19.000
			Catalyst		150	15000
7	G01	Beta cypermethrin	Sulphuric Acid*	7664-93-9	400	40000
			Sodium Hypo Chlorite	7681-52-9	200	20000
			Acetic Acid*	<u>64-19-7</u>	2	200
			Sodium hydroxide*	1310-73-2	300	30000
0	<u>C01</u>	Poto Cufluthrin	Crude Cyfluthrin	68359-37-5	1240	124000
0	601	Beta Cynuthrin	Isopropyl Alcohol*	67-63-0	110	11.000





Sr. No.	Group	Name of Products	Name of Raw Materials	CAS No.	Quantity (Kg/MT)	Quantity (Kg/Month)
			TEA (Catalyst)	121-44-8	40	4000
			Deltametric Acid Chloride	55710-82-2	550	5500
0	C01	Delterrethrin	Alpha-Hydroxy-3-phenoxybenzeneacetonitrile (CPBA)	39515-47-4	500	50000
9	601	Deitamethrin	Benzene*	71-43-2	12	1.200
			Catalyst		180	18000
			Sodium hydroxide*	1310-73-2	100	10000
			2,3,5,6 Tetra FluoroBenzly Alcohol	4084-38-2	495	49500
			R-Trans Cypermethic Acid Chloride	52314-67-7	625	62500
10	G01	Transfluthrin	Catalyst		12	1200
			Hexane*	110-54-3	50	5.000
			Soda Ash	497-19-8	248	24800
		1 Cyfluthrine	СМАС	52314-67-7	543	54300
			FlourinatedMetaphenoxy Benzaldehyde (4-FMPB)	68359-57-9	505	50500
			Toluene*	108-88-3	59	5.900
			Sodium Cyanide*	143-33-9	177	17700
11	G01		Sodium Bisulphite*	7631-90-5	253	25300
			Sodium Hydroxide*	1310-73-2	145	14500
			Tetra Butyl Ammonium Bromide	1643-19-2	3	300
			Soda Ash	497-19-8	15	1500
			Sodium Hypochlorite	7681-52-9	130	13000
			Acetic Acid*	<u>64-19-7</u>	1	100
			Methanol	67-56-1	28	1.400
			Potassium carbonate (K <sub>2</sub> CO <sub>3</sub> )	584-08-7	730	36500
12	G1	Acetamiprid	2-Chloro-5-chloromethylpyridine (CCMP)	70258-18-3	990	49500
			2-Cyano-N-methylacetamide(CMA)	6330-25-2	640	32000
			Monomethyl amine (MMA)*	74-89-5	200	10000





Sr. No.	Group	Name of Products	Name of Raw Materials	CAS No.	Quantity (Kg/MT)	Quantity (Kg/Month)
			2-Chloro-5-chloromethylpyridine (CCMP)	70258-18-3	970	48500
12	C1		2-Nitro Iminoidmmidazolidine(2-NII)	5465-96-3	900	45000
15	GI	minuaciopriu	Acetonitrile*	75-05-8	1370	68500
			Potassium carbonate (K <sub>2</sub> CO <sub>3</sub> )	584-08-7	940	47000
			M, N, O (2,3-Dimethylal-Nitrosourea	615-53-2	700	35000
14	G1	Dinotefuran	3- (Aminomethyl)Tetrahydrofuran	165253-31-6	534	26700
			Sodium hydroxide*	1310-73-2	20	1000
			2,6-Difluorobenzamide	<u>18063-03-1</u>	413	28910
15	C2	Lufonuron	Toluene*	108-88-3	32	2.240
15	62	Luienui on	Oxalyl Chloride	79-37-8	367	25690
			2,5 Dichloro-4 (1,1,2,3,3,3 axafluroproxy) Anilne	95-82-9	750	52500
	G2	Novaluron	2,6- Difluoro BenzoylIsocyanate	60731-73-9	320	22400
16			3 Chloro-4-(1,1,2-Trifluoro-2-(Trifluoro Methoxy) Ethoxy) Aniline*	116714-47-7	792	55440
			Monochloro benzene (MCB)*	108-90-7	17	1.190
			Toluene*	108-88-3	20	1.400
			Monochloro benzene (MCB)*	108-90-7	20	1.400
			1-Isopropyl-3-T Butyl Thiourea	52599-24-3	670	46900
17	G2	Buprofezin	N Chloromethyl-N-Phenyl Carbamoyl Chloride	52123-54-3	875	61250
			Ammonium Carbonate	506-87-6	2400	168000
			Methanol	67-56-1	100	7.000
			1- (2,6-Diisopropyl-4-Phenoxy) Phenylthiourea (DIPPT)	135252-10-7	901	63070
10	62	Dieferthieren	Xylene	1330-20-7	108	7.560
10	62	Dialenunuron	Sulphuric Acid*	7664-93-9	133	9310
			tert-Butylamine	75-64-9	222	15540
			Acetonotrile*	75-05-8	1000	70000
19	G2	Ethaphon	Epoxyethane	75-21-8	825	57750





Sr. No.	Group	Name of Products	Name of Raw Materials	CAS No.	Quantity (Kg/MT)	Quantity (Kg/Month)
			Phosphorus trichloride	7719-12-2	855	59850
			HCl gas*	7647-01-0	460	32200
			2-(4-Tert Butyl Phenoxy) Cyclohexanol	1942-71-8	706	49420
			Thionyl Chloride*	7719-09-7	540	37800
20	G2	Propargite	Toluene*	108-88-3	50	3.500
			Propargyl Alcohol*	107-19-7	160	11200
			Triethyl Amine*	121-44-8	183	12810
			5-Amino-3-cyano-1-(2,6-dichloro-4- trifluoromethylphenyl)pyrazole	120068-79-3	867	21675
			Chlorobenzene*	108-90-7	2600	65000
21		Ethinvolo	Sulfur monochloride*	10025-67-9	184	4600
	<b>C</b> 2		Ethyl Bromide*	74-96-4	137	3425
21	63	Ethiprole	Methanol	67-56-1	296	7.400
			Ethylene Dichloride (EDC)	107-06-2	3400	85000
			Hydrogen Peroxide*	<u>7722-84-1</u>	93	2325
			Formic Acid*	<u>64-18-6</u>	112	2800
			Methane Sulfonic Acid	75-75-2	112	2800
			Fipronil Pyrazole	120068-79-3	850	21250
			Trimethyl amine hydrochloride (TMA HCl)	593-81-7	250	6250
22	G3	Fipronil	Trifluoromethane Sulfinyl Chloride (TFMSC)	20621-29-8	400	10000
			Liquor Ammonia	1336-21-6	220	5500
			Toluene*	108-88-3	200	5.000
			2-amino-5-chloro-N, 3-mdimethylebenzamide	890707-28-5	440	4400
23	G3	Chlorantraniliprole	3-bromo-1-(3-chloropyridin-2-yl)-1H-pyrazole-5- carbonyl chloride	943982-60-3	706	70600
			Triethyl Amine*	121-44-8	225	22500
			Toluene*	108-88-3	158	15.800
24	G4	Toifenpyrod	Toluene*	108-88-3	7	0.700





Sr. No.	Group	Name of Products	Name of Raw Materials	CAS No.	Quantity (Kg/MT)	Quantity (Kg/Month)
			Inermediate-1	6192-52-5	553	55300
			Intermediate-2	1182281-78- 2	563	56300
			4-trifluoromethyl nicotinic Acid	158063-66-2	1020	10200
			Toluene*	108-88-3	140	14.000
			Dimethylformamide (DMF)	<u>68-12-2</u>	20	2000
			Thionyl Chloride*	7719-09-7	700	70000
25	G4	Flonicamide	Tetra hydrofuran*	109-99-9	55	5.500
			Triethyl Amine*	121-44-8	1225	122500
			Amino Acetonitrile Hydrochloride	6011-14-9	540	54000
			Dichloroethane	107-06-2	308	30.800
			Soda Ash	497-19-8	48	4800
	G4	Spiromesifen	Dimethylformamide (DMF)	<u>68-12-2</u>	1947	194700
			Soda Ash	497-19-8	90	9000
26			Ester	6306-52-1	500	50000
20			Toluene*	108-88-3	6	0.600
			TBAC	75-57-0	438	43800
			Sodium Bicarbonate	144-55-8	1228	122800
			Bensultap	17606-31-4	2000	200000
			Sodium Sulphide*	1313-82-2	365	36500
27	G4	Thiocyclam Oxalate	Methanol	67-56-1	102	10.200
			Toluene*	108-88-3	102	10.200
			Oxalic acid	144-62-7	417	41700
			Dichloromethane	75-09-2	3000	300000
28	G4	G4 Flubendiamide	3-IODO-N2-(2-Methyl-1-(Methylthio) Propan-2-YL)- N1-(2-Methyl-4-(Perfluoropropan-2YL) Phenyl) (IMMTPMPFPPP)	272451-61-3	1000	100000
			3-Chloro Peroxy Benzoic Acid (m-CPBA)	937-14-4	550	55000





Sr. No.	Group	Name of Products	Name of Raw Materials	CAS No.	Quantity (Kg/MT)	Quantity (Kg/Month)
			2- Butoxy Ethanol	111-76-2	500	75000
			Chloroacetic Acid*	79-11-8	460	69000
			Sulphuric Acid*	7664-93-9	34	5100
			Hexane*	110-54-3	72	10.800
29	G5	Trichlopyr Ester	Sodium Carbonate	497-19-8	80	12000
			Sodium salt of HTCP	105140-23-6	944	141600
			Catalyst (TBAB)	1643-19-2	60	9000
			Sodium Bicarbonate	144-55-8	40	6000
			Sodium Chloride	7440-23-5	270	40500
			Nitrobenzene*	98-95-3	100	15.000
			Acrylonitrile*	107-13-1	310	46500
			Trichloro acetyl chloride*	76-02-8	900	135000
			Catalyst		6	900
30	G5	Chlorpyrifos Ethyl	Activated Carbon	7440-44-0	11	1650
			Soda Ash	497-19-8	473	70950
			Ethylene Dichloride (EDC)	107-06-2	180	27.027
			Catalyst (TABA +TEDA)	1643-19-2	12	1800
			Diethyl Thiophosphoryl Chloride (DETCL)	2524-04-1	563	84450
			Sodium salt of HTCP	105140-23-6	900	135000
			Sodium Chloride	7440-23-5	215	32250
			Boric Acid	10043-35-3	45	6750
31	65	Chlornyrifos Methyl	Sodium hydroxide Flakes*	1310-73-2	26	3900
51	uJ	Child pyrhos Methyr	Methylene Dichloride	75-09-2	2650	397500
			Catalyst (TEBA)	56-37-1	8	1200
			1-Methyl Imidazole	616-47-7	4	600
			Dimethyl thionylphosphoryl chloride (DMTCL)	2524-03-0	590	88500
20	I1	Bifonthrin Alcohol	2,6- Dichloro Toluene	118-69-4	950	190000
32	11	Bilenthrin Alconol	Magnesium Turning*	7439-95-4	272	54400



Sr. No.	Group	Name of Products	Name of Raw Materials	CAS No.	Quantity (Kg/MT)	Quantity (Kg/Month)
			Bromo Benzene	108-86-1	880	176000
			Dimethyl formamide	68-12-2	430	86000
			THF*	109-99-9	170	34.000
			Potassium Borohydride	13762-51-1	160	32000
			Dil. Sulphuric Acid Solution	7664-93-9	2400	480000
			Catalyst		74	14800
			Toluene*	108-88-3	65	13.000
			Methyl 3,3 Dimethyl 4-pentenoate	63721-05-1	835	167000
			1,1,2-Trichloro-1,2,2-trifluoroethane (R-113A)	76-13-1	1412	282400
		lambda cyhalothric	T-Butanol	75-65-0	14177	2835400
			Catalyst-1		7	1400
33	I1	Acid	Catalyst-2		20	4000
		Aciu	Dimethylformamide (DMF)	<u>68-12-2</u>	1765	353000
			Sodium t-Butoxide	865-48-5	553	110600
			KOH*	1310-58-3	588	117600
			HCL (15% solution)	7647-01-0	1176	235200
		Sodium Salt of HTCP	Nitrobenzene*	98-95-3	119	23.810
			Acrylonitrile*	107-13-1	410	82000
34	I1		Trichloro acetyl chloride*	76-02-8	1190	238000
			Catalyst		8	1600
			Soda Ash	497-19-8	625	125000
			Acrylonitrile*	107-13-1	440	154000
			Carbon tetrachloride (CTC)*	56-23-5	1696	593600
			Acetonitrile*	75-05-08	14	0
35	I2	СМАС	DEA HCL	869-24-9	6	2100
			Cupric chloride	7447-39-4	6	2100
			HCI	7647-01-0	1990	696500
			Dimethylformamide (DMF)	<u>68-12-2</u>	4	1400



Sr. No.	Group	Name of Products	Name of Raw Materials	CAS No.	Quantity (Kg/MT)	Quantity (Kg/Month)
			Thionyl chloride*	7719-09-7	1617	565950
			Hexane*	110-54-3	549	192.150
			Soda Ash	497-19-8	2405	841750
			Isobutylene	115-11-7	538	188300
			Triethanolamine (TEA)*	102-71-6	22	7.700
			Sodium Bicarbonate	144-55-8	92	32200
			Boron trifluoride (BF <sub>3</sub> )	7637-07-2	11	3850
	12	2 High Trans CMAC	CMAC 25/75	52314-67-7	2000	700000
			Hexane*	110-54-3	175	61.250
36			Sodium Bicarbonate	144-55-8	10	3500
			Thionyl chloride*	7719-09-7	655	229250
			Sodium hydroxide*	1310-73-2	390	136500
			CMAC 25/75	52314-67-7	2100	735000
37	I2	High Trans CMA	Hexane*	110-54-3	130	45.500
			Sodium Bicarbonate	144-55-8	10	3500
			Meta phenoxy benzaldehyde (MPBD)	39515-51-0	990	346500
20	12	MDP Alcohol	Hydrogen*	1333-74-0	12	4200
30	12	MITD AICOHOI	Raney Nickel*	7440-02-0	49	17150
			Isopropyl Alcohol*	67-63-0	115	40.250

# 3.6 DETAILS OF STORAGE OF HAZARDOUS RAW MATERIALS IN BULK.

# **TABLE: 3.4**

Sr. No.	Raw Materials	Mean of Storage	At a time, Storage in MT	No. of Storage means	Temp. (°C)	Pressure	Type of Hazard	Control Measures
1.	IB	AG/ SS Tank	10	1	Amb.	3-4 Kg/cm <sup>2</sup>	Fire& Exp.	Provided- 3.7.14
2.	Hexane	AG Tank	10	1	Amb.	Atm.	Fire & Exp.	Provided- 3.7.3
3.	T-Butanol	AG / Tank	10	5	Amb.	Atm.	Fire & Exp.	Provided- 3.7.2
4.	Acetic Acid	AG / SS Tank	10	1	Amb.	Atm.	Fire & Toxic	Provided- 3.7.1
5.	Acetonitrile	AG/ SS Tank	10	1	Amb.	Atm.	Fire & Toxic	Provided- 3.7.1
6.	Acrylonitrile	AG / SS Tank	10	1	Amb.	Atm.	Fire & Toxic	Provided- 3.7.1
7.	Triethyl Amine	AG / SS Tank	10	2	Amb.	Atm.	Fire & Toxic	Provided- 3.7.2
8.	Thionyl chloride	AG/ MS Lead	10	3	Amb.	Atm.	Toxic	Provided- 3.7.7
9.	Hydrogen	Cylinder bank	1300 M <sup>3</sup>	1	Amb.	200 Kg/cm <sup>2</sup>	Fire & Exp.	Provided- 3.7.11 & 3.7.12
10.	BF <sub>3</sub> (Boron trifluoride)	Cylinder/Tonner	0.1	1	Amb.	0.3 Kg/cm <sup>2</sup>	Toxic	Drovidad 2712
11.	HCL Gas	Cylinder	50 Kg	1	Amb.	3 Kg/cm <sup>2</sup>	Toxic	Provided- 5.7.15
12.	Sulphuric Acid	AG/ Tank	10	2	Amb.	Atm.	Corrosive	Provided- 3.7.3
13.	Caustic	AG/ Tank	20	3	Amb.	Atm.	Corrosive	Provided- 3.7.3
14.	HCL	AG/ Tank	20	2	Amb.	Atm.	Corrosive	Provided- 3.7.3
15.	Sodium Hypo Chlorite	AG/ Tank	10	2	Amb.	Atm.	Corrosive	Provided- 3.7.2
16.	Carbon Tetrachloride	AG/ Tank	10	2	Amb.	Atm.	Corrosive	Provided- 3.7.2
17.	2, Butoxy Ethanol	AG/ Tank	10	1	Amb.	Atm.	Toxic	Provided- 3.7.2
18.	TMA HCL	AG/ MS Lead	10	1	Amb.	Atm.	Toxic	Provided- 3.7.8
19.	Benzene	Drum	0.1	1	Amb.	Atm.	Fire	Provided- 3.7.6





Sr. No.	Raw Materials	Mean of Storage	At a time, Storage in MT	No. of Storage means	Temp. (°C)	Pressure	Type of Hazard	Control Measures
20.	Xylene	Drum	0.1	3	Amb.	Atm.	Fire	Provided- 3.7.6
21.	Toluene	Drum	0.1	79	Amb.	Atm.	Fire	Provided- 3.7.6
22.	Methanol	Drum	0.1	9	Amb.	Atm.	Fire	Provided- 3.7.6
23.	Isopropyl Alcohol	Drum	0.1	237	Amb.	Atm.	Fire	Provided- 3.7.5
24.	Methylene Dichloride	Drum	0.1	6	Amb.	Atm.	Fire	Provided- 3.7.6
25.	Nitrobenzene	Drum	0.1	13	Amb.	Atm.	Fire	Provided- 3.7.6
26.	Dichloroethane	Drum	0.1	122	Amb.	Atm.	Fire	Provided- 3.7.6
27.	Dicloro Toluene	Drum	0.1	63	Amb.	Atm.	Fire	Provided- 3.7.6
28.	EDC	Drum	0.1	268	Amb.	Atm.	Fire	Provided- 3.7.6
29.	Epoxyethane	Drum	0.1	19	Amb.	Atm.	Fire	Provided- 3.7.6
30.	Ester	Drum	0.1	17	Amb.	Atm.	Fire	Provided- 3.7.6
31.	Bifenthrin Alcohol	Drum	0.1	76	Amb.	Atm.	Fire	Provided- 3.7.5
32.	Triethanolamine (TEA)	Drum	0.05	155	Amb.	Atm.	Fire & Toxic	Provided- 3.7.8
33.	Tetrahydrofuran (THF)	Drum	0.1	11	Amb.	Atm.	Toxic	Provided- 3.7.8
34.	Hydrogen Peroxide	Drum	0.1	1	Amb.	Atm.	Toxic	Provided- 3.7.8
35.	Liquor Ammonia	Drum	0.05	4	Amb.	Atm.	Toxic	Provided- 3.7.8
36.	Dichloro methane	Drum	0.1	100	Amb.	Atm.	Toxic	Provided- 3.7.8
37.	Dimethyl formamide	Drum	0.1	29	Amb.	Atm.	Toxic	Provided- 3.7.8
38.	Trichloroacetylchloride	Drum	0.1	124	Amb.	Atm.	Toxic	Provided- 3.7.8
39.	Ethyl Bromide	Drum	0.1	1	Amb.	Atm.	Toxic	Provided- 3.7.8
40.	Formic Acid	Drum	0.1	1	Amb.	Atm.	Corrosive	Provided- 3.7.9
41.	Ter-butyl Amine	Drum	0.1	5	Amb.	Atm.	Corrosive	Provided- 3.7.9
42.	Bromo Benzene	Drum	0.1	59	Amb.	Atm.	Corrosive	Provided- 3.7.9
43.	R-113A	Drum	250 Ltr.	40	Amb.	Atm.	Corrosive	Provided- 3.7.9
44.	Oxalic acid	Drum	0.1	14	Amb.	Atm.	Corrosive	Provided- 3.7.9
45.	Oxalyl Chloride	Drum	0.1	9	Amb.	Atm.	Corrosive	Provided- 3.7.9
46.	Amino Acetonitrile	Drum	0.1	18	Amb.	Atm.	Corrosive	Provided- 3.7.9





Sr. No.	Raw Materials	Mean of Storage	At a time, Storage in MT	No. of Storage means	Temp. (°C)	Pressure	Type of Hazard	Control Measures
	Hydrochloride							
47.	Activated Carbon	PP Bags	0.05	1	Amb.	Atm.	Fire	Provided- 3.7.10
48.	Ammonium Carbonate	PP Bags	0.05	112	Amb.	Atm.	Corrosive	Provided- 3.7.10
49.	Boric Acid	PP Bags	0.05	5	Amb.	Atm.	Corrosive	Provided- 3.7.10
50.	Cupric chloride	PP Bags	0.05	1	Amb.	Atm.	Corrosive	Provided- 3.7.10
51.	K2CO3 -Potassium Carbonate	PP Bags	0.05	31	Amb.	Atm.	Corrosive	Provided- 3.7.10
52.	KOH-Potassium Hydroxide	PP Bags	0.05	78	Amb.	Atm.	Corrosive	Provided- 3.7.10
53.	NaOH (Sodium hydroxide)	PP Bags	0.05	91	Amb.	Atm.	Corrosive	Provided- 3.7.10
54.	Raney Nickel	PP Bags	0.05	11	Amb.	Atm.	Corrosive	Provided- 3.7.10
55.	Soda Ash	PP Bags	0.05	44	Amb.	Atm.	Corrosive	Provided- 3.7.10
56.	Sodium Bicarbonate	PP Bags	0.05	109	Amb.	Atm.	Corrosive	Provided- 3.7.10
57.	Sodium Bisulphite	PP Bags	0.05	17	Amb.	Atm.	Corrosive	Provided- 3.7.10
58.	Sodium Carbonate	PP Bags	0.05	8	Amb.	Atm.	Corrosive	Provided- 3.7.10
59.	Sodium Chloride	PP Bags	0.05	49	Amb.	Atm.	Corrosive	Provided- 3.7.10
60.	Sodium Cyanide	PP Bags	0.05	58	Amb.	Atm.	Corrosive	Provided- 3.7.10
61.	Sodium Hydroxide	PP Bags	0.05	10	Amb.	Atm.	Corrosive	Provided- 3.7.10
62.	Sodium Sulfide	PP Bags	0.05	24	Amb.	Atm.	Corrosive	Provided- 3.7.10
63.	Sodium t-Butoxide	PP Bags	0.05	74	Amb.	Atm.	Corrosive	Provided- 3.7.10
64.	Sulfur monochloride	PP Bags	0.05	3	Amb.	Atm.	Corrosive	Provided- 3.7.10
65.	DCA (Dichloroacetic acid)	PP Bags	0.05	37	Amb.	Atm.	Corrosive	Provided- 3.7.10



# 3.7 PRECAUTION TO BE TAKEN DURING STORAGE:

## 3.7.1 For Proposed PESO Underground storage tank farm Safety:

- 1. Class A/B/C petroleum products will be received through road tanker and stored in underground storage tank as per petroleum rules.
- 2. Tank farm will be constructed as per explosive department requirement and separation distance is maintained.
- 3. Static earthing provision will be made for road tanker as well as storage tank.
- 4. Flame arrestor with breather valve will be provided on vent line.
- 5. Road tanker unloading procedure will be prepared and implemented.
- 6. Fire load calculation will be done and as per fire load Hydrant System is provided as per NFPA std. and Fire extinguishers will be provided as per fire load calculation.
- 7. Spark arrestor will be provided to all vehicles inside premises.
- 8. Flame proof type equipment s and lighting will be provided.
- 9. Lightening arrestor will be provided on the top of chimney.
- 10. Trained and experience operator will be employed for tank farm area.
- 11. NFPA label (hazard identification) capacity and content will be displayed on storage tank.
- 12. Solvents will be transferred by pump only in plant area and day tank will provided. Overflow line will return to the storage tank or Pump On-Off switch will be provided near day tank in plant.
- 13. Jumpers will be provided on solvent handling pipeline flanges.
- 14. Flexible SS hose will be used for road tanker unloading purpose and other temp. connection

## 3.7.2 For Proposed Above Ground Non-PESO storage tank farm Safety:

- 15. MS storage tank will be provided as per IS code.
- 16. Dyke wall will be provided to storage tank.
- 17. Level gauge provided with low level high level will be provided.
- 18. Fire hydrant monitor with foam trolley facility will be provided.
- 19. FLP type pump will be provided.
- 20. Double static earthing will be provided to storage tank.
- 21. Double Jumper clip will be provided to all pipeline flanges.
- 22. Road tanker unloading procedure will be prepared and implemented.
- 23. Lightening arrestor, PPEs will be provided.
- 24. Safety shower, eye washer will be provided.
- 25. NFPA labelling system will be adopted for storage tanks

# 3.7.3 For proposed Acid Alkali storage Tank farm safety:

- 1. Dyke wall will be provided to storage tank Level gauge will provided.
- 2. Scrubber will be provided
- 3. Required PPEs will be provided to all employees
- 4. Double drain valve will be provided to Acid storage tank.



- 5. Full body protection will be provided to operator during unloading and handling of Acids
- 6. Caution note and emergency first aid measures will be displayed and train for the same to all employees.
- 7. Safety shower and eye wash will be provided in storage tank area and plant area.
- 8. Total close process will be adopted for Acid handling.
- 9. Vent line of storage tank will be connected to Scrubber.
- 10. MS rubber lined or lead lined storage tank MOC.
- 11. Storage tank will be stored away from the process plant.
- 12. Tanker unloading procedure will be prepared and implemented.
- 13. NFPA label will be provided.
- 14. Required PPEs like full body protection PVC apron, Hand gloves, gumboot, Respiratory mask etc. will be provided to operator.
- 15. Neutralizing agent will be kept ready for tackle any emergency spillage.
- 16. Material will be handled in close condition in pipeline.
- 17. TREM CARD will be provided to all transporters and will be trained for transportation Emergency of Hazardous chemicals.

# 3.7.4 For Acrylonitrile Tank Storage safety:

- 1. Kept ay from water sources.
- 2. Total body protection suite will be provided to charging operator with airline respirator.
- 3. Static earthing provision will be made for road tanker as well as storage tank.
- 4. Flame arrestor with breather valve will be provided on vent line.
- 5. Road tanker unloading procedure will be prepared and implemented.
- 6. Safe operating (Charging) procedure will be prepared and displayed in Transportation and storage area.
- 7. Total close process will be available for charging and handling.
- 8. Antidote kit for cyanide will be kept ready in OHC.
- 9. Training will be being provided to handling of Acrylonitrile.
- 10. SCBA sets will be available in handling area.
- 11. Operator having cuts and sores should not use cyanides.
- 12. If a little poisoning, inhale cyanide antidote kit (amyl nitrite, sodium nitrite and sodium thiosulfate) and oxygen for 15-30 seconds as first aid measures
- 13. Never mixed cyanides and strong acids.
- 14. Keep notice board "DANGER, CYANIDE REACTION IS IN PROGRESS" in the Hood.
- 15. Use sodium hypochlorite, calcium hypochlorite solution or potassium permanganate for washing balance, glass apparatus, spatula, workplace and in case of spillage
- 16. Use Apron, eye protecting glass, Mask, and gloves during transferring, work-up and decomposition of chemicals.
- 17. Issued quantity is used fully for reactions. Cannot be stored in the Lab
- 18. Separate Logbook for issuing above cyanides and Manager must sign on the register.


#### 3.7.5 For Proposed Acid Alkali Drum Storage Safety.

- 1. Drum pallet will be provided with secondary containment tray.
- 2. Proper ventilation will be available in Drum storage area.
- 3. Required PPEs will be provided to all employees
- 4. Full body protection will be provided to operator during unloading and handling of Acids
- 5. Caution note and emergency first aid measures will be displayed and train for the same to all employees.
- 6. Safety shower and eye wash shower will be provided near storage area and plant area.
- 7. Sandbags will be kept ready near storage area.

#### 3.7.6 For Proposed Flammable Material Drum Storage area:

- 1. FLP type light fittings will be provided.
- 2. Proper ventilation will be available in Drum storage area.
- 3. Proper label and identification board /stickers will be provided in the storage area.
- 4. Drum pallet will be provided with secondary containment tray.
- 5. Drum handling trolley / stackers/forklift will be used for drum handling.
- 6. Separate dispensing room with local exhaust and static earthing provision will be available.
- 7. Fire Hydrant Point or Portable type fire extinguishers will be provided near flammable drum storage area.
- 8. Materials will be stored as per its compatibility study and separate area will be available for flammable, corrosive and toxic chemical drums storage.
- 9. Smoking and other spark, flame generating item will be banned from this area.
- 10. NFPA labels will be provided on drums for hazard identification of the chemicals.
- 11. Exhaust will be provided at ground level in drum storage area.
- 12. Drum loading unloading procedures will be prepared and implemented.
- 13. Safety shower and eye wash shower will be provided near storage area and plant area.

#### 3.7.7 For Proposed Thionyl Chloride drum storage safety

- 1. Separate Acid Drum storage area to be Thionyl Chloride drum storage
- 2. Caution note and emergency first aid is displayed and train for the same to all employees.
- 3. MSDS will be displayed near TC Storage Area.
- 4. Required PPEs will be provided to all employees & Full body protection is provided to operator.
- 5. Fire Hydrant Point or Portable type fire extinguishers will be provided near TC drum storage area.
- 6. Authorised operator will be defined for TC drum handling.
- 7. Proper ventilation will be available in Drum storage area.
- 8. Safety shower and eye wash will be provided in storage.
- 9. Total close process is adopted for handling.





#### 3.7.8 For Proposed Toxic Material Drum Storage area:

- 1. Spill control kit will be provided near drum storage Area.
- 2. SCBA set will be provided and Trained staff will be available for spillage and leakage of Toxic chemical.
- 3. Proper ventilation will be available in Drum storage area.
- 4. Proper label and identification board /stickers will be provided in the storage area. Caution note and emergency first aid is displayed and train for the same to all employees.
- 5. Drum handling trolley / stackers/forklift will be used for drum handling.
- 6. Required PPEs will be provided to all employees while transporting and Handling.
- 7. Drum pallet will be provided with secondary containment tray.
- 8. Drum handling trolley/stackers/forklift will be used for drum handling.
- 9. Separate dispensing room with local exhaust and static earthing provision will be available.
- 10. Fire Hydrant Point or Portable type fire extinguishers will be provided near flammable drum storage area.
- 11. Toxic will be stored as per its compatibility study and separate area will be available toxic chemical drums storage.
- 12. Exhaust will be provided at ground level in drum storage area.
- 13. Area evacuation plan, Emergency assembly point, Emergency control centre is prepared and is maintained round the clock.
- 14. OHC facility with part time Doctor and male nurse is prepared and maintained.
- 15. Emergency siren and wind shock is provided.
- 16. Tele Communication system and mobile phone is used in case of emergency situations for communication

#### 3.7.9 For Proposed Corrosive Material Drum Storage area:

- 1. Spill control kit will be provided near drum storage Area.
- 2. All flooring, walls and shelving should resist corrosive attacks, and flooring should be impenetrable.
- 3. Proper ventilation will be available which help to remove any fumes.
- 4. Store corrosive chemicals below eye level to reduce the hazards should a vessel spill, leak or rupture
- 5. Proper label and identification board /stickers will be provided in the storage area. Caution note and emergency first aid is displayed and train for the same to all employees
- 6. Fitted with suitable equipment and protection for the clean-up of spills.
- 7. Properly labelled with warning signs
- 8. Only trained personnel can carry out the venting of a liquid and they must wear the appropriate PPE while undertaking the task

#### 3.7.10 For Proposed Warehouse Safety Measures:

1. FLP type light fittings will be provided.





- 2. Smoking and other spark, flame generating item will be banned from this area.
- 3. Proper ventilation & Illumination will be available in go-down.
- 4. Proper label and identification stickers will be provided on each and every drum in the storage area.
- 5. NFPA labels will be provided on drums for hazard identification of the chemicals
- 6. MSDS will be displayed near drums storage.
- 7. Materials will be stored as per its compatibility study and separate area will be available for flammable, corrosive and toxic chemical drums storage.
- 8. Pallets will be provided for material bag storage with proper rack system and secondary containment tray.
- 9. Material handling trolley/stackers/forklift will be used.
- 10. Unwanted and empty drum will be stored away with identification.
- 11. Required PPEs will be provided to all employees & Full body protection is provided to operator.
- 12. Fire Hydrant Point or Portable type fire extinguishers will be provided near TC drum storage area.
- 13. Safety shower and eye wash will be provided in storage.

#### 3.7.11 Hydrogenation Reaction Safety

- 1. Total enclosed process system will be adopted.
- 2. Temperature gauge or temperature indicator will be provided.
- 3. Pressure gauge will be provided with red mark of S.W.P.
- 4. Auto cut off temperature and pressure arrangement will be provided.
- 5. Safety valve will be provided on hydrogen gas line header.
- 6. Safety valve will be provided on reactor.
- 7. Rupture disc will be provided for additional safety.
- 8. Vent line will be connected with scrubber in case of Ammonia used.
- 9. Vent will be terminated above roof level in case of Hydrogen gas used.
- 10. Flame arrestor will be provided to vent line.
- 11. Nitrogen blanketing will be provided before the charging of hydrogen and after completion of reaction. The line and reactor will be flushed with Nitrogen gas properly to avoid fire or explosion in reactor.
- 12. Chilling cooling arrangement and alternative arrangement for water will be provided to the reactor.
- 13. Alternative power supply arrangement will be provided to autoclave.
- 14. Blow down (drawing tank) will be connected to transfer complete reaction mass in case of any extreme emergency.
- 15. Double Body earthing will be provided to autoclave.
- 16. Flameproof fittings will be provided in the process area.
- 17. PRV station with shut off valve, safety valve provision will be made for hydrogenation reaction safety.
- 18. Before Hydrogen Gas charging into reactor and after completion of reaction Nitrogen flushing will be done.
- 19. Flame arrestor will be provided on vent line of reactor and it will be extended up to roof level.





- 20. Open well ventilated and fragile roof will be provided to on reactor.
- 21. Safe Catalyst charging method will be adopted.
- 22. SOP will be prepared, and operators will be trained for the same.
- 23. Static earthing and electric earthing (Double) will be provided.
- 24. Rector vent will be extended outside the process area and flame arrestor will be provided on vent line.
- 25. Jumpers for static earthing on pipeline flanges of flammable chemical will be provided

#### 3.7.12 For Hydrogen Cylinder connecting header:

- 1. Hydrogen cylinder will be received by road will be stored away from process plant.
- 2. Non sparking tools will be used in this area.
- 3. Auto Shut off valve and safety valve will be provided on PRV station.
- 4. SOP will be prepared, and operators will be trained for the same.
- 5. Trained and experience parson will be done the connection.
- 6. Flame proof light fitting will be installed.
- 7. Double pressure gauge will be provided
- 8. Static earthing and electric earthing (Double) will be provided.
- 9. Jumpers for static earthing on pipeline flanges of flammable chemical will be provided.
- 10. Non sparking tools will be used for hydrogen line fitting.

## 3.7.13 Control Measures for AHCL& BF3Gas Cylinder storage safety

- 1. Stored in cool and dry place and PESO approved area.
- 2. Empty and filled cylinders are stored separately.
- 3. Hazard identification, control measures in case of leakage and first Aid procedure to be prepared and displayed at storage location.
- 4. Gas detector provided in storage area.
- 5. Cylinder store made well ventilated and safe distance maintained.
- 6. Sprinkler system provision made in cylinder storage area.
- 7. Cylinder leakage control Kit kept available at cylinder storage area.
- 8. Sprinkler point and Eyewash / Safety shower provided near cylinder filling point.
- 9. Special charging cabinet with blower provision made. Charging valve and weighing indicator fixed outside the cabinet.
- 10. Blower connected with HCL scrubber.
- 11. Double safety valve provided, and safety valve outlet connected scrubber.
- 12. CCTV(FLP type) camera to be provided in tank farm area.
- 13. Double static earthing provided.
- 14. Emergency breathing airline provided near bullets and positive pressure suit with hood provided in storage area.
- 15. Online AHCL detection censers (PPM based) provided in tank farm area.
- 16. Wind direction indicator provided.





#### 3.7.14 Safety Measures For ISOBUTYLENE storage tank.

- 1. Storage tank away from the process plant.
- 2. Caution note and emergency handling procedure to be displayed at unloading area and trained all operators.
- 3. NFPA label to be provided.
- 4. Required PPEs like full body protection PVC apron, Hand gloves, gumboot, Respiratory mask etc. are provided to operator.
- 5. Safety shower, eye wash with quenching unit provided in acid storage area.
- 6. Material handled in close condition in pipe line.
- 7. Dyke wall provided to all storage tanks, collection pit with valve provision.
- 8. Drain valve provided with blind flange fitting.
- 9. Level gauge provided on all storage tanks. Level transmitter with LOW and HIGH and HIGH-HIGH level cut off alarm to be provided on each tank.
- 10. Safety permit for loading unloading of hazardous material prepared and implemented.
- 11. Static earthing interlocking with transfer pump to be provided.
- 12. Fire hydrant system with jockey pump as per NFPA/ TAC norms to be installed.
- 13. PPFRP tanks to be replace by SS or other competitive MOC.
- 14. Flange guard provided.

## 3.8 HAZARDOUS PROPERTIES OF THE CHEMICALS, COMPATIBILITIES AND SPECIAL HAZARD

Table-3.5

Sr. No.	Name of Chemical	Hazard	Flash Point <sup>o</sup> c	Bp ⁰c	LEL %	UEL %	Sp.Gr. 20 <sup>0</sup> c	Vapor Press. VP	Vapour density	Solubility With Water At 20 °c	NFPA H F R	Hazardous Combustion Product	TLV Ppm	IDLH Ppm	LC50 Mg/M3	Target Organs	Carcinogen- Enicity	Antidote
1.	Acetic Acid CAS No. 64-19-7	T / F	44.4	117. 9	5.4	16.0	1.015	2.1	1.5 kPa (@ 20°C	Soluble	221	Irritating Vapour generated	10 ppm	50 ppm	5620 ppm / 1H	Teeth, eyes, skin, mucous membranes	No	Milk of magnesia.
2.	Acetonitrile CAS #75-05-8	T/F	42	81.6	4.4	16	1.4	1.4	97 hPa @ 20∘C	Soluble	231	Toxic vapor is generated	2.7	40 ppm	4000 ppm	Eye, Skin, eyes, skin, respiratory	No	Cyanide Kit
3.	Acrylonitrile (ACN) CAS#: 107-13-1	F/R	·4.9	77	3.5	17	1.05	1.8	86 mm Hg@ 20 °C	0.1 %	432	CO, CO2 Toxic fumes	2 PPM	10 (mg/m3	333 ppm 4 hour(s) [Rat].	skin, respiratory system, lungs	Yes	Cyanide Kit
4.	Hexane 110-54-3	FΤ	-25.9	62- 67	1.2	7.7	0.659	2.97	176, 0 hPa at 20,0 °C	Insolubl e	231	Carbon oxides	NA	NA	48000 ppm (rat, 1 hour)	Eyes, skin	No	No specific antidote
5.	Iso Butane CAS# 75-28-5	F	- 82.2	- 12. 2	1.6	8.4	2.51	2.05	72.2 psi @ 37.7 ∘C	In soluble	140	СО	NA	NA	rat, 4 hours = 277000 ppm (27.7%)	Central nervous system	No	No specific antidote





Sr. No.	Name of Chemical	Hazard	Flash Point <sup>0</sup> c	Bp ⁰c	LEL %	UEL %	Sp.Gr. 20 ⁰c	Vapor Press. VP	Vapour density	Solubility With Water At 20 °c	NFPA H F R	Hazardous Combustion Product	TLV Ppm	IDLH Ppm	LC50 Mg/M3	Target Organs	Carcinogen- Enicity	Antidote
6.	tert-Butyl alcohol T-Butanol CAS#: 75-65-0	F/ H	11.1	82.4	2.4	8	0.78	2.55	36 mbar @20 ∘C	Soluble	130	CO, CO2	NA	NA	(LC50): Acute: 10000 ppm 4 hours [Rat]	Eyes, skin,	A4	No specific Antidote
7.	Tri Ethyl Amine CAS No#: 121-44-8	F	-8.3 °С	89.7 °C	1.2	8.0	0.73	3.48	68.99 hPa @ 20 ° C	Easily soluble	330	Incomplete combustion can generate carbon dioxide and nitrogen oxides	1	200	NA	kidney, liver	NA	No specific antidote
8.	Sulfuric Acid CAS # 7664-93-9	С	NA	340	NA	NA	1.84	NA	1.2 mm Hg @ 40 ∘ C	Water reactive	3 0 2	Non combustible	1 mg/ m3	15 mg/m <sup>3</sup>	510 Rat	Eyes, skin, respiratory system, teeth	No	Sodium Hydro- Carbonate (4% Conc.), Milk, Lime Juice, Milk of Megnesia
9.	Caustic Lye CAS # 1310-73-2	С	NA	138 8	NA	NA	2.13	NA	NA	Soluble	301	Non combustible	2 mg/ m3	200 mg/m3	2300 mg/m3 for 2H Rat	Eyes, skin, respiratory system	No	Sodium Hydro- Carbonate (4% Conc.), Milk, Lime Juice, Milk of Magnesia
10.	Hydrochloric Acid HCL CAS#: 7647-01-0	C/ T	NF	108	NF	NF	1.12- 1.19	1.26 7	14.6 to 80 mm Hg @ 20 ∘ C	Soluble	301	N A	5 ppm	50 ppm	3124 ppm for 1h rat	Kidney, liver, mucous membranes, respiratory system, skin, eyes	No	Sodium Hydro- Carbonate (4% Conc.),
11.	Sodium hypo chlorite CAS#7681-52-9	Т	NA	40	NA	NA	1.07- 1.09	0.62	NA	Soluble	300	Toxic fumes	500. 0 mg/ m3	NA	NA	eyes, skin	No	No specific antidote.





Sr. No.	Name of Chemical	Hazard	Flash Point <sup>0</sup> c	Bp ⁰c	LEL %	UEL %	Sp.Gr. 20 ⁰c	Vapor Press. VP	Vapour density	Solubility With Water At 20 <sup>o</sup> c	NFPA H F R	Hazardous Combustion Product	TLV Ppm	IDLH Ppm	LC50 Mg/M3	Target Organs	Carcinogen- Enicity	Antidote
12.	Carbon Tetra Chloride CAS #56-23-5	С	NF	76.5	NA	NA	1.59	53	90 mm Hg@ 19.8 ∘C	Soluble	200	Poisonous vapor	5 ppm	300 ppm	NA	Eye, Skin	No	No specific Antidote
13.	Benzene CAS # 71-43-2	T/F	-11	80	1.3	7.9	0.879	2.8	25 mm Hg @ 20 ° C	In soluble	230	Toxic fumes	0.5 ppm	500 ppm	24 ml/kg for rat for 2H	Eyes, skin, respiratory system	Yes	Not available
14.	Xylene CAS # 1330-20-7	F	25	135- 145	1.7	7.6	0.878	3.7	32-43 hPa @ 50 ∘C	0.2 g/l	320	CO2, CO	100 ppm	150 ppm	4550 ppm 4 hour(s) [Rat].	Eyes, skin,	No	Diazem – 1 mg/Kg. (Intravenous), Epinephina, Efidrine
15.	Tetrahydrofuran CAS # 109-99-9	F/ E	-21	66	1.5	12	0.88	2.5	170 hPa 20º C	miscible	230	Toxic vapour	200 ppm	2000 ppm	21000 mg/m 3 hours [Rat	Skin, eyes, Lung,	No	No specific Antidote
16.	Thionyl Chloride CAS # 7719-09-7	Т	NF	76	1.64	4.6	NA	NA	13.3 kPa @ 21º C	Water reactive	402	sulfur dioxide, sulfur chloride	1 pp m	NA	500 ppm for 1 Hr Rat	Skin, eyes, Lung	No	natural oil and one table spoon sodium or magnesium sulphate with one glass of water.
17.	Trimethylamine hydrochloride- (TMA HCL) 593-81-7	Н	> 200 °C	100 °C	NA	NA	NA	1030 kg/c m <sup>3</sup>	0.00 0221 Pa @ 25o C	soluble	NA	Carbon oxides, Nitrogen oxides (NOx), Hydrogen chloride gas	NA	NA	NA	Eyes, skin,	No	No specific Antidote





Sr. No.	Name of Chemical	Hazard	Flash Point <sup>0</sup> c	Bp ⁰c	LEL %	UEL %	Sp.Gr. 20 ⁰c	Vapor Press. VP	Vapour density	Solubility With Water At 20 °c	NFPA H F R	Hazardous Combustion Product	TLV Ppm	IDLH Ppm	LC50 Mg/M3	Target Organs	Carcinogen- Enicity	Antidote
18.	Toluene CAS # 108-88-3	F	4.0	111	1.1	7.1	0.87	3.2	109 hPa @ 50 ∘C	In soluble	230	Irritating Vapour generated	50	2000	400 ppm for 24Hr Rat	Eyes, skin, respiratory system, central nervous system, liver, kidneys	No	Diazem – 1 mg/Kg. (Intravenous), Epinephina, Efidrine
19.	Methyl alcohol (Methanol) CAS#: 67-56-1	F	12	4.5	6	6.5	0.79	1.1	128 hPa @ 20 ∘C	soluble	130	CO, CO2	200	6000 LEL	64000 ppm for 4H rat	Kidneys, heart, central nervous system, liver, eyes	No	10 mg diazepam through injection Activated Charcoal
20.	Hydrogen peroxide 7722-84-1	/C	N/F	1-8	NF	NF	1.1	1.1	18 mm Hg@ 30 ∘C	yes	201	Explosion due to hydrogen	1	NA	70.17 rat	Eye & Skin	No	No specific Antidote
21.	Isopropyl alcohol (IPA) CAS # 67-63-0	F	18.5	82.3	2.3	12.7	0.785	2.1	44 hPa @ 20 ∘C	Miscibl e	130	Acid smoke & fumes	400	2000 LEL	NA	NA	No	No specific Antidote
22.	Methylene Chloride CAS #75-09-2	Т	NF	39.8	12	19	1.322	29	350	soluble in cold water.	201	CO, CO2, COCl2, HCL	100 pp m	5000	52000 1 hours [Rat]	NA	No	No specific Antidote
23.	Nitro Benzene (NB) CAS # 98-95-3	T/F	88	211	1.8	40.0	1.2	4.3	0.15 mm Hg @ 20 ° C	0.2	321	Irritating Vapour generated	NA	1 ppm	556 ppm for 4H Rat	Eye, Skin, Respiratory system	No	Diazem – 1 mg/Kg. (Intravenous Epinephina, Efidrine





Sr. No.	Name of Chemical	Hazard	Flash Point <sup>0</sup> c	Bp ⁰c	LEL %	UEL %	Sp.Gr. 20 ⁰c	Vapor Press. VP	Vapour density	Solubility With Water At 20 <sup>o</sup> c	NFPA H F R	Hazardous Combustion Product	TLV Ppm	IDLH Ppm	LC50 Mg/M3	Target Organs	Carcinogen- Enicity	Antidote
24.	Ammonia liquor CAS #1336-21-6	Т	NA	36	16	25	0.9	1.2	NA	Miscible	310	Not combustible	25	300	2000 ppm/4- hr	Eyes, skin	No	Wash with Lactic Acid, apply soframycin Smelling Ethanol or Ether
25.	Di chloro Methane (MDC, DCM) CAS#: 75-09-2	Т	NF	39.8	14.0	22.0	1.325	2.9	350 mm Hg @ 20 ° C	20 g/ lit.	201	CO, CO2, Cocl2, HCL (g) generated	50	NA	52 gm/m3 inhalation - rat	blood, central nervous system	Yes	no specific antidote.
26.	Dichloro Ethane 107-06-2	F/T	13	83.5	6.2	16	1.235	3.42	65 mm Hg @ 29 ∘ C	In soluble	230	Irritating & toxic Vapour	10	NA	5100 mg/ m3/ 6 Hrs for rat	Eyes, skin, kidney	No	No specific antidote
27.	2,6- Dichlorotoluene 118-69-4	NA	82 °C	196 - 203 °C	NA	NA	1.250	5.6	NA	NA	210	Carbon monoxide (CO). Carbon dioxide (CO2). Hydrogen chloride gas	NA	NA	NA	Eyes, skin,	No	No specific antidote
28.	DMF (di methyl formamide) CAS#: 68-12-2	F	42.7	.53°C	2.2	15.2	1.018	2.51	0.3 kPa @ 20 ∘C	In soluble in water 0.1 mg/mL at 64° F	120	Highly flammable	10	500	LC-50 rat (inhalative, 4 h) > 5900 mg/m	liver	No	No specific antidote.





Sr. No.	Name of Chemical	Hazard	Flash Point <sup>0</sup> c	Bp ⁰c	LEL %	UEL %	Sp.Gr. 20 ⁰c	Vapor Press. VP	Vapour density	Solubility With Water At 20 <sup>o</sup> c	NFPA H F R	Hazardous Combustion Product	TLV Ppm	IDLH Ppm	LC50 Mg/M3	Target Organs	Carcinogen- Enicity	Antidote
29.	Tri-chloro acetyl chloride 76-02-8	C/ T	100	I-116	Na	NA	1.620	6.3	1.33 hPa @ 51 ∘C	In compatible with water	400	HCL gas, CO, CO2, Phosgene gas	NA	NA	475 mg/m3 (Rat) 4 h	Respiratory system	No	No specific antidote
30.	Triethanolamine TEA CAS#: 102-71-6	Н	179	335	1.3	8.5	1.12	5.15	NA	soluble	211	CO, CO2	NA	NA	NA	Eye, Skin	NA	No specific Antidote
31.	Epoxyethane CAS # 75-21-8	E/ F/ T/ R	17.8	.0.7	3.0	.00	).869	1.4	1.5 bar @ 20∘C	2.0 %	243	irritating fumes	1.0	800	4443 PPM for human	Eyes, skin, respirator system	No	No specific antidote
32.	Ester CAS #: 1200-26-2	N A	3.321 °C	0.999 °C at 760 mm Hg	NA	NA	NA	NA	NA	Soluble	NA	NA	NA	NA	NA	NA	No	NA
33.	Formic acid (85%) CAS # 64-18-6	С	62	.07	15	48	1.22	1.6	5.7 kPa @ 20 ∘C	miscible	320	Toxic vapour	5 ppm	30 ppm	6200 mg/m3[Rat]	Eyes, skin	No	Sodium Hydro- Carbonate (4% Conc.), Milk, Lime Juice, Milk of Megnesia
34.	tert-Butylamine CAS-No 75-64-9	F	-34	46	70	3.9	0.69	2.5	294.7 mmH g 20∘C	Stable	330	CO, CO2 NOx	NA	NA	LC50 = 3800 mg/m3 (Rat) 4 h	Eyes, skin,	No	No specific Antidote
35.	Bromo benzene CAS#: 108-86-1	F	51	.56	NA	NA	1.49	5.41	0.7 kPa @ 20°C	slightly soluble	220	(CO, CO2)	NA	NA	NA	Eyes, skin,	No	No specific Antidote





Sr. No.	Name of Chemical	Hazard	Flash Point <sup>0</sup> c	Bp ⁰c	LEL %	UEL %	Sp.Gr. 20 ºc	Vapor Press. VP	Vapour density	Solubility With Water At 20 <sup>o</sup> c	NFPA H F R	Hazardous Combustion Product	TLV Ppm	IDLH Ppm	LC50 Mg/M3	Target Organs	Carcinogen- Enicity	Antidote
36.	Bifenthrin Alcohol CAS No 76350-90- 8	Н	177	NA	NA	NA	1.14	NA	NA	Soluble	200	NA	NA	NA	NA	Eyes, skin,	No	No specific Antidote
37.	Oxalic acid anhydrous CAS#: 144-62-7	Н	NA	NA	NA	NA	1.97	4.62	NA	Soluble	310	CO, CO2	2 (mg /m3 )	NA	LC50): 4000 mg/l 24 hours [Fish	Eyes, skin,	No	No specific Antidote
38.	Oxalyl chloride CAS: 1332-65-6	H/ T	NF	comp ose s	NA	NA	3.76	NA	Prect ically Zero	Ins oluble	201	NA	NA	NA	NA	Eyes, skin,	No	No specific Antidote
39.	Amino Acetonitrile Hydrochloride CAS-No 6011-14-9	Н	NA	NA	NA	NA	NA	NA	NA	Soluble	100	NF	NA	NA	NA	Eyes, skin,	No	No specific Antidote
40.	Hydrogen CAS # 1333-74-0	F/ E	N.A.	- 252 .8° C	3.0	74	0.0696	NA	NA	Soluble in water	140	Explosive gas	250 ppm	NA	LC50 >800000 ppm rat	lungs, heart, upper respiratory tract, central nervous system (CNS)	No	No specific Antidote
41.	Boron trifluoride CAS No: 7637-07- 2	Н	NA	- 99. 8	NA	NA	NA	NA	NA	NA	410	NA	0.7 ppm	25 ppm	806 ppm/1h	Eye, Skin	No	No specific Antidote
42.	Activated Carbon CAS#: 7440-44-0	F	NA	NA	NA	NA	1.07	0.62	1 mm @ 3586 C	In soluble	130	ammonium nitrate, NA2s	NA	NA	NA	No	No	No specific Antidote





Sr. No.	Name of Chemical	Hazard	Flash Point <sup>o</sup> c	Bp ⁰c	LEL %	UEL %	Sp.Gr. 20 ⁰c	Vapor Press. VP	Vapour density	Solubility With Water At 20 °c	NFPA H F R	Hazardous Combustion Product	TLV Ppm	IDLH Ppm	LC50 Mg/M3	Target Organs	Carcinogen- Enicity	Antidote
43.	Ammonium Carbonate CAS# 506-87-6	Т	NA	west: 100	NA	NA	1.5	0.6 2	2.3 kPa @ 20°C	Soluble in cold water	200	NA	NA	NA	2.15 g/Kg	Eyes, skin, respiratory system	NO	Drink water or milk
44.	Boric Acid CAS#: 10043-35-3	Н	NF	300	NA	NA	1.43	NA	Negl igibl e @ 20° C	soluble	100	CO, CO2	NA	NA	NA	Eye, Skin	No	No specific Antidote
45.	Cupric chloride CAS#: 10125-13-0	Н	NA	NA	NA	NA	2.54	NA	NA	In soluble	300	NA	NA	NA	NA	Eye, Skin	No	No specific Antidote
46.	Potassium Carbonate, K2CO3 CAS#: 584-08-7	Н	NA	NA	NA	NA	2.298	NA	NA	Soluble	200	NA	NA	NA	NA	Eyes, skin,	No	No specific Antidote
47.	Potassium Hydroxide CAS # 1310-58-3	С	NA	1420	NA	NA	2.13	NA	NA	Soluble	301	oncombustible	2 mg/ m3	200 mg/m3	2300 mg/m3 for 2H Rat	Eyes, skin, respiratory system	No	Sodium Hydro- Carbonate (4% Conc.), Milk, Lime Juice, Milk of Magnesia
48.	Sodium hydroxide NaOH CAS#: 1310-73-2	Н	NF	1 388	NA	NA	2.13	NA	<0.1 hPa @20 ∘C	soluble	301	C0, C02	NA	NA	NA	Eye, Skin, lung damage	NA	No specific Antidote





Sr. No.	Name of Chemical	Hazard	Flash Point <sup>0</sup> c	Bp ⁰c	LEL %	UEL %	Sp.Gr. 20 ⁰c	Vapor Press. VP	Vapour density	Solubility With Water At 20 °c	NFPA H F R	Hazardous Combustion Product	TLV Ppm	IDLH Ppm	LC50 Mg/M3	Target Organs	Carcinogen- Enicity	Antidote
49.	Raney nickel 7440-02-0	T/ F	NA	NA	NA	NA	NA	NA	NA	In contact with water releases flamma ble gas	320	obnoxious and toxic fumes	1	5	NA ATE > 20 mg/l.	Skin.	Yes	No specific antidote
50.	Soda ash 497-19-8	C/ H	NA	NA	NA	NA	NA	NA	NA	Miscible	201	nits Na2O fumes when heated to decompositon	NA	NA	2300 mg/m 2 hours [Rat]. 1200 mg/m 2 hours [Mouse].	NA	NA	No specific antidote
51.	Sodium Bicarbonate CAS# 144-55-8	Т	NA	100	NA	NA	1.06	0.62	NA	Soluble	100	NA	NA	NA	(LD50): 81800 mg/kg (Rat	Eyes, skin, respiratory system	No	No specific Antidote
52.	Sodium Bisulphite 7631-90-5	С	NA	NA	NA	NA	1.48	NA	NA	Very Soluble	201	NA	NA	NA	NA	Eyes, skin, respirator system	No	No specific antidote
53.	Sodium Carbonate 497-19-8	С	NA	NA	NA	NA	2.53	NA	NA	Soluble	101	NA	NA	NA	2300 ppm	Eyes, skin	No	No specific antidote
54.	Sodium chloride CAS#7647-14-5	Т	NF	1412	NA	NA	2.165	NA	1 mm Hg @ 865 °C	Soluble in water	100	Not combustible	NA	NA	LC50(1hr) Inhalation. > 42,000 mg/m3. Rat.	eyes, skin and gastrointestinal tract.	No	No specific antidote.





Sr. No.	Name of Chemical	Hazard	Flash Point <sup>0</sup> c	Bp ºc	LEL %	UEL %	Sp.Gr. 20 ⁰c	Vapor Press. VP	Vapour density	Solubility With Water At 20 °c	NFPA H F R	Hazardous Combustion Product	TLV Ppm	IDLH Ppm	LC50 Mg/M3	Target Organs	Carcinogen- Enicity	Antidote
55.	Sodium cyanide NaCN CAS #143-33-9	Н	NF	high	NF	NF	1.60	NA	100 Pa @ 800 ∘C	Soluble	300	Irritating vapor	5 mg/ m3	25 mg/m3	NA	Eye & Skin	No	Methelene Blue or Kelocynere injection
56.	Sodium sulphide CAS#: 1313-82-2	Н	NA	NA	NA	NA	NA	NA	NA	Soluble	311	NF	NA	NA	NA	Eyes, skin,	No	No specific Antidote
57.	Sodium t-Butoxide CAS-No. 865-48-5	F	14	NA	2.3	8.0	NA	NA	NA	Soluble	322	CO, CO2 SO2, SO3	NA	NA	NA	Eyes, skin,	No	No specific Antidote
58.	Sulfur Monochloride (l) (SMC) 10025-67-9	T/ F	130	.38	NA	NA	1.7	4.6	6.8 mm Hg @ 20 ∘ C	React with water	211	Toxic gases generated	1.0	NA	NA	Eyes, skin	No	No specific Antidote
59.	Dichloroacetic acid 79-43-6	T/ C	.12 °C	94 °C	NA	NA	1.560	4.45	1.3 mbar @ 44 °C	Soluble	410	Toxic gases generated	0.5	NA	NA	Skin,Eye	No	No specific Antidote
	F E UH E R NI	EL FPA N.A	= = = = E = N = N = NOT	FIRE EXPLC BOILIN UPPEN VAPOF REACT ATION	OSIVE NG POIN EXPLC ATION TIVE HA AL FIRE ABLE	IT DSIVE LI RATE ZARD E PROTI	IMIT ECTION A:	H SSOCIA'	T I S S I TION-us	R LEL P.GR = HEA 3R Sa	= TOX = REA = LOV = SPE LTH HAZ = BUR	IC ICTIVE VER EXPLOSIVE I CIFIC GRAVITY ARD CLASS RNING RATE	LIMIT	F	C = CORF STEL = SHOF PPM = PAR' VD = VAPC = FIRE HAZARD TLV = THRF	ROSIVE RT TERM EXPOSURE ITS PER MILLION DUR DENSITY CLASS ESHOLD LIMIT VALU	I LIMIT	

N.L. =NOT LISTED





## 3.9 Transportation, Unloading and handling procedure

# 3.9.1 Transportation, Unloading and handling procedure for Flammable Chemical.

SR.NO.	ACTIVITY	TYPE OF	PROCEDURES.
		POSSIBLE HAZARD	
1	Transportation of Flammable chemical by road tanker	Leakage, Spillage, fire, explosion, Toxic release	<ul> <li>Training is provided to driver and cleaner regarding the safe driving, hazard of Flammable chemicals, emergency handling, use of SCBA sets.</li> <li>TREM card will kept with TL.</li> <li>SCBA set is kept with TL.</li> <li>Fire extinguishers is kept with TL.</li> <li>Flame arrestor is provided to TL exhaust.</li> <li>Instructions is given not to stop road tanker in populated area.</li> <li>Clear Hazard Identification symbol and emergency telephone number is displayed as per HAZCHEM CODE.</li> <li>Appropriate PPEs is kept with TL.</li> </ul>
2	Flammable chemical Road tanker unloading at site.	Leakage, Spillage, fire, explosion, toxic release	<ul> <li>Priority is given to Tanker to immediately enter the storage premises at site and will not be kept waiting near the gate or the main road.</li> <li>Security person will check License, TREM CARD, Fire extinguisher condition, SCBA set condition, Antidote Kit, required PPEs as per SOP laid down.</li> <li>Store officer will take sample as per sampling SOP from sampling point.</li> <li>After approval of QC department unloading procedure is allowed be started.</li> <li>Following precautions is adopted during unloading</li> <li>Wheel stopper is provided to TL at unloading platform.</li> <li>Static earthing is provided to road tanker.</li> <li>Tanker unloading procedure is followed according to check list and implemented.</li> <li>Flexible SS hose connection is done at TL outlet line.</li> <li>The quantity remaining in the hose pipeline is drained to a small underground storage tank, which is subsequently transferred by nitrogen pressure to the main storage tank thus ensuring complete closed conditions for transfer from road tanker.</li> <li>All TL valves is closed in TL.</li> </ul>





			<ul> <li>Finally earthing connection and wheel stopper is removed.</li> </ul>
3	Flammable chemical Storage tank safety	Leakage, Spillage, Fire, Explosion, Toxic release.	<ul> <li>Only daytine unloading is permitted.</li> <li>SS storage tank is provided as per IS code.</li> <li>Dyke wall is provided to storage tank.</li> <li>Level transmitter is provided with low-level high-level auto cut-off provision.</li> <li>Vent is connected to water trap and vent of water trap is provided with flame arrestor.</li> <li>Water sprinkler system is provided to storage tank.</li> <li>Fire hydrant monitor with foam attachment facility is provided.</li> <li>Dumping / Drain vessel/alternate vessel is provided to collect dyke wall spillage material.</li> <li>FLP type pump is provided.</li> <li>Nitrogen blanketing is provided to storage tank.</li> <li>Double static earthing is provided to all Solvent handling pipeline flanges.</li> </ul>
4	Flammable chemical transfer from storage tank to Day tank	Leakage, Spillage due to Line rupture, Flange Gasket failure, Fire, Explosion, Toxic release.	<ul> <li>Double mechanical seal type FLP type pump is provided.</li> <li>Double on / off switch will be provided at tank farm and process area near day tank. Pump auto cut off with day tank high level is provided.</li> <li>Flame arrestor is provided on day tank vent.</li> <li>Overflow is provided for additional safety and it is connected to main storage tank.</li> <li>NRV is provided on pump discharge line.</li> <li>Double Jumper clip is provided to all solvent handling pipeline.</li> <li>Double static earthing is provided to day tank.</li> </ul>
5	Flammable chemical transfer from Day tank to reactor.	Leakage, Spillage due to Line rupture, Flange Gasket failure, Fire, Explosion, Toxic release.	<ul> <li>Gravity transfer.</li> <li>Total quantity of day tank material is charged in to reactor at a time.</li> <li>NRV is provided on day tank outlet line.</li> <li>Static earthing is provided to storage tank.</li> <li>Double Jumpers is provided to pipeline flanges.</li> </ul>



#### 3.9.2 Transportation, Unloading and handling procedure for Isobutylene(IB): Table 3.6

SR.NO.	ACTIVITY	TYPE OF	PROCEDURES.
		POSSIBLE	
		HAZARD	
1	Transportation of IB by road tanker	Leakage, Spillage, fire, explosion, Toxic release	<ul> <li>Training is provided to driver and cleaner regarding the safe driving, hazard of Flammable chemicals, emergency handling, and use of SCBA sets.</li> <li>TREM card will kept with TL.</li> <li>SCBA set is kept with TL.</li> <li>Fire extinguishers is kept with TL.</li> <li>Flame arrestor is provided to TL exhaust.</li> <li>Instructions is given not to stop road tanker in populated area.</li> <li>Clear Hazard Identification symbol and emergency telephone number is displayed as per HAZCHEM CODE.</li> <li>Appropriate PPEs is kept with TL.</li> </ul>
2	IB Road tanker unloading at Meghmani site.	Leakage, Spillage, fire, explosion, toxic release	<ul> <li>Priority is given to Tanker to immediately enter the storage premises at site and will not be kept waiting near the gate or the main road.</li> <li>Security person will check Licence, TREM CARD, Fire extinguisher condition, SCBA set condition, Antidote Kit, required PPEs as per SOP laid down.</li> <li>Store officer will take sample as per sampling SOP from sampling point.</li> <li>After approval of QC department unloading procedure is allowed be started.</li> <li>Following precautions is adopted during unloading</li> <li>Wheel stopper is provided to TL at unloading platform.</li> <li>Static earthing is provided to road tanker.</li> <li>Tanker unloading procedure is followed according to check list and implemented.</li> <li>Flexible SS hose connection is done at TL outlet line.</li> <li>The quantity remaining in the hose pipeline is drained to a small underground storage tank, which is subsequently transferred by nitrogen pressure to the main storage tank thus ensuring complete closed conditions for transfer from road tanker.</li> </ul>





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SR.NO.	ACTIVITY	TYPE OF POSSIBLE HAZARD	PROCEDURES.
			<ul> <li>All TL valves is closed in TL.</li> <li>Finally earthing connection and wheel stopper is removed.</li> <li>Only day time unloading is permitted.</li> </ul>
3	IB Storage tank safety	Leakage, Spillage, Fire, Explosion, Toxic release.	<ul> <li>Under N2 pressure storage.</li> <li>Safety valve provided.</li> <li>Dyke with separate fencing area is provided.</li> <li>SOP prepared</li> <li>Road tanker unloading procedure prepared</li> <li>Flame-proof area.</li> <li>Work permit followed</li> <li>Firefighting equipment provided.</li> <li>PPEs used</li> <li>Safety shower, eye wash provided.</li> <li>NFPA labeling system adopted for storage tanks.</li> <li>Level indicator at local.</li> <li>Alarm for high level &amp; high pressure.</li> <li>Sprinkler system is provided</li> <li>Pressure equalizer provided on both tanks.</li> </ul>
4	IB transfer from storage tank to Day tank	Leakage, Spillage due to Line rupture, Flange Gasket failure, Fire, Explosion, Toxic release.	<ul> <li>Nitrogen blanketing provided in day tank.</li> <li>Double mechanical seal type FLP type pump is provided.</li> <li>High level cutoff provision made on day tank.</li> <li>Safety valve provided on day tank.</li> <li>Double on / off switch will be provided at tank farm and process area near day tank. Pump auto cut off with day tank high level is provided.</li> <li>NRV is provided on pump discharge line.</li> <li>Double Jumper clip is provided to all solvent handling pipeline.</li> <li>Double static earthing is provided to day tank.</li> </ul>
5	IB transfer from Day tank to reactor.	Leakage, Spillage due to Line rupture, Flange Gasket failure, Fire, Explosion, Toxic release.	<ul> <li>With nitrogen pressure.</li> <li>Total quantity of day tank material is charged in to reactor at a time.</li> <li>NRV is provided on day tank outlet line.</li> <li>Static earthing is provided to storage tank.</li> <li>Double Jumpers is provided to pipeline flanges.</li> </ul>



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#### 3.9.3 Transportation, Unloading and handling procedure for Acrylonitrile(ACN): Table 3.7

SR.NO.	ACTIVITY	TYPE OF	PROCEDURES.	
		POSSIBLE		
		HAZARD		
1	Road tanker filling at Kandla tank farm area.	Spillage, toxic release, fire, explosion.	<ul> <li>Inis activity falls under Kandla Port Authority Following measures is provided at Kandla Tank Lorry Filling (TLF) area.</li> <li>Static earthing provision to Tank Lorry (TL) and interlocking with filling pump.</li> <li>Wheel stoppers to TL.</li> <li>Automatic Charging by PLC based system with volume measurement.</li> <li>Flame arrestor/ spark arrestor on TL exhaust</li> </ul>	
2	Transportation of ACN by road tanker	Leakage, Spillage, fire, explosion, Toxic release	<ul> <li>Training is provided to driver and cleaner regarding the safe driving, hazard of ACN, ACN emergency handling, use of antidote kit administration.</li> <li>TREM card will kept with TL.</li> <li>Antidote Kit will kept with TL.</li> <li>SCBA set is kept with TL.</li> <li>SCBA set is kept with TL.</li> <li>Fire extinguishers is kept with TL.</li> <li>All the TL is equipped with Global Positioning system (GPS) and route is predefined.</li> <li>Flame arrestor is provided to TL exhaust.</li> <li>Instructions is given not to stop ACN road tanker in populated area.</li> <li>Clear Hazard Identification symbol and emergency telephone number is displayed as per HAZCHEM CODE.</li> <li>Appropriate PPEs is kept with TL.</li> </ul>	
3	ACN tank Lorry unloading at Meghmani site	Leakage, Spillage, fire, explosion, toxic release	<ul> <li>Priority is given to Tanker to immediately enter the storage premises at site and will not be kept waiting near the gate or the main road.</li> <li>Security person will check License, TREM CARD, Fire extinguisher condition, SCBA set condition, Antidote Kit, required PPEs as per SOP laid down.</li> <li>Store officer will take sample as per sampling SOP from sampling point.</li> <li>After approval of QC department unloading procedure is allowed be started.</li> <li>Following precautions is adopted during unloading by Nitrogen pressure.</li> </ul>	





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SR.NO.	ACTIVITY	TYPE OF	PROCEDURES.	
		POSSIBLE		
		HAZARD		
SR.NO.	ACTIVITY	TYPE OF POSSIBLE HAZARD	<ul> <li>PROCEDURES.</li> <li>Wheel stopper is provided to TL at unloading platform.</li> <li>Static earthing is provided to road tanker.</li> <li>Tanker unloading procedure is followed according to check list and implemented.</li> <li>Nitrogen hose connection is done with TL nitrogen inlet line for ACN transfer by Nitrogen pressure.</li> <li>Flexible SS hose connection is done at TL outlet line.</li> <li>After connecting all hoses properly, check is carried out for leakage and then charging line valve is opened, followed by TL outlet line valve and finally Nitrogen charging line valve is opened gradually to apply N2 pressure inside TL.</li> <li>When TL is empty, first N2 pressure line valve is closed followed by TL outlet line valve and finally remaining in the hose pipeline is drained to a small underground storage tank, which is subsequently transferred by nitrogen pressure to the main storage tank thus ensuring complete closed conditions for ACN transfer from road tanker.</li> <li>All TL valves is closed keeping a nitrogen blanketing in TL.</li> <li>Finally earthing connection and wheel stopper is removed.</li> <li>Only daytime unloading is permitted.</li> <li>Following precautions is adopted during TL unloading work by pump.</li> <li>Wheel stopper is provided to TL at unloading plate form.</li> <li>Static earthing is provided to road tanker.</li> </ul>	
			<ul> <li>Tanker unloading procedure with check list is followed and implemented.</li> <li>Flexible SS hose connection is made to TL outlet line.</li> <li>After connecting all hoses is properly checked for any leakages and then sorage tank</li> </ul>	
			charging line valve is opened followed by TL outlet line valve and finally pump is started.	



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SR.NO.	ACTIVITY	TYPE OF	PROCEDURES.	
		POSSIBLE		
		HAZARD		
			<ul> <li>When TL is empty, stop the pump pump then tank charging line valve is closed followed by TL outlet line valve.</li> <li>The quantity remaining in the hose pipeline is drained to a small underground storage tank, which is subsequently transferred by nitrogen pressure to the main storage tank thus ensuring complete closed conditions for ACN transfer from road tanker.</li> <li>All TL valves are closed and nitrogen blanketing in TL is provided.</li> <li>Earthing connection and wheel stopper is removed.</li> <li>Only daytime unloading is permitted.</li> </ul>	
4	Storage tank safety	Leakage, Spillage, Fire, Explosion, Toxic release.	<ul> <li>Solidy daytime unloading is permitted.</li> <li>SS storage tank is provided as per IS code.</li> <li>Dyke wall is provided to storage tank.</li> <li>Level transmitter is provided with low-level high-level auto cut-off provision.</li> <li>Vent is connected to water trap and vent of water trap is provided with flame arrestor.</li> <li>Water sprinkler system is provided to storage tank.</li> <li>Fire hydrant monitor with foam attachment facility is provided.</li> <li>Dumping / Drain vessel is provided to collect dyke wall spillage material.</li> <li>FLP type pump is provided.</li> <li>Nitrogen blanketing is provided to storage tank.</li> <li>Double static earthing is provided to storage tank.</li> <li>Double Jumper clip is provided to all ACN handling pipeline flanges.</li> </ul>	
5	ACN transfer from storage tank to Day tank	Leakage, Spillage due to Line rupture, Flange Gasket failure, Fire, Explosion, Toxic release.	<ul> <li>Double mechanical seal type FLP type pump is provided.</li> <li>Double on / off switch will be provided at tank farm and process area near day tank. Pump auto cut off with day tank high level is provided.</li> <li>Flame arrestor is provided on day tank vent.</li> <li>Overflow is provided for additional safety and it is connected to main storage tank.</li> <li>NRV is provided on pump discharge line.</li> </ul>	





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SR.NO.	ACTIVITY	TYPE OF POSSIBLE HAZARD	PROCEDURES.
			<ul> <li>Double Jumper clip is provided to all ACN handling pipeline.</li> <li>Double static earthing is provided to day tank.</li> </ul>
6	ACN transfer from Day tank to reactor.	Leakage, Spillage due to Line rupture, Flange Gasket failure, Fire, Explosion, Toxic release.	<ul> <li>Gravity transfer.</li> <li>Total quantity of day tank material is charged into reactor at a time.</li> <li>NRV is provided on day tank outlet line.</li> <li>Static earthing is provided to storage tank.</li> <li>Double Jumpers is provided to pipeline flanges.</li> </ul>





## 3.9.4 Transportation, Unloading and handling procedure for Thionyl Chloride:

SR.NO.	ACTIVITY	TYPE OF POSSIBLE HAZARD	CONTROL MEASURES AND HANDLING PROCEDURES.
1	Transportation of TC by road tanker	Leakage, Spillage, Toxic release	<ul> <li>Training is provided to driver and cleaner regarding the safe driving, hazard of Flammable chemicals, emergency handling, use of SCBA sets administration.</li> <li>TREM card will kept with TL.</li> <li>SCBA set is kept with TL.</li> <li>Instructions is given not to stop road tanker in populated area.</li> <li>Clear Hazard Identification symbol and emergency telephone number is displayed as per HAZCHEM CODE.</li> <li>Appropriate PPEs is kept with TL.</li> <li>Emergency telephone numbers list of Offsite emergency agencies is provided in TREM CARD</li> </ul>
2	TC Road tanker unloading at Meghmanisite.	Leakage, Spillage, toxic release	<ul> <li>Priority is given to Tanker to immediately enter the storage premises at site and will not be kept waiting near the gate or the main road.</li> <li>Security person will check License, TREM CARD, Fire extinguisher condition, SCBA set condition, required PPEs as per SOP laid down.</li> <li>Store officer will take sample as per sampling SOP from sampling point.</li> <li>After approval of QC department unloading procedure is allowed be started.</li> <li>Following precautions is adopted during unloading</li> <li>Wheel stopper is provided to TL at unloading platform.</li> <li>Tanker unloading procedure is followed according to check list and implemented.</li> <li>Flexible hose connection is done at TL outlet line and checked for no leakage.</li> <li>Every time rubber gasket is changed.</li> <li>The quantity remaining in the hose pipeline is drained to a small container, which is subsequently transferred to the main storage tank thus ensuring complete closed conditions</li> </ul>



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SR.NO.	ACTIVITY	TYPE OF	CONTROL MEASURES AND HANDLING	
		POSSIBLE	PROCEDURES.	
		HAZARD		
			for transfer from road tanker.	
			All TL valves is closed in TL.	
3	TC Storage	Leakage,	• Storage tank is stored away from the process	
	tank safety	Spillage,	plant.	
		Toxic	• Tanker unloading procedure is prepared and	
		release.	implemented.	
			• Caution note and emergency handling	
			procedure is displayed at unloading area and	
			NEDA lobal is provided	
			• NFPA label is provided.	
			• Required PPES like full body protection PVC	
			apron, Hand gloves, gumboot, Respiratory	
			Mask etc. is provided to operator.	
			• Neutralizing agent is kept ready for tackle any emergency spillage.	
			• Safety shower, eye wash with quenching unit	
			is provided in acid storage area.	
			• Material is handled in close condition in	
			pipeline.	
			• Dyke wall is provided to all storage tanks,	
			collection pit with valve provision.	
			<ul> <li>Double drain valve will be provided.</li> </ul>	
			<ul> <li>Level gauge is provided on all storage tanks.</li> </ul>	
			• Safety permit for loading unloading of	
			hazardous material is prepared and	
			implemented.	
			• TREM CARD is provided to all transporters	
			and is trained for transportation Emergency of	
			Hazardous chemicals.	
			• Fire hydrant system with jockey pump as per	
4	TC therefored	Lookaga	I AU NORMS IS INSTAILED.	
4	from storage	Leakage,	• Double mechanical seal type pump is	
	tank to Day	to Line	<ul> <li>Double on / off switch will be provided at tank</li> </ul>	
	tank to Day	runture	farm and process area poar day tank Dump	
		Flange	auto cut off with day tank high lovel is	
		Gasket	nrovided	
		failure. Toxic	<ul> <li>Flame arrestor is provided on day tank yent</li> </ul>	
		release.	• Overflow is provided for additional safety and	
			it is connected to main storage tank	
			NRV is provided on numn discharge line	
			<ul> <li>Flange Guard is provided to all flanges</li> </ul>	
			- Trange duard is provided to an nanges.	





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SR.NO.	ACTIVITY	TYPE OF POSSIBLE HAZARD	CONTROL MEASURES AND HANDLING PROCEDURES.
5	TC transfer from Day tank to reactor.	Leakage, Spillage due to Line rupture, Flange Gasket failure, Toxic release.	<ul> <li>Gravity transfer.</li> <li>Double valve is installed on day tank outlet line.</li> <li>Total quantity of day tank material is charged into reactor at a time.</li> <li>NRV is provided on day tank outlet line.</li> <li>Flange guard is provided to pipeline flanges.</li> </ul>





## 3.9.5 Drums Transportation, Unloading and handling procedure

#### Table-3.9

SR.	ACTIVITY	TYPE OF	PROCEDURES.	
NO.		POSSIBLE		
		HAZARD		
1	Transportation of drums	Leakage, Spillage, fire, explosion, Toxic release	<ul> <li>Training will be provided to driver and cleaner regarding the safe driving, hazard of Flammable chemicals, emergency handling, use of SCBA sets.</li> <li>TREM card will kept with TL.</li> <li>SCBA set will be kept with TL.</li> <li>Fire extinguishers will be kept with TL.</li> <li>Flame arrestor will be provided to TL exhaust.</li> <li>Instructions will be given not to stop road tanker in populated area.</li> <li>Clear Hazard Identification symbol and emergency telephone number will be displayed as per HAZCHEM CODE.</li> <li>Appropriate PPEs will be kept with TL.</li> </ul>	
2	Drums unloading at site.	Leakage, Spillage, fire, explosion, toxic release	<ul> <li>Priority will be given to truck to immediately enter the storage premises at site and will not be kept waiting near the gate or the main road.</li> <li>Security person will check License, TREM CARD, Fire extinguisher condition; SCBA set condition, Antidote Kit, required PPEs as per SOP laid down.</li> <li>Store officer will take sample as per sampling SOP from sampling point.</li> <li>After approval of QC department unloading procedure will be allowed be started.</li> <li>Following precautions will be adopted during unloading</li> <li>Wheel stopper will be provided to TL at unloading platform.</li> <li>Only daytime unloading will be permitted.</li> </ul>	
3	Go-down / warehouse safety	Leakage, Spillage, Fire, Explosion, Toxic release.	<ul> <li>FLP type light fittings will be provided.</li> <li>Proper ventilation will be provided in go down.</li> <li>Proper label and identification board /stickers will be provided in the storage area.</li> <li>Conductive drum pallets will be provided.</li> <li>Drum handling trolley / stackers/fork lift will be used for drum handling.</li> <li>Separate dispensing room with local exhaust</li> </ul>	





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SR.	ACTIVITY	TYPE OF	PROCEDURES.
NO.		POSSIBLE	
		HAZARD	
			<ul> <li>and static earthing provision will be made.</li> <li>Materials will be stored as per its compatibility study and separate area will be made for flammable, corrosive and toxic chemical drums storage.</li> <li>Smoking and other spark, flame generating item will be banned from the Gate.</li> </ul>
4	Acids, Solvents, etc. transfer from drum to Day tank/ reactor	Leakage, Spillage due to Line rupture, Flange Gasket failure, Fire, Explosion, Toxic release.	<ul> <li>Acids and solvents transfer by vacuum or by pump only.</li> <li>Static earthing will be provided.</li> <li>SS flexible hose / conductive hose will be used.</li> </ul>
5	Acids, Solvents, etc., transfer from Day tank to reactor.	Leakage, Spillage due to Line rupture, Flange Gasket failure, Fire, Explosion, Toxic release.	<ul> <li>Gravity transfer.</li> <li>Total quantity of day tank material will be charged into reactor at a time.</li> <li>NRV will be provided on day tank outlet line.</li> <li>Static earthing will be provided to storage tank.</li> <li>Double Jumpers will be provided to pipeline flanges.</li> </ul>





## 3.9.6 Sodium Cyanide Transportation, Unloading and handling Procedure:

SR.NO.	ACTIVITY	TYPE OF POSSIBLE	PROCEDURES.
1	Transportation of Sodium Cyanide by road truck	Leakage, Spillage, Toxic release in case of direct contact or ingestion	<ul> <li>Close pack HDPE drums with seal.</li> <li>No hazard during transportation due to solid pallets.</li> </ul>
2	NACN storage and handling safety	Leakage, Spillage, Toxic release in case of direct contact or ingestion	<ul> <li>Separate stored in locked room.</li> <li>Away from water sources.</li> <li>Total body protection suite is provided to charging operator with airline respirator.</li> <li>Safe operating (Charging) procedure is prepared and displayed in process and storage area.</li> <li>Total close process for charging and handling.</li> <li>Antidote kit for cyanide is kept ready in OHC.</li> <li>Training is being provided to handle NACN,</li> <li>SCBA sets are available in handling area.</li> </ul>



## 3.10 Fire Prevention & Protection System.

Department wise List	Fire Load calculation will be done, and department wise fire	
of fire extinguishers	Extinguishers will be provided throughout the plant.	
with hydrant details,		
mapping if available		
Fire hydrant system	Fire Hydrant system will be provided as per TAC norms or rule 66	
with drawing	A.	
Fire and safety team	Onsite emergency plan, Firefighting team and various another	
On site emergency	team will be prepared and trained. Mock drills will be conducted	
plan report	regularly.	
Smoke detectors,	Smoke detectors, MCP and gas detectors will be provided.	
MCP and gas		
detectors details		
Environment control	Will be Prepared by PLPL.	
plan.		
Workplace	Regular workplace monitoring will be carried out and records	
monitoring data	maintain in form no 37.	
record of last year.		



#### 3.11 Details of occupational health program.

i) To which chemicals, workers are exposed directly or indirectly.

Provided in Table No: 3.12 column B

ii) Whether these chemicals are within Threshold Limit Values (TLV)/ Permissible Exposure Levels as per ACGIH recommendation.

Yes, regular Workplace monitoring carried out and checked where it is in TLV limit or not. If required control measures to be provided to control under TLV limit.

iii) What measures company has taken to keep these chemicals within PEL/TLV?

Measures to keep exposure below TLV/ PEL are provided in below table 3.12 column D.

iv) How the workers are evaluated concerning their exposure to chemicals during replacement and periodical medical monitoring.

Premedical examination and periodical medical examination is carried out once in a year and record maintained in Form No-32 & 33

- v) What are onsite and offsite emergency plan during chemical disaster. Onsite and offsite emergency plan provided in Table-3.12 column E
- vi) Liver function tests (LFT) during pre-placement and periodical examination.

LFT will be done those workers who are working in process area and record will be maintained.

vii) Details of occupational health surveillance program.

- In process there is no any high noise, high heat stress and low level illumination exposure to workers.
- Manual material handling only the causes of musculo-sketal disorders (MSD), backache, pain in minor and major joints, fatigue etc. following measure have been taken to avoid above mentioned ill health effect to workers.
- Below 25 kgs weight will be handling by a worker if required to do so.
- Material handling lorry-cart, drum handling trolley, for lift, stacker, etc. will be used for material handling.
- Training will be carried out for Manual material handling.
- Ergonomics study will be carried out before commissioning of the plant and correct material flow, Process flow of workplace will be designed.



Following activities will be carried out for Occupational health of the workers.

- Treatment part (OPD) for both company and contractor employees.
- Occupational related problems will be studded like ergonomic issues and control measures
- Prevention part- Pre-medical examination and periodical medical examination for operators, helpers, chemists.
- Profile active (Health Awareness programme)

3.12 Occupational health impact on employees, control measures, action plan if accident occur and its Antidotes

Table-3.12	
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Sr.No.	Chemical	Occupational health impact on	Measures to keep exposure	EMP for STEL & IDLH
		employees	below	
			TLV/ PEL	
Α	В	С	D	Е
1.	Acetic Acid	Chronic respiratory disease due	Process enclosure,Local	Remove victim from the spillage location into fresh air area.
	CAS No. 64-	to long term exposure inhalation	exhaust, General dilution	Small spillage control absorbs on paper towel.
	19-7		ventilation,Personal	Large spillage – Evacuate area and stop source of ignition.
		Skin disease due to skin contact	protective Equipments	Dilute with water and collect washed out water in tank and
				neutralize it in safe manner.
2.	Hydrochloric	Very hazardous in case of skin	Provide close process and	Corrosive liquid. Poisonous liquid. Stop leak if without risk.
	Acid	contact (corrosive, irritant,	scrubber on process vent	Absorb with DRY earth, sand, or other non-combustible
		permeator), of eye contact	and storage vent	material.
		(irritant, corrosive), of ingestion.		Do not get water inside container. Do not touch spilled material.
		SlightlyHazardous in case of		Use water spray curtain to divert vapor drift.
		inhalation (lung sensitizer). Non-		
		corrosive for lungs. Liquid or		
		spray mist may produce tissue		
		damageParticularly on mucous		
		membranes of eyes, mouth, and		
		respiratory tract. Skin contact		
		may produce burns. Inhalation of		
		theSpray mist may produce		
		severe irritation of respiratory tra		
		ct, characterized by coughing,		
		choking, or shortness of breath.		
		Severe over-exposure can result		
		in death.		
3.	Sulfuric Acid	Prolonged or repeated skin	Facilities storing or	Clean up spills immediately, observing precautions in the
		contact may cause dermatitis.	utilizing this material	Protective Equipment section. Carefully scoop up and place into





Sr.No.	Chemical	Occupational health impact on	Measures to keep exposure	EMP for STEL & IDLH
	_	employees	below	
			TLV/ PEL	
		Prolonged or repeated inhalation	should be equipped with	appropriate disposal container. Provide ventilation. Do not get
		may cause nosebleeds, nasal	an eyewash facility and a	water inside containers. Cover with dry earth, dry sand, or other
		congestion, erosion of the teeth,	safety shower. Use	non-combustible material followed with plastic sheet to
		perforation of the nasal septum,	adequate general or local	minimize spreading and contact with water.
		chest pain and bronchitis.	exhaust ventilation to keep	
		Prolonged or repeated eye	airborne concentrations	
		contact may cause conjunctivitis.	below the permissible	
		Effects may be delayed. Workers	exposure limits. Use a	
		chronically exposed to sulfuric	corrosion-resistant	
		acid mists may show various	ventilation system.	
		lesions of the skin,		
		tracheobronchitis, stomatitis,		
		conjunctivitis, or gastritis.		
		Occupational exposure to strong		
		inorganic acid mists containing		
		sulfuric acid is carcinogenic to		
		humans.		
4.	Liq. Ammonia	Very hazardous in case of skin	Provide exhaust	Dilute with water and mop up,or absorb with an inert dry
		contact (corrosive, irritant,	ventilation or other	material and place in an appropriate waste disposal container. If
		permeator),Inhalation of the	engineering controls to	necessary: Neutralize the residue with a dilute solution of acetic
		spray mist may produce severe	keep the airborne	acid.Corrosive liquid. Poisonous liquid. Stop leak if without risk.
		irritationof respiratory tract,	concentrations of vapors	Absorb with DRY earth, sand or other non-combustible material.
		characterized by cougning,	below their respective	Do not get water inside container. Do not touch spilled material.
		Choking, or shortness of breath.	threshold limit value.	Use water spray curtain to divert vapor drift. Use water sprayto
		severe over-exposure can result	Ensure that eyewash	reduce vapors. Prevent entry into sewers, basements or
		In dealh.	stations and safety	dianonal Neutraliza the residue with a dilute solution of assistance on
		The substance is toxicto upper	the work station leastion	uisposal. Neutralize the residue with a unitle solution of acetic
	Havana	The substance is tasks to blog	Drovido aloga ana acces	duu. Elemmehle liquid Keen euror from heet Keen er from
5.	nexane	The substance is toxic to blood,	Provide close process	Frammable liquid. Keep away from neat. Keep away from
	CAS #110-	the reproductive system, liver,		sources of ignition. Stop leak if without risk. Absorb with
	54-3	upper respiratory tract, skin,		DRY earth, sand. or other non-combustible material. Do not





employees     below TLV/ PEL       central nervous     touch spilled material. Prevent entry into basements, or confined areas; dike if needed.       6.     n- Butanol     Repeated or prolonged     Provide     exhaust     Flammable liquid. Keep away from heat. Keep away	sewers,
TLV/ PEL       TLV/ PEL         central nervous       touch spilled material. Prevent entry into basements, or confined areas; dike if needed.         6.       n- Butanol       Repeated or prolonged       Provide exhaust       Flammable liquid. Keep away from heat. Keep avay	sewers, way from
central nervous       touch spilled material. Prevent entry into basements, or confined areas; dike if needed.         6.       n-Butanol       Repeated or prolonged       Provide       exhaust       Flammable liquid. Keep away from heat. Keep availing and the spilled material.	sewers,
6.       n- Butanol       Repeated       or       prolonged       Provide       exhaust       Flammable liquid. Keep away from heat.	way from
6. n-Butanol Repeated or prolonged Provide exhaust Flammable liquid. Keep away from heat. Keep av	way from
CAS # 71- exposure is not known to ventilation or other sources of ignition. Stop leak if without risk. Abs	sorb with
36-3 aggravate medical condition engineering controls to DRY earth, sand, or other non-combustible materia	al. Do not
keep the airborne touch spilled material. Prevent entry into	sewers,
concentrations of vapors basements, or confined areas; dike if needed. B	e careful
below their respective that the product is not present at a concentrat	tion level
Threshold limit value. above ILV.	
Ensure that eyewash	
stations and safety	
snowers are proximal to	
the work-station	
IOCATION.	
7. Inionyl Corrosive. Extremely Use process enclosure, Do not contact with water. ventilate area of leaf	t or spill.
Chloride destructive to tissues of the local exhaust ventilation, wear appropriate personal protective equip	ment as
CAS # mucous memoranes and upper or other engineering specified in Section 8. Isolate nazard are	a. Keep
7/1909-7 respiratory tract. Symptoms controls to control unnecessary and unprotected personnel from	entering.
inay include building sensation, an borne levels below Contain and recover inquid when possible. Neutral	illze with
cougning, wheezing, laryingitis, recommended exposure and inert material (soud asil, inne), then absorb	and place
shortness of breath, headache, finnts. Facilities storing filert inderial (e.g., verificulte, dry said, eardr), a	allu place
Indused, and volniting. Of utilizing this indefinit in a themical waste container. Do not use tor	libustible
himalation may be latar should be equipped with inaterials, such as saw dust. Do not hush to sewer:	
inflammation and edema of the safety shower Use only	
larvny and bronchi chemical under a chemical fume	
neumonitis and nulmonary bood	
edema Prolonged or repeated	



Sr.No.	Chemical	Occupational health impact on employees	Measures to keep exposure below TLV/PEL	EMP for STEL & IDLH
		exposure may cause conjunctivitis, dermatitis, rhinitis, and pneumonitis.		
8.	Hydrogen peroxide	Very Hazardous inCase of Skin Contact (Irritant), of Eye Contact (Irritant). Hazardous in Caseof Skin Contact (Corrosive), of Eye Contact (Corrosive), of Ingestion. Slightly Hazardous Incase of Inhalation (Lung Sensitizer). The Substance is toxic to Lungs, Mucous Membranes	Provide Exhaust Ventilation or Other Engineering Controls to Keep the Airborne Concentrations of Vapors Below Their Respective Threshold Limit Value. Ensure That Eyewash Stations and Safety Showers Are Proximal to The Work- Station Location. Use PPEs.	Explosion Hazard: Severe, When Highly Concentrated or Pure H2o2 Is Exposed to Heat, Mechanical Impact, Or Caused to Decompose Catalytically by Metals & Their Salts, Dusts &Alkalis Another Source of Hydrogen Peroxide Explosions Is from Sealing the Material in Strong Containers. Under Such Conditions Even Gradual Decomposition of Hydrogen Peroxide to Water + 1/2 Oxygen Can Cause Large Pressures to Build Up in The Containers Which May Burst Explosively. Corrosive Liquid. Oxidizing Material. Stop Leak If Without Risk. Absorb with Dry Earth, Sand or Other Non- Combustible Material. Do Not Get Water Inside Container. Avoid Contact with A Combustible Material (Wood, Paper, Oil, Clothing). Keep Substance Damp Using Water Spray. Do Not Touch Spilled Material. Use Water Spray Curtain to Divert Vapor Drift. Prevent Entry into Sewers, Basements or Confined Areas; Dike If Needed
9.	Phosphoric acid (85 %)	Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, . Hazardous in case of skin contact (corrosive,	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors	Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand, or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use




Sr.No.	Chemical	Occupational health impact on employees	Measures to keep exposure below TLV/ PEL	EMP for STEL & IDLH
		permeator), of eye contact (corrosive). Slightly hazardous in case of inhalation (lung sensitizer)	below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.	water spray to reduce vapors. Prevent entry into sewers, basements, or confined areas; dike if needed.
10.	Nitric acid CAS#7697- 37-2	The substance may be toxic to lungs, mucous membranes, upper respiratory p. 2 tract, skin, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.	Corrosive liquid. Oxidizing material. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other noncombustible material. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing). Keeps substance damp using water spray. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements, or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV.
11.	Toluene CAS # 108- 88-3	The substance is toxic to blood, the reproductive system, liver, upper respiratory tract, skin, central nervous	Provide close process	Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand, or other non-combustible material. Do not touch spilled material. Prevent entry into sewers.



Sr.No.	Chemical	Occupational health impact on employees	Measures to keep exposure below	EMP for STEL & IDLH
			TLV/ PEL	
				basements,
				or confined areas; dike if needed.
12.	Acetonitrile CAS #75-05- 8	Potential Acute Health Effects: skin contact (irritant), of eye contact (irritant),Potential Chronic Health Effects:The substance is toxic to blood, kidneys, lungs, liver, mucous membranes, gastrointestinal tract, upper respiratory tract, skin, eyes, central nervous system (CNS). The substance	Closed system, ventilation, explosion- proof electrical equipment, and lighting. Do NOT use compressed air for filling, discharging, or handling.	Ventilation. Remove all ignition sources. Collect leaking liquid in sealable containers. Absorb remaining liquid in dry sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Personal protection: complete protective clothing including self-contained breathing apparatus
		reproductive system.		
13.	Ethyl Alcohol CAS # 64– 17-5	The substance is toxic to blood, the reproductive system, liver, upper respiratory tract, skin, central nervous	Provide close process	Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth,sand, or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements, or confinedareas; dike if needed.
14.	Ethyl Acetate CAS # 141- 78-6	The substance is toxic to blood, the reproductive system, liver, upper respiratory tract, skin, central nervous	Provide close process	Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth,sand, or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements, or confinedareas; dike if needed.
15.	Methanol CAS# 67-56- 1	The substance is toxic to blood, the reproductive system, liver, upper respiratory tract, skin, central nervous	Provide close process	Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth,sand, or other non-combustible material. Do not touch spilled material. Prevent entry into sewers,





C- N-	Chamiaal		Maanna ta laan and a	
Sr.NO.	Chemical	Occupational nearth impact on	Measures to keep exposure	EMP for SIEL & IDLH
		employees	Delow	
			TLV/ PEL	
				basements, or confinedareas; dike if needed.
16.	Sodium	The substance may be toxic to	Use process enclosures,	Corrosive solid. Poisonous solid. Stop leak if without risk.
	Cyanide	skin, eyes, central nervous	local exhaust ventilation,	Do not get water inside container. Do not touch spilled
	CAS#: 143-	system (CNS).	or other engineering	material. Usewater spray to reduce vapors. Prevent entry
	33-9	Repeated or prolonged	controls to keep	into sewers, basements, or confined areas; dike if needed.
		exposure to the substance can	airborne levels below	Eliminate all ignitionsources. Call for assistance on
		produce target organs damage.	recommended	disposal. Be careful that the product is not present at a
		Repeated exposure of the eyes	exposure limits. If user	concentration level above TLV
		to a low level of dust can	operations generate	
		produce eye irritation.	dust, fume, or mist, use	
		Repeated skin exposure can	ventilation to keep	
		produce local skin destruction,	exposure to airborne	
		or dermatitis.	contaminants	
		Repeated inhalation of dust	below the exposure	
		can produce varying degree of	limit.	
		respiratory irritation or lung		
		damage. Repeated exposure to		
		a highly toxic material may		
		produce general deterioration		
		of health by an accumulation in		
		one or many human organs.		

# 3.13 Manufacturing & Process Flow Chart.

Provided in EIA Report.



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# 3.14 DO's and DON'T's for strengthening HSE

## DO's

- ✓ Wash affected part immediately with plenty of water.
- ✓ Take the patients affected by toxic vapour to well ventilated area.
- ✓ In case of vapor inhalation/gas poisoning, immediately render first aid to the patient and then move the patient to First Aid Centre.
- ✓ In case of emergency everyone should try to reach at Assembly point. Move in direction perpendicular to direction of gas leakage.
- In case of emergency all (except emergency staff) should reach at nearest assembly point.
- ✓ In case of vapour inhalation/gas poisoning, immediately render first aid to the patient and then move to First Aid Centre.
- ✓ Use ear plug/muff in high noise area.
- ✓ Work permit system to be followed before starting any hot work, vessel entry or working at height.
- ✓ Barricade and mark hazardous/unsafe area
- ✓ Ensure use of safety belt while working at height.
- ✓ Electrical cables should be protected from water and from attack by corrosive substances.
- ✓ Maintain good housing keeping, it will eliminate many unnecessary hazards.
- ✓ Protruding nail should be pulled out or bent over.
- ✓ All aisles, passageways and stairways should be maintained, clean and unobstructed.
- ✓ Employees must know the locations of fire extinguisher and fire exists.
- ✓ During emergency be calm and do not get panicky.

## DON'T's:-

- ✓ Smoking or carry cigarettes/bidis, match box, lighter, mobile phone or any instruments etc. in the plant/battery limit area. It is prohibited.
- ✓ Unauthorized entry into battery limits of every plant is prohibited.
- Moving in the plant area without wearing safety helmet and safety shoes is not permitted.
- ✓ Wearing of loose garments, ornaments etc. in the plant area.
- ✓ Cotton waste, paper, oil etc. should not be left in plant area.
- ✓ Do not follow shortcuts, use proper roads, pathways, wherever provided.
- ✓ Do not wear chappals or slippers in the plant.
- No automobile vehicle should be allowed to enter in the plant area without muffler or exhaust.
- ✓ Chewing of tobacco, betel nut, chewing gum and other such items are not allowed in any of process utility area.



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#### SECTION IV

#### HAZARD IDENTIFICATION

#### 4.1 INTRODUCTION

Risk assessment process rests on identification of specific hazards, hazardous areas and areas vulnerable to effects of hazardous situations in facilities involved in processing and storage of chemicals.

In fact, the very starting point of any such assessment is a detailed study of materials handled & their physical / chemical / thermodynamic properties within the complex at various stages of manufacturing activity. Such a detailed account of hazardous materials provides valuable database for identifying most hazardous materials, their behaviour under process conditions, and their inventory in process as well as storage and hence helps in identifying vulnerable areas within the complex.

Hazardous posed by particular installation or a particular activity can be broadly classified as fire and explosive hazards and toxicity hazards. Whether a particular activity is fire and explosive hazardous or toxicity hazardous primarily depends on the materials handled and their properties.

It will be from the above discussion that study of various materials handled is a prerequisite from any hazard identification process to be accurate. Based on this study the hazard indices are calculated for subsequent categorization of units depending upon the degree of hazard they pose.

Identification of hazards is the most important step to improve the safety of any plant. The hazard study is designed to identify the hazards in terms of chemicals, inventories and vulnerable practices /operations.

The hazard evaluation procedures use as a first step by checklists and safety reviews. Dow and Mond fire and explosion indices, which make use of past experience to develop relative ranking of hazards, is also extensively used. For predictive hazard analysis, Hazard and Operability studies (HAZOP), Fault tree analysis, Event tree analysis, Maximum credible accident and consequence analysis etc are employed.

#### 4.2 Identification of Hazardous Areas:

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- Process plant is Batch process and multi utility base plant due to that at a time inventory of raw material at production area will be very less.
- All raw material and finished product are stored warehouse in drums, Carboys and bags. Required material will be charged in process through pump, drums in close circuit.





- Batch size requirement chemicals will be charged in to day tank or reactor and empty drums will be sent back to drum shed for neutralization and disposed of. Thus, the inventory of the raw material in process area will be limited and for limited time.
- Various raw materials used in the manufacturing processes are listed in Table-3.3 in Section-3 along with mode / type of storage & storage conditions. It can be readily seen that raw materials even though hazardous in nature, will be used in small quantities & storage quantities will also very low at process plant.
- Drums will be stored in drum storage area as per petroleum rules. Maximum five days running products raw material inventory will be kept in drum storage area.
- List of chemicals stored in larger quantities is provided in Table-3.4, hazardous properties are provided in Table-3.5 and Occupational health impact to employees and emergency action plan and its antidotes provided in Table 3.6

#### 4.3 Failure Frequencies

- 4.3.1 Hazardous material release scenarios can be broadly divided into 2 categories
  - I) Catastrophic failures which are of low frequency and
  - II) ruptures and leaks which are of relatively high frequency. Releases from failure of gaskets, seal, rupture in pipelines and vessels fall in the second category whereas catastrophic failure of vessels and full-bore rupture of pipelines etc. fall into the first category.
- 4.3.2 Typical failure frequencies are given below: -

Item	Mode of failure	Failure frequencies	
Atmospheric	Catastrophic failure	10-9 /yr	
storage	Significant leak	10-5 /yr	
Process Pipelines			
< = 50  mm dia	Full bore rupture	8.8 x 10-7 /m. yr	
	Significant leak	8.8 x 10-6 /m. yr	
> 50 mm <=150mm dia	Full bore rupture	2.6 x 10-7 /m. yr	
	Significant leak	5.3 x 10-6 /m. yr	
< 150 mm dia	Full bore rupture	8.8 x 10-8 /m. yr	
	Significant leak	2.6 x 10-6 /m. yr	
Hoses	Rupture	3.5 x 10-2 /m. yr	

#### TABLE-4.1



#### TABLE-4.2: Table of Estimated Frequencies of Vapour Cloud Explosion (from Less 1996):

(1) Caused by failure of:	Frequency	Units
Pressure vessel	1E-5	Occ/plant. yr
Special Pipeline	1E-5 to 1E-4	Occ/plant. yr
Normal Pipeline	1E-4 to 1E-3	Occ/plant. yr
Pump normal duty	1E-2	Occ/plant. yr
Pump: severe duty pump	1E-1	Occ/plant. yr
Reciprocating Compressor	1E-1	Occ/plant. yr
(2) caused by leak from:		
Batch reactor	1E-2 to 1E-1	Occ/plant. yr
Tanker filling hose	1E-2 to 1E-1	Occ/plant. yr

#### TABLE-4.3: Table of Failure rates For Pressure Storage:

Event	Frequency or Probability			
Catastrophic failure of vessel				
Complete failure	3E-6 occ/vessel. yr			
Failure equivalent of 6 in. nozzle	7E-6 occ/vessel. yr			
Fracture in Liquid line:				
Pipework	3E-7 occ/m. yr			
• Fittings	5E-6 occ/item. yr			
Release due to overfilling	1E-4 occ/vessel. yr			
Fracture of vapour line	3E-6 occ/m. yr			
Serious leak (1kg/s):				
• 6 in pipework	6E-6 occ/m. yr			
• 3 in pipework	6E-5 occ/m. yr			
• Flange	6E-4 occ/m. yr			
Pump seal	5E-3 occ/m. yr			
Release in course of draining or sampling (1.5kg/s)				
Release pre operation				
Draining operation	1E-4 (release/operation)			
Sampling operation	50 occ/yr			
Failure to recover during draining	100 occ/yr			
• Failure to recover during sampling	P-1E-1			
	P-1E-2			

Considering this, the risk analysis and consequences studies are concentrated on Below area.

- (a) Iso Butylene, Hexane, Acetic Acid, Acetonitrile, Acrylonitrile, TEA, TC, Tank Storage Area.
- (b) Hydrogen Gas Cylinder Bank.
- (c) HCL & Boron trifluoride 50 Kg Gas Cylinder.
- (d) Coal Storage Yard.
- (e) Drum Storage Warehouse.

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#### SECTION V

#### **RISK ASSESSMENT**

#### 5.1 Effects of Releases of Hazardous Substances

Hazardous substances may be released as a result of failures / catastrophes, causing possible damage to the surrounding area. In the following discussion, an account is taken of various effects of release of hazardous substances and the parameters to be determined for quantification of such damages.

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In case of release of hazardous substances, the damages will depend largely on source strength. The strength of the source means the volume of the substance released. The release may be instantaneous or semi-continuous. In the case of instantaneous release, the strength of the source is given in kg and in semi-continuous release the strength of the source depends on the outflow time (kg/s.).

In order to fire the source strength, it is first necessary to determine the state of a substance in a vessel. The physical properties, viz. Pressure and temperature of the substance determine the phase of release. This may be gas, gas condensed to liquid and liquid in equilibrium with its vapour or solids.

Instantaneous release will occur, for example, if a storage tank fails. Depending on the storage conditions the following situations may occur.

The source strength is equal to the contents of the capacity of the storage system.

In the event of the instantaneous release of a liquid a pool of liquid will form. The evaporation can be calculated on the basis of this pool.

# 5.2 Fire

## 5.2.1 Jet Fire:

Jet fire causes damage due to the resulting heat radiation. The working level heat radiation impact will vary widely depending on the angle of the flame to the horizontal plane, which mainly depends on the location of the leak. The flame direction was considered horizontal for consequence analysis of leaks and ruptures from process equipment. Jet fire heat radiation impacts were estimated for the identified credible and worst-case scenarios.

Upon accidental leakage, the pressurized fluid will disperse as a jet, initially moving forward in the spatial direction of the leak till the kinetic energy is lost and gravity slumping or lifting of the cloud occurs, dependent upon whether the fluid is heavier or lighter than air.

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#### 5.2.2 Tank on Fire/Pool Fire:

In the event of the instantaneous release of a liquid a pool of liquid will form. The evaporation can be calculated on the basis of this pool.

The heat load on object outside a burning pool of liquid can be calculated with the heat radiation model. This model uses average radiation intensity, which is dependent on the liquid. Account is also taken of the diameter-to-height ratio of the fire, which depends on the burning liquid. In addition, the heat load is also influenced by the following factors:

- Distance from the fire
- The relative humidity of the air (water vapour has a relatively high heatabsorbing capacity)
- The orientation i.e. horizontal/vertical of the objective irradiated with respect to the fire.

#### 5.2.3 Flash Fire:

The vapour / gas release from a pool would disperse under the influence of the prevailing wind; with material concentration in air reducing with distance. At a particular location downwind, the concentration will drop below its lower flammable level (LFL) value. If ignited within the flammable envelope, the mass of the material available between the LFL and ½ LFL will be likely to burn as a flash fire; rapidly spreading through the cloud from the point of ignition back to the source of release.

Although flash fires are generally low intensity transitory events, the burning velocity is quite high and escape following ignition is not possible. Flash fires often remain close to the ground, where most ignition sources are present. It is assumed that personnel caught inside a flash fire will not survive while those outside suffer no significant harm. If other combustible material is present within the flash fire it is also likely to ignite and a secondary fire could result.

#### 5.3 Explosion:

#### 5.3.1 Late Explosion (UVCE):

The magnitude of the vapour cloud explosion is dependent on the size of the gas cloud that has formed and the degree of congestion in the area, as these determine the acceleration of the flame front.

The TNO GAMES model is used for modeling of vapour cloud explosions, as the model incorporates the characteristics of the explosion, such as the type of fuel, its reactivity, the effect of obstacles in the congested region, etc. Turbulence is the governing factor in blast generation, which could intensify combustion to the level that will result in an explosion. Obstacles in the path of vapour cloud or when the cloud finds a confined area, as under the bullets, often create turbulence.

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Insignificant level of confinement will result in a flash fire. The VCE will result in overpressures.

It may be noted that VCEs have been responsible for very serious accidents involving severe property damage and loss of lives. Vapour Cloud Explosions in the open area with respect to Pure Methane is virtually impossible due to their lower density.

#### 5.3.2 Ball Fire / BLEVE:

This happens during the burning of liquid, the bulk of which is initially over rich (i.e. above the upper flammable limit.). The whole cloud appears to be on fire as combustion is taking place at eddy boundaries where air is entrained (i.e. a propagating diffusion flame). The buoyancy of the hot combustion products may lift the cloud form the ground, subsequently forming a mushroom shaped cloud. Combustion rates are high, and the hazard is primarily thermal.

#### 5.4 Modes of Failure:

- Liquid release due to catastrophic failure of storage vessel or road tanker.
- Liquid release through a hole/crack developed at welded joints/flanges / nozzles / valves etc.
- > Vapour release due to exposure of liquid to atmosphere in the above scenarios.
- Gas release due to catastrophic failure of Ammonia cylinder or outlet valve/line failure.

Event	Causes			
Tank on Fire/	- Catastrophic failure of tank + Ignition availability			
Pool fire	- Failure of liquid outlet line + Ignition availability			
Fire Ball/BLEVE	- Catastrophic failure of road tanker/ storage tank			
Flash Fire	Vapour generation due to substrate and wind			
UVCE	Vapour cloud generation and about 15 % of			
	total vapour mass Above the UEL-LEL % Ignition			
	availability			
Toxic gas dispersion	-Toxic Gas release due to catastrophic failure of tonner/bullet/			
	Tanks and ignition not available within LEL- UEL range.			

Considering the quantity of storages & nature of Toxic nature and Flammable storage, following scenarios were taken up for detailed analysis & safe distances computed:

Failure cases considered for consequence analysis are representative of worst-case scenarios. Probability of occurrence of such cases is negligible (less than 1 x 10-6 per year) because of strict adherence to preventive maintenance procedures within the complex. General probabilities for various failure are provided in Table-4.2, 4.3 and 4.4, but consequences of such cases can be grave & far reaching in case such systems fail during life history of the company. Hence such scenarios are

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considered for detailed analysis. It is to be noted however that such situations are not foreseeable or credible as long as sufficient measures are taken. Also, consequence analysis studies help us evaluate emergency planning measures of the Company.

#### 5.5 Impact Criteria:

Consequence assessment is conducted to understand the impact of identified scenarios in terms of Thermal radiation (Jet fire, Flash Fire), Explosion (vapor cloud explosion- UVCE). A range of potential consequences are assessed for each of the release scenarios identified. This step identifies the fatality probability, based on hazard type and caused by each release case, to personnel at a range of distances.

Estimate of damage or impact caused due to thermal radiation, explosion overpressure and toxic effects is generally based on the published literature on the subject. The actual potential consequences from these likely impacts can then be visualized by superimposing the damage effect zones on the proposed layouts and identifying the elements within the project which might be adversely affected, should one or more hazards materialize in practice. The damage criteria used in the present study is described in the following sections.

#### 5.6 Damage Criteria for Heat Radiation:

Damage effects vary with different scenarios. Calculations for various scenarios are made for the above failure cases to quantify the resulting damages.

The results are translated in term of injuries and damages to exposed personnel, equipment, building etc.

Tank on fire /Pool fire due to direct ignition source on tank or road tanker or catastrophic failure or leakage or damage from pipeline of storage facilities or road tanker unloading arm, can result in heat radiation causing burns to people depending on thermal load and period of exposure.

All such damages have to be specified criteria for each such resultant effect, to relate the quantifier damages in this manner, damage criteria are used for Heat Radiation.

#### TABLE 5.1

Heat Radiation (kW/m <sup>2</sup> )	Damage to Equipment	Damage to People
1.2	Solar	r Heat at Noon
1.6		Minimum Level of pain threshold
2.0	PVC insulated cables damaged	
4.0		Causes pain if duration is longer than 20 seconds. Blistering is unlikely.
4.5		Blistering of skin

#### Practical Significance of Radiation Intensity





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Heat Radiation (kW/m <sup>2</sup> )	Damage to Equipment	Damage to People
6.0		First degree burn
9.5		Pain threshold reached after 8 seconds. Second degree burns after 20 seconds.
12.0		Initiation of secondary fires
12.5	Minimum energy to ignite wood with a flame, Melts plastic tubing.	First degree burns in ten seconds. 1% Fatality in 20 sec, 30% Fatality in 30 seconds.
16.0		Severe burns after 5 seconds.
21.2		1% Fatality in 10 seconds, with protection of clothing
25.0	Minimum energy to ignite wood at indefinitely long exposure without a flame.	100 % Fatality in 1 (one) minute.
27		Third degree burns (30secs)
30.0	Damage to plant & machinery	
37.5	Severe damage to plant	100 % Fatality

## 5.7 Explosion / Over Pressure:

In case of vapour cloud explosion, two physical effects may occur: A flash fire over the whole length of the explosive gas cloud; A blast wave, with typical peak overpressures circular around ignition source.

Overpressure (bar)	Mechanical Damage to Equipment	Damage to People		
0.2068	Heavy damage to plant & structure	Fatality probability = 1 for humans indoor as well as outdoor		
		> 50% eardrum damage		
		> 50% serious wounds from flying objects		
0.1379	Repairable damage to building	1% death		
	and house	> 1% eardrum damage		
		> 1% serious wounds from flying objects		
0.02068	10% glass damage,			
	Safe distance			

Table 5.2: Practical Significance of	f Overpressure
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#### SECTION VI

#### **CONSEQUENCE ANALYSIS**

#### 6.1 Consequence analysis.

In the risk analysis study, probable damages due to worst case scenarios were quantified and consequences were analyzed with object of emergency planning. Various measures taken by the company and findings of the study were considered for deciding acceptability of risks.



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6.2 The catastrophic/ rupture failure (Worst case - WCS) and Maximum Credible Loss Scenarios (MCLS) identified for plant base on above criteria is listed below:

Se	Sec. No. Scenario Description		Longitude/ Latitude	Material	Equipment	Capacity KL / MT	Operating Pressure Kg/cm <sup>2</sup> & temperature <sup>0</sup> C
1		Isobutylene 10 MT Bullet Catastrophic Rupture					
	1.1	Pool Fire					
	1.2	Flash Fire	21º36'50 73"N				
	1.3	Fire Ball	73° 2'2 98"F	Isobutylene	Bullet	10 MT	4 kg/cm <sup>2</sup> &Amb.
2		Isobutylene 10 MT Bullet Short Pipeline Rupture	75 <u>2</u> <u>2</u> .70 <u>L</u>				
	2.1	Jet Fire					
	2.2	Flash Fire					
3		Hexane 10 MT Storage Tank Catastrophic Rupture					
	3.1	Pool Fire					
	3.2	Flash Fire					
	3.3	Explosion Worst case	21°36'50.76"N	Hovano	Storage	10 MT	Atn & Amh
4		Hexane 10 MT Storage Tank Short Pipeline Rupture	73° 2'3.80"E	Hexalle	Tank	10 101	Alp.@Allib.
	4.1	Pool Fire					
	4.2	Flash Fire					
	4.3	Explosion Worst case					
5		Acetic Acid 10 MT Storage Tank Catastrophic Rupture					
	5.1	Pool Fire	21º36'50 97"N		Storago		
6		Acetic Acid 10 MT Storage Tank Short Pipeline	21 30 30.97 N Acetic Acid		Tank	10 MT	Atp.&Amb.
0		Rupture	75 <u>22.2</u> L				
	6.1	Pool Fire					
7		Acetonitrile 10 MT Storage Tank Catastrophic Rupture	21º36'50 96"N				
	7.1	Pool Fire	73° 2'2 05"F	Acetonitrile	Storage	10 MT	Atp. &Amb.
	7.2	Flash Fire	75 2 2.05 E		Tank	10 101	

Table: 6.1

Se	c. No.	Scenario Description	Longitude/ Latitude	Material	Equipment	Capacity KL / MT	Operating Pressure Kg/cm <sup>2</sup> & temperature <sup>0</sup> C
	7.3	Explosion Worst case					
8		Acetonitrile 10 MT Tank Short Pipeline Rupture					
	8.1	Pool Fire					
9		Acrylonitrile 10 MT Tank Catastrophic Rupture					
	9.1	Pool Fire					
	9.2	Flash Fire					
	9.3	Explosion Worst case	21°36'50.98"N	Acrylonitrile	Storage	10 MT	Atn & Amb
	9.4	Maximum Concentration footprint	73° 2'1.90"E	Actylollicille	Tank	10 101	Acp. &Allib.
10		Acrylonitrile 10 MT Tank Short Pipeline Rupture					
	10.1	Pool Fire					
	10.2	Maximum Concentration footprint					
11		Triethylamine 10 MT Tank Catastrophic Rupture					
	11.1	Pool Fire					
	11.2	Flash Fire					
	11.3	Explosion Worst case					
	11.4	Maximum Concentration footprint	21°36'51.20"N	Triothylamino	Storage	10 MT	Atn & Amb
12		Triethylamine 10 MT Tank Short Pipeline Rupture	73° 2'1.90"E	Inethylamine	Tank		Atp. &Allib.
	12.1	Jet Fire					
	12.2	Pool Fire					
	12.3	Flash Fire					
	12.4	Maximum Concentration footprint					
13		Thionyl Chloride 10 MT Tank Catastrophic Rupture					
	13.1	Maximum Concentration footprint	21º36'51 14"N	Thionyl	Storage		
14		Thionyl Chloride 10 MT Tank Short Pipeline Rupture	73° 2'2 07"F	Chloride	Tank	10 MT	Atp. &Amb.
	14.1	Maximum Concentration footprint					
15		Hydrogen Gas Cylinder Rack Catastrophic Rupture		Hydrogen Gas	Cylinder	26 Nos.	200 Kg/Cm <sup>2</sup>



Se	c. No.	Scenario Description	Longitude/ Latitude	Material	Equipment	Capacity KL / MT	Operating Pressure Kg/cm <sup>2</sup> & temperature <sup>0</sup> C
	15.1	Flash Fire	21°36'53.27"N			of	
	15.2	Explosion Worst case	73° 2'3.05"E			cylinder	
	15.3	Fireball	_			Rack	
16		Hydrogen Gas Cylinder bank ¼" Connecting Tube				1300 M <sup>3</sup>	
10		Rupture	-				
	16.1	Jet Fire	-				
	16.2	Explosion Worst case					
17		HCL 50 kg Gas Cylinder Catastrophic Rupture	_				
	17.1	Maximum Concentration footprint	21°36'50.87"N	HCL Gas	Cylinder	50 Kg	$200 \text{ Kg}/\text{Cm}^2$
18		HCL 50 kg Gas Cylinder ½" Connecting Tube Rupture	73° 2'4.38"E		Cymaci	50 Ng	200 Ng/ CIII
	18.1	Maximum Concentration footprint					
19		Boron Trifluoride 50 kg Gas Cylinder Catastrophic Rupture	-	Boron			
	19.1	Maximum Concentration footprint	21°36'53.37"N	Trifluorido	Culindor	50 Ka	1. Kg/cm2
20		Boron Trifluoride 50 kg Gas Cylinder ½" Connecting	73° 2'3.57"E	gas	Cymuer	JUNG	T Ng/ CIII2
20		Tube Rupture	-	643			
	20.1	Maximum Concentration footprint					
21		Coal Storage Yard	21º37'0 36"N				
	21.1	Pool Fire	73° 2'5 93"F	Coal	Cylinder	50 Kg	4 Kg/cm2
	21.2	Dust Explosion Coal Cyclone	75 2 5.75 E				
22		Drum Storage Warehouse	21º36'49 በ3"N		Drum		
	22.1	Pool Fire	73° 2'4 29"F	Chemicals	Storage	200 ltr	Atp.&Amb.
	22.2	BLEVE	75 2 T.27 L		Juliage		



#### 6.3 Consequence Results:

Table: 6.2

Sr.	Scenario	Failure Case	Jet Fire Radiation Intensity (Kw/ M²)		Pool Fire Radiation Intensity (Kw/ M <sup>2</sup> )			Flash I (ppn	Fire n)	Fire Ball (Kw/ M²)			
NO.			37.5	12.5	4.0	37.5	12.5	4.0	1.8 % LEL	½ LEL	37.5	12.5	4.0
1	Isobutylene 10	Catastrophic Rupture	NR	NR	NR	101.6	190.3	319.4	164.5	223.2	97.22	174.6	305.1
2	MT Bullet	MT Bullet Short Pipeline Rupture		25.56	32.87	NR	NR	NR	NR	18.40	NR	NR	NR

Sr. No.	Scenario	Failure Case	Pool Fire I	Radiation In (Kw/ M²)	tensity	Flash Fire(	ppm)	Explosion Worst case (bar)			
			37.5	12.5	4.0	10.5 % LEL	1⁄2 LEL	0.2068	0.1379	0.02068	
3	Hexane 10 MT Storage	Catastrophic Rupture	22.58	32.53	53.05	35.86	45.57	55.54	60.76	146.8	
4	tank	Short Pipeline Rupture	11.92	20.22	36.85	NR	12.43	11.72	12.31	21.93	

Sm No	Sconorio	Ecilyre Cose	Pool Fire	Pool Fire Radiation Intensity(Kw/ M <sup>2</sup> )					
5ľ. NO.	Scenario	Fanure Case	37.5	12.5	4.0				
5	Agetic Agid 10 MT Storage tenk	Catastrophic Rupture	19.22	53.08	107.3				
6	Acetic Acid 10 MT Storage tank	Short Pipeline Rupture	2.35	2.74	7.16				

Sr. No.	Scenario	Failure Case	Pool Fire I	Radiation In (Kw/ M²)	tensity	Flash Fire(	ppm)	Explosion Worst case (bar)			
			37.5	12.5	4.0	4.4 % LEL	1⁄2 LEL	0.2068	0.1379	0.02068	
7	Acetonitrile 10 MT	Catastrophic Rupture	16.15	33.66	54.27	18.39	25.89	24.08	25.47	58.51	
8	Storage tank	Short Pipeline Rupture	11.48	24.60	39.39	NR	NR	NR	NR	NR	



Sr.	Gamaria	Failure Case	Radiati	Pool Fire onIntens M²)	e ity(Kw/	Fla Fire(	ash ppm)	Explosio	on Worst	case (bar)	Maximum Co	oncentrati	on footpri	int (ppm)
No.	Scenario	Fallure Case	37.5	12.5	4.0	2.4 % LEL	½ LEL	0.2068	0.1379	0.02068	1060 ppm (LC-50 Human)	85ppm (IDLH)	75ppm (ERPG- 2)	20ppm (ERPG- 1)
9	Acrylonitrile	Catastrophic Rupture	21.78	42.09	60.46	22.08	27.86	29.29	32.48	84.29	57.56	499	948	2199.3
10	10 MT Storage tank	Short Pipeline Rupture	14.57	29.59	47.47	NR	NR	NR	NR	NR	34.91	358.2	565.9	1434

Sr.	Conorio	Failure Case	Radia	Jet Fir ation In (Kw/ M	e tensity <sup>[2</sup> )	Pool Inter	Fire Radi sity (Kw	ation / M²)	Flas (p	h Fire pm)	Explosio	on Worst o	case (bar)	Max	kimum Cor footprint	icentrat (ppm)	ion
No	Scenario	ranure case	37.5	12.5	4.0	37.5	12.5	4.0	2.0 % LEL	½ LEL	0.2068	0.1379	0.02068	500 ppm	200 ppm (IDLH)	100 ppm	50 ppm
11	Triethylamine	Catastrophic Rupture	NR	NR	NR	34.03	62.58	102.8	103	124.3	160.1	173.5	424.8	351	497	863	1488
12	10 MT Storage Tank	Short Pipeline Rupture	NR	NR	10.19	11.78	24.31	39.50	8.7	16.09	NR	NR	NR	83.55	192.5	346	590

Sn No	Sconorio	Failura Casa	Maximum Concentration footprint (ppm)						
31. NU	Scenario	Fallule Case	500 ppm	250 ppm	100 ppm(IDLH)	50 ppm			
13	Thionyl Chlorida 10 MT Storage tents	Catastrophic Rupture	93.30	186.6	484.9	770.8			
14	Thionyl Chioride 10 MT Storage tank	Short Pipeline Rupture	68	130	294	511			



Sr.	Sconorio	Failure Case	Jet FireRadiation Intensity(Kw/M²)		Flash Fire (ppm)		Explosio	on Worst o	Fire Ball (Kw/ M²)				
No.	Scenario	Fanure Case	37.5	12.5	4.0	4.0 % LEL	<sup>1</sup> √2 LEL	0.2068	0.1379	0.02068	37.5	12.5	4.0
15	Hydrogen Gas	Catastrophic Rupture	NR	NR	NR	9.6	13.2	33.04	40.79	168.4	23.60	41.44	72.26
16	Cylinder Bank	<sup>1</sup> / <sub>2</sub> " Connecting Tube Rupture	NR	NR	5.64	NR	NR	12.74	13.67	28.43	NR	NR	NR

			Maximum	Concentration footprint (p	opm)	
Sr. No	Scenario	Failure Case	3940 ppm(LC-50 Human)	150 ppm (ERPG-3)	50 ppm (IDLH)	20 ppm (ERPG-2)
17	HCL 50 kg Gas Cylinder	Catastrophic Rupture	19.67	294.6	679.1	1260

Sr. No	Sconorio	Ecilure Coco	Maximum Concentration footprint (ppm)							
	Scenario	ranure case	50 ppm (IDLH)	20 ppm (ERPG-2)	3 ppm (ERPG-1)	2 ppm (TLV)				
18	HCL 50 kg Gas Cylinder	½" Connecting Tube Rupture	116.3	255.1	942	1210				

Cr. No.	Samaria	Eailura Casa	Maximum Concentration footprint (ppm)				
Sr. NO	Scenario	Failure Case	854 ppm(LC-50 Human)	500 ppm	25 ppm(IDLH)	10 ppm	
19	Boron Trifluoride 50 kg Gas Cylinder	Catastrophic Rupture	53.81	67.87	676.8	1261	

Sr No	Samaria	Ecilum Coco	Maxi	mum Concentration f	ootprint (pp	m)
2L' NO	Sr. No Scenario	Fallure Case	50 ppm	25 ppm (IDLH)	10ppm	1 ppm
20	Boron Trifluoride 50 kg Gas Cylinder	1/2" Connecting Tube Rupture	81.15	150.3	323	1498



Sr. No.	Caonaria	Ecilum Cooc	Pool Fire Radiati	on Intensity(	Explosion Worst case (bar)			
	Scenario	Fanure Case	37.5	12.5	4.0	0.2068	0.1379	0.02068
21	Coal Storage Yard	Dust Explosion Coal Cyclone	55.0	95.3	168.4	31.32	40.50	156.4

Sr. No.			Pool Fire	Radiation Intensity	r (Kw/ M <sup>2</sup> )	BLEVE (bar)		
	Scenario	Failure Case	37.5	12.5	4.0	0.2068	0.1379	0.02068
22	Drum Storage	Ware house Fire	14.24	82.00	36.67	10.06	13.06	50.09

#### 6.4 Conclusion:

#### Jet Fire

As can be seen from the results of the summary of the Quantitative Risk Analysis study, the Fatality distance due to Scenario 2.1 Isobutylene 10 MT Bullet Short Pipeline Rupture of **20.61 meter** at **37.5 Kw/M<sup>2</sup>-(Total Damage distance),25.56 meter** at **12.5 Kw/M<sup>2</sup>-(First Deg. Burn)**, and **32.87 Meter** at **4.0 Kw/M<sup>2</sup>-(Safe Zone)**.

#### **Pool Fire**

As can be seen from the results of the summary of the Quantitative Risk Analysis study, the Fatality distance due to Scenario 1.1 Isobutylene 10 MT Bullet Catastrophic Rupture at dispersion of 101.6 meterat37.5 Kw/M<sup>2</sup> -(Total Damage distance),190.3 meter at 12.5 Kw/M<sup>2</sup> -(First Deg. Burn), and 319.4 Meter at 4.0 Kw/M<sup>2</sup> -(Safe Zone).

#### Flash Fire Cases

Flash Fire is usually dispersion case, where the extent of cloud until the flammability limits (LEL, UEL) is measured. The important factor in measuring the extent of cloud is atmospheric stability & wind speed. As the wind speed increases, the cloud tends to move further down & gets diluted which results in lower quantity of material in the flammability limits i.e. lower strength of flash fire. The highest damage distances for flash fire are for isolatable is Scenario 1.2Isobutylene 10 MT Bullet Catastrophic Ruptureat 1.5F weather condition. The maximum damage distance for Flash Fire is **164.5 meter(1.8%LEL)** &**223.2 meter (1/2 LEL)** – 1.5F of whether condition. UFL is defined as burning zone, which means people caught within the burning zone are exposed to a fatality rate of 100%.

#### Late Explosion Worst case - UVCE

As can be seen from the results of the summary of the Quantitative Risk Analysis study, the Fatality distance due to Scenario 11.3Triethylamine 10 MT Storage Tank Catastrophic Rupture dispersion of 160.1 meter at 0.2068 bar –(100% Damage), 173.5 meter at 0.1379 bar –(Ear Drum Rupture), and 424.8 meter at 0.02068 bar – (10% Glass Damage).

#### Fireball

As can be seen from the results of the summary of the Quantitative Risk Analysis study, the Fatality distance due to Scenario 1.3Iso Butylene 10 MT Bullet Catastrophic Rupture dispersion of 97.22 meter at 37.5 Kw/M<sup>2</sup>- (Total Damage distance),174.6 meter at 12.5 Kw/M<sup>2</sup>-(First Deg. Burn), and 305.1 Meter at 4.0 Kw/M<sup>2</sup>- (Safe Zone).

#### BLEVE



As can be seen from the results of the summary of the Quantitative Risk Analysis study, the Fatality distance due to Scenario 22.2 Drum Storage Warehouse Fire dispersion 10.06 meter at 0.2068 bar –(100% Damage), 13.06 meter at 0.1379 bar – (Ear Drum Rupture), and 50.09 meter at 0.02068 bar –(10% Glass Damage).

#### **Maximum Concentration Footprint**

As can be seen from the results of the summary of the Quantitative Risk Analysis study, the Fatality distance due to Scenario 15.1 Chlorine Gas 900Kg Tonner Catastrophic Rupture toxic release dispersion of **57.56 meter** at **1060 ppm (LC 50 For Human)**, **499meters** at **85 ppm (IDLH)**, **948meters** at **35ppm (ERPG-2)**. and **2199.3 meters** at **10 ppm (ERPG-1)**.



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#### **SECTION VII**

#### **RISK REDUCTION MEASURES**

#### 7.1 Recommendations

- **7.1.1** From the Risk Analysis studies conducted, it would be observed that by and large, the risks are confined within the factory boundary walls in case of fire, explosion, and spillage of chemicals. On site emergency plan & preparedness plan to be prepared and implemented to combat such situations. To minimize the consequential effects of the risk scenarios, following steps are recommended.
  - Plant should meet provisions of the Manufacture, storage & Import of Hazardous Chemicals Rules, 1986 & the factories Act, 1948.
  - Process hazard analysis and HAZOP study to be conducted for each process and recommendation to be implemented.
  - Safety measures shall be implemented as per provided in report.
  - Explosive license and other statutory norms shall be incorporated in plant construction.
  - Process parameter and safety shall be considered as a built-in safe system.
  - All new employees shall be trained for safe operation, handling and storage of hazardous process and material.
  - Emergency plan shall be prepared as per QRA hazardous scenarios and periodic On-Site Emergency, Mock Drills should be conducted, in order to train the staff and make them mentally prepare to tackle emergency.
  - Emergency handling facilities should be maintained in a tip top condition round the clock.
  - The details of emergency equipment are given in on site emergency Plan along with its quantity shall be procure and maintained.
  - For proposed plant Fire & Safety organization setup to be plan for better plant safety.
  - Safety devices and control instruments should be calibrated once in a year.
  - HSE management system shall be prepared and implemented at early stage of the plant commissioning.
  - Permit to work system shall be implemented on 100 % basis for hazardous work to be carried out in the plant.
  - Fire hydrant system and sprinkler system needs to be provided and it should be expanded in proposed plant also. Hydrant system shall be maintained in auto mode at all time.
  - Manual call point and smoke detectors to be installed at design level.
  - Double Static earthing and electrical earthing needs to be provided.



# **CONSEQUENCE CONTUORS**

Please refer tag Maps/Plans/Figures for further consequence contuors.





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#### SECTION IX

#### DESASTER MANAGEMENT PLAN

An onsite emergency in the industries involving hazardous processes or in hazardous installations is one situation that has potential to cause serious injury or loss of life. It may cause extensive damage to property and serious disruption in the work area and usually, the effects are confined to factory or in several departments of factory, premise. An emergency begins when operator at the plant or in charge of storage cannot cope up with a potentially hazardous incident, which may turn into an emergency.

#### 8.1 ONSITE EMERGENCY PLAN

#### 8.1.1 OBJECTIVES OF ONSITE EMERGENCY PLAN

A quick and effective response at during an emergency can have tremendous significance on whether the situation is controlled with little loss or it turns into a major emergency. Therefore, purpose an emergency plan is to provide basic guidance to the personnel for effectively combating such situations to minimize loss of life, damage to property and loss of property.

An objective of Emergency Planning is to maximize the resource utilization and combined efforts towards emergency operations are as follows. :

#### 8.1.2 DURING AN EMERGENCY.

- To increase thinking accuracy and to reduce thinking time.
- To localize the emergency and if possible, eliminates it.
- To minimize the effects of accident on people and property.
- To take correct remedial measures in the quickest time possible to contain the incident and control it with minimum damage.
- To prevent spreading of the damage in the other sections.
- To mobilize the internal resources and utilize them in the most effective way
- To arrange rescue and treatment of causalities.

#### 8.1.3 DURING NORMAL TIME.

- To keep the required emergency equipment in stock at right places and ensure the working condition.
- To keep the concerned personnel fully trained in the use of emergency equipment.
- To give immediate warning tooth surrounding localities in case of an emergency situation arising.
- To mobilize transport and medical treatment of the injured.
- To get help from the local community and government officials to supplement manpower and resources.
- To provide information to media & Government agencies, Preserving records, evidence of situation for subsequent emergency etc.



#### 8.2 SCOPE OF OSEP

This OSEP is prepared for industrial emergencies like fires, explosions, toxic releases, and asphyxia and does not cover natural calamities and societal disturbances related emergencies (like strikes, bomb threats, civil commission's etc.)

#### 8.3 ELEMENTS OF ONSITE EMERGENCY PLAN

The important elements to be considered in plan are

- Emergency organization
- Emergency Facilities.
- Roles and Responsibilities of Key Personnel and Essential Employee.
- Communications during Emergency
- Emergency Shutdown of Plant & Control of situation.
- Rescue Transport & Rehabilitation.
- Developing Important Information.

#### 8.4 METHODOLOGY.

The consideration in preparing Emergency Plan will be included the following steps:

- Identification and assessment of hazards and risks.
- Identifying, appointment of personnel & Assignment of Responsibilities.
- Identification and equipping Emergency Control Centre.
- Identifying Assembly, Rescue points Medical Facilities.
- Formulation of plan and of emergency sources.
- Training, Rehearsal & Evaluation.
- Action on Site.

Earlier, a detailed Hazard Analysis and Risk Assessment was carried out on hazards and their likely locations and consequences are estimated following the standard procedure.

However, the causing factors for above discussed end results may be different and causing factors are not discussed in this plan.

#### 8.5 EMERGENCIES IDENTIFIED

Emergencies that may be likely at bulk fuel storage area, process plant, cylinder storage area, and drum storage shed, and autoclave reactor area. There are chances of fire and explosive only.

#### 8.6 OTHERS

Other risks are earthquake, lightning, sabotage, bombing etc., which are usually, not in the purview of management control.





#### 8.7 EMERGENCY ORGANISATION.

Plant organization is enclosed. Based on the plant organization, which includes shift organization, an Emergency Organization is constituted towards achieving objectives of this emergency plan.

Plant Manager is designated as Overall in Charge and is the Site Controller.

The following are designated as Incident Controllers for respective areas under their control. Shift in charge Engineer (Plant Operations) is designated at Incident Controller for all areas of plant.

#### 8.8 EMERGENCY FACILITIES

#### 8.8.1 EMERGENCY CONTROL CENTRE (ECC)

It is a location, where all key personnel like Site Controller, Incident Controller etc. can assemble in the event of onset of emergency and carry on various duties assigned to them.

Plant Manager's Office is designated as Emergency Control Centre. It has P&T telephone as well as internal telephones, ECC is accessible from plant located considerably away from process plant, Storage's and on evaluation of other locations, Plant Manager's Room find merit from the distance point of view, communication etc.

# 8.8.2 FACILITIES PROPOSED TO BE MAINTAINED AT EMERGENCY CONTROL CENTRE (ECC)

The following facilities and information would be made available at the ECC

- Latest copy of Onsite Emergency Plan and off sites Emergency Plan (as provided by District Emergency Authority).
- Intercom Telephone.
- P&T Telephone.
- Telephone directories (Internal, P&T)
- Factory Layout, Site Plan
- Plans indicating locations of hazardous inventories, sources of safety equipment, hydrant layout, location of pump house, road plan, assembly points, vulnerable zones, escape routes.
- Hazard chart.
- Emergency shut-down procedures.
- Nominal roll of employees.
- List and address of key personnel
- List and address of Emergency coordinators.
- List and address of first aides,
- List and address of first aid fire-fighting employees,
- List and address of qualified Trained persons.





#### 8.8.3 FIRE FIGHTING FACILITIES.

- Internal hydrant system
- Portable extinguishers

#### 8.8.4 FIRE PROTECTION SYSTEMS

These systems are proposed to protect the plant by means of different fire protection facilities and consist of

- Hydrant system for exterior as well as internal protection of various buildings/areas of the plant.
- Portable extinguishers and hand appliances for extinguishing small fires in different areas of the plant.
- Water cum foam monitor to be provided in bulk fuel storage area.
- Fire water pumps.
- Two (2) independent motor driven pumps each of sufficient capacity and head are proposed for the hydrant systems which is capable to extinguish Fire or cooling purpose.

#### 8.8.5 HYDRANT SYSTEM.

Adequate number of fire hydrants and monitors will be provided at various locations in and around the buildings and other plant areas. The hydrants will be provided on a network of hydrant mains drawing water from the hydrant pump, which starts automatically due to drop of pressure in the event of operating the hydrant valves. We are suggesting you to go for TAC approved hydrant system for foolproof safety and benefit from fire policy premium.

#### 8.9 EMERGENCY ESCAPES

The objective of the emergency escape is to escape from the hazardous locations, to the nearest assembly point or the other safe zone, for rescue and evacuation.

#### 8.10 ASSEMBLY POINT.

Assembly point is location, where, persons unconnected with emergency operations would proceed and wait for rescue operation.

#### 8.11 WIND SOCK.

Wind socks for knowing wind direction indication would be provided at a suitable location to visible from many locations. It is proposed to install windsocks at plant and Administration Building so as to be visible from different locations in the plant.



#### 8.12 EMERGENCY TRANSPORT.

Emergency Ambulance would be stationed at the Administration Office and round the clock-driver would be made available for emergency transportation of injured etc. However, the other vehicles of the company also would be available for emergency services.

#### 8.13 EMERGENCY COMMUNICATION.

There are two kinds of communication system provided.

(a) Regular P&T phones with intercom facility.(b) Mobile phone

#### 8.14 WARNING/ALARM/COMMUNICATION OF EMERGENCY

The emergency would be communicated by operating electrical siren for continuously for five minutes with high and low pitch mode.

#### 8.15 EMERGENCY RESPONSIBILITIES:

Priority of Emergency Protection.

- Life safety
- Preservation of property
- Restoration of the normalcy

#### 8.16 MUTUAL AID

While necessary facilities are available and are updated from time to time, sometimes, it may be necessary to seek external assistance; it may be from the neighboring factories or from the State Government as the case may be.

#### 8.17 MOCK DRILL

Inspite 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 see whether the plan meets the objectives of the OSEP, occasional mock drills are contemplated. Before undertaking the drill, it would be very much necessary to give adequate training to all staff members and also information about possible mock drill. After few pre-informed mock drills, few UN-informed mock drills would be taken. All this is to familiarize 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 shift etc. To improve preparedness once in 6 months and performance is evaluated and Site Controller maintains the record. Incident Controller coordinates (IC)this activity.



#### 8.18 Scenarios based emergency action plan:

8.18.1 Possible Emergency: - Heavy Spillage of Flammable Chemicals from road tanker.

Location	Scenario	Hazard	Possible	Action to be taken	Action by	Remedial measures to
	considered	Consequence	Causes			prevent recurrence of
		_				such incident
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Flammable	Heavy	(1) Vapour	(1)Connecting	Raised alarm immediately for	First	Tanker unloading
Chemicalsroad	spillage of	generated and	hose	warning the people if large	observer/	procedure to be
tanker	product from	run in down	disconnected	spillage observed.	driver/	prepared and
unloading	the road	wind	from the		cleaner/	implemented strictly.
point	tanker	direction.	flange and	Do not entre in spillage are.	operator	
	unloading		100 % release		All	Sampling method to be
	hose	(2) Fire and	of material	Stop all hot work in this area.	employees	prepared and
		explosion.	from valve.			implemented.
			(2) Rupture of	Call fire and Safety department	Operator	
			unloading			Wheel stopper to be
			hose.	Close valve immediately if it is	Operator	provided.
			(3) Leaking	safe to do.		
			from flange			Static earthing with
			gasket	Cordon the area immediately.	Operator	interlocking shall be
			(4) fire in spill			provided.
			collection	Do not touch any electrical		
			drum.	switches in spillage area.	Driver	Leakage proof
					cleaner	connection hose to be
				Stop all activities in tank farm		done before starting the
				area.	All team	unloading.
					members	
				Evacuate non-essential persons		No spillage of Flammable
				from the affected area	IC	Chemicals to be allowed



Location	Scenario considered	Hazard Consequence	Possible Causes	Action to be taken	Action by	Remedial measures to prevent recurrence of such incident
				immediately.		in tank farm area.
				Try to control situation at department level with available	Rescue team	All firefighting equipment to be kept in good working condition.
				resources with full PPEs. Identify the spillage material and refer MSDS for control plan.	Rescue team	200 Lit AFFF foam drum to be kept ready in tank farm area for firefighting.
				Inform the Site main Controller (SMC) in detail. Take decision to Declare onsite emergency.	IC	All employees in area to be trained for firefighting and such scenarios base emergencies.
				Efforts to be made to prevent spreading of Flammable Chemicalsto a large area by containing it in a small area by temporary arrangements or by	IC SMC	Strict supervision of whole activity responsibility to be define.
				diverting the spreading oil to a low-lying area away from strategic plant areas. Start to spread AFFF foam on	Fire and spill control team	LEL % base gas detection system to be provided and to be maintained in good working condition.



Location	Scenario considered	Hazard Consequence	Possible Causes	Action to be taken	Action by	Remedial measures to prevent recurrence of such incident
				spilled material to control evaporation rate. Do not drain spilled material in any trench or sump.	Fire team	Emergency telephone number list to be displayed in this area.
				Ensure search and rescue and causalities receive attention. Administer first aid to the victim.	Fire team	In case of emergency – action plan and communication chart to be displayed in this area.
				Make arrangement to send injured person/s to Hospital. If off site emergency situation occur –Inform to following agencies	team First Aid team First Aid	Remaining Flammable Chemicals collection crude method of road tanker run forward and backward practices to be
				Request for Mutual aiders, local authorities like – DISH office, Collectorate office, Disaster management cell, Police, fire brigade, nearby hospital, local GPCB office	team SMC	stopped immediately. Such crude method will lead road tanker disaster.

# 8.18.2 Possible Emergency: - Unconfined pool fire due to heavy spillage of Flammable Chemicals from road tanker unloading hose.

Location	Scenario	Hazard	Possible	Action to be taken	Action by	Remedial measures to
	considered	Consequence	Causes			prevent recurrence of
						such incident
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Flammable	Heavy	(1) Unconfined	Immediate	Raise fire siren or shouting	First Observer	Tanker unloading
ChemicalsUnloading	spillage of	Pool fire	ignition	FireFire Fire		procedure to be
point	product	(2) In case of	available.			prepared and
	from the	Flammable		Evacuate the area	All employees	implemented strictly.
	road tanker	Chemicalsif the		immediately.	in this area	
	unloading	liquid does not				Sampling method to
	hose and it	catch fire			First observer	be prepared and
	got fire.	Flammable		Inform the area in charge.		implemented.
	(Unconfined	chemical etc.			Department	
	pool fire)	can evaporate		Inform IC in detail.	employee	Wheel stopper to be
		and if the vapor				provided.
		cloud in its			Security team	
		movement in		Affected area to be		Static earthing with
		the direction of		cordoned off.	IC	interlocking shall be
		wind, meets				provided.
		any source of		Call fire department		
		ignition, it may		immediately and help them	Department	Leakage proof
		result in a		for firefighting.	firefighting	connection hose to be
		vapor cloud			team.	done before starting
		explosion.		Try to control situation at		the unloading.
				department level with		
				available resources with	IC	No spillage of



Location	Scenario considered	Hazard Consequence	Possible Causes	Action to be taken	Action by	Remedial measures to prevent recurrence of such incident
				full PPEs. If it is found uncontrollable		Flammable Chemicalsto be allowed in tank farm
				condition by department level inform SMC for onsite emergency situation.	SMC	area. All firefighting
				Declare on site emergency if required.	Fire team	equipments to be kept in good working condition.
				Start fire hydrant system or water hose rill and spray water on nearby tank farm area for cooling purpose.	Fire team All team	200 Lit AFFF foam drum to be kept ready in tank farm area for firefighting.
				Use foam fire extinguishers for firefighting of Flammable Chemicalsfire.	member SMC	All employees in area to be trained for firefighting and such scenarios base
				Do not enter in fire prone area.		emergencies.
				If the fire is not controlled, Emergency may be declared and on-site	SMC and all	Strict supervision of whole activity responsibility to be define.
				brought into action and	uept. nead.	LEL % base gas



Location	Scenario	Hazard	Possible	Action to be taken	Action by	Remedial measures to
	considered	Consequence	Causes		-	prevent recurrence of
						such incident
				services from outside		detection system to
				agencies to be	SMC	be provided and to be
				requisitioned, if considered		maintained in good
				necessary.	<b>D</b>	working condition.
					Rescue team	
				If fire found uncontrollable		Emergency telephone
				and mutual aider for help	First Aid toom	diamber list to be
				and mutual alder for help.	First Alu team	uispiayeu in uiis area.
				All hazardous activates	Administration	
				stop at site.	team	In case of emergency
				L .		– action plan and
				Ensure search and rescue		communication chart
				and causalities receive	SMC	to be displayed in this
				attention.		area.
				Administer first aid to the		
				victim.		Remaining
				Make arrangement to send		Chomicalscolloction
				injured person/s to		crude method of road
				Hospital And inform		tanker run forward
				victim's family.		and backward
				· · · · · · · · · · · · · · · · · · ·		practices to be
				If off site emergency		stopped immediately.
				situation occurs –Inform to		Such crude method
				following agencies.		will lead road tanker



Location	Scenario considered	Hazard Consequence	Possible Causes	Action to be taken	Action by	Remedial measures to prevent recurrence of such incident
				Request for Mutual aiders,		disaster.
				local authorities like – DISH		
				office, Collectorate office,		
				Disaster management cell,		
				Police, fire brigade, nearby		
				hospital, local GPCB office.		
# 8.18.3 Possible Emergency: - Heavy Spillage of ACN from road tanker

Location	Scenario	Hazard	Possible Causes	Action to be taken	Action by	Remedial measures to
	considered	Consequence				prevent recurrence of such
						incident
(1)	(2)	(3)	(4)	(5)	(6)	(7)
ACN	Heavy spillage	(1) Hydrocarbon	(1) Connecting	Raised alarm immediately for	First	Tanker unloading
Unloading	of product	vapour	hose	warning the people if large	observer/	procedure to be prepared
point	from the road	generated and	disconnected	spillage observed.	driver/	and implemented strictly.
	tanker	run in down	from the flange		cleaner/	
	unloading	wind direction.	and 100 %	Do not entre in spillage are.	operator	Sampling method to be
	hose		release of			prepared and
		(2) Fire and	material from	Stop all hot work in this area.	All	implemented.
		explosion.	valve.		employees	
			(2) Rupture of	Call fire and Safety department		Wheel stopper to be
			unloading		Operator	provided.
			hose.	Close valve immediately if it is		
			(3) Leaking	safe to do.	Operator	Static earthing with
			from flange			interlocking shall be
			gasket	Cordon the area immediately.	Operator	provided.
			(4) fire in spill			
			collection	Do not touch any electrical		Leakage proof connection
			drum.	switches in spillage area.	Driver	hose to be done before
					cleaner	starting the unloading.
				Stop all activities in tank farm		
				area.	All team	No spillage of ACN to be
					members	allowed in tank farm area.
				Evacuate non-essential persons		
				from the affected area		All firefighting equipments
				immediately.	IC	to be kept in good working
						condition.



Location	Scenario considered	Hazard Consequence	Possible Causes	Action to be taken	Action by	Remedial measures to prevent recurrence of such incident
				Evacuate the surrounding area up to 200 meter in all direction.	Rescue team	200 Lit AFFF foam drum to be kept ready in tank farm
				Try to control situation at department level with available	Rescue team	area for firefighting.
				resources with full PPEs.	IC	All employees in area to be trained for firefighting and such scenarios base
				refer MSDS for control plan.		emergencies.
				Inform the Site main Controller (SMC) in detail.	IC	Strict supervision of whole activity responsibility to be define.
				Take decision to Declare onsite emergency.	IC	LEL % base gas detection
				Efforts to be made to prevent spreading of ACN to a large area by containing it in a small area	SMC	system to be provided and to be maintained in good working condition.
				by temporary arrangements or by diverting the spreading oil to a low-lying area away from strategic plant areas.	Fire and spill control team	Emergency telephone number list to be displayed in this area.
				Start to spread AFFF foam on spilled material to control evaporation rate.	Fire team	Incase of emergency – action plan and communication chart to be displayed in this area.



Location	Scenario considered	Hazard Consequence	Possible Causes	Action to be taken	Action by	Remedial measures to prevent recurrence of such incident
				Do not drain spilled material in		
				any trench or sump.	Eine toom	Domaining ACN collection
				Ensure search and rescue and causalities receive attention.	Fire team	crude method of road tanker run forward and
				Administer first aid to the victim.	Rescue team	backward practices to be stopped immediately. Such
				Make arrangement to send	First Aid	crude method will lead
				injured person/s to Hospital.	team	road tanker disaster.
				occurs –Inform to following	First Aid	
				agencies	team	
				Request for Mutual aiders, local		
				authorities like – DISH office,	SMC	
				management cell. Police, fire	31410	
				brigade, nearby hospital, local		
				GPCB office		

0101	Possible Emergency	Drum Spillago in	drum storago aroa	(Spill Control Plan)
0.10.4	FOSSIBLE Entergency: -	Di uni spinage m	ui uiii stoi age ai ea.	(Spin Cond of Flair)

Loca tion	Scenario	Hazard Conseque	Possible Causes	Action to be taken	Action by	Remedial measures to prevent
	ed	nce	Guubeb			
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dru m	Small spillage	Toxic vapour	Drum puncher or	Find out leakage drum	Incident controller	<ol> <li>FLP type light fittings provided.</li> <li>Proper ventilation is available</li> </ol>
age area	Large spillage	to drum handling operators.	wrong storage method.	Raised alarm immediately for warning the people if large spillage observed.	IC	<ol> <li>Proper ventuation is available in Drum storage area.</li> <li>Proper label and identification board /stickers is provided in</li> </ol>
		Fire in case of		Do not entre in confined room if spillage in room.	IC	the storage area. 4. Conductive drum pallets are provided.
		ignition source available		Do not touch any electrical switches in spillage area.	IC and department team	5. Drum handling trolley / stackers/fork lift are used for drum handling.
		within LEL-UEL		Stop all hot work in this area.	IC	6. Separate dispensing room with local exhaust and static
		% concentra		Call fire and Safety department	Security team	earthing provision is available. 7. Materials are stored as per its
		tion		Cordon the area.	Non-essential	compatibility study and separate area is available for
				Evacuate non-essential persons from the affected area immediately.	workers	flammable, corrosive and toxic chemical drums storage.
				Inform the area in charge.	IC	8. Smoking and other spark, flame generating item are
				Try to control situation at department level	IC	banned from the Gate. 9. NFPA labels are provided on



Loca tion	Scenario consider	Hazard Conseque	Possible Causes	Action to be taken	Action by	Remedial measures to prevent recurrence of such incident	
	ea	nce					
				with available resources with full PPEs.	10	drums for hazard	
					IC	identification of the chemicals.	
				Identify the spillage material and refer MSDS		10. Exhaust is provided at	
				for control plan.	<b>D</b> . <b>M</b> .	ground level in drum storage	
					Dept. Toxic	area.	
				Segregate leakage drum from the area.	control team	11. Drum loading unloading	
					IC	implemented	
				Inform the Site main Controllor (SMC) in	IC.	implementea.	
				detail	Dont Toxic		
					Dept. Toxic		
				Open all deers and windows in this area	control team		
				open an doors and windows in this area.	SMC		
				Take decision to Declare onsite emergency	SMC		
				Take decision to beclare onsite emergency	Tovic /Spill		
				Spill control and noutralization team	control toom		
				member try to control spread material in	control team		
				more area by absorbing material and dry			
				sand	Tovic/Spill		
				Sullu.	control team		
				If material is toxic or any other flammable	control team		
				and toxic chemical special precautions needs			
				to be taken as per chemical expert Key	Fire team		
				person guide line.			
				F 00	Toxic/Spill		
				Do not spray water or Foam on spilled	control team		
				material.			
				Do not drain spilled material in any trench.	Toxic/Spill		



Loca tion	Scenario consider	Hazard Conseque	Possible Causes	Action to be taken	Action by	Remedial measures to prevent recurrence of such incident
	ed	nce				
					control team	
				Collect the spilled material in close container and send for ETP for further neutralization of the residual contents.	Rescue team	
				Ensure search and rescue and causalities receive attention.	First Aid team	
					Administratio	
				Administer first aid to the victim.	n team.	
				Make arrangement to send injured person/s to Hospital.	SMC	
				If off site emergency situation occur –Inform to following agencies, Request for Mutual aiders, local authorities like – DISH office, Collectorate office, Disaster management cell, Police, fire brigade, nearby hospital, local GPCB office		

# 8.18.5 Possible Emergency: - Fire in drum storage area

Loca	Scenario	Hazard	Possible	Action to be taken	Action by	Remedial measures to
tion	considere	Consequ	Causes			prevent recurrence of
	d	ence				such incident
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dru	Small	Fire in	Drum	Raise fire siren or shouting FireFire Fire	First Observer	1. FLP type light fittings
m	spillage	drum	leakage			provided.
stor		storage	or	Evacuate the area immediately.	All employees in	2. Proper ventilation is
age		area	damage,		this area	available in Drum
area	Large		wrong	Inform the area in charge.		storage area.
	spillage	BLEVE of	storage		First observer	3. Proper label and
		drums	method.	Inform IC in detail.		identification board
					Department	/stickers is provided
			Ignition	Call fire department immediately and help them for	employee	in the storage area.
			source	firefighting.	IC	4. Conductive drum
			like			pallets are provided.
			electrical	Try to control situation at department level with		5. Drum handling trolley
			source,	available resources with full PPEs.	Department fire	/ stackers/fork lift
			Friction		fighting team.	are used for drum
			etc.	If it is found uncontrollable condition by department		handling.
				level inform SMC for onsite emergency situation.	IC	6. Separate dispensing
			BLEVE			room with local
			due to	Declare on site emergency if required.		exhaust and static
			Metal		SMC	earthing provision is
			drum	Remove un burned drums from the site if possible		available.
			heat in	without any risk.		7. Materials are stored
			fire.		Rescue and	as per its
				Start fire hydrant system or water hose rill and spray	evacuation team	compatibility study
				water on uninvolved drums in fire for cooling purpose.	Fire team	and separate area is



Loca tion	Scenario considere	Hazard Consegu	Possible Causes	Action to be taken	Action by	Remedial measures to prevent recurrence of
	d	ence				such incident
				Use foam fire extinguishers for firefighting of fire.		available for flammable, corrosive
				Do not enter in fire prone area.	Fire team	and toxic chemical drums storage.
				If fire found uncontrollable condition call fire brigade		8. Smoking and other
				and mutual aider for help.	All team member	spark, flame generating item are
				In case of BLEVE fire, immediate evacuate the area up to 50 meters of the area surrounding.	SMC	banned from the Gate. 9. NFPA labels are
				All hazardous activates stop at site.		provided on drums
					All team member	for hazard
				Inform nearby company to remove hazardous		identification of the
				material or inventory from the compound wall.	SMC and all dept.	chemicals.
					head.	10. Exhaust is provided
				attention.	SMC	at ground level in drum storage area.
				Administer first aid to the victim. Make arrangement to send injured person/s to Hospital. And inform victim's family.	Rescue team	unloading procedures are
				If off site emergency situation occur –Inform to following agencies.	First Aid team	implemented.
					Administration	
				Request for Mutual aiders, local authorities like – DISH	team	
				office, Collectorate office, Disaster management cell,		
				Police, fire brigade, nearby hospital, local GPCB office	SMC	

# 8.18.6 Possible Emergency: - Heavy Spillage of acid from Storage tank.

Location	Scenario	Hazard	Possible Causes	Action to be taken	Action by	Remedial measures
	considered	Consequence				to prevent
						recurrence of such
						incident
(1)	(2)	(3)	(4)	(5)	(6)	(7)
acid	Heavy	(1) Heavy spillage of	Over filling due	Raised alarm immediately for	First	High level indication
storage	spillage of	sulfuric acid in dyke area	to malfunction	warning the people if large	observer/	shall be provided.
tank	acid from	and due to contact with	of level gauge	spillage observed.	driver/	
	Storage tank	humid air and water	and level		cleaner/	High level cutoff
		contact with spilled	transmitter.	Do not entre in spillage are.	operator	shall be provided on
		material SO3 mist / fumes				storage tank.
		will be generated and	Bottom valve	Evacuate area in down wind	All	
		travelled in down wind	leakage	direction up to 200 meters	employees	Integrity of the tank,
		direction.				pump and piping
			Bottom line	Call fire and Safety	Operator	shall be checked
			rupture.	department for spill control		regularly.
			Puncher in tank	Close valve immediately if it is	Operator	Spill control plan to
			wall	safe to do.		be prepared and
					0	training to be
			•	Cordon the area immediately.	Operator	conducted to all
						operators.
				Stop all activities in tank farm	Deriver	F
				area.	Driver	Emergency
					cleaner	telephone number
				Evacuate non-essential		list to be displayed in
				persons from the affected		this area.
				area immediately.	Description	
					Rescue team	incase of emergency



Location	Scenario	Hazard	Possible Causes	Action to be taken	Action by	Remedial measures
	considered	Consequence			-	to prevent
						recurrence of such
						incident
				Try to control situation at department level with available resources with full PPEs.	Rescue team	<ul> <li>action plan and communication chart to be displayed in this area.</li> </ul>
				Identify the spillage material and refer MSDS for control plan.	IC	Neutralized material to be collect in close containers and disposed off in safe
				Inform the Site main Controller (SMC) in detail.	IC	manner.
				Take decision to Declare onsite emergency.	SMC	
				Efforts to be made to prevent spreading of Sulfuric acid to a large area by containing it in a	Fire and spill control team	
				small area by temporary	Fire and spill	
				arrangements or by diverting	control team	
				the spreading liquid to a low		
				lying area away from strategic	Rescue team	
				plant areas.		
				Start to spread soda ash on	Finat A:-	
				spined material to neutralize	FII'ST Ald	
				Figure search and rescue and	tealli	
				Linsure scarch and rescue allu		



Location	Scenario	Hazard	Possible Causes	Action to be taken	Action by	Remedial measures
	considered	Consequence				to prevent
		-				recurrence of such
						incident
				caucalities receive attention		meruent
				causanties receive attention.		
				Administer first aid to the	SMC	
				victim.		
				Make arrangement to send		
				injured person/s to Hospital.		
				If off site emergency situation		
				occurs –Inform to following		
				agencies		
				Request for Mutual aiders,		
				local authorities like – DISH		
				office, Collectorate office,		
				Disaster management cell,		
				Police, fire brigade, nearby		
				hospital, local GPCB office		

8.18.7 P	ossible Emergency :-	AHCL cylinder	catastrophic failure	/ puff release scenario
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Location	Scenario	Hazard	Possible	Action to be taken	Action by	Remedial measures to prevent
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) AHCL cylinder storage shed	considered (2) Puff release from AHCL cylinder	Consequence(3)Toxic releasein down winddirection atLC 50, IDLH& TLVconcentrationFatality tohuman up to125 meterImmediatedanger to lifeandhealth(IDLH)Distance648meter i.eEvacuationarea	Causes(4)Overpressure dueto temp.increaseReaction intonner withincompetitivematerial.Over filling ofAHCLExplosiondue tocylinderinvolved infire or IHR offire.	(5) Evacuate the surrounding area in factory premises. Raised alarm immediately for warning the people. Call fire and Safety department Evacuate non essential persons from the affected area immediately. Inform the area incharge Try to control situation at department level with available resources. Inform the Site main Controller (SMC) in detail.	(6) Incident controller (IC) IC IC Non essential workers First observer IC and department team IC	<ul> <li>recurrence of such incident <ul> <li>(7)</li> </ul> </li> <li>Stored in cool and dry place and PESO approved area.</li> <li>Empty and filled cylinders are stored separately.</li> <li>Hazard identification, control measures in case of leakage and first Aid procedure to be prepared and displayed at storage location.</li> <li>On line AHCL Gas detector provided in storage area.</li> <li>Cylinder store made well ventilated and safe distance maintained.</li> <li>Sprinkler system provision made in cylinder storage area.</li> <li>Cylinder leakage control Kit kept available at cylinder</li> </ul>
		Safe distance 6365 meter	Valve damaged	Start sprinkler system and Mayur curtain Take decision to Declare onsite	Toxic control team	<ul> <li>storage area.</li> <li>Sprinkler point and Eyewash</li> <li>/ Safety shower provided near cylinder filling point.</li> <li>Special charging cabinet</li> </ul>



Location	Scenario	Hazard	Possible	Action to be taken	Action by	Remedial measures to prevent
	considered	Consequence	Causes			recurrence of such incident
				Shutdown the plant in safe manner	IC	with blower provision made. Charging valve and weighing indicator fixed out side the
				Toxic control team members must wear air line respirator or SCBA set .	Toxic control	cabinet. • Blower connected with HCL
				Barricade and restrict movement in affected area.	team Security	<ul> <li>Auto cut off of charging of AHCL with weight interlocking provided</li> </ul>
				Ensure search and rescue and causalities receive attention.	Rescue team	<ul> <li>Air line respirator and SCBA sets are provided in this area.</li> </ul>
				Administer first aid to the victim.	First aid	
				person/s to Hospital. If off site emergency situation occur –	team	
				Inform to following agencies Request for Mutual aiders, local authorities like – DISH office,	First aid team	
				Collectorate office, Disaster management cell, Police, fire brigade, nearby hospital, local GPCB office	SMC	

# 8.18.8 Possible Emergency: - AHCL cylinder Charging line failure / Point source release scenario

Location	Scenario	Hazard	Possible	Action to be taken during emergency	Action by	Remedial measures to prevent
	considered	Consequence	Causes			recurrence of such incident
(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) AHCL cylinder storage shed	considered (2) Point source release from AHCL Charging line	Consequence (3) Toxic release in down wind direction at LC 50 , IDLH & TLV concentration Fatality to human up to 207 meter Immediate danger to life and health(IDLH) Distance	Causes (4) Connecting tube 100 % leakage Valve 100 % leaking Charging line leakage	(5) Evacuate the surrounding area up to factory premises. Inform the area incharge Raised alarm immediately for warning the people. Call fire and Safety department and SMC Evacuate non essential persons from the affected area immediately. Try to control situation at department level with available resources.	(6) Incident controller (IC) First observer IC IC IC Non essential workers IC and	<ul> <li>recurrence of such incident <ul> <li>(7)</li> </ul> </li> <li>Stored in cool and dry place and PESO approved area.</li> <li>Empty and filled cylinders are stored separately.</li> <li>Hazard identification, control measures in case of leakage and first Aid procedure to be prepared and displayed at storage location.</li> <li>On line AHCL Gas detector provided in storage area.</li> <li>Cylinder store made well ventilated and safe distance maintained.</li> <li>Sprinkler system provision</li> </ul>
		3034 meter i.e Evacuation area Safe distance 13880 meter		Inform the Site main Controller (SMC) in detail. Declare onsite emergency Start sprinkler system (Dil. Caustic solution)	department team IC SMC Toxic team	<ul> <li>made in cylinder storage area.</li> <li>Cylinder leakage control Kit kept available at cylinder storage area.</li> <li>Sprinkler point and Eyewash / Safety shower provided near cylinder filling point.</li> </ul>



Location	Scenario	Hazard	Possible	Action to be taken during emergency	Action by	Remedial measures to prevent
Location	Scenario considered	Hazard Consequence	Possible Causes	Action to be taken during emergencyBarricade and restrict movement in affected area.Shutdown the plant in safe mannerToxic control team members must wear air line respirator or SCBA set .Applied cylinder kit to control leakage from valveEnsure search and rescue and causalities receive attention.Administer first aid to the victim.Make arrangement to send injured person/s to Hospital.If off site emergency situation occur – Inform to following agenciesRequest for Mutual aiders, local	Action by Security staff IC Toxic control team Toxic control team Rescue team First aid team First aid team SMC	<ul> <li>Remedial measures to prevent recurrence of such incident</li> <li>Special charging cabinet with blower provision made. Charging valve and weighing indicator fixed out side the cabinet.</li> <li>Blower connected with HCL scrubber.</li> <li>Auto cut off of charging of AHCL with weight interlocking provided.</li> <li>Air line respirator and SCBA sets are provided in this area.</li> </ul>
				Request for Mutual aiders, local authorities like – DISH office, Collectorate office, Disaster management cell, Police, fire brigade, nearby hospital, local GPCB office	SMC	

# 8.18.9 Possible Emergency: - Thionyl Chloride drum spillage. (Thionyl Chloride Spill Control Plan)

Location	Scenario	Hazard	Possible	Action to be taken	Action by	Remedial measures to prevent
	considered	Consequence	Causes			recurrence of such incident
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Drum	Small	Toxic	Drum	Raise siren or shouting for help	First observer	1. Check for leakage all drums
storage	spillage	vapour	damage,			properly while unloading
area		exposure	punctured,	Evacuate the area immediately.	All employees	from truck.
			wrong		in down wind	2. If found any spillage first
	Large		storage		direction.	search for leakage drum.
	spillage	Evacuate	method.			3. Store separate from water
		area in		Inform the area incharge.	First observer	source or reactive chemical
		down wind				drums.
		direction up		Inform Incident controller (IC)	Area incharge	4. Proper ventilation is
		to 327		in detail.	Shift incharge	available in Drum storage
		meters				area.
				Call toxic control team	IC	5. Proper label and
						identification board
				Try to control situation at department	Area incharge	/stickers is provided in the
				level with available resources with full	Shift incharge	storage area.
				PPEs. And respiratory system.	_	6. Drum containment
						provision to be made.
				If it is found uncontrollable condition by	IC	7. Drum handling trolley /
				department level inform SMC for onsite		stackers/fork lift are used
				emergency situation.		for drum handling.
					SMC	8. Drum loading procedure to
				Declare on site emergency if required.		be prepared.
					SMC	9. TC handling safety training
				Inform nearby company to evacuate area		to be provided to all



Location	Scenario	Hazard	Possible	Action to be taken	Action by	Remedial measures to prevent
	considered	Consequence	Causes			recurrence of such incident
				in down wind direction.		operators.
					Security team	10. NFPA labels are
				Cordon the area		provided on drums for
					All team	hazard identification of the
				Do not entre in this area without	members	chemicals.
				respiratory protection and full body		11. Exhaust is
				protection suite.	Toxic control	provided at ground level in
					team	drum storage area.
				Find out leakage drum.		12. Drum loading
					Toxic control	unloading procedures are
					team	prepared and implemented.
				Remove spilled drum from the area in		
				open place.	Tania antual	
				Ctop lookage if peopible, by drypp peoition	TOXIC CONTROL	
				stop leakage if possible, by drum position	team	
				change.	Toxic control	
				Transfer material from drum in a new	toom	
				drum by barrel nump or by gravity	team	
				aram by barrer pamp or by gravity.	Dent Toxic	
				Neutralize spilled drum by soda ash or	control team	
				soda lime powder.		
					Dept. Toxic	
				Spilled area to be covered and spray with	control team	
				soda ash or soda lime.		
					Dept. Toxic	
				Keep as it is for 1 -2 hrs. for neutralizing	control team	
				the TC.		
					All team	



Location	Scenario considered	Hazard Consequence	Possible Causes	Action to be taken	Action by	Remedial measures to prevent recurrence of such incident
Location	Scenario considered	Hazard Consequence	Possible Causes	Action to be takenCollect the powder in close container and send ETP for safe disposal.Never use water for cleaning of TC spilled area. TC is water reactive chemical. It will generate SO2 and HCL fumes and will create white fumes cloud in down wind direction.Ensure search and rescue and causalities receive attention.Administer first aid to the victim. In open air place.Make arrangement to send injured person/s to Hospital. And inform victim's family.If off site emergency situation occur – Inform to following agencies	Action by members Rescue team Fire team Administration team. SMC	Remedial measures to prevent recurrence of such incident
				Request for Mutual aiders, local authorities like – DISH office, Collectorate office, Disaster management cell, Police, fire brigade, nearby hospital, local GPCB office.		

# 8.18.10 Possible Emergency: - Hydrogen cylinder Charging line failure / Point source release scenario

Location	Scenario	Hazard	Possible	Action to be taken	Action by	Remedial measures to prevent
	considered	Consequence	Causes			recurrence of such incident
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Hydrogen	Puff	Fire &	Over	Evacuate the surrounding area in factory	Incident	• Stored in cool and dry place
cylinder	release	Explosion	pressure due	premises.	controller	and PESO approved area.
storage	from		to temp.		(IC)	• Empty and filled cylinders
shed	Hydrogen		increase			are stored separately.
	cylinder			Raised alarm immediately for warning	IC	• Hazard identification,
			Reaction in	the people.		control measures in case of
			tonner with		IC	leakage and first Aid
			incompetitive	Call fire and Safety department		procedure to be prepared
			material.		Non-	and displayed at storage
				Evacuate non-essential persons from the	essential	location.
			Over filling of	affected area immediately.	workers	• On line Gas detector
			Hydrogen			provided in storage area.
				Inform the area incharge	First	<ul> <li>Cylinder store made well</li> </ul>
			Explosion		observer	ventilated and safe distance
			due to	Try to control situation at department		maintained.
			cylinder	level with available resources.	IC and	<ul> <li>Sprinkler system provision</li> </ul>
			involved in		department	made in cylinder storage
			fire or IHR of		team	area.
			fire.	Inform the Site main Controller (SMC) in		• Cylinder leakage control Kit
			** 1	detail.	IC	kept available at cylinder
			Valve			storage area.
			damaged	Start sprinkler system and Mayur	Toxic	<ul> <li>Sprinkler point and</li> </ul>
				curtain	control	Eyewash / Safety shower
					team	, ,



Location	Scenario	Hazard	Possible	Action to be taken	Action by	Remedial measures to prevent
	considered	Consequence	Causes			recurrence of such incident
Location	Scenario considered	Hazard Consequence	Possible Causes	Action to be takenTake decision to Declare onsite emergencyShutdown the plant in safe mannerToxic control team members must wear airline respirator or SCBA set.Barricade and restrict movement in affected area.Ensure search and rescue and causalities receive attention.Administer first aid to the victim.Make arrangement to send injured person/s to Hospital.If off site emergency situation occur – Inform to following agencies Request for Mutual aiders, local authorities like – DISH office,	Action by SMC IC Toxic control team Security team Rescue team First aid team First aid team	<ul> <li>Remedial measures to prevent recurrence of such incident</li> <li>provided near cylinder filling point.</li> <li>Special charging cabinet with blower provision made. Charging valve and weighing indicator fixed outside the cabinet.</li> <li>Auto cut off of charging of Hydrogen with weight interlocking provided.</li> </ul>
				authorities like – DISH office, Collectorate office, Disaster management cell, Police, fire brigade, nearby hospital, local GPCB office	SMC	

#### 8.18.11 Possible Emergency: - Major electrical fire in HT/LT panel, cable trench, cable tray, electrical equipment's.

Location	Scenario	Hazard	Possible Causes	Action to be taken	Action by	Remedial measures to
	considered	Consequence				prevent recurrence of
						such incident
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Plant area	Fire in panel, cable, cable trench, electrical equipments like motor, etc.	Fire	Electrocution and flashing due to short circuit or over load	Raise fire siren or shouting FireFire	First observer	<ol> <li>Safety measures taken at design level and facilities installed as per requirements and electrical load.</li> <li>Double earthing provided to all</li> </ol>
				Evacuate the area immediately.	Non-essential workers.	electrical equipments.
				Inform the area in charge.	Department employee	3. Rubber met provided near
				Inform IC in detail.	Department employee	electrical panels and switches.
				OFF electrical supply in fire porn area.	Electrical head	4. All safety
				Call fire department immediately and help them for firefighting.	Department employee IC	<ul><li>measures taken at design stage.</li><li>5. Magger test and</li></ul>
				Try to control situation at department level with available resources with full PPEs.	Department firefighting team.	earthing continuity test regularly carried out and log sheet
				If it is found uncontrollable condition by		



Location	Scenario considered	Hazard Consequence	Possible Causes	Action to be taken	Action by	Remedial measures to prevent recurrence of such incident
				department level inform SMC for onsite		maintain
				emergency situation.		6.
				Declare on site emergency if required.	SMC	7.
				Start fire hydrant system and spray water on fire.	Fire team	8. ed. 9. All electrical
				Do not enter in fire prone area. Due to toxic	All team	hazardous
				gas liberate in cable fire.	member	condition known
						to all concern
				Remove combustible and flammable material from the fire site.	Rescue team	dept. 10. Appropriate
				If fire found uncontrollable condition call	SMC	firefighting
				fire brigade and mutual aider for help.		arrangement is
				All hazardous activates stop at site.	SMC and all	provided to
					dept. head	control electrical
				Ensure search and rescue and causalities	Rescue team	fire.
				receive attention.		
				Administer first aid to the victim.	First aid team	
				Make arrangement to send injured person/s	Administration	
				to Hospital. And inform victim's family.	team	
				If off site emergency situationoccurs –Inform	SMC	
				to following agencies.		
				Request for Mutual aiders, local authorities		
				like – DISH office, Collectorate office,		
				Disaster management cell, Police, fire		
				brigade, nearby hospital, local GPCB office.		

# 8.18.12 Possible Emergency: - Leak from flanges, valves, during transfer from/to main tank.

Locat	Scenario	Hazard	Possible	Action to be taken	Action by	Remedial measures to
ion	consider	Consequen	Causes			prevent recurrence of such
	ed	се				incident
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Pipel	Spillage	Fire,	Gasket	Detect the source of leakage.	Maintenance	Proper PMS system
ine		spillage,	failure,		team	prepared and
netw		corrosion,	corrosion			implemented.
ork		burn effect	,			
		on human.	improper			
			maintena			
			nce.			
				If the leakage is found significant then isolate branch of	Maintenance	
				line & stop the flow.	team	
				Stop the loading /unloading operation in the Tank.	Maintenance	
					team	
				Bring the portable fire extinguishers near to the area of	Maintenance	
				leakage	team	
				Ensure operation of the fire pump	Fire team	
				In case of major leakage follow action plan as per spill control plan.	-	

# 8.18.13 Possible Emergency: - Earth Quack

Locat	Scenario	Hazard	Possible	Action to be taken	Action by	Remedial measures to
ion	consider	Consequence	Causes			prevent recurrence of such
	ed					incident
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Whol e plant	Earth quack	Building, structure collapse	Natural calamities	Do not panic. Raise alarm.	First observer	<ul><li>Planning &amp; Preparedness</li><li>1. Constitute Emergency Response Team</li></ul>
				Evacuate building /plant immediately.	All employees	2. Identify control
				Avoid standing near to windows, external walls.	All employees	3. Control centers to be
				Stand near the columns or duck under sturdy furniture.	All employees	4. Communication facilities
				Assemble at emergency assembly point.	All employees	5. Emergency vehicles/
				Take head count	HR dept.	6. List of emergency
				Activate plant emergency plan as situation demands.	SMC	contacts & suppliers 7. Medical facilities
				Assess situation and initiate shut down of plants (if required)	SMC and plant head	
				Initiate search & rescue (if required)	Rescue team	
				Provide first aid to victims. Remove casualties Key persons to report to site	First aid team	
				Assess damage	Key personals	

				Undertake restorative measures & repairs	Engg. team	
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8.18.14 Possible Emergency: - Floods:

Besides this, flooding of plants during monsoon due to clogging of storm water drains/ outlets may also take place. The plan to deal with floods can be divided in following stages:

Locat	Scenario	Hazard	Possible	Action to be taken	Action by	Remedial measures to prevent
ion	considered	Consequence	Causes		_	recurrence of such incident
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Whol	Floods	Floods	Natural	Stop all field activities.	IC	Check
e			calamities			1. All storm water drains & outlets are
plant						cleaned & de-choked.
				Stop all permits to work.	IC	Constitute
				Remain indoor observant	IC and employees	2. Plant Emergency Response Team
				to		comprising of (at least) one
				✤ Detect any damage to		engineer, one HSE member, two
				equipment or buildings.		operators & one Electrician.
				✤ Detect development of		3. Civil & Mechanical support team
				unsafe conditions.		(including supply of spares).
				✤ Maintain communication		Maintain
				with Emergency Control		4. Inventory of emergency items such
				Center.		as torches, ropes, lines, wire,
				Respond to emergency call		tarpaulins, plastic sheets, tool kits,
				Audit plant area(s) for	Engineering team	duct tapes, assorted gears &sand
				damage assessment		bags etc.
				Implement fire preventive		5. Food stock, water, blankets
				measures		&bedding and medicines for
				Undertake restorative		distribution.
				measures & repairs		Obtain & circulate



Locat	Scenario	Hazard	Possible	Action to be taken	Action by	Remedial measures to prevent
ion	considered	Consequence	Causes			recurrence of such incident
		consequence	Lauses	Restart the plant(s)		<ol> <li>Advance forecast warnings to be continuously updated.</li> <li>Mobilize emergency response team</li> <li>Release non-essential personnel</li> <li>Initiate shut down of plants(s) if required</li> <li>Audit plant safety measures</li> <li>Implement preventive &amp; precautionary measures especially</li> <li>Hot equipment to be cooled down.</li> </ol>
						13. Exposed machinery & equipment to
						be coated with grease.
						14. Open flames should be extinguished

#### 8.18.15 Possible Emergency: - Cyclonic Storms / Hurricane

Cyclonic storms/ hurricanes are intense depressions, which develop in tropical latitudes and are often the cause of very high winds and seas. The wind blows around the center of a tropical storm in a spiral flow inward, anti-clockwise in Northern Hemisphere and clockwise in Southern Hemispheres. Plan for tackling cyclonic storm/ hurricane can be broadly divided in following stages:

Location	Scenario	Hazard	Possible	Action to be taken	Action by	Remedial measures to prevent recurrence
	considered	Consequence	Causes			of such incident
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Whole	Cyclonic	Cyclonic Storms	Natural	Mobilize emergency	IC	1. Inventory of emergency items such as
plant	Storms /	/ Hurricane	calamities	response team		torches, ropes, lines, wire, tarpaulins,
	Hurricane					plastic sheets, tool kits, duct tapes,
				Release non-essential	IC	assorted gears &sand bags etc.
				personnel		2. Food stock, water, blankets &bedding
						and medicines for distribution.
				Initiate shut down of	IC and	3. Implement preventive &
				plants(s) if required	employees	precautionary measures
				Stop field activities.	IC	
				Stop all permits to work.		
				🗅 Remain indoor	Engineering	
				observant to	team	
				✤ Detect any damage		
				to equipment or		
				buildings.		
				✤ Detect development		
				of unsafe conditions.		
				Maintain		
				communication with		
				Emergency Control		

		Center.	

#### 8.18.16 Possible Emergency: - Bomb Threat

All telephone calls and emails threatening harm to people or property, such as bomb threats, should be taken seriously.

Locat	Scenario	Hazard	Possible	Action to be taken	Action by	Remedial measures to
ion	considered	Consequence	Causes			prevent recurrence of such
						incident
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Whol	Bomb	Fatality and		If the threat is by Email	E-mail receiver	1. Security system is
e	Threat	injury to		Contact immediately your site Security & Crisis		provided.
plant		employees		Management Leader / EHS Leader or Emergency		2. CCTV camera
				Response Team and report that you have		provided in all areas
				received a threatening e-mail.		of the plant.
				1. Be calm.	IC and	3. Without photo ID no
				2. Contact the C M Leader/EHS Manager/ IC/	employees	one can enter in
				Functional Leader if you have received the		premises.
				call and give all information regarding the		4. Vehicles are checked
				call or Email.		at main gate
				3. Evacuate immediately through the nearest		thoroughly for
				exit after hearing the alarm and		suspicious material
				announcement,		during entry of
				4. Shut down critical operation.		vehicle.
				5. Do not disturb anything while evacuating.		
				6. Follow evacuation procedure and reach the		
				designated assembly point.		
				7. Do not run or dash.		
				8. Keep the doors & windows open.		



Locat ion	Scenario considered	Hazard Consequence	Possible Causes	Action to be taken	Action by	Remedial measures to prevent recurrence of such incident
				WHAT TO DO IF YOU RECEIVE A BOMB THREAT ON YOUR TELEPHONE. Contact immediately your site Security & Crisis Management Leader / EHS Leader or Emergency Response Team and report that you have received a threatening Phone		
				<ul> <li>Question to Ask:</li> <li>1. when is it going to occur (or explode)? Where is the harmful item (or bomb) right now?</li> <li>2. What kind of item (or bomb) is it?</li> <li>3. What does it look like?</li> <li>4. Why did you place the item (or bomb)?</li> <li>5. Where are you calling?</li> </ul>	Call Recipient	
				<ul> <li>Things to note:</li> <li>1. Apparent sex, age, and maturity of the caller.</li> <li>2. Peculiarities of voice or speech</li> <li>3. Speech impediment, foreign accent, regional flavor, signs of intoxication, irrationality, and "pet phrases," or their mannerisms.</li> <li>4. Listen for background noises</li> </ul>	Call Recipient	
				<ul> <li>What to do ifYou observe Suspicious Behavior:</li> <li>1. Description of the suspicious behavior.</li> <li>2. Description of person(s).</li> <li>3. Make/Year of vehicle (if applicable).</li> <li>4. Color of vehicle.</li> <li>5. License plate number and State.</li> </ul>	Observer	



Locat ion	Scenario considered	Hazard Consequence	Possible Causes	Action to be taken	Action by	Remedial measures to prevent recurrence of such incident
				<ol> <li>Time</li> <li>Vehicle's location and/or direction of travel.</li> <li>Vehicle in restricted areas without proper identification.</li> <li>Passengers taking photographs or video of any part of the facility.</li> </ol>		
				1. Inform Site Shift Manager & Security	Observer/Call Recipient	
				2. Inform all personnel to provide information regarding any unidentified or suspicious objects/ persons	Observer/ Call Recipient	
				3. Intensify vigilance & patrolling	Security head	
				4. Initiate bomb search	Security head	
				5. If any suspicious object is detected, inform Police Commissioner for arranging bomb disposal squad	SMC	
				6. Make arrangement to minimize effects	SMC	
				7. Make arrangement for evacuation	SMC	
				8. Liaise with police	SMC	
				9. If bomb recovered/ no untoward incident occurs restore normalcy.	SMC	
				<ul> <li>If blast occurs</li> <li>1. Activate concerned plant(s) emergency plan <ul> <li>tackle fire/ toxic leakage/ structural collapse etc. Assess damage.</li> </ul> </li> <li>2. Take restorative measures.</li> <li>3. Liaise with authorities (police, insurance)</li> </ul>	SMC	

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Locat ion	Scenario considered	Hazard Consequence	Possible Causes	Action to be taken	Action by	Remedial measures to prevent recurrence of such incident
				etc.).		

#### 8.18.17 Possible Emergency: - Industrial Unrest

Industrial relation between personnel and management may deteriorate because of any reason. Problems, which may arise due to industrial unrest, include:

Dharna/ Strike/ Hunger strike	Unofficial gatherings/ Gate meetings/ Forceful entry
Work to rule/ Go slow/ Disobedience	Gherao/ Rasta rook
Intimidation & Use of force	Support from local & criminal elements
Sabotage	

In such a scenario, to ensure smooth operation of plant(s), protection of lives and property, well-coordinated effort is needed from all concerned. Plan to deal with industrial unrest can be broadly divided in following stages:

Location	Scenario	Hazard	Possible	Action to be taken	Action by	Remedial measures to
	considered	Consequence	Causes			prevent recurrence of such
						incident
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Whole	Industrial	Unofficial	Industrial	Any employee noticing or heard about the	First	
plant	Unrest	gatherings/	Unrest	Civil Disturbance immediately call EHS /	victim	
		Gate		Security department to give the information.		
		meetings/				
		Forceful				



Location	Scenario considered	Hazard Consequence	Possible Causes	Action to be taken	Action by	Remedial measures to prevent recurrence of such incident
		entry				
		Gherao/ Rasta rook		Don't allow to enter any unknown person in the site	Security team	
		Support from local & criminal elements		Strengthen security at sensitive points	Security team	
				Ensure protection lives & property	Security team	
				Intensify vigilance & patrolling	Security team	
				Assemble in designated Safe Assembly point.	All employees	
				Brief to Site main controller and Crisis management Leader.	First victim	
				Join your group at assembly point and present yourself for headcount to head count coordinator.	All employees	
				Communicate to ECC/Emergency team for missing or trapped employees.	Victim /IC	
				Give this information to site main controller/ EHS dept./ Manufacturing Head.	Victim /IC	
				Maintain law & order	SMC	
				Ask help form nearest police station.	SMC	
				Assess damage (if any)	SMC	
				Restore normalcy	SMC	



#### STANDARD TOR: DETAILS ON PROPOSED LDAR PROTOCOL.

Details on volatile organic compounds (VOCs) from the plant operations and occupational safety and health protection measures. Proposal for Leak Detection and Repair (LDAR) program as per the CPCB guidelines.

#### LDAR Program

LDAR Program – APL shall be carrying out LDAR program as per sources of Leakages Following activities shall be carried out as part of LDAR

- Monitoring of Solvent Losses
- Preventive Maintenance to prevent Leakages
- Immediate Corrections in case of Leakages

#### Monitoring of Solvent Losses

- In awarding, storage, and consumption of solvents in various products shall be measured through Level Transmitters and Load cells weighing systems resp. The quantity at each stage shall be reconciled periodically to arrive at Losses.
- Batch outputs shall be monitored and reconciled with quantity of input raw materials added. Any variation beyond 5% shall be analysed in detail and action plan shall be prepared to reduce the variation.
- Workplace VOC monitoring shall be carried out at the shop floor
- Periodic Leakage Audit at Plant

#### Preventive Maintenance to prevent Leakages

• In order to prevent leakage from Pump, Seals, Valves etc, preventive maintenance shall be carried out periodically as per plan. In case of any recurring problem, action plan shall be prepared, or frequency shall be revised.

Sr. No.	Component	Preventive Maintenance schedule
1	Valves/flanges	Quarterly
2	Compressor seals	Quarterly
3	Pressure relief devices	Yearly
4	Pump seals with visible liquid dripping	Daily
5	Any component with visible leaks	Weekly
6	Any component after repair/ replacement	Weekly
7	Pipeline Thickness Testing	Yearly