Chapter 7: ADDITIONAL STUDIES

7.1 Risk Assessment

Risk is a potential that a chosen action or activity will lead to a loss of human or property.

Risk assessment is a step for Risk Management. Risk assessment is determination of qualitative and quantitative value of risk related a situation or hazard.

Hazard is a situation that poses a level of threat to life health or environment.

Disaster is a natural or man-made hazard resulting in an event of substantial extent causing significant physical damage or distraction loss of life or drastic change in environment.

Risk assessment involves the following:

- Hazard Identification
- Vulnerability Analysis
- Risk Analysis
- Emergency Plan

7.2 Hazard Identification

The proposed Project is Pesticide manufacturing unit. There may be following types of hazards associated with the operation of the unit:

7.2.1 Natural Hazard:

1. Earthquake
2. Flooding
    - Heavy rainfall

7.2.2 Man Made Hazard:

- Fire & explosion
    - Explosive material
    - Chemicals
    - Short circuiting
    - Boiler
    - Chemical
    - Oil storage
    - Leakage from process
- Electrical
    - Electrical room

- Non insulated wires

- Mechanical/ Accident
  - Equipment area
  - Transportation
- Thermal
  - Boiler
  - Incinerator
- Toxic
  - Exposure to chemicals
  - Chemical spillage or leakage
  - Storage & handling of chemical

7.2.3 VULNERABILITY ANALYSIS

The vulnerable analysis is done on all the hazards as below:

S.no	HAZARD IDENTIFICATION	Severity (1-5)	Likelihood (1-5)	Severity x Likelihood (1-25) (Hazards scoring 1-9 are less serious hazards & 9-25 are very serious hazards & require risk assessment)	Proposed General Mitigation Measure/ Control
Natural hazard					
1	Earthquake	5	1	5	Buildings/ All structures shall be designed to withstand structures up to 8.0 on the Richter scale.
2	Flood	5	1	5	Drainage in the Site will be provided to prevent built-up of water.
Man-made hazards					
1	Fire/ Explosion in boiler & incinerator Explosion in process/ storage areas	5	3	15	Leakage of oil, Unequal mixing ratio(s) of fuel to air and unauthorized material in the boiler uncontrolled temperature of boiler, pressurization of fluid heater etc. are the root causes of the hazard for activities in the boiler. These are mitigated by proper procedure and authorization of material to be fed in incinerator/Boiler. Maintenance checks, planned and systematic shut down for maintenance and other verification of pipelines, coils and other insulation will be

					done and inspected by floor in-charge and health and safety in-charge. This details with procedure(s) covering all aspects in the detailed risk assessment report. All control measures for firefighting will be installed and all the aspects of rules and legislations under Explosives Act shall be covered. It is recommended that there are systematic checks and audits of all near misses, accidents and or other maintenance be done. Amount of storage of chemicals are always be controlled to the rules as applicable and as per the procedure formulated. All control systems such as cold storage and chillers will be maintained and controlled electronically fitted with alarm system when system reaches beyond the acceptable limits. Pressure sensors, temperature sensors shall be fitted in all process reactors and maintenance from control room is to be done to ensure compliance to the acceptable levels at all time. All Non-compliance shall be registered and Root Cause identification are done by the Health and Safety and production in-charges in consultation with the Plant head. The same will be addressed over the P&ID indicating each sensor and connection to the main control system(s) with documentation on NC registration, acceptable levels of conditions in tanks/ storage areas.
2	Electrical	2	3	6	All the electrical fitted area will be insulted. Periodic replacement of damaged line. Sign danger at the hazard places. Electrical insulation mat will be provided.

3	Mechanical Failure/ Accident	2	3	6	Spark to the mechanical equipment can cause fire. Periodic replacement of critical components of machine. Sign danger at the hazard places. The transportation of the raw material, chemicals & products will be done in Leak Proof MS Tankers/Drums while transporting through trucks & tempo. Special refer trucks shall be employed for transportation from the port to the site. Cushion will be provided to the materials to prevent chemical container breakage. Safety data sheets will be kept & Labelling done on the tanks used for transportation of the chemicals.
4	Thermal	2	4	8	Open flame from boiler, Furnace and hot machinery can cause burning. The area associated with thermal will be restricted.
5	Toxic	4	4	16	All probable leakage areas such as pipelines, joints, pumps and structure of reactor/ storage vessel will be inspected and maintained proactively. Leak Detector(s) installation are recommended and detailed study over the P&ID of the complex shall be done for proactive control systems. All valves and other flanges will be inspected and a plan for management of the same are covered in detailed risk assessment. This mainly done in process areas and chemical storage areas as suggested in report from third party risk assessment agency. Spillage will be managed by detection of leaks in the first place from structures or vessels. Spillage during loading unloading shall be channelized properly to drains and all PPE will be worn during this time. The loading unloading activity shall be done with a safe zone defined and in a marked safe area. All systems and connections will be maintained and checked regularly so that connections are leak proof. Manual handling of chemicals [solid or liquid] will not be done in the process however if done this will be done with the personnel with PPE and in rooms with proper channelization of air emissions. All chemicals shall be purchased in tanks, tankers, drums as applicable from the standard from competent suppliers and

					other guidelines of local and international authorities.

All points in the above table shall be covered in the detailed HIRA (Hazard Identification and Risk Assessment) study to be done by the proponent. This shall be outside the scope of EIA and shall be done as part of Health and Safety compliance under Factories act and Explosives act. Proponent shall engage competent agency for this study and this shall be done prior to operation phase.

7.3 Risk Analysis

The risk is likelihood of harmful effect big or small due to hazard, together with severity of harm suffered. Risk also depends on number of people exposed to hazard.

Risk analysis provides severity of harm from particular type of hazard.

7.3.1.1 Earthquake:

The area under study falls in Zone-III, according to the Indian Standard Seismic Zoning Map, which is high damage risk zone.

7.3.1.2 Flooding:

Contour level of the site is about 26 m AMSL., the River Yamuna which borders the district in the east, is the main river in the district. The main drainage of the area is River Narmada flowing almost E-W located at about 7.02 Km (NW) from the project area. The other tributaries of Narmada river are Amravati River flowing SE-NW located at 2.79 Km NE and Amla Khadi flowing S-NNW located at 3.24 km SW away from the project area. The area is covered by number of natural drains which flow towards the NW direction of area. The chances of flood are less in the area.

7.3.1.3 Fire & Explosion:

Fire is mainly caused due to carelessness. Since it is a proposed Pesticide unit, fire can occur due to exposure of chemicals used in the process to electrical spark or vapour from chemical storage tanks, problems in boiler, incinerator operation etc.

7.3.1.4 Electrical:

The electrical current can pass to the floor & metals due to inadequate insulation or accidently.

7.3.1.5 Mechanical:

The mechanical fault can cause the risk & hazard. Mechanical hazards are created by powered operation of equipment or tools.

7.3.1.6 Thermal:

Thermal heat can be generated from the process machinery, D.G sets, Boiler, Incinerator and the vehicles in the area. Thermal hazards are objects or substances that transfer energy as heat.

7.3.1.7 Chemical:

All the chemical uses in process have risk of leakage during handling, storage, transferring and processing due to them being toxic.

7.4 On-site Emergency Planning

An onsite emergency is caused by an accident or hazard that takes place within the plan area and the effects are confined to the plant area.

The onsite emergency plan consists of following key elements:

- Planning as per hazard analysis
- Preventive measures
- Emergency response procedure
- Recovery procedure

7.4.1 Planning

1. Mapping of hazard vulnerable area
2. Disaster Management cell will be put into place. It has the following members to share the responsibility
    - Site Controller (Administrator of complex)
    - Incident Controller (Asst. Administrator)
    - Personal Manager
    - Communication Officer
    - Fire Officer
    - Security Officer
    - Engineering In-charge
    - Fire pump attendant
    - First Aid Team

7.4.2 Preventive measures

7.4.2.1 Earthquake:

The project is situated at Seismic zone-III area. Special attention will be given to the structural design of foundation, elements of masonry, timber, plain concrete, reinforced concrete, pre-stressed concrete, and structural steel. All applicable guidelines will be followed in this regard to ensure safety of the building.

7.4.2.2 Flooding:

Proper designing of drainage system for domestic as well as storm water will be done.

7.4.2.3 Fire and Life Safety

Safety Precautions

1. Smoking will be prohibited
2. Vehicle access strictly controlled.
3. Ventilation will be sufficient to cope with the maximum expected vapour levels in building.
4. Storage tank vents to atmosphere will be sized for fire-heated emergency vapour release.
5. Electrical equipment will be explosion-proof to meet national electrical code requirements.
6. Dry chemical extinguishers will be accessible for small fires. An adequate supply of handheld and wheeled types shall be available.
7. Hydrants shall be strategically placed with adequate hoses.
8. Small spills shall be remediated with sand, earth, or other non-combustible absorbent material, and the area then flushed with water. Larger spills will be diluted with water and diked for later disposal.
9. Lighting grounded. Tall vessels and structures will be fitted with lightning conductors that are securely grounded.

Precaution in Case of Fire

- All practicable measures will be taken to prevent outbreak of fire and its spreads, both internally and externally, to provide and maintain: -

a) Safe means of escape for all person in the event of a fire, and
b) The necessary equipment and facilities for extinguishing fire.

- Effective measures will be taken to ensure that all the workers are familiar with the means of escape in case of fire and have been adequately trained in the routine to be followed in such cases.

Fire Fighting Personal Protective Equipment -

Due consideration will be given to hazards from chemical and heat exposure. Therefore, fire-fighters wear full-face, positive pressure, self-contained breathing apparatus or an airline. Chemical protection will be provided with impervious clothing, gloves and footwear. Suitable materials include polyvinyl plastic, neoprene or rubber.

7.4.2.4 Chemical:

Various chemicals will be used in the different processes of the plant. Many of them are hazardous and thus require necessary safety measures.

Chemical Handling:

- Instructions shall be given to not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
- Operator training as well as written operating instructions, safety rules and check lists will be provided.
- All the toxic chemicals shall be pumped in closed loop to the reactors to avoid fugitive emission.
- All the storage / reactor vents shall be connected with scrubber.
- Local Exhaust ventilation facility will be available at strategic locations of all plants where chemicals handled / packing done to remove traces of chemical vapours / dust.
- Required Personal Protective Equipment's like respirator / dust masks, Gloves, Goggles, Shoe, Apron, etc. are issued and will be used by employees when handling chemicals.
- Eye washer / Safety showers will be available at strategic locations of all plants.
- Periodically work place shall be monitored to identify toxic chemicals presence if any.
- All employees shall be advised to take bath before leaving the work spot at end the shift and followed.
- Annual medical examination shall be done for all the employees.
- Doctor visits the plant weekly twice for checking of employees.

Sources of Exposure: Human exposure to chemicals can occur mainly via absorption, contact with the eyes, inhalation or ingestion.

First Aid Measures taken:

1. In case of chemicals come in contact with the skin, remove contaminated clothing. Wash with soap and water for 15 minutes. Seek medical attention if irritation occurs.

2. In case of chemicals contact with the eyes, flush immediately with gently running water for a minimum of 15 minutes, ensuring all surfaces and crevices are flushed by lifting lower and upper lids. Obtain medical attention.

3. In case of inhalation of chemical's vapours, remove the individual to fresh air, but only if it is safe to do so. Asphyxiation from vapours may require artificial respiration. Due to the possibility of delayed onset of more serious illness, it is important to obtain medical attention.

4. Ingestion of chemicals is life threatening. Onset of symptoms may be delayed for 18 to 24 hours after ingestion. Do not induce vomiting. Transport to medical attention. The individual should remain under close medical care and observation for several days.

Chemical Storage:

- Chemicals shall be kept away from heat, sparks, and flame. Kept away from sources of ignition. Stored in a tightly closed container.

- Chemicals will be stored in a cool, dry, well-ventilated area away from incompatible substances. Specific storage will be given as per chemicals storage requirement.
- Storage & handling area will be readily accessible with safety showers, fire extinguishers and other fire-fighting equipment, water hydrants with spray nozzle and other emergency equipment such as chemical proof suits and respiratory apparatus.
- The flammable materials shall be stored in a separate safety storage room. Kept away from heat. Kept away from sources of ignition. Containers will be kept tightly closed and in a cool, well-ventilated place.
- Operating procedures will be in place with appropriate training.

Spills / Leaks: Spills will be absorbed with inert material (e.g. vermiculite, sand or earth), then placed in suitable container. All sources of ignition will be removed and a spark-proof tool used. Ventilation will be provided and a vapour suppressing foam used to reduce vapours.

Hazardous Substances & Chemicals

Some of the raw materials solvents, fuels and products are classified as hazardous substances. Based on the physical, thermal, chemical and biological properties available from the material safety data sheets (MSDS) of the various substances handled in the proposed project, the hazardous substances are identified. Storage of all chemicals shall not exceed their threshold limit, if any. All provisions as per M.S.I. of Hazardous Chemicals Rules 1989 shall be followed as required for the chemicals falling in the list of rules.

To prevent and control risk and damage, all the raw material shall be stored in leak proof MS/SS tanks at a secured and contained location with proper safety measures. MSDS will be displayed at all the prominent sites.

Storage facilities of chemicals:

Following is the list of Product wise chemicals proposed to be used for manufacturing in the plant:

S.No.	Raw material	Maximum Quantity to be stored in MT	TLQ as per MSIHC Rules (MT)	Covered in MSIHC Rules 1989 (Y/N)
Herbicides				
Pendimethalin (20MT)				
1	Dichloroethane	0.4	-	N
2	3,4-Xylidine	3.3		N
3	Imazethapyr	2.4		N
4	Technical	0.1		N
5	Nitric acid	7.0		Y
6	Pd/catalyst	0.2		N
7	Sulphuric acid	6.0		Y
ATRAZINE				

1	Toluene	0.1		Y
2	Cyanuric chloride	3.0		N
3	isopropyl amine	1.4		N
4	Caustic lye	0.7		Y
5	mono ethyl amine	1.1		N
6	soda ash	0.9		N
Metribuzin				
1	Sulphuric acid	4.2		Y
2	Triazinone	3.3		N
3	Dimethyl sulphate	2.1		N
4	soda ash	6.3		N
GLYPHOSATE				
1	FeSO4(10%)	1.0		N
2	PMIDA	6.6		N
3	Hydrogen Peroxide (50%)	2.5		Y
4	Catalyst	0.0		-
5	caustic lye (48%)	2.4		Y
Clodinafop-propergyl				
1	Acetonitrile	0.4		Y
2	RHPPA (R(+)-2-[4-(5-chloro-3-fluoropyridin-2-yloxy) phenoxy] propionic acid)	1.7		N
3	Potassium carbonate	2.8		N
4	CDFP	1.4		N
5	Propargyl chloride	0.8		N
Pretilachlor				
1	DEPA	2.3		N
2	Chloro Acetyl chloride	1.5		N
3	Hexane	0.2		Y
4	ammonia gas	0.2		Y
2, -4, Dichlorophenoxy Acetic Acid				
1	30% HCl	2.9	25t	Y
2	2,4 D sodium salt	6.0		N
Bispyribac Sodium				
1	2,6 hydroxy benzolic acid	4.0		N
2	4,6 Diethoxy2,Methyl sulfonyl pyrimidine	1.5		N
3	TBAB	0.1		N
4	Caustic soda	0.4		Y

5	Toluene	0.2		Y
6	n-butanol|+ Ethyl acetate	0.2		Y
Dicamba Technical				
1	1,2,4 tricholoro benzene	0.8		N
2	Methanol	0.4		N
3	Sodium hydroxide flakes	0.2		Y
4	HCl	5.1	25t	Y
5	NaOH	0.3		Y
6	Xylene	0.3		Y
7	48% KOH	0.9		N
8	Anhydrous potassium carbonate	1.1		N
9	CO_2 gas feeding	0.4		N
10	NaOH solution	2.2		Y
11	Dimethyl sulphate	0.8		N
Oxyfluorfen Technical				
1	3-chlorophenol	0.7		N
2	Chloroethane	0.4		N
3	HNO_3	0.4		Y
4	H_2SO_4	0.5		Y
5	4-trifloromethyl 2- chlorophenol potassium salt	1.0		N
Fungicides				
TRICYCLAZOLE				
1	3-mythyl-(1,2)-benzothiazole	2.4		N
2	KOH	2.2		N
3	DMF	0.3		N
4	1,2,4 Triazol	0.9		N
5	K2CO3	0.2		N
Hexaconazole				
1	2,4-DVP	2.8		N
2	Dimethyl sulphide	4.0		Y
3	Dimethyl sulphate	2.4		N
4	KOH	2.4		N
5	DMF	0.3		N
6	1,2,4 Triazol	2.2		N
7	Heptane	0.3		N
8	K2CO3	0.2		N
Difenconazole				
1	1,2,4-Triazole	0.3		N
2	Toluene	0.2		Y

3	DMSO	0.1		N
4	KOH	0.2		N
5	Bromoketal	1.8		N
6	IPE & PE	0.1		N
Propiconazole				
1	MDCB	1.2		N
2	AlCl3	1.4		N
3	Acetyl Chloride	0.6		N
4	Toluene	0.2		Y
5	1, 2 Pentane diol	0.9		N
6	PTSA	0.0		N
7	EDC	0.3		N
8	Bromine	1.1	40 t	Y
9	HCl 30%	0.1	25t	Y
10	DMF	0.4		N
11	1,2,4 Triazole	0.5		Y
12	K2CO3	0.3		N
Tebuconazole				
1	Dimethyl Sulphate	0.8		N
2	Sodium sulphide	0.0		N
3	Ketal	1.3		N
4	KOH	0.5		Y
5	1,2,4-triazole	0.4		N
6	K2CO3	0.1		N
7	DMF	0.2		N
Insecticides		0.0		
Thiamethoxam				
1	CCMT	6.4		N
2	MNIO	6.1		N
3	DMF	0.2		N
4	K2CO3	7.1		N
5	80% Methanol	2.8		N
Difenthiuron				
1	DTU	1.7		N
2	O-xylene	0.3		N
3	Toluene	0.3		Y
4	tert-butylamine	1.1		Y
5	N-Hexane	0.4		Y
Imidacloprid				

1	CCMP	2.9		N
2	N-NII	2.4		N
3	DMF	0.4		N
4	Na2CO3	2.2		N
5	Methanol	0.1		N
6	Catalyst	0.0		N
Fipronil				
1	CF3COOH	0.3		N
2	Monochloro benzene	0.1		Y
3	H2O2	3.5		Y
4	Thiopyrazole derivative	8.3		N
Chlorpyriphos				
1	NaTCP	2.2		N
2	DETC	1.9		N
3	Catalyst	0.0		N
4	EDC	0.9		N
5	C. S. lye 48%	0.1		Y
Metalyxyl				
1	N-(2,6- Dimethyl phenyl) alanine-methyl ester	1.3		N
2	methoxy acetyl chloride	0.7		N
3	Catalyst	0.0		N
4	Toluene	0.2		Y
5	C.S.Lye 48%	0.1		Y
Cypermethrin				
1	CMAC	2.0		N
2	MPB	1.6		N
3	NaCN	0.5		Y
4	PTC	0.0		N
5	Hexane	0.2		Y
6	Hypochlorite	5.4		N
Lambda Cyhalothrin				
1	MPBAD	3.0		N
2	TP Acid Chloride	4.1		N
3	NaCN	0.8		Y
4	n-Hexane (F)	0.8		Y
5	n-Hexane (R)	15.1		Y
6	Soda ash Soln. 5%	6.3		N
7	IPA-Solvent (R)	0.3		N
8	IPA-Solvent (F)	6.3		N
9	Catalyst-2	1.0		-
10	Catalyst	0.1		-
11	10 % Sodium hypochlorite	9.5		N

Novaluron				
1	2,6-difluoro benzoyl isocyanate	0.5		N
2	2-chloro-4-amino phenoxy ether	1.3		N
3	Monochloro benzene	0.9		N
4	Toluene	0.0		Y
Other Pesticides				
Abamectin				
1	Streptomycess avermemitis	1.9		N
2	Anthelminic	1.8		N
3	Acaricidal	1.9		N
4	Crude abamectin	5.6		N
5	Methanol	0.4		N
Emmamectin Benzoate				
1	Streptomycess avermemitis	1.5		N
2	Anthelminic	3.0		N
3	Acaricidal	3.0		N
4	Methyl amine	0.6		N
5	Methyl benzoate	0.8		N
6	Methanol	1.0		Y
Azoxystrobin Technical				
1	2,6-Dichloropyrimidine	2.1		N
2	DMF	0.5		N
3	MHPMP	2.9		N
4	Potassium carbonate	4.6		N
5	cyno phenol	1.6		N
6	Cuprus chloride	0.1		N
7	caustic soda	0.1		N
8	Hexane	0.4		Y
9	Dicholo methane	0.2		N
Acetamiprid Technical				
1	NCMA	0.9		N
2	CMAMP	1.2		N
3	Methanol	0.1		N
Propargite Technical		0.0		
1	1,2 –cyclohexane oxide			N
2	Potassium hydroxide (KOH)	0.5		Y
3	Toluene	0.3		Y
4	Thionyl chloride	1.7		Y

5	Propargyl alcohol	0.6		Y
6	p-teret. Butyl alcohol	1.6		N
7	Brine solution (15% NaCl)	8.0		N
PMIDA				
1	IDA-HCl	3.4		
2	Phosphorous acid	2.3		N
3	HCl 32%	1.9	25t	Y
4	Formaldehyde solution	2.6	5t	Y
5	Caustic solution 30%	5.2		Y
CMAC				
1	CTC	9.9		N
2	CAN	3.4		N
3	Acetonitrile	0.2		Y
4	Dea. HCl	0.1		N
5	Catalyst 1	0.1		N
6	H2SO4	12.3		Y
7	SOCl2	13.0		Y
8	IB	4.0		N
9	Hexane	28.4		Y
10	TEA	4.2		N
11	10% NaHCO3	5.5		N
12	Caustic lye	3.3		N
13	Catalyst 2	0.1		N
14	DMF	0.0		N
MPBD				
1	Benzaldehyde	1.7		N
2	Liquid Bromine	0.1	40 t	Y
3	AlCl3	7.7		N
4	EDC	0.6		N
5	Cl2	3.4		N
6	HCL	10.7		N
7	Formic acid	0.1		Y
8	Sodium Thio	0.2		N
9	Caustic Soda Lye	1.0		N
10	MEG	0.1		N
11	PTSA	0.0		N
12	Phenol	4.7		Y
13	Toluene	0.5		Y
14	Turkey red oil	0.0		N

15	Cuprous chloride	0.1		N
16	Caustic Potash	0.3		N
17	Sulphuric acid	0.5		Y
18	Sodium Sulphate	0.2		N
CCMP		0.0		
1	Sodium Tungstate	0.1		N
2	Sulphuric acid	0.6		Y
3	3-Picoline	6.2		N
4	Hydrogen Peroxide	5.4		Y
5	MDC	0.1		N
6	Triethyl Amine	0.2		N
6	HCL	0.1	25t	Y
7	Benzoyl chloride	2.7		Y
8	Sodium hydroxide	0.2		Y
9	Chloride Gas	2.7		N
10	AIBN	0.2		N
CCMT				
1	AllyL Chloride	15.7		Y
2	30% HCl	5	25t	Y
3	Catalyst-1	0.2		N
4	Catalyst-2	0.2		-
5	Chloride	11.7		-
6	Caustic Soda Flakes	8.0		Y
7	Potassium Thio Cyanate	16.7		N
8	Sulfuryl Chloride	14.4		N
9	Solvent MDC	1.1		N
4-NITRO OXYLENE				
1	Hexane	2.7		Y
2	O-xylene	20.6		Y
3	Nitric Acid + water	26.1		Y
4	Catalyst	3.2		-
Triazoles				
1	Formic acid 85%	20.0		Y
2	ammonia gas	7.0		Y
3	Hydrazine Hydrate 60%	12.0		Y

Product recovery and Emission Control:

1. Reactors will be provided with mechanical seals.
2. Solvent handling pumps will be Air Operated Diaphragm (AOD) pumps and it transfers the solvents by creating vacuum. Solvents shall be transferred in closed line and added in the vessel by side wall wetting. It ensures no vapour generation during transfer operation
3. The traces of vapour generated in the vessel shall be sent to scrubber.

Identification of Hazardous Substances and MSIHC rules reportable substances

Some of the raw materials solvents, fuels and products are classified as hazardous substances. Based on the physical, thermal, chemical and biological properties available from the material safety data sheets

(MSDS) of the various substances handled in the proposed project, the hazardous substances are identified.

Under the Environment Protection Act 1986, the Government of India formulated the Manufacturer Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989 to regulate the activities associated with the handling and storage of hazardous substance. Under these rules, the chemical substances which are considered hazardous are identified, and the threshold inventory quantities are specified above in storage of chemicals.

Design of storage Facilities

Separate storage areas for various hazardous materials handled in the plant, based on their nature and degree of hazard. They include the following category:

- Volatile raw materials and solvents
- Dry Powders
- Catalysts and additives
- Nitrocellulose cotton
- Diesel oil
- Finished products
- Solid waste

Volatile raw materials and solvents

These materials include monomers and organic solvents. They are received in sealed drums of 50-200 L capacity each. These drums will be stored in a well ventilated and covered storage area. Overhead water sprinkles and class B type portable fire extinguishers will be provided for the protection. In addition, fire hydrants shall be provided according to the TAC (Tariff Advisors Committee) guidelines. Drains will be provided for the collection of fire water into an isolated fire water containment pit.

Dry Powders

These materials are mostly the dye powders. They are received usually in sealed bags of about 25-50 kg capacity. They will be stored in a dry covered area. Portable fire extinguishers, chemical foam or dry powder type, and fire hydrants shall be provided for general fire protection.

Catalysts and Additives

These materials are received in relatively small quantities and are considered high value items. They will be stored in a well secured & air-conditioned room. Dry powder portable fire extinguishers (class D category) will be provided. Further fire hydrants will be provided for general fire protection.

Diesel Oil

The maximum inventory of diesel oil in the plant is 500L. The diesel oil bulk storage facility is MS drums at flammable RM storage area. Necessary provisions for containment of spills or overflows will be made. Fire hydrants and portable fire extinguishers will be provided as required for fire protection.

Finished Products

Separate storage areas will be provided for the liquid and solid (powder) products. The dry powder formulations and dye liquid formulation will be stored separately adjacent to the formulation area. All the other products, which are liquids or emulsions shall be stored as separate stacks in the finished goods store room. Portable fire extinguishers, chemical foam and dry powder type, and fire hydrants will be provided for general fire protection.

Solid Wastes

Separate storage areas will be provided for the hazardous and non-hazardous solid wastes. The hazardous solid wastes which include the sludge/MEE salt from the effluent treatment plant and MEE will be filled in discarded containers, sealed and stored in a covered dry area prior to the final disposal.

Process residue, spent catalyst, Incinerator ash will be packed in HDPE bags and send to TSDF site for disposal. Used oil will be packed in drums and given to approved recycler.

Storage & Transportation Method of Chemical:

Sr. No.	Chemical Name	Storage capacity (m^3)	Method of storage
1.	2,4 DCP 2,4-Dichlorophenol	40	Storage Tank
2.	DMF (N, N-Dimethylformamide)	20	Storage Tank
3.	Hexane	20	Storage Tank
4.	HCl	40	Storage Tanks
5.	Methanol	20	Storage Tank
6.	Sulfuric Acid	40	Storage Tank
7.	Toluene	10	Storage Tank
8.	Bromine	55 bottles	Capacity-25 kg
9.	Liq. Chlorine	20	Tonner Cylinders
10.	EDC (Ethylene Dichloride)	10	Storage Tank
11.	Caustic Lye	40	Storage Tank
12	H_2O_2 (Hydrogen Peroxide)	10	Storage Tank
13.	Acetic Acid	20	Storage Tank
14.	Formaldehyde Solution	20	Storage Tank
15.	MDC (Methylene Dichloride)	1	Drums
16.	Sodium Cyanide	2 MT	Drums
17.	Phosphorus Oxy Chloride	20	Storage Tank

18.	Phenol	10	Drums
19.	Nitric Acid	2	Carboys
20.	Ammonia Solution	20	Storage Tank
21.	Methyl Amine	2	Drums
22.	Ethanol	2	Drums
23.	Dimethyl Sulphide	10	Drums
24.	Acetonitrile	10	Drums
25.	Xylene	10	Storage Tank
26.	Carbon Disulphide	10	Drums
27.	Chloroethane	10	Storage Tank
28.	Benzene	10	Storage Tank
29.	Phosphorus Penta Chloride	20	Storage Tank
30.	Thionyl Chloride	10	Drums
31.	Hydrazine Hydrate	10	Drums
Drums Capacity~ 200 litres			

7.4.2.5 Mechanical:

Mechanical hazards are created by powered operation of equipment or tools.

Mechanical hazards can occur at:

1. Process machinery
2. DG set room
3. Boiler
4. Incinerator
5. Vehicular Movement

Following preventive measures will be taken:

1. Periodic replacement of critical components of machine.
2. Proper training to operators of machines.
3. Safe distance demarcating on heavy machines like cranes (during construction)
4. Sign of danger at the hazard places.

7.4.2.6 Thermal:

Thermal hazards are objects or substances that transfer energy as heat.

Pesticide manufacturing industry can have following points of thermal hazard:

- Open flame
- Boiler
- Hot machines/ equipment

The thermal hazard can cause burn of skin; following preventive measures can be taken:

- The open flame area like canteen are restricted for entry.
- Boiler section will be properly insulated and safe distance & guard are provided.
- D.G set room etc. area restricted for entry.
- Operators in the thermal hazard area will be provided with protective gears like gloves, goggles etc.
- For emergency first aid room shall be provided and well maintained.

7.4.3 Emergency Response Procedure

Even after all the preventive measures for any emergency following infrastructure has been provided:

1. There will be Emergency Control Room.
2. Assembly area demarked for Industry.
3. Communication system will be installed which includes intercom and public addressing system.
4. Fire alarm will be installed at vulnerable place.
5. The safe zones (at the time of emergency) will be displayed at different locations.
6. First Aid facility will be made available at Control room.

In case of emergency following action shall be taken:

1. The emergency shall be declared in case of following:
   - i) Fire alarm buzzing (Fire hazard)
   - ii) Vibration/Earthquake feeling (Earthquake)
   - iii) Water logging above 30 cm (Flood)
   - iv) Any unusual smell of gas or suffocating feeling (Chemical leakage)
   - v) Security alarm from main gate. (Security risk/Terrorism)
2. On declaration of emergency, communication shall be made to residents for any type emergency
3. All the resident of the affected area shall be moved to safe zone
4. The control measures shall be done as per the emergency action plan for each type of hazard.
5. All the members of disaster management cell shall take charge of their respective duties.
6. Outside help like fire tender, police ambulance etc. shall be called by site controller or Incident controller.

7.4.4 Recovery Procedure

The recovery procedure will depend on the type of emergency. Recovery procedure shall be followed by engineering section to restore the essential services.

7.5 Off Site Emergency Management Plan:

If an accident takes place in an industry/ unit & its impacts are felt outside its premises, the situation is called an **"Offsite Emergency"**. To meet such Emergencies, an Off-site Emergency Plan is required to be prepared.

Cause of off-site emergency

In a Pesticide manufacturing industry, the chemical storage room, chemical handling area & transportation of the chemicals, or a problem in the plant utilities may cause off- site emergency to occur.

The main objectives of the off-site emergency plan are: -

i. To save lives and injuries.

ii. To prevent or reduce property losses and

iii. To provide for quick resumption of normal situation or operation.

Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 prescribes for the constitution of the State Crisis Group as apex body at the State Level to deal with major chemical accidents and to provide expert guidance for handling major chemical accidents and for the constitution of District and Local Crisis Groups

Areas in vicinity (Vulnerable areas)

Major Industries in 500 m radius area:

S. No.	Industries	Type of Industry	Distance (Km)
1	RPG Lifesciences	chemical	0.05 Km N
2	Fortune Rubber	Rubber	0.05 Km SSE
3	Hemani Industries limited	chemical	0.12 Km W
4	Asian Paints	chemical	0.13 Km SW
5	Ramdev Chemical Industry	chemical	0.18 Km E
6	UPL Ltd Unit 3	chemical	0.18 Km WNW
7	ZCL Chemical Ltd	chemical	0.2 km N
8	Perfect Acids and chemicals	chemical	0.24 Km ESE
9	Samrat Pharmachem Ltd	Pharmaceutical	0.25 Km E
10	UPL ltd unit 2	chemical	0.28 Km NE
11	Sunit Dye Chem Industries	chemical	0.37 Km ENE
12	Surya Lifesciences	chemical	0.38 Km SSW

Direction from Project site	Industries near to Project site
North	ZCL Chemicals Limited,
East	Lyka Labs Ltd
West	Hemani Industries Limited
South	Fortune Rubber Products

7.5.1 Vulnerability Analysis

The vulnerable analysis is done for the hazards that may cause offsite emergency as given below:

Activity	Hazard	Severity (1-5)	Likelihood (1-5)	Severity x likelihood (1-25) (1 – Hazard with Least Concern & 25 - Hazard with Highest Concern)	Vulnerability Radius
Chemical Transportation	Spillage/ leakage	3	2	6	Approximately 50 m
	Fire/ Explosion	4	2	8	Approximately 200 m
Chemical Storage & Handling	Spillage/ leakage	3	2	6	Approximately 50m
	Fire/ Explosion	4	3	12	Approximately 200 m
Boiler Operation	Fire/ Explosion	4	3	12	Approximately 250 m

7.5.2 Preventive Measures

7.5.2.1 During Transportation

Following measures shall be adopted to ensure safe transportation:

- The transportation of the raw material, chemicals & products will be done in Leak Proof MS Tankers/Drums while transporting through trucks & tempo.
- Special refer trucks shall be employed for transportation from the port to the site.
- Cushion will be provided to the materials to prevent chemical container breakage.
- Safety data sheets will be kept & Labelling done on the tanks used for transportation of the chemicals.
- A sheet listing the materials being transported shall be available in the vehicle and the emergency phone numbers shall also be listed.
- Workers/ driver will be trained for MSDS & handling of these chemicals.
- Proper First Aid facility shall be provided within the transportation vehicle in case of any accidental release.
- The shipping paper of vehicles used for transportation of hazardous chemicals shall be proper & vehicles shall not be overloaded.

7.5.2.2 During Storage and Handling

- Based on the physical, thermal, chemical and biological properties available from the material safety data sheets (MSDS) of the various substances handled in the proposed project, the hazardous

substances shall have identified. Out of the chemicals used, the ones notified under M.S.I. of Hazardous Chemical Rules (1989) shall have the necessary provisions as specified.

- Permission for storage of hazardous chemicals over the threshold shall be obtained and necessary measures for it shall be taken.
- To prevent and control risk and damage, all the raw material will be stored in leak proof MS/SS tanks at a secured and contained location with proper safety measures. MSDS will be displayed at all the prominent sites
- Chemicals shall be stored in the environment as specified to prevent reactivity (temperature, pressure etc.)
- Handling will be done as per NIOSH guidelines
- There will be common drainage lines or water bodies near the chemical storage room to avoid contamination of water up to long distances.

7.5.2.3 Process Emission/Odour Control

1. All reactors will be equipped with condensers.
2. All reactors / storage tanks will be connected with scrubber. Reactor agitator and scrubber blower interlocked to ensure scrubber running during manufacturing activity. Scrubber liquid sent to ETP for treatment and scrubbed air let out through tall stack for effective dispersion.
3. Chemicals will be transferred in closed system from bulk tank to avoid fugitive emissions.
4. Chemicals from drums will be transferred inside the toxic cabin which will be connected with scrubber. Respirator will be used by the operator during transfer to avoid odour nuisance.
5. Cyclone available in spray drier plant and bag filter will be connected with cyclone outlet for air purification purpose.
6. Bag filters available in power blending / packing areas. Dust mask will be used during powder handling.

7.5.3 Emergency Response Procedures

Under the 'Manufacture, Storage and Import of Hazardous Chemicals Rules 'preparation of 'Off-site Emergency Plan' is covered in Rule No.14. The duty of preparing and keeping up to date the 'Off-site Emergency Plan' as per this rule is placed on the District Emergency Authority. Also, occupiers are charged with the responsibility of providing the above authority with such information, relating to the industrial activity under their control, as they may require for preparing the off-site emergency plan.

As per the rules, the main component of the Off-Site Emergency Plan is coordination with the District Authority. The District Authority (i.e. District Collector, Factory Inspector etc.) in conjunction with the company & nearby industries under mutual aid scheme and relevant emergency services should have an off-site emergency plan considering the following:

- Incidents at the site including fires and/or explosions would likely cause concern among local population. People will be advised to stay away from the area, and relevant actions shall be followed.

7.5.4 Roles and responsibilities

The roles of the various parties that may be involved in the implementation of an off-site plan are described below:

A) ROLE OF THE POLICE

- Protecting life and property and controlling traffic movements.
- Controlling bystanders, evacuating the public, identifying the dead and dealing with casualties and informing relatives of dead or injured.

B) ROLE OF THE FIRE AUTHORITIES

- The control of a fire is normally the responsibility of the senior fire brigade officer who would take over the handling of the fire from the site incident controller on arrival at the site.
- Fire authorities having major hazard works in their area should have familiarized themselves with the location on site of all stores of flammable materials, water and foam supply points and fire-fighting equipment.

C) ROLE OF THE HEALTH AUTHORITIES

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

D) ROLES OF THE GOVERNMENT SAFETY AUTHORITY

- In the event of an accident, local arrangements regarding the role of the factory inspector will apply.
- In the aftermath, factory inspectors may wish to ensure that the affected areas are rehabilitated safety.

Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 prescribes for the constitution of the State Crisis Group as apex body at the State Level to deal with major chemical accidents and to provide expert guidance for handling major chemical accidents and for the constitution of District and Local Crisis Groups.

A. Functions of the State Crisis Group

i. Review all district off-site emergency plans in the State with a view to examine its adequacy in accordance with the Manufacture, Storage and Import of Hazardous Chemical, Rules and forward a report to the Central Crisis Group once in three months;
ii. Assist the State Government in the planning, preparedness and mitigation of major chemical accidents at a site in the State;
iii. Continuously monitor the post-accident situation arising out of a major chemical accident in the State and forward a report to the Central Crisis Group;
iv. Review the progress report submitted by the District Crisis Groups;

B. Functions of the District Crisis Group

i. Assist the preparation of the district off-site emergency plan;
ii. Review all the on-site emergency plans prepared by the occupier of Major Accident Hazards installation for the preparation of the district off-site emergency plan;

iii. Assist the district administration in the management of chemical accidents at a site lying within the district;

iv. Ensure continuous information flow from the district to the Centre and State Crisis Group regarding accident situation and mitigation efforts;

v. Forward a report of the chemical accident to the State Crisis Group; and Conduct mock-drill of a chemical accident at a site each year.

C. Functions of the Local Crisis Group

i. Prepare local emergency plan for the industrial pocket;

ii. Ensure dovetailing of the local emergency plan with the district off-site emergency plan;

iii. Train personnel involved in chemical accident management;

iv. Conduct at least one full scale mock-drill of a chemical accident at a site every six month and forward a report to the District Crisis Group; and

v. Respond to all public inquiries on the subject.

7.5.5 Recovery Procedures

The recovery procedure is depending on the type of emergency. Recovery plans based on different emergencies are prepared. Recovery procedure shall be followed by engineering section to restore the essential services.

7.6 Emergency Control Team

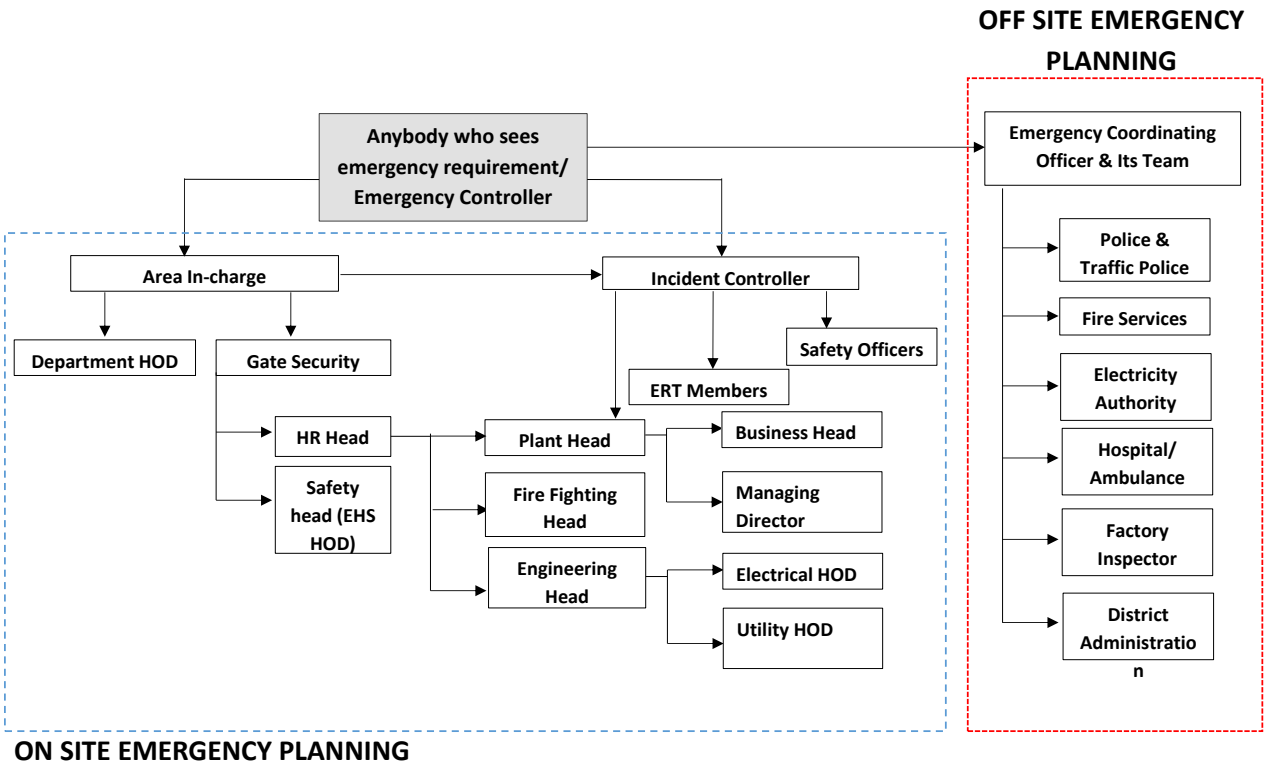
7.6.1 Key Personnel

The key personnel involved in Emergency (Onsite & Offsite) are given below:

1. Emergency Controller – Plant Head
2. Incident Controller – EHS Manager
3. Security Supervisor
4. Utilities Manager
5. Fire fighter
6. Evacuation members [Emergency Response Team (ERT) Members]
7. First Aid provider
8. Rescue members

7.6.2 Chain of command during emergency

The organizational chart for coordination within the industry as well as the external agencies is given below:



7.7 Occupational Health and Safety

Action plan for the implementation of OHS standards as per OHSAS/USEPA/NIOSH/ACGIH is being followed as given below:

- Occupational health surveillance programme shall be done six monthly & and their records will be maintained.
- At project site in case of emergency First Aid facility will be provided. A room will be provided separately with provision of bed and an experienced doctor.
- Health check-up camps will be organized regular basis at company dispensary / nearby locations for nearby peoples to evaluate exposure of the workers to chemicals during pre-placement and periodical medical monitoring.
- Prior to working with chemicals, workers will be trained on its proper handling & storage and its MSDS.
- Proper medical facility arrangements will be provided in case of any accidental release.
- Label Precautions and First Aid facility will be provided.
- Emergency plan will be prepared and mock drill of the on-site emergency will be conducted.
- Employers and employees will be made aware of the hazardous properties of materials in their workplaces, and the degree of hazard each poses.
- Inspection of the industrial activity will be done at least once in year and annually status report on the compliance with the Rules shall be submitted.

- An Environment, Health and Safety (EHS) Manager will be available, which handles all the safety issues related to man, machine & materials.
- Exterior refuge or safe areas include parking lots, open fields or streets which will be located away from the site of the emergency are present and which provide sufficient space to accommodate the employees.

BUDGET FOR OCCUPATIONAL HEALTH & SAFETY

S.No	Description	Amount (Rupees in Lacs)
1	Workers will be subjected to primary health check-up before they are employed to ascertain their health conditions. Thereafter, Regular Medical check-up & First Aid facility will be organized for workers to evaluate the adverse impact if any on these persons due to proposed activity. Occupational health surveillance programme shall be done six monthly. A safety officer / environmental officer shall be recruited.	4
2	Infrastructure facilities such as sanitation, fuel, restroom, canteen etc. shall be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.	4
3	Workers will be provided with masks, gloves, goggles & ear muffs will be provided.	1
4.	Covered transportation of vehicles.	2
5.	Insurance for worker & Tie up with ESI Hospital	4
	Total	Rs. 15 lacs

BUDGET FOR PUBLIC HEALTH AND SAFETY

Sr. No.	Impact	Mitigation	Amount (In Lacs)
1.	Health and Safety	• Health Check-up camps shall be organized. • Support to primary Health centre. • Public addressing system	5
Total			Rs. 5 lacs

Personal Protective Equipment

The level of risk of exposure to particular chemical will dictate the appropriate level of personal protective equipment (PPE) required such as side shielded safety spectacles and appropriate gloves, footwear, face shields, respiratory protection, fire-resistant clothing, or chemical suits.

- **Respirators:** A complete respiratory protection program will be instituted. It includes evaluations of workers' abilities to perform tasks while wearing CPC, Regular training of personnel, Fit testing, Periodic environmental monitoring, Regular maintenance, inspection, and cleaning.
- **Clothing:** Workers wear appropriate protective clothing to prevent skin exposure.
- **Skin Protection:** Workers wear solvent resistant gloves and clothing.
- **Eye Protection:** Workers wear splash proof chemical goggles and face shield when working with liquid, unless full face piece respiratory protection is worn.
- **Eyewash facility and a safety shower:** Common work places are equipped with Eyewash facility and a safety shower.

SAFETY IN WORK ENVIRONMENT FOR WORKER HEALTH

EXPOSURE LIMIT:

Raw material	CAS number	OSHA PEL 8-hour TWA (ST) STEL (C) Ceiling	NIOS REL Up to 10-hour TWA (ST) STEL (C) Ceiling	ACGIH 2018 TLV 8-hour TWA (ST) STEL (C) Ceiling
Dichloroethane	75-34-3	100 ppm	100 ppm	100 ppm
Nitric acid	7697-37-2	2 ppm (ST) 4 ppm	2 ppm (ST) 4 ppm	2 ppm (ST) 4 ppm
Sulphuric acid	7664-93-9	TWA 1 mg/m3	TWA 1 mg/m3	
Toluene	108-88-3	10 ppm (ST) 150 ppm (C) 500 ppm	100 ppm (ST) 150 ppm	20 ppm
Sulphuric acid	7664-93-9	TWA 1 mg/m3	TWA 1 mg/m3	
FeSO4(10%)	7782-63-0		TWA 1 mg/m3	
Hydrogen Peroxide(50%)	7722-84-1	1 ppm	1 ppm	1 ppm
Acetonitrile	75-05-8	40 ppm (ST) 60 ppm	20 ppm	20 ppm
Methanol	67-56-1	TWA 200 ppm (260 mg/m3)	TWA 200 ppm (260 mg/m3) ST 250 ppm (325 mg/m3) [skin]	
Sodium hydroxide flakes	1310-73-2	(C) 2 mg/m^3	(C) 2 mg/m^3	(C) 2 mg/m^3
HCl	7647-01-0	0.3 ppm (C) 2 ppm	(C) 5 ppm	(C) 2 ppm
NaOH	1310-73-2	(C) 2 mg/m^3	(C) 2 mg/m^3	(C) 2 mg/m^3
Xylene	1330-20-7	100 ppm (ST) 150 ppm (C) 300 ppm	100 ppm (ST) 150 ppm	100 ppm (ST) 150 ppm
48% KOH	1310-58-3		C 2 mg/m3	
NaOH solution	1310-73-2	(C) 2 mg/m^3	(C) 2 mg/m^3	(C) 2 mg/m^3
Dimethyl sulphate	77-78-1	0.1 ppm	Ca 0.1 ppm	0.1 ppm
3-chlorophenol	108-43-0			
Chloroethane	75-00-3	TWA 1000 ppm (2600 mg/m3)		

HNO_3	7697-37-2	2 ppm (ST) 4 ppm	2 ppm (ST) 4 ppm	2 ppm (ST) 4 ppm
DMF	68-12-2	10 ppm	10 ppm	5 ppm
DMF	68-12-2	10 ppm	10 ppm	5 ppm
Heptane	142-82-5	400 ppm (ST) 500 ppm	85 ppm (ST) 440 ppm [15-min]	400 ppm (ST) 500 ppm
Bromine	7726-95-6	(C) 0.1 ppm	0.1 ppm (ST) 0.3 ppm	0.1 ppm (ST) 0.2 ppm
DMF	68-12-2	10 ppm	10 ppm	5 ppm
Dimethyl Sulfate	77-78-1	0.1 ppm	Ca 0.1 ppm	0.1 ppm
K2CO3			C 2 mg/m3	
DMF	68-12-2	10 ppm	10 ppm	5 ppm
DMF	68-12-2	10 ppm	10 ppm	5 ppm
80% Methanol	67-56-1	TWA 200 ppm (260 mg/m3)	TWA 200 ppm (260 mg/m3) ST 250 ppm (325 mg/m3) [skin]	
N-Hexane	110-54-3	50 ppm	50 ppm	50 ppm
DMF	68-12-2	10 ppm	10 ppm	5 ppm
Methanol	67-56-1	TWA 200 ppm (260 mg/m3)	TWA 200 ppm (260 mg/m3) ST 250 ppm (325 mg/m3) [skin]	
H2O2	7722-84-1	1 ppm	1 ppm	1 ppm
Toluene				
NaCN	143-33-9	TWA 5 mg/m3 [*Note: The PEL also applies to other cyanides (as CN) except Hydrogen cyanide.]	C 5 mg/m3 (4.7 ppm) [10-minute] [*Note: The REL also applies to other cyanides (as CN) except Hydrogen cyanide.]	
MPBAD	107-41-5		C 25 ppm (125 mg/m3)	
NaCN	143-33-9	TWA 5 mg/m3 [*Note: The PEL also applies to other cyanides (as CN) except Hydrogen cyanide.]	C 5 mg/m3 (4.7 ppm) [10-minute] [*Note: The REL also applies to other cyanides (as CN) except Hydrogen cyanide.]	
n-Hexane (F)	110-54-3	50 ppm	50 ppm	50 ppm
n-Hexane (R)	110-54-3	50 ppm	50 ppm	50 ppm
Methyl amine	74-89-5	5 ppm (ST) 15 ppm	10 ppm	5 ppm (ST) 15 ppm
DMF	68-12-2	10 ppm	10 ppm	5 ppm
Thionyl chloride	07-09-7719		C 1 ppm (5 mg/m3)	
Propargyl alcohol	107-19-7		TWA 1 ppm (2 mg/m3) [skin]	
p-ter. Butyl alcohol	71-36-3	TWA 100 ppm (300 mg/m3)	C 50 ppm (150 mg/m3) [skin]	

Formaldehyde solution	50-00-0	0.75 ppm (ST) 2 ppm	Ca 0.016 ppm (C) 0.1 ppm [15-min]	0.1 ppm (ST) 0.3 ppm
CTC	32488-50-9	2 ppm (ST) 10 ppm (C) 200 ppm	Ca (ST) 2 ppm [60-min]	5 ppm (ST) 10 ppm
Acetonitrile	75-05-8	40 ppm (ST) 60 ppm	20 ppm	20 ppm
Thionyl chloride	7719-09-7		C 1 ppm (5 mg/m3)	
TEA	121-44-8	(C) 1 ppm	TWA 10 ppm; STEL 15 ppm	0.5 ppm (ST) 1 ppm
DMF	68-12-2	10 ppm	10 ppm	5 ppm
Liquid Bromine	7726-95-6	(C) 0.1 ppm	0.1 ppm (ST) 0.3 ppm	0.1 ppm (ST) 0.2 ppm
HCL	7647-01-0	0.3 ppm (C) 2 ppm	(C) 5 ppm	(C) 2 ppm
Formic acid	64-18-6	5 ppm (ST) 10 ppm	5 ppm	5 ppm (ST) 10 ppm
Phenol	108-95-2	5 ppm	5 ppm (C) 15.6 ppm [15-min]	5 ppm
Sulphuric acid	7664-93-9	TWA 1 mg/m3	TWA 1 mg/m3	
Hydrogen Peroxide	7722-84-1	1 ppm	1 ppm	1 ppm
Benzoyl chloride	98-88-4	1 ppm	1 ppm (5 mg/m3) 15-minute CEILING	
Sodium hydroxide	1310-73-2	(C) 2 mg/m^3	(C) 2 mg/m^3	(C) 2 mg/m^3
Formic acid 85%	64-18-6	5 ppm (ST) 10 ppm	5 ppm	5 ppm (ST) 10 ppm

Material Safety Data Sheet (MSDS)

A safety data sheet (SDS), material safety data sheet (MSDS), or product safety data sheet (PSDS) is a document that lists information relating to occupational safety and health for the use of various substances and products. SDSs are a widely used system for cataloguing information on chemicals, chemical compounds, and chemical mixtures. SDS information may include instructions for the safe use and potential hazards associated with a particular material or product, along with spill-handling procedures. MSDS i.e. LC50 oral, LD50 Inhalation and LD50 Dermal with their classification and potential

The LC50 & LD50 of all the raw material used in the proposed Pesticide Unit with their classification and Potential Hazards extracted from the MSDS sheets of all the raw materials used are given in Enclosure: 18.

WORKER HEALTH CHECKUP PLAN

Company will be conducting pre-employment and post-employment medical tests for it employees besides various educative and awareness programs on health and safety. A full-time medical assistance centre will be always available to its employees to carry out any first aids.

Pre-Employment Tests: Any employee who joins the F&R Plant goes under company prescribed pre-employment medical examination tests from a MBBS qualified doctor. The medical fitness reports will be

required to be submitted on or before joining the organization. If some new employee reports for his/her joining without Medical Examination and fitness report; he/she will not be allowed to join until Medical Examination and fitness report is produced to HR department. Such incident will also be reported to HR Head.

Annual / Bi-annual Medical Tests: Annual / Bi-annual Medical tests will be conducted in the months of January and July respectively. All those employees who will be exposed to hazardous raw materials / processes, will be examined twice a year. Presently, following departments are involved in hazardous process and covered for medical examination:

(i) Production
(ii) EHS
(iii) Quality Control
(iv) Mechanical
(v) Electrical
(vi) Instrumentation
(vii) Packing

Apart from the employees of above-mentioned departments, employees of other departments will also be covered for medical examination if they are also exposed to hazardous process due to any reason. The cost of pre-employment and during employment medical examination will be borne by company.

Exposure of workers to Raw Materials and safety Measures:

All our concerned employees will be given shop floor and classroom awareness training on hazardous raw materials that will be used. The MSDS data of raw materials will also be shared with them for their knowledge and awareness. This detailed data will also made available in medical centre for every body's information.

Following is the list of Medical Tests / occupational health surveillance program for employees.

LIST OF MEDICAL TESTS

	Existing Practice			Proposed Practice
S.N.	Pre-Employment Medical Tests	Post-Employment Medical Tests		Post-Employment Medical Tests
		Annual Medical Tests (January- February every year)	Bi-Annual Medical Tests (July-August)	
1.	Physical Examination: 1. Chest Examination 2. Weight 3. Height 4. Pulse 5. B.P.	Physical Examination: 1. Chest Examination 2. Weight 3. Height 4. Pulse 5. B.P.	Physical Examination 1. Chest Examination 2. Weight 3. Height 4. Pulse 5. B.P.	Continue
2	Urine Routine Examination -Physical Examination -Macroscopic Examination	Urine Routine Examination -Physical Examination -Macroscopic Examination	N.A.	Continue

3	Haematology -Haemoglobin -TLC -DLC -Polymorphs -Lymphocytes -Eosinophils -Monocytes -ESR (Wintrobe)	haematology -Haemoglobin -TLC -DLC -Polymorphs -Lymphocytes -Eosinophils -Monocytes -ESR (Wintrobe)	N.A	Continue
4	Liver Function Tests (LFT)(For those workers only directly exposed to chemicals)	Liver Function Tests (LFT) (For those workers only directly exposed to chemicals)	N.A.	Continue (For all the workers)
5	Chest X-pay P.A. View	Chest X-pay P.A. View	N.A	Continue
6	Vision test for near & far	Vision test for near & far	Vision test for near & far	Continue
7	Blood Sugar	Blood Sugar	N.A.	Continue
8	ECG	ECG	N.A.	Continue
9	Blood Group	Blood Group	N.A.	Continue
10	Ultrasound (Abdomen)	N.A	N.A.	Continue
11	Spirometry Test	Spirometry Test	N.A.	Continue
12	Colour Blindness Test	Colour Blindness Test	Colour Blindness Test	Continue

7.7.1 Environment, Health and Safety (EHS) Management Plan

Management Policy

The company has a written policy for the safety, Health and Environment Management. Through this policy, the company management commits itself to the following objectives.

- Meet all the relevant laws, regulations and international agreements
- Conduct its activities safely, protecting the health of all employees and the products users
- Reduce the adverse environmental impacts to a practicable minimum at an acceptable cost to the company and society
- Encourage continuous improvement in safety, health and environment performance.