:: Risk Assessment ::

1.1 Introduction

Increasing use of hazardous chemicals as raw materials, intermediates and finished products in chemical manufacturing industry has attracted attention of the Government and the public at large in view of the chemical disasters that have occurred in the past. The serious nature of the accidents, which cause damage to the plant, personnel and public, has compelled industries to pay maximum attention to the safety issues and also to effectively manage the hazardous material and operations. It is mandatory for the industries handling hazardous chemical to maintain specified safety standards and generate an on-site emergency plan and keep it linked with off-site emergency plan. The safety management includes the implementation of preventive methods or accident prevention methods to avoid incident or accident and handling of emergency in case of accident. Special studies were carried out on risk and hazard management for the SHPL plant at Kurkumbh.

1.1.1 Objective of the Risk and Hazard analysis

1) Identify hazards and nature of hazard in the process, storage and handling of hazardous chemicals.
2) Carry out Qualitative risk analysis for the process and suggest mitigation measures.
3) Carry out Quantitative risk analysis of the storage of hazardous chemicals and estimate the threat zones for Most Credible and Worst case scenarios
4) Suggest mitigation measures to reduce the risk/probability of the accident to the minimum.
5) Incorporate these measures for ensuring safe operations and safe layout and for effective preparation of On-site and Off-site emergency plans
6) Suggest Guidelines for on-site and off - site emergency plan

1.1.2 Methodology:

A] Identify hazards based on

- Processes description received.
- Identify Hazardous Chemicals handled and stored.
- Inventory of Hazardous chemicals
- Proposed storage facilities for hazardous chemicals
- Plant layout
- Safety measures to be adopted by the company

B] Hazard Assessment:

- By Qualitative Risk Assessment

- By Quantitative Risk Assessment by Hazard index calculations and estimate threat zones by using ALOHO.

C] Recommendations:

- Recommend mitigation measures based upon the above
- Recommending guidelines for the preparation of On-site Emergency plan.

1.2 Hazard Identification

Following are the major areas of hazard identified:

1) Reaction and separation sections of production unit.
2) The storage and handling of hazardous raw materials.

1.2.1 Reaction and separation sections of production unit

✓ **Qualitative Risk analysis**

The manufacturing processes are described earlier in the **Chapter 2** of EIA report. Basically these involve reactions carried out in batch reactor, separation and recovery of solvents (Used as reaction media), un-reacted components, neutralization, followed by separation and purification of the product. In such pharmaceutical API production plants, in the reaction section, separation sections are the major hazards. The hazards identified are;

1. Fire, and explosion
2. Toxic release
3. Exposure to hazardous chemicals

All the above hazards are also associated with storage of hazardous chemicals.

✓ **Reaction and separation section:**

Fire, explosion and release of toxic gases of serious nature are result of accident particularly in reactors or separation units in the production plant. The accidents can occur due to wrong operation, failure of utilities and failure of safety systems installed.

✓ **Mitigation measure:**

It is strongly recommended to take all the preventive measures to minimize the probability of the accident to the minimum and make the process and reactor operation as intrinsically safe as possible. Because prediction of realistic estimation of the extent of damage and damage control after the accident is extremely difficult in case of reactor accident.

HAZOP study is the most effective and recommended method for identification of hazards in reaction and separation sections and for incorporating necessary changes in SOP's and to provide effective instrumentation alarms and interlocks as mitigation measures to make the process/plant operation inherently safe.

All the recommendations of HAZOP study particularly for exothermic reactions will be strictly implemented in the plant.

- ✓ **Major Hazard in Reactions**

It is known that highly exothermic reactions and even mildly exothermic reactions can lead to the uncontrollable rise in temperatures and pressures in the reactors and ultimately to the conditions of run-away reaction, (mostly in highly exothermic reactions and which use solvents as reaction media or and flammable and explosive chemicals) and this results in catastrophic explosion and fire.

The major reason for occurrence of uncontrollable rise in temperature is accumulation of un-reacted reactants. This has to be avoided at any cost.

For this basic and the most important mitigation measures suggested are:

1. Setting up a (Standard Operating Procedure) SOP for all critical operations, reactions and separations.
2. Once the SOP and operating parameters have been finalized, strictly following it, 24X7, particularly for batch operations without any change of procedure.
3. Must have in built system to check that the procedures (SOP) are not violated at any time, and no short cuts are taken in batch processes. Manufacturing and production of API's are in majority batch processes.
4. Have following alarm and interlock system (essential for highly exothermic reactions and alarms recommended for all exothermic reactions)
   - Utility failure alarm
   - Agitator failure alarm
   - High temperature alarm
   - Alarm for High rate of addition of limiting reactant which is added at controlled rate.
   - Raw material (limiting reactant) addition rate should be controlled by flow control loop. (FT, FIC, FCV). Controlling parameter being reactor temperature.
   - FCV and/or On-Off valve should be interlocked with the reaction mass temperature and agitator tripping.

- ✓ **Reactions at high pressure:**

For the reactions carried out at more than atmospheric pressures following mitigation measures

will be adopted:

• Reactor will be designed at pressure which will be double than operating pressure.

• Rupture Disc and safety relief valve will be installed on the reactor to control excess pressure.

✓ **For Exothermic Reactions:**

Hazards involved are:

In exothermic reactions, in case of accumulation of reactants, it is likely to reach runaway reaction conditions, which can cause serious accident, like explosion and fire.

Mitigation Measures recommended for this and all exothermic reactions:

Following mitigation measures must be taken to avoid, accumulation of un-reacted reactants.

1. Accurate Flow indication and control of critical reactant added over a period of specific time and at specific flow rate.
2. Reaction High/low temperature alarm with interlock to critical reactant flow rate.
3. Cooling water/ chilled water failure alarm.
4. Agitator failure alarm.

Hazard:

Release of hazardous/toxic gases like SO_2, HCL, etc. in the reactions which produce hazardous gases, which have TLV and IDLH values in the range of 2-5 ppm and 30 to 100 ppm. The exposure to these gases can be harmful, in case of leakage, through flange joints to the workers in the plant and to the environment, if these are released into the atmosphere.

Mitigation measures:

1. Installation of efficient scrubbers/absorbers and ensuring proper operation as per design conditions.
2. The appropriate PPE's and breathing devices should be readily available and all the operators and staff should be trained in use of these PPE's.
3. Emergency instructions, in local languages should be displayed prominently near the work place.
4. It is also recommended to install gas leak detectors for highly toxic gases at appropriate locations.

- ✓ **Neutralization/pH adjustment Reactions:**

Safety measures to be adopted for neutralization reactions are as follows-

• Cooling system will be provided.

• Two temperature sensors will be provided, in case neutralization reactions are critical to temp variations for yield and quality.

Centrifuge operation: Safety measures adopted in centrifugation areas are as follows-

- Ensuring proper Grounding/earthing of centrifuge, to prevent static electricity built up.

• Flow rate control, while feeding slurry in solvent with low flash point as per standard operating procedure (SOP), if required maintain Nitrogen atmosphere inside the centrifuge.

• Regular maintenance and inspection as per SOP,

• Vibration sensors to cutoff centrifuge

HAZOP Study:

Detailed HAZOP studies, for all the above products have been carried out for the processes proposed to be set up at the site and all the recommendations of the study will be incorporated and implemented in the design and then on the plant.

1.2.2 Storage and handling of hazardous raw materials:

i] Hazard Identification:

This is another area of major concern for fire, explosion and exposure to and release of toxic liquids and gases and there is risk to persons, outside the factory limits getting affected.

The aim for RH analysis is;

1. To identify the hazardous materials handled and stored at the plant site. Based on the hazardous properties, conditions of storage.
2. Quantify the hazards in case of major fire, explosion or toxic release by visualization of Maximum Credible Accident Scenarios.
3. Incorporate the results of QRA for safe layout of hazardous chemicals storage in tank farm as well as in the warehouse and factory layout, in addition to the requirements of statutory rules and regulations.
4. Suggest mitigation measures to reduce the risk/possibility of the accident to the minimum.

5. Incorporate all these measures to arrive at Safe Disaster Management Plan, On-site and Off-site Emergency preparedness plan, if there is any possibility of off-site emergency. For storage and handling of the potentially hazardous material also.

ii] Hazard Analysis and Risk Assessment

Hazard analysis is the process of determining the release probabilities and quantities, emission or release rates, the routes/pathways by which the released substances could reach the receptors, the fate of the substances in environmental media through which they are transported or moved and the characteristics of the receptors at risk.

iii] Disaster Management

To provide guidelines for Disaster Management Plan (DMP) for on- site emergencies and Emergency Preparedness Plan (EPP) for off –site emergency, based on above i) & ii) studies of proposed plant. The Existing DMP Plan is attached as **Annexure [V].**

1.2.3. Characterization of Hazardous Raw Materials:

For the manufacture of above products number of organic/inorganic chemicals are used. Out of these, hazardous raw chemicals have been characterized into

A. Flammable solvents
B. Toxic and hazardous chemicals
C. Corrosive chemicals

A. Flammable solvents/chemicals

1] Flammable Solvents stored in Tanks:

There are chemicals/solvents in the category of flammable liquids. The **Annexure [I]** attached gives the list of these solvents with all the critical properties like, Flash point, Upper and lower explosion limits, Nh, Nf and Nr ratings, boiling points, MF values. {Table No. 1.1}

Out of these following solvents will be stored in underground 15 Cu. M tank each.

Table No. 1.1 Flammable Liquids

Sr. No	Solvent
1	Dimethylformamide {DMF}
2	Ethylene Di Chloride
3	Ethanol
4	Ethyl acetate
5	Heptane

6	Hexane
7	Isobutanol
8	Isopropyl Alcohol
9	Methanol
10	Methylene Dichloride
11	Toluene
12	Xylene
13	Acetone
14	CMA Solvent

2] Hazard in storage of solvents in underground tanks:

Major hazard for underground storage tanks is fire due to;

1) Leakage or failure of unloading hoses

2) Due to improper earthing of tanks and tanker from which solvent is being unloaded.

The other hazard is soil pollution due to leakage of underground tanks due to improper maintenance, use of improper anti- corrosive paint, failure to conduct regular pressure testing and thickness testing.

3] Mitigation measures to be incorporated:

Guidelines for safe storage of flammable solvents in Underground tanks:

1) It is necessary and mandatory to follow the, guidelines, rules and regulation given in Petroleum storage Rules 2002 for maintaining the clear distance between the tanks, distance of tank-farm location in the factory layout.
2) It is necessary and mandatory to obtain approval of CCE (Chief Controller of Explosives)
3) It is necessary to barricade the tank farm and put necessary sign of safety precautions, license number etc.
4) The minimum recommended separation distance from any underground tank to any building line is at least 2 m, to avoid undermining the building foundations. It is advisable to increase this distance to 6 m for a basement or pit, to minimize the risk of vapour accumulation.
5) Corrosion is one of the main causes of equipment failure. Hence it is absolutely necessary to provide corrosion protection, to the internal and external surface of the tanks. Protection may be provided by paints or other coatings.
6) Cathodic protection may be used as an additional precaution as per the Indian and /or as per the international standard AP 620.
7) Coatings should be inspected for thickness, continuity and hardness prior to installing the tank.
8) For underground tanks, a bituminous coating can be applied using the appropriate standards.
9) Internal corrosion may result from the accumulation of water in the tank. A means to remove such water may be necessary. Caution is essential when draining water from beneath the product.

10) Reliance on a single valve to retain the tank contents is not sufficient. Two permanent in-line valves to the drainage point are recommended or temporary replacement of the blanking plate by a second valve during the draining operation.
11) Similarly, underground tanks require: ■ foundations and adequate support (concrete or masonry); ■ to be securely anchored or weighted to avoid flotation from flood water or a high water table; ■ backfilling with inert material such as rounded pea gravel or with concrete. Large stones or rocks may damage the protective coating on the tank. (Note: concrete is not suitable for double-skin tanks); ■ protection from loadings from above ground, particularly from traffic. A reinforced concrete slab may be suitable. Alternatively the area around the tank should be fenced off, with the perimeter of the tank clearly marked ■ an excavation of sufficient size to prevent damage to the tank's protective coating and to allow safe work during installation and backfilling.

Mitigation measures during unloading Material from the tankers:

- ✓ Flexible hoses should only be used, taking the precaution to keep the length to the minimum.
- ✓ Hoses should be made of a standard material suitable for the application and should be compatible with the materials handled.
- ✓ They should be adequately supported (for example by slings or saddles or steel braided) so that the bend radius is not less than the minimum recommended by the manufacturer.
- ✓ When they are not in use, flexible hoses should be protected from accidental damage, extremes of temperature and direct sunlight.
- ✓ They should be inspected daily for signs of leaks, wear and mechanical damage, and examined and pressure tested annually or according to the manufacturer's recommendations.
- ✓ Hoses should be electrically continuous or bridged with an earthing cable to avoid electrostatic charging.
- ✓ Static charge generation is prevented by proper mitigation measures as per rule 78 (7): No tank (vehicle) shall be loaded at rate exceeding 1 meter /sec at the delivery end of the filling pipe until filling pipe is completely submerged in petroleum and there after loading rate may be increased gradually but should not exceed 6 meters per second in any case.
- ✓ Precautions and measures to be taken as petroleum rules 2002 Rule 44 to 49, for installing mitigation measures, the layout of tank and tank farm, loading and unloading bay.

- ✓ **Bonding and earthing:**
  (**Static electricity** is generated when movement separates charge which can then accumulate on plant and equipment and on liquid surfaces. If the plant is not earthed or the liquid has a low electrical conductivity, then the charge may be generated faster than it can dissipate. Eventually, there may be an electrical discharge or spark. If this has sufficient energy it could ignite a flammable gas or vapour.)
- ✓ To minimize the accumulation of electrostatic charge and prevent incendive sparks, all metal parts of the storage installation should be bonded together and earthed.
- ✓ A maximum resistance to earth of 10 ohms is recommended. It should be possible to disconnect the earthing facilities for periodic test measurement.
- ✓ For Further advice on earthing and bonding is it is recommended to follow the relevant

Indian or International standards. in BS 7430.40

- ✓ If the liquid has a particularly low electrical conductivity and is being stored above its flashpoint, it may be advisable to store it under a blanket of nitrogen or inject it with a static dissipating additive; if used, these degrade with time and the concentration and effectiveness should be monitored.

B] Hazardous/Toxic Chemicals

Total 31 hazardous and toxic chemicals are stored in smaller quantities in 200 liter standard drums or other standard sized containers of proper Material of Construction in the warehouse.

The details with respect to Maximum quantity to be stored, corresponding NFPA ratings with respect to toxicity, TWA/ TLV values, Boiling points, and other relevant details are given in the **Annexure [II]**

Table No. 1.2 Hazardous /Toxic Chemical

Sr. No	Hazardous chemicals	MAX QTY STORED	NH	NF	NR
1	2,6-Xylidine	2500 kg	3	1	0
2	Ammonia Gas	10 CYL./100 Kg	3	0	0
3	Cyclohexanone	2500 KGS	2	2	0
4	Di Fluorobenzene	500 KGS	0	3	0
5	Diethyl Amine	1000 KGS	3	3	0
6	Epichlorohydrine	2500 KGS	3	3	2
7	Formaldehyde	1000 KGS	3	2	0
8	Methyl Chloro acetate	2000 KGS	2	2	1
9	Methylene Dichloride	5000 KGS		1	0
10	Mono Chloro acetic acid	500 KGS	3	1	0
11	Monomethyl amine	1000 KGS	4	4	0
12	PCL3 {Phosphorous Tri Chloride}	250 KGS	4	0	2
13	Phosphoric acid	500 KGS	3	0	0
14	Pyridine	250 KGS	3	3	0
15	Sodium Methoxide	2000 KGS			
16	Tetrahydrofuran	2000 KGS	2	3	1
17	TriethylOrthoformate	2000 KGS	2	3	0
18	Triethyl amine	500 KGS	3	3	0

Toxicity Index is calculated for the following chemicals which has high Nh rating, more than 3 and low TLV/TWA values [**Table No. 1.3**]. Details are given in **Annexure [III]**

Table No.1.3 Toxic Chemical

Sr. No	**Hazardous chemicals**	NH	TLV ppm	**TI**
1	0rthoPhosphoric acid	3	0.75	**22.125**
2	2,6-Xylidine	3	0.6	**22.125**
3	Ammonia Gas	3	25	**19.175**
4	Diethyl Amine	3	25	**19.175**
5	Formaldehyde (37% sol)	3	0.3	**22.125**
6	Methylene Dichloride/chloride	3	50	**19.175**
7	Mono Chloro acetic acid	3	0.3	**22.125**
8	Monomethyl amine	3	10	**19.175**
9	Epichlorohydrin	4	2	**26.55**
10	PCL3 {Phosphorous Tri Chloride}	4	0.5	26.55
11	Phosphoric acid	3	0.75	**22.125**
12	Pyridine	3	5	**22.125**
13	Triethylamine	3	3	**22.125**

Toxicity Index values are ranked as:

1-5 Light

6-9 Moderate

10-up High

Toxicity index is very high for all the chemicals handled as calculated above.

Mitigation measure:

Mitigation measures and special precautions in handling of hazardous and toxic chemicals are given below. This includes measures for handling of hazardous solids like Sodium, Magnesium nitrate etc.:

I] FOR METHYLENE CHLORIDE/ METHYLENE DICHLORIDE (DICHLOROMETHANE)

- **Understanding the Potential Hazards of Dichloromethane**

Classified as a neurotoxin, dichloromethane has been proven to cause damage to the brain and central nervous system (CNS). The Environmental Protection Agency (EPA) has classified it as a probable human carcinogen since high levels of exposure to the chemical has been proven to cause liver and lung cancer in animals.

- **The following health risks are associated with exposure to dichloromethane:**

Inhalation - can cause coughing, wheezing and/or shortness of breath. Higher levels of dichloromethane inhalation can lead to headache, mental confusion, nausea, vomiting, dizziness and fatigue.

Skin Exposure - Redness and irritation may occur if skin comes in contact with liquid dichloromethane and, if it remains on the skin for an extended period of time, it may lead to skin burns.

Eye Exposure - Contact with eyes can cause severe irritation and possibly chemical burns to the eyes.

- **Safety Precautions When Handling Dichloromethane**

When handling dichloromethane in the workplace, use the following safety precautions:

- Wear protective clothing. Footwear should cover the entire foot.
- Always wear PPE such as chemical splash goggles and safety gloves.
- Work in a well-ventilated area (preferably in an environment with a fume extraction system).

- **Storage:** Dichloromethane is highly volatile and should be stored in a cool, dry area in tightly closed, labeled containers. This chemical needs to be kept away from metals, light and any source of heat or ignition.

- **What to Do When Exposed to Methylene Chloride**

Here are the safety steps that need to be taken if exposed to Methylene Chlorides occurs:

- Employ effective engineering controls, good work practices and proper maintenance procedures.
- Ideally, all work with Methylene dichloride should be conducted in a chemical fume hood or in another type of appropriate exhaust ventilation. Using enclosed processes may also control exposure.
- Provide appropriate personal protective equipment (PPE) such as safety glasses with side shields, splash-proof goggles, and/or chemical-resistant aprons, coveralls, lab coats and gloves.
- Require that workers change any clothing that becomes contaminated with Methylene dichloride.
- Eating, drinking, smoking and the storage of food should be prohibited in areas where Methylene dichloride is stored or used.
- Exposures that cannot be controlled with ventilation or other work practices may require the use of a respirator.
- When possible, replace Methylene dichloride with a chemical that has been shown not to cause cancer or other adverse health effects in animals or humans.
- It is recommended that workers who are or who may be exposed to Methylene dichloride be given a copy of this fact sheet.
- Immediately and thoroughly wash with soap and water all areas of the body that come into contact with Methylene dichloride. Know the location and proper operation of safety showers in your immediate work area.

- **Disposal / Recovery:**

- Methylene chloride/ dichloride should be collected with other halogenated solvents
- It will recover all the through safe handling procedure and send back to the supplier/ original manufacturer.

III] 2-6 Xylidine :

2-6 Xylidine is to be handled with extreme care as it is a carcinogenic chemical. Regular medical checkup is advised and if there are symptoms the worker should be immediately referred to a specialist**.**

- **Exposure** to high levels will interfere oxygen carrying capacity of blood and breathing and may lead to death.
- 2-6 Xylidine affects liver.
- **Odour threshold limit id 0.005 ppm and TLV is 5 ppm**
- **Ways to reduce exposure:**

- Use local ventilation exhaust conditions, if not possible use breathing apparatus, recommended PPEs
- Workers need to be properly informed and trained to handle this.
- As far as possible use suitable air operated pump to transfer TC from the work place to the user end.
- Eye and shower facilities should be installed at the nearest possible position and it should be ensured that it is always in working condition.
- Spill kit must be kept handy to absorb small leaks and disposal.

IV] 1,4-Difluorobenzene Flash point 2 Deg C

Use explosion-proof electrical/ventilating/lighting/equipment. Use only non-sparking tools Take precautionary measures against static discharge. Wear protective gloves/protective clothing/eye protection/face protection Skin IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower Fire In case of fire: Use CO_2, dry chemical or foam for extinction. Store in a well-ventilated place. Dispose of contents/container to an approved waste disposal plant.

Flash Point 2 °C / 35.6 °F

V] Phosphorus trichloride

- Exposure on long term basis may damage kidneys and liver. It is highly reactive and with explosive hazard TLV is 0.2 to 0.5 ppm.
- Medical test advised are for kidney and liver function.
- To reduce exposure use of barrel /automatic pump.
- Must be stored away from oxidizing chemicals

Special Remarks on Reactivity: It has a violent reaction with water producing hydrochloric and phosphoric acid releasing toxic and/ or corrosive gases. Incompatible with acetic acid, **aluminum, chromyl chloride**, nitric acid, organic matter, potassium, sodium, water, combustible materials, alcohol.

Chronic Effects on Humans: May cause damage to the following organs: blood, kidneys, lungs, liver, upper respiratory tract.

Other Toxic Effects on Humans: Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (irritant), of ingestion, .

Hazardous in case of skin contact (corrosive, permeator), of eye contact (corrosive). Slightly hazardous in case of skin contact (sensitizer).

VI] Pyridine

Odour threshold limit 0.66 ppm, TLV 5 ppm, No evidence to cause Cancer. Excessive exposure will damage kidneys, liver & brain confusion. Exposure can affect developing fetus. The substance may be toxic to blood, kidneys, liver, mucous membranes, peripheral nervous system, eyes, central nervous system (CNS). Repeated or prolonged exposure to the substance can cause organs damage.

Medical test advised are for kidney and liver function. Alcohol consumption will enhance liver damage, combined with exposure to Pyridine.

To reduce exposure use of barrel /automatic pump is advisable.

It is Incompatible with oxidizing chemicals and chloroform.

Use only non-sparking tools while opening the drums. During transfer containers should be grounded.

VII] Phosphoric Acid : Work place limits are not established hence not harmful

VIII] Diethyl amine:

Odour threshold 0.02 to 14 ppm TLV =10 ppm TWA 25 ppm.

Medical tests advised: Liver & kidney function tests.

Non compatible with oxidizing and acids like HCl

IX] Monomethyl amine

Odour threshold 4.7 ppm.

X] Epichlorohydrin: When inhaled it can affect to respiratory tract and when absorbed through skin can cause severe burns,

Carcinogen and has to be handled with extreme care.

It is flammable and reactive and can polymerize violently when exposed to heat. ACIGH exposure limit is 0.5 ppm. IDLH = 75 ppm

XI] Triethylamine TLV = 3 ppm

The substance is toxic to kidneys, liver. Repeated or prolonged exposure to the substance can result in target organs damage.

XII] Sodium Metal

Sodium Auto-Ignition Temperature: 115°C (239°F)

Fire Hazards in Presence of Various Substances: Extremely flammable in presence of moisture. Highly flammable in presence of open flames and sparks of heat.

Fire Fighting Media and Instructions:

Small Fire: Obtain advice on use of water. Use DRY chemical powder. **Large Fire**: Use water spray or fog. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits toxic fumes.

Large Spill: Flammable solid that, in contact with water, emits flammable gases. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Cover with dry earth, sand or other non-combustible material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Precautions: Keep under inert atmosphere. Keep container dry. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes keep away from incompatible materials such as oxidizing agents, acids and moisture.

Storage: Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. Keep container dry. Keep in a cool place.

Incompatibility with various substances: Highly reactive with oxidizing agents, acids and moisture. The product reacts violently with water to emit flammable but non toxic gases.

XIII] Magnesium metal:

Explosion Hazards in Presence of Various Substances: Risks of explosion of the product in presence of mechanical impact. Risks of explosion of the product in presence of static discharge: Explosive in presence of acids or moisture.

Fire Fighting Media and Instructions: Flammable solid. **Small Fire**: Use DRY chemical powder. **Large Fire**: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, auto-ignition or explosion.

Special Remarks on Fire Hazards: Magnesium turnings, chips or granules, ribbons, are flammable. They can be easily ignited. They may reignite after fire is extinguished. Produces flammable gases on contact with water and acid. May ignite on contact with water or moist air. Magnesium fires do not flare up violently unless moisture is present.

Special Remarks on Explosion Hazards: Reacts with acids and water to form hydrogen gas which is highly flammable & explosive.

Special Remarks on Reactivity: Violent chemical reaction with oxidizing agents. Reacts with water to create hydrogen gas and heat. Must be kept dry. Reacts with acids to form hydrogen gas which is highly flammable and explosive.

Incompatibility: Magnesium forms hazardous or explosive mixtures with aluminum and potassium perchlorate; ammonium nitrate; barium nitrate, barium dioxide and zinc; beryllium oxide; boron phosphodiiodide; bromobenzyltrifluoride; cadmium cyanide; cadmium oxide; calcium carbide; carbonates; carbon tetrachloride; chlorine; chlorine trifluoride; chloroform; cobalt cyanide; copper cyanide; copper sulfate(anhydrous), ammonium nitrate, potassium chlorate and water; cupric oxide; cupric sulfate; fluorine; gold cyanide; hydrogen and calcium carbonate; hydrogen iodide; hydrogen peroxide; iodine; lead cyanide; mercuric oxide; mercury cyanide; methyl chloride; molybdenum trioxide; nickel cyanide; nitric acid; nitrogen dioxide; oxygen (liquid); performic acid; phosphates; potassium chlorate; potassium perchlorate; silver nitrate; silver oxide; sodium perchlorate; sodium peroxide; sodium peroxide and carbon dioxide; stannic oxide; sulfates; trichloroethylene; zinc cyanide and zinc oxide.

XIV] Magnesium Nitrate

Explosion:
Contact with oxidizable substances may cause extremely violent combustion.

XV] Aluminum Chloride

Chronic Effects on Humans: Causes damage to the organs: lungs, mucous membranes. Other Toxic Effects on Humans: Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive). Toxic & hazardous properties of products & others raw material are presented in the **Table No. 1.2 & Table No. 1.3**

Flammable solvents stored in drums: Out of the 31, chemicals mentioned above, following are Flammable Class A chemicals with Flash point less than 23 deg C: Trimethyl amine, Tetrahydrofuran, Pyridine, Diethyl Amine. They will be stored in drums in a warehouse.

Hazard Identification for Flammable solvents stored in drums:

Major hazards involved in storage of flammable liquids in the containers, like drums are: Fires and vapour explosion due to leakage of liquids coming in contact with ignition source. The extent of a fire or explosion hazard depends on the amount of flammable vapour given off from liquid which is determined by: the temperature of the liquid; the volatility of the liquid; how much of the surface area is exposed; how long the liquid is exposed for; and the air movement over the surface.

Physical properties of the liquid give additional information on how vapour/air mixtures may develop into serious potential hazards. These physical properties include: flashpoint; auto-ignition temperature lower and upper explosion limits.

Reasons

Main reasons for fire are, lack of awareness of the properties of flammable liquids; operator error, lack of training; inadequate or poor storage facilities; hot work on or close to flammable liquid; exposure to heat from a nearby fire; decanting flammable liquids in unsuitable storage and dismantling or disposing of containers containing flammable liquid.

Mitigation Measures:

1. Proper and adequate training to the operators, contract workers on the hazards and precautions. SOP must follow while handling and transferring flammable liquids. Make sure that they don't lose the fear of hazards involved in handling of flammable solvents and consequence of the accident.
2. Must have standard work permit system for carrying out any maintenance work, hot or cold near the storage of flammable liquids. Ensuring that this is implemented always and strictly.
3. In the design of storage of warehouse ensuring implementation of following 5 principles will reduce the possibility of accidents to the minimum
    - ✓ **Ventilation:** Good ventilation means vapours given off from a spill, leak, or release, will be rapidly dispersed.
    - ✓ A good standard of ventilation is required in buildings or rooms used for storing flammable liquids, to disperse the vapours from any small releases. The ventilation arrangements need to take into account the heavy nature of the vapours and to ensure adequate air movement at high and low levels.
    - ✓ Five air changes per hour are normally sufficient to ensure vapor levels in the store are kept to a low level. For small buildings, the simplest method of ensuring adequate ventilation is to provide fixed, permanent openings
    - ✓ **Ignition:** Have all ignition sources been removed from the storage area, by FLP electrical fittings, no sparking by ensuring permit system during maintenance work, Declaring this as NO Smoking and No naked flame area.
    - ✓ **Containment:** Use of proper containers, providing spill kit, proper drainage of spillage to safe place, collection and recycle. Containers should be stored in at ground level (singly or in stacks). This enables leaks or releases to be quickly seen and allows for any vapors to be dispersed effectively by natural ventilation.
    - ✓ **Exchange:** Substituting with less flammable liquid.
    - ✓ **Separation:** flammable liquids should be stored well away from other processes and general storage areas. If necessary the storage should be separated by a physical barrier, wall or partition.

Following Hazardous solids are stored in the warehouse:

Table No. 1.4 Hazardous solids are stored in the warehouse

Sr. No	Hazardous chemicals	MAX QTY STORED	NH	NF	NR
1	Aluminum Chloride	1500 KG	3	0	0
2	Sodium Nitrite	300 KG	2	0	0
3	Sodium metal	1000 KG	3	3	2
4	Magnesium turning	1000 KG	1	3	2
5	Magnesium Nitrate	1000 KG	2	0	3
6	5-Chloro 2-Nitro Benzoic acid	2500 kg			
7	Chloroacetylchloride	500 KG	3	1	0
8	Fumaric acid	500 KG	2	1	0
9	P-Hydroxy Benzyl alcohol	500 KG	2	1	1

Special precautions in storage and handling of Sodium metal, Magnesium turnings, Magnesium Nitrate are given in the earlier part dealing with storage of toxic/hazardous chemicals.

1.3 Warehouse Design:

Warehouse for the storage of chemicals in drums having adequate area will be constructed as per the IS code 3594 and other relevant standards;

Major points are from the code are given below:

1. Roadways around warehouse should be min 5 meters wide and compound gates min 4.5 m wide
2. Floor areas: WH should be divided to have max 750 sqm by separating walls. Dimensions LXW not exceeding 40 meter.
3. Floors should have 2 hrs fire resistances.
4. Buildings used for storage of hazardous and extra-hazardous goods should be preferably of single storied structure and in no case should exceed 2 stories in height

5. In no case should a storage building exceed 15 m in height
6. Floor Drainage The floors should be of watertight construction and Scuppers of not less than 20 cm sq cross sectional area should be provided at no more than 6·0 m intervals or as required to take care of maximum water discharge from hydrant/sprinkler system.
7. External Drainage External drains of not less than 25 CM width and 30 Cm depth should be provided along the side of each building and so constructed that any flow of water from the building be directed to a suitable ground tank or reservoir or public drainage system in the vicinity not leading to a natural water source. No external drainage of warehouses storing hazardous goods should be connected to public drainage system which leads directly to a natural water source.
8. Every storage/warehouse building should have a minimum of two exit doorways and at the rate of one exit doorway per every 30 m length of the external walls of the building
9. The means of exit as well as the exit ways, travel distances, etc, should be as per the guidelines given in IS 1641 : 1988 If used for storage of hazardous goods, it should conform to Type I of IS 1642 : 1989.

1.3.1. Additional measures suggested for improving Warehouse Safety

Measures suggested for improvement in the design of warehouse:

1. Dividing warehouse into fire compartments, by suitably designed firewalls, to limit the spread of fire.
2. Limiting the quantity of hazardous chemicals stored.
3. It is safe practice to store explosive, self igniting, oxidizing and organic peroxides separately, preferably in different compartments.
4. Storage of chemicals should be planned by categorizing them based on their hazardous properties, like toxicity, flammability, explosibility, for which MSDS needs to be critically studied.
5. Based on the above, proper segregation of materials should be achieved.
6. Installation of smoke, fire and toxic gas leak detectors.
7. It should be easily possible to reach and attend toxic chemical leakage.
8. There should be enough space and pathways for easy approach and escape.
9. Having all flameproof fittings inside the warehouse.

1.4 Storage of Coal & Briquette

For the boiler, Coal and Briquette will be used as fuels. These will be stored in the areas earmarked for these fuels.

1.4.1 Mitigation measures for Coal and Briquette storage

1. Fire hydrant lines (self auto-mode fire fighting) will be laid around these areas.**[Annexure{VII}]**
2. No hot work will be permitted in this area without safety permit.
3. There will be no high voltage (H.T.) transmission lines over & near Briquette and coal storage.
4. All useful material will be stored far away from storage of Briquette and coal area.
5. Proper supervision staff with necessary communication facility will be deployed.
6. Training will be arranged for all the staff in normal & emergency operating system. Proper training will be imparted for creating awareness among workers about sudden Briquette and coal fire and emergency action plan. This will be part of On-site-emergency plan.

1.5 Quantitative Risk Analysis (QRA) for solvents stored in underground tanks:

Basis for QRA calculations

1. All the flammable solvents are stored in 15 cum underground tanks. All necessary safety measures are in place.
2. Fire/ accident can occur only while there is leakage in the hose connecting tanker and the underground tank, during unloading. Road tanker of 10 cum capacity is assumed.
3. Road tanker dimensions maximum diameter = 8 ft. i.e. 2.5 meter and length = 1.88 meters, approx. 2 meters.
4. MCA scenario is assumed to be leakage through 10 mm diameter hole in the unloading hose of 50 mm diameter.
5. Worst case 50 mm pipe getting disconnected from the tanker during unloading operation.
6. **Atmospheric Data:** Wind: 4.5 miles/hour from WNW at 3 meters
7. Ground Roughness: open country Cloud Cover: 5 tenths
8. Air Temperature: 35° C Stability Class: B
9. No Inversion Height Relative Humidity: 5%
10. **Source Strength**:
11. Leak from hole in unloading hose
12. Flammable chemical is burning as it escapes from tank
13. Tank Diameter: 2.5 meters Tank Length: 2.04 meters
14. Tank Volume: 10 cubic meters
15. Tank contains liquid Internal Temperature: 35° C
16. Chemical Mass in Tank: 6,590 kilograms
17. Tank is 85% full
18. Circular Opening Diameter: 1 centimeters

Summary of the results

For Acetone

Scenario	Leakage	Release duration	Qtykgs	Flame length Meters	Puddle dia meters	Threat zone in meters	Threat zone in meters	Threat zone in meters
						10KW/sq m	5 KW/sq m	1.2 sq km
Scenario	10 mm hole n hose	60 minutes	212	3.3	1.2	<10	< 10	<10
Scenario 2	50 mm hose disconnected	60 min	5306	10	6.1	12	17	25

For Hexane

Scenario	Leakage	Release duration	Qtykgs	Flame length Meters	Puddle dia meters	Threat zone in meters	Threat zone in meters	Threat zone in meters
						10KW/sq m	5 KW/sq m	1.2 sq km
Scenario	10 mm hole n hose	60 minutes	196	4	0.8	<10	< 10	<10
Scenario 2	50 mm hose disconnected	60 min	4910	13	4	13	19	30

For Toluene

Scenario	Leakage	Release duration	Qtykgs	Flame length Meters	Puddle dia meters	Threat zone in meters	Threat zone in meters	Threat zone in meters
						10KW/sq m	5 KW/sq m	1.2 sq km
Scenario	10 mm hole n hose	60 minutes	224	3	1	<10	< 10	<10
Scenario 2	50 mm hose disconnected	60 min	5609	10	4.9	17	21	29

For EPICHOROHYDRIN

Scenario	Leakage	Release duration	Qtykgs	Puddle dia meters	Threat zone in meters	Threat zone in meters	Threat zone in meters
					IDLH 75 ppm	10 ppm	2 ppm

Scenario	10 mm hole in hose	1 minutes	14.5	7.3	31	88	198
Scenario 2	0.5 mm hole in hose	60 min	3.6	3.96	16	45	101

Mitigation Measures based on QRA (in addition to mitigation measures suggested in the earlier part of the report :

- Even minor leak and pool fire can create a serious situation, in 3-4 meters area around.
- Even minor leak in case of Epichlorohydrin, will result in serious situation and area of 16 meters around. Where the concentration will be 75 ppm which will of Immediate Danger to life. Hence all recommended PPEs must be available in the nearest location and leak should be attended only after wearing appropriate PPEs.
- Emergency situation will be within 100 to 200 meter area.

QRA for toxic chemicals stored in drums:

QRA has been done for the following conditions:

1. Wind: 5 meters/second from NW at 3 meters
2. Ground Roughness: open country
3. Cloud Cover: 0 tenths
4. Air Temperature: 35° C
5. Stability Class: C
6. No Inversion Height
7. Relative Humidity: 5%

Under following storage conditions:

- Chemical stored in standard 200 liter drum/carboy of Diameter: 0.58 meters, Height: 0.88 meters
- Volume: 0.23 cubic meters, Tank is 85% full, Internal Temperature: 35° C
- Chemical Mass in Tank: 202 kilograms
- Circular Opening Diameter: 0.5 centimeters
- Opening is 20 centimeters from tank bottom
- Ground Type: Concrete

Results for Phosphorous Tri Chloride

Scenario	Leakage	Release duration	Qty kgs	Puddle dia Meters	IDLH 25 ppm Threat zone in meters	AEGL=2 ppm Threat zone in meters	TLV = 0.5 ppm Threat zone in meters
Scenario 1	5mm hole	60 min	4.43	3.6	33	116	234
Scenario 2	10 mm hole	60 min	224	3.4	63	229	465
Scenario 3	Instantaneous source	1 min	20		236	881	1700
Scenario 4	Instantaneous source	1 min	5		116	431	883

Results for 2-6 Xylidyne Instantaneous release

Scenario	Leakage	Release duration	Qtykgs	Puddle dia Meters	PAC =150 ppm	PAC= 10 ppm	TLV= 0.6 ppm
Scenario 4	Instantaneous source	1 min	5		29	113	474

Results for Pyridine

Scenario	Leakage	Release duration	Qtykgs	Puddle dia Meters	IDLH =1000 ppm ppm Threat zone in meters	PAC= 7 ppm Threat zone in meters	TLV = 5ppm Threat zone in meters
Scenario 1	5mm hole	60 min	24.1	3.1	<10	59	90
Scenario 2	10 mm hole	60 min	77	4.9	<10	96	147
Scenario 4	Instantaneous source	1 min	5		23	300	465

1.5.1 Conclusion & Recommendations from QRA (in addition to mitigation measures suggested in the earlier part of the report :

1. It is extremely dangerous to physically/manually transfer any of the toxic materials even in small quantities like 5 kgs in bottles or carboys for charging or for any purpose as leakage/spillage will endanger the life of person carrying it and large area around 20 to 100 meters of leakage will be seriously affected.
2. Leak detectors to be installed.
3. Spillage kit and appropriate PPEs and breathing apparatus should be available. Personnel working in this area should be properly trained to contain and deal with toxic leakages.

1.6 Occupational Health Center (OHC):

The company will have OHC and other medical facilities at the site as per the factories act, and number of employees.

Some guide lines are given below:

Under rule 73 W All factories carrying out hazardous processes must have OHC with services and facilities

A) For factories employing up to 50 workers: i) Medical officer on retainership basis, ii) minimum 5 workers trained in first aid, at least one shall be available during all working hours. iii) Fully equipped first aid box
B) For factories employee 51 to 200 workers
    a. OHC with min. floor space of 15 sq. meters
    b. Part time medical officer
    c. One qualified and trained dresser-cum- compounder throughout all working hours.
    d. Equipped first aid box
- For factories employing more than 200 workers,
    i) Full time medical officer up to 500 workers, and one more full time medical officer for every additional 1000 workers or part thereof
    ii) OHC with 2 rooms
    iii) one compounder and one ward boy 24 by 7 iv) OHC to be equipped all emergencies
    iv) With what OHC should be equipped with is given in details in schedule

Requirement of Ambulance van for any factory carrying on hazardous process shall be provided and maintained is defined under 73-X.

For factories with less than 200 workers, management must have an arrangement for getting ambulance van at short notice it also details out what facilities ambulance Van should have other important requirements are: company must have, MSDS for all hazardous chemicals at site***[MSDS : Annexure {IV}]***

Pre-employment medical checkup and six monthly medical check-up for all employees, including contract workers must be available. Since the operation involve storage and handling of toxic chemicals, affecting liver, kidneys, lunges, medical test must include the specific tests to check functioning of these vital organs. For existing plant, medical tests were successfully done & all the reports are normal. No abnormalities have been detected. While the entire medical test includes physical examination, past history, systematic examination, Haemogram, Blood sugar Test, FVC test, Audiogram test & ECG test. Sample of Medical reports of workers for existing plant are enclosed as ***Annexure [V].***

- **EHS policy:** The Company's EHS policy, if needed will be modified and displayed and known to the employees must inform district officials and hospitals.

- **On-site and Off-site Emergency plan (Disaster Management Plan)**: For existing plant, Disaster management plan already developed. For proposed plan DMP shall be prepared on similar line. Company has to declare that the existing OEP will be modified, as per the guidelines. Copy of Onsite emergency plan enclosed with ***Annexure [VI]***

1.7 Transportation of Raw Material/Safety Guidelines for transportation of Solvent & Hazardous Chemicals

Following recommendations will be followed while fixing the transport agency for transporting Class A solvents and other hazardous chemicals:

Recommendations for transport of Class A chemicals and hazardous chemicals

Class A Solvents transport: Rules to be followed and precautions to be taken. The Petroleum Act and the Petroleum rules 2002 clearly specify in PART IV "TRANSPORT ON LAND BY VEHILES" UNDER RULES 62 TO 86 mandatory for the transportation of Class A chemicals.

A. Rule No 63: CCE Approval required for tank and vehicle used for transportation.
B. Rule No 64: deals with tank capacity limits and solvent filling limits in the tank.
C. Rule No 65: clearly specifies that the vehicle approved for Class A solvent will not be used for transportation of any other purpose.
D. Rule No 69: No other article can be transported in the vehicle transporting Class A chemical.

E. Rule No 70: makes it mandatory to have spark arrestor fitted to the exhaust pipe of the vehicle and engine air intake fitted with effective flame-arrestor.
F. Rule No 71: specifies Electrical installation requirement for the tanker.
G. Rule No 72: specifies that it is mandatory to carry Fire Extinguisher of minimum 10 kg capacity.
H. Rule No 73: specifies that it is mandatory to have at least one person with knowledge attending the vehicle 24X7 during parking.
I. Rule No 74: specifies regarding parking of vehicle in the public place.
J. Rule No 76: specifies for loading and unloading of the tanker.
K. Rule No 78: specifies precautions against static charge, the most important being (7) of the same.
L. Rule No 79: specifies precautions against electrical hazard: No loading or unloading unless the engine is switched off.
M. Rule No 83: specifies tanker loading and unloading to be restricted between sunrise and sunset.
N. Rule No 84: prohibits smoking /open flame etc.

Common Guidelines for transport and handling hazardous chemicals and Class A solvents:

It will be ensured that during the transportation contents are not spilled.Personnel, including the driver and cleaner are properly trained about the hazardous properties of the material being carried and for transport of hazardous material, in general.

- Tanker must be RTO approved and tested and approved by CCE for Class A solvents. Frequently tested for integrity. Certificate must be available.
- Vehicle must have safety equipment/PPEs and antidote if necessary.
- It is mandatory that driver possess a valid driver's license.
- The maximum speed limit is prescribed.
- Driver will be instructed to park the tanker at safe place and they should be available in the near vicinity.
- TREM (Transport Emergency) cards are to be provided to the drivers.

Annexure 1{I}

List of Solvents Stored

Sr. No.	Name of Solvents	LEL	UEL	F Point deg C	B.P.	NFPA Hazard Index			
		(%)	(%)		(^{0} C)	N_h	N_f	N_r	M.F.
1	Acetone	2.6	13	-20	56	1	3	0	16
2	CMA Solvent	3.5	19	9	78	2	3	1	16
3	DMF	2.2	15.2	57	153	2	2	0	
4	EDC	6.2	15.6	13	83.5	2	3	0	
5	Ethanol	3.3	9	16	78	2	3	0	
6	Ethyl acetate	2.2	9	minus 4.4	77	1	3	0	
7	Heptane	1.05	6.7	minus 4	98.4	1	3	0	16
8	Hexane	1.1	7.5	minus 22.5	68	1	3	0	
9	Isobutanol	1.2	10.9	28	108	2	3	0	
10	Isopropyl Alcohol	2	12	11.7	83	1	3	0	16
11	Methanol	5.5-6	31-36.5	16.1	65	1	3	0	16
12	Methylelene chloride	12	19	NA	39	2	1	0	
13	Toluene	1.1	7.1	4.44	110.62	2	3	0	16
14	Xylene	1	7	24	138	2	3	0	

Ethylene Dichloride CARCINOGENIC EFFECTS: Classified + (PROVEN) TWA 10 ppm

Annexure [II]

List of Hazardous Chemicals Liquid Stored In Warehouse

Sr. No	Hazardous chemicals	MAX QTY STORED	NH	NF	NR	TWA/TLV PPM	B.P DEG C		SPL TOXICITY	CONTINER SIZE LITERS
1	0rthoPhosphoric acid	300 kg	3	0	0	3 mg/ cu m	158	mp 40 deg c	skin	100/50
2	2,6-Xylidine 2500 kg	2500 kg	3	1	0	0.5 TO 2	216		PL SEE NOTE	200
3	4-Methyl Isocyanate	100 kg					180			25/50
6	Ammonia Gas [10 Cylinders of 100 kg each]	10 CYL.	3	0	0	25ppm /17mg/cu m	Gas			100 Kg
9	Cyclohexanone2500 kg	2500 KGS	2	2	0	TWA 25 ppm	155			200
10	Cyclopentane anhydride	NA							MSDS NA	
11	Di Fluorobenzene500 kg	500 KGS	0	3	0		88-89		PL SEE NOTE	100/50
12	Diethyl Amine1000 kg	1000 KGS	3	3	0	TWA 25	55	**F P MINUS 18 Class A**		200/100
13	Epichlorohydrine2500 kg	2500 KGS	4-Jan	3	2	2-3 ppm	115			200
14	Formaldehyde (37% sol)1000 kg	1000 KGS	3	2	0	0.3	96			200
18	Methyl Choro acetate 2000 kg	2000 KGS	2	2	1		130			200

19	Methylene Dichloride/chloride 5000 kg CAS#: 75-09-2	5000 KGS	3	1	0	TWA 50ppm	39		CAS#: 75-09-2	200
20	Mono Chloro acetic acid 500 kg	500 KGS	3	1	0	TWA 0.3 ppm	189			100/50
21	Monomethyl amine 1000 kg	1000 KGS	3	1	0	10 PPM	MINUS 6		PL SEE NOTE	200
22	PCL3 {Phosphorous Tri Chloride} 250 kg	250 KGS	4	0	2	TWA 0.5 PPM	76		PL SEE NOTE	100/50
23	Phosphoric acid500 kg	500 KGS	3	0	0	TWA 3 MG/CU M	150			100/50
25	Pyridine 250 kg	250 KGS	3	3	0	TWA 5 PPM	115	**Class A FP 17**	PL SEE NOTE	100/50
26	SMO liquid 2000 kg	2000 KGS								
29	Tetrahydrofuran 2000 kg	2000 KGS	2	3	1	TWA=200 ppm	65	**Class A FP minus15**		200
30	Triethyl Orthoformate 2000 kg	2000 KGS	2	3		na	100			200
31	Triethylamine500 kg	500 KGS	3	3	0	TLV 3 ppm	89.7	**Class A FP MINUS 8.3**		100/50

1-4 DIFLUROBENZE CAS Number 540-36-3 **1-2 DIFLUROBENZEN** CAS Number 367-11-3 bp 92 DEG C Which is used?

2,6-Xylidine CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) Absorbed through skin

The substance may be toxic to blood, kidneys, liver, heart. Repeated or prolonged exposure to the substance can produce target organs damage.

4- MIC To the best of our knowledge the acute and chronic toxicity of this substance is not fully known. material is available .

No classification data on carcinogenic properties of this
Epichlorohydrine: Suspect carcinogenic 75 ppm IDLH, suspect carcinogenic
Cyclcopentene anhydride MSDS could not be found. Please check if you can get it .
Methylene Dichloride/chloride CARCINOGENIC EFFECTS: Classified + (Proven.)
Monomethyl amine1000 kg NORMALLY GAS. WHAT % OF MMA SOLUTION IS STORED AND USED ?
The substance may be toxic to blood, kidneys, liver, heart. Repeated or prolonged exposure to the substance can produce target organs damage.
The last column of Container size has been filled based on my knowledge/ guess work. Please confirm the same. It is essential for
Quantitative Risk analysis QRA calculations

Annexure {III}

Toxicity Index

Sr. No	Hazardous chemicals	NH	TLV ppm	Th	Ts	Th+Ts/100	GH	SH	1+GH+SH	TI
1	0rthoPhosphoric acid	3	0.75	250	125	3.75	2.75	2.15	5.9	**22.125**
2	2,6-Xylidine	3	o.6	250	125	3.75	2.75	2.15	5.9	**22.125**
3	Ammonia Gas	3	25	250	75	3.25	2.75	2.15	5.9	**19.175**
4	Diethyl Amine	3	25	250	75	3.25	2.75	2.15	5.9	**19.175**
5	Formaldehyde (37% sol)	3	0.3	250	125	3.75	2.75	2.15	5.9	**22.125**
6	Methylene Dichloride/chloride	3	50	250	75	3.25	2.75	2.15	5.9	**19.175**
7	Mono Chloro acetic acid	3	0.3	250	125	3.75	2.75	2.15	5.9	**22.125**
8	Monomethyl amine	3	10	250	75	3.25	2.75	2.15	5.9	**19.175**
9	Epichlorohydrin	4	2	325	125	4.5	2.75	2.15	5.9	**26.55**
10	PCL3 {Phosphorous Tri Chloride}	4	0.5	325	125	4.5	2.75	2.15	5.9	**26.55**
11	Phosphoric acid	3	0.75	250	125	3.75	2.75	2.15	5.9	**22.125**
12	Pyridine	3	5	250	125	3.75	2.75	2.15	5.9	**22.125**
13	Triethylamine	3	3	250	125	3.75	2.75	2.15	5.9	**22.125**

Annexure {IV}: Material Safety Data Sheet for Products & Raw Material

{Products}

Sr. No.	Raw materials/ products	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
1	Metformine Hydrochloride	C4-H11-N5.H-Cl	Solid	NA	165.6	NA	223-226	NA	1000	Stable		NA	NA	NA	NA	NA
2	Ibuprofen	C13H18O2	Solid	Slight	206.29	NA	75	NA	636	Stable	Irritation to eye, skin, inhalation, ingestion	White	NA	NA	NA	NA
3	Alopurinol	C5-H4-N4-O	Solid	Slight	136.11	NA	>350	NA	78	Stable	Irritant to skin, corrosive to eye	White	NA	NA	NA	NA
4	Alandronate Sodium	C4-H12-N-Na-O7P2.3H2O	Solid	NA	325.1	NA	NA	NA	NA	Stable	Irritation to eye, skin, on inhalation, on ingestion	NA	NA	NA	NA	NA
5	Pioglutazone Hydrochloride	C19H20N2O3S	Solid	NA	356.4	NA	NA	NA	NA	Stable	Irritation to eye, skin, on inhalation, on ingestion	NA	NA	NA	NA	NA
6	Glimeperide	C24H34N4O5S	Solid	NA	490.6	NA	NA	NA	NA	Stable	Irritation to eye, skin, on inhalation, on ingestion	NA	NA	NA	NA	NA
7	Tramadol Hydrochloride	C16-H25-N-O2.HCl	Solid	Odorless	299.88	NA	178-181	NA	228	Stable	Irritation to eye, skin, on inhalation, on ingestion	White	NA	NA	NA	NA
8	5-Amino Salicylic Acid [Mesalamine]	C7-H7-N-O3	Solid	NA	153.14	NA	NA	NA	2800	Stable	NA	NA	NA	NA	NA	
9	4-Amino	C7H7N	Solid	NA	153.14	NA	150.5	Deco	NA	Stable	Irritant to skin,	White	NA	NA	NA	NA

Sr. No.	Raw materials/ products	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
	Salicylic Acid [PAS Sodium]	O3						mposes			eye					
10	Miconazole Nitrate	C18-H14-Cl4-N2-O.HNO3	Solid	NA	479.14	NA	170.5	NA	920	Stable	Irritant to skin, eye	White	NA	NA	NA	NA
11	Divelporex Sodium	C8H16O2	Solid	NA	167.20	NA	NA	NA	NA	Stable	Irritant to skin, eye	NA	NA	NA	NA	NA
12	Sertaconazole	NA	NA	Odouless	NA	NA	155-156	NA	>8000	Stable	None	White	NA	NA	NA	NA
13	Chlorzoxazone	C7H4ClNO2		NA	169.6	NA	NA	NA	NA	Stable	Irritant to skin, eye	NA	NA	NA	NA	NA
14	Levothyroxine Sodium	C15-H10-N-Na-O4.5H2O	Solid	NA	888.94	NA	NA	NA	NA	Stable	Irritant to skin, eye	Off White	NA	NA	NA	NA
15	Sitagliptin Phosphate Monohydrate	C16H15F6N5OH3PO4	Solid	NA	505.3	NA	NA	NA	NA	Stable	Irritant to skin, eye	NA	NA	NA	NA	NA
16	Sitagliptin (Phosphate Anhydrous)	C16H15F6N5OH3PO4	Solid	NA	505.3	NA	NA	NA	NA	Stable	Irritant to skin, eye	NA	NA	NA	NA	NA
17	Sesagliptin															
18	Warfarin Sodium	NA	Solid	NA	NA	NA	NA	NA	NA	Stable	Irritant to skin, eye	NA	NA	NA	NA	NA
19	Glyclazide	C15-H21-N3-O3-S	Solid	NA	323.41	NA	162-169	NA	1750	Stable	Irritant to skin, eye	Off White	NA	NA	NA	NA
20	Etam Sylate	C10H17	Liqui	NA	263.31	NA	NA	NA	4000	Stable	NA	NA	NA	NA	NA	NA

Sr. No.	Raw materials/ products	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
		NO5S	d													
21	Fluconazole	C13-H12-F2-N6-O	Solid	NA	306.3	NA	NA	NA	1270	Stable	Irritant to skin, eye	White	NA	NA	NA	NA
22	Gabapentin	C9-H17-N-O2	Solid	NA	NA	NA	NA	NA	8000	Stable	Irritant to skin, eye	NA	NA	NA	NA	NA
23	Lidocaine Base	C14-H22-N2-O	Solid	NA	234.34	NA	68.5	181	NA	Stable	Irritant to skin, eye	White to yellowish	NA	NA	NA	NA
24	Lidocaine Hydrochloride	C14H22N2O.HClH2O	Solid	Odorless	288.82	NA	77	NA	220	Stable	Irritant to skin, eye	White	NA	NA	NA	NA
25	Bisoprolol Hemifumarate	NA	Solid	Odorless	NA	NA	95-105	NA	940	Stable	Irritant to skin, eye	White	NA	NA	NA	NA
26	Mtehyl Cyanocobalamine	C63H88CoN14O14P	Solid	NA	1355.39	NA	102.5	NA	NA	Stable	Irritant to skin, eye	NA	NA	NA	NA	NA
27	Sertranil Hydrochloride	NA	Liquid	NA	NA	NA	NA	NA	1591	Stable	Irritant to skin, eye	Colorless	NA	NA	NA	NA
28	Flubiprofen	C15-H13-F-O2	Solid	Odorless	244.27	NA	110	NA	117	Stable	Irritant to skin, eye	White to yellowish	NA	NA	NA	NA
29	Dilitiazem	C22-H26-N2-O4-S.	Solid	NA	450.99	NA	212	NA	560	Stable	Irritant to skin, eye		NA	NA	NA	NA

{Raw Materials}

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
1.	**Metformine Hydrochloride**															
1	Di Cyano Di Amide	C2H4N4	Solid	NA	84.08	NA	208-211	NA	NA	Stable	NA	White	NA	NA	NA	NA
2	Di Methyl amine hydrochloride	C2-H7-N.ClH	Solid	NA	81.54	NA	171	NA	1070	Stable	Irritation to eye, skin, inhalation, ingestion	White	NA	NA	NA	NA
3	Xylene	C6H4(CH3)2	Sweetish	Sweetish	106.17	24	-47.4	138	4300	Stable	Irritation to eye, skin, inhalation, ingestion	Colorless	0.864	7	1	1
4	Carbon	C	Solid	NA	12.1	NA	3651.6	4826.6	NA	Stable	Irritant to skin, eye	Black	2-2.5	NA	NA	NA
2	**Ibuprofen**															
5	2,6-Xylidine	C8H11N		aromatic	121.1	91	10 - 12	214	840	Stable under control	Irritation to eye, skin, inhalation	Yellow to red	0.984	6.9	1.3	NA
6	Chloroacetyl chloride	C2H2Cl2O	Liquid	Pungent	112.95	NA	-22	105	208 oral	Stable under normal condtion	Irritation to eye, skin, inhalation, ingestion	Colorless to light yellow	NA	NA	NA	NA
7	Sodium carbonate	Na2CO3	Solid	Odorless	105.99	NA	851	NA	NA	Stable	NA	White	NA	NA	NA	NA
8	Toluene	C6H5CH3	Liquid	Aromatic , hydrocarbon	NA	40	NA	231	2.6 to 7.5 gm/kg	Stable	Irritant	Clear	0.86	7.1	1.2	0.2-5.0
9	Diethylamine	(CH3CH2)2NH	Liquid.	Ammoniaca	73.14	18	-50	55.5	540	Stable	Irritation to eye, skin, inhalation,	Colorless	0.71	10.1	1.8	NA

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
				l							ingestion					
10	Sodium carbonate	Na2CO3	Solid	Odorless	105.99	NA	851	NA	NA	Stable	NA	White	NA	NA	NA	NA
11	Acetone	C3H6O	Liquid	Pungent	58.09	-17	-93.35	56.1	2500	Stable	Flammable	Colorless	0.7910-0.7930 at 20^{0}C	12.8	2.6	NA
12	Activated carbon	C	Solid	Odorless	NA	NA	NA	4827	NA	Stable	NA	Black	NA	NA	NA	NA
13	Hyflow supercell	SiO 2	Solid	odorless	NA	NA	NA	NA	NA	Stable	NA	slight grey	2.3	NA	NA	NA
3	**Alopurinol**															
14	Cyanoacetamide	C3H4N2O	Solid	None Reported	84.08	215	121.00 - 122.00	NA	1680	Stable	NA	White to yellow	NA	NA	NA	NA
15	Triethyl orthoformate	C7H16O6	Liquid	Pungent	148.2	30	-76	143	7060	Stable	Flammable	Colorless	0.891	NA	NA	NA
16	Morpholine	C_4H_9NO	Liquid	Amine like	87.12	35	-4.9	128.19	525	Stable	Flammable	Clear	0.9168	NA	NA	0.1
17	CMA Solvent	NA	Liquid	Pleasant	46.07	12.78	-114.1	78.5	7060	Stable	Flammable	Colorless	0.789	NA	NA	100
18	Hydrazine Hydrate	N2H4.H2O	Liquid	NA	50.06	NA	-51.7	113.5	129	Stable	Corrosive	NA	1	NA	NA	NA
19	Sulphuric acid	H2SO4	Liquid	Odorless	98.08	NA	-35 to 10.36	270-340	2140	Stable	Corrosive	Colorless	1.84	NA	NA	NA
20	Formamide	CH3NO	Liquid	Faint Ammonia like	45.04	154	2.0-3.0	210	3150 -	Stable at room temp.	NA	clear	1.13	19	2.7	NA

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
21	Liquor Ammonia	NH_4OH	Liquid	Pungent	NA	NA	-94 to -62	23	NA	Stable	Corrosive	Colorless	NA	NA	NA	As low as 5 ppm
22	Activated carbon	C	Solid	Odorless	NA	NA	NA	4827	NA	Stable	NA	Black	NA	NA	NA	NA
23	Hyflosupercel	SiO2	Solid	No odor	NA	NA	NA	NA	-	NA	NA	White	2.3	NA	NA	NA
4	**Alandronate Sodium**															
24	Methane sulphonic acid	NA	Liquid	No odor	NA	NA	20	100	NA	Stable	Corrosive	Colorless	1.3	NA	NA	NA
25	Phosphorus acid	H3PO3	Solid	NA	82	NA	70	180	NA	Stable	Corrosive to eyes and skin	NA	1.651	NA	NA	NA
26	PCL3 (Phosphorus Trichloride)	PCL3	Liquid	Pungent	137.35	NA	-112	76	18	Stable	Irritant to skin, corrosive to eye	Colorless to light yellow	1.574	NA	NA	NA
27	Carbon	C	Solid	NA	12.1	NA	3651.6	4826.6	NA	Stable	Irritant to skin, eye	Black	2-2.5	NA	NA	NA
28	NaH flakes	NaH	Liquid	NA	NA	NA	NA	360	NA	Stable	Irritant Eye, skin, ingestion, inhalation	NA	0.89	NA	NA	NA
29	Acetone	C3H6O	Liquid	Pungent	58.09	-17	-93.35	56.1	2500	Stable	Flammable	Colorless	0.7910-0.7930 at 20^{0}C	12.8	2.6	NA
5	**Pioglutazone Hydrochloride**															
30	Pioglutazone base	C19H20N2O3S	NA	NA	356.4	NA	NA	NA	NA	Stable	Irritant to skin, eye	NA	NA	NA	NA	NA
31	HCL 30 %	HCl	Liquid	Acidic	6.46	NA	-46	51	700	Stable	Corrosive	Colorless	1.18	NA	NA	0.25 to 10

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
32	Carbon	C	Solid	NA	12.1	NA	3651.6	4826.6	NA	Stable	Irritant to skin, eye	Black	2-2.5	NA	NA	NA
33	Methanol	CH3OH	Liquid	Alcohol	32.04	NA	-97.6	64.5	NA	Stable	Flammable	colorless	0.7915	36.50	6.72	NA
6	**Glimeperide**															
34	Sulphonamide	C6H8N2O2S	Solid	Odorless	172.21	NA	165.5	NA	NA	Stable	Irritant to skin, eye Inhalation & ingestion	Off White	1.08	NA	NA	NA
35	Acetone	C3H6O	Liquid	Pungent	58.09	-17	-93.35	56.1	2500	Stable	Flammable	Colorless	0.7910-0.7930 at 20^{0}C	12.8	2.6	NA
36	Potassium Carbonate	K2CO3	Solid	Odorless	138.21	NA	891	NA	2570	Hygroscopic	Skin, eye irritation	NA	2.43	NA	NA	NA
37	4-Methyl Isocynate	C2H3NO	Liquid	Sharp, unpleasant	NA	<-15	45	39.5	69	Stable	Inhalation & ingestion	Colorless	0.9230	26	5.3	NA
38	Acetic acid	C2-H4-O2	Liquid	Pungent	60.05	39	16.6	118	3310	Stable	Irritant to skin, eye Inhalation & ingestion	Colorless	1.049	19.9	4	0.48
39	Carbon	C	Solid	NA	12.1	NA	3651.6	4826.6	NA	Stable	Irritant to skin, eye	Black	2-2.5	NA	NA	NA
7	**Tramadol Hydrochloride**															
40	Formaldehyde	HCHO	Liquid	Pungent	30.02	50	-15	98	42	Stable	Irritant to skin, eye Corrosive	Colorless	1.08	36.5	6	100
41	Cyclohexazone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
42	HCL 30%	HCl	Liquid	Acidic	6.46	NA	-46	51	700	Stable	Corrosive	Colorless	1.18	NA	NA	0.25 to 10
43	DMA. HCl	C2-H7-N.ClH	Solid.	NA	81.54	NA	171	NA	1070	Stable	Irritant to skin, eye Inhalation	White	NA	NA	NA	NA

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
											&. ingestion					
44	NaOH lye	NaOH	Solid.	Odorless	NA	NA	12	140	NA	Stable	corrosive, irritant	Colorless	1.53	NA	NA	NA
45	Toluene	C6H5CH3	Liquid	Aromatic , hydrocarbon	NA	40	NA	231	2.6 to 7.5 gm/kg	Stable	Irritant	Clear	0.86	7.1	1.2	0.2-5.0
46	Water	H2O	Liquid	Odorless	18.02	NA	NA	100	NA	Stable	Non Hazardous	Colorless	1	NA	NA	NA
47	Magnesium	Mg^{+2}	Solid	Odorless	NA	40	NA	NA	NA	Stable	NA	NA	1.77	NA	NA	NA
48	Tetrahydrofuran	C4H8O	Liquid	Petroleum distillate	72.11	-21	-108	66	1650	Hygroscopic	Skin, eye irritation	Colorless	0.880	11.8	2.0	NA
49	Magnesium Nitrate	Mg(NO3)2.6H2O	Solid	NA	256.14	93.3	89	330	5440	Stable	Irritant to skin, eye Inhalation & Ingestion	White	1.64	NA	NA	NA
50	IPA HCl	NA	Liquid	NA	NA	11.67	-89.5	82.22	1562	Stable	Skin, eye irritation	NA	0.7855	2	12	50
51	m- Bromo Anisole	C7H7BrO	Liquid	NA	187.04	98	2	210	NA	Stable	Irritant to skin, eye	clear very slight brown	1.477	NA	NA	NA
52	Carbon	C	Solid	NA	12.1	NA	3651.6	4826.6	NA	Stable	Irritant to skin, eye	Black	2-2.5	NA	NA	NA
53	Hyflow	SiO2	Solid	No odor	NA	NA	NA	NA	-	NA	NA	White	2.3	NA	NA	NA
54	Isopropanol	C3H8O	Liquid	Rubbing alcoho	60.1	12	-88.5	82	5,045	Stable	Irritating	Colorless	NA	NA	NA	NA

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
				l												
8	**5-Amino Salicylic Acid [Mesalamine]**															
55	5-Chloro 2-Nitro benzoic acid	C7H4ClNO4	Solid	NA	201.6	> 110	136 - 140	NA	NA	Stable	Irritant to skin, eye	NA	NA	NA	NA	NA
56	Potassium Hydroxide	KOH	Liquid	Odorless	NA	NA	48	271-293	>90	Stable	Corrosive	Clear to slightly turbid	1.51	NA	NA	NA
57	HCL 30%	HCl	Liquid	Acidic	6.46	NA	-46	51	700	Stable	Corrosive	Colorless	1.18	NA	NA	0.25 to 10
58	Sodium carbonate	Na2CO3	Solid	Odorless	105.99	NA	851	NA	NA	Stable	NA	White	NA	NA	NA	NA
59	Raney Ni Catalyst	Ni	Solid	Odorless	NA	NA	>100	NA	NA	Stable	Irritant to skin, eye	Grayish-black	1.94	NA	NA	NA
60	Hydrogen Gas	H2	Gas	Odorless	2	NA	-259.2	-252.9	> 15000	Stable	Flammable	Colorless	NA	NA	NA	NA
61	Carbon	C	Solid	NA	12.1	NA	3651.6	4826.6	NA	Stable	Irritant to skin, eye	Black	2-2.5	NA	NA	NA
9	**4-Amino Salicylic Acid [PAS Sodium]**															
62	3-Amino Phenol	C6-H7-N-O	Solid	Odorless.	1.09.13	155	122.5	164	924	Stable	Irritant to skin, eye Inhalation &. ingestion	White	NA	NA	NA	NA
63	Carbon di oxide	CO2	Gas	Odorless	44	NA	NA	-78.5	NA	Stable	Irritant to eye Inhalation &. Ingestion	Colorless	NA	NA	NA	NA
64	Potassium Carbonate	K2CO3	Solid	Odorless	138.21	NA	891	NA	2570	Hygroscopic	Skin, eye irritation	NA	2.43	NA	NA	NA

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65	Sulphuric acid 50%	H2SO4	Liquid	Odorless	98.08	NA	-35 to 10.36	270-340	2140	Stable	Corrosive	Colorless	1.84	NA	NA	NA
66	NaOH flakes	NaOH	Solid	Odorless	40	NA	318	1390	NA	Stable	Corrosive	White	2.13	NA	NA	NA
67	Isopropanol	C3H8O	Liquid	Rubbing alcohol	60.1	12	-88.5	82	5,045	Stable	Irritating	Colorless	NA	NA	NA	NA
68	Acetic acid	C2-H4-O2	Liquid	Pungent	60.05	39	16.6	118	3310	Stable	Irritant to skin, eye Inhalation & ingestion	Colorless	1.049	19.9	4	0.48
69	Carbon	C	Solid	NA	12.1	NA	3651.6	4826.6	NA	Stable	Irritant to skin, eye	Black	2-2.5	NA	NA	NA
70	Hyflow	SiO2	Solid	No odor	NA	NA	NA	NA	-	NA	NA	White	2.3	NA	NA	NA
10	**Miconazole Nitrate**															
71	Trichloro Acetophenone	C8 H5 Cl3 O	Solid	Odorless	223.49	> 112	50 - 57	130 - 135	NA	Stable	Skin, eye irritation	NA	NA	NA	NA	NA
72	Toluene	C6H5CH3	Liquid	Aromatic , Hydrocarbon	NA	40	NA	231	2.6 to 7.5 gm/kg	Stable	Irritant	Clear	0.86	7.1	1.2	0.2-5.0
73	Sodium carbonate	Na2CO3	Solid	Odorless	105.99	NA	851	NA	NA	Stable	NA	White	NA	NA	NA	NA
74	Imidazole	C3H4N2	Solid	NA	68.08	145	90	256	220	Stable	Irritant to skin, eye Inhalation & ingestion	NA	NA	NA	NA	NA
75	Tetra butyl ammonium	C16H36NBr	Solid	NA	322.38	NA	103.5	NA	NA	Stable	Irritant to skin, eye Inhalation	NA	NA	NA	NA	NA

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
	Bromide										&. Ingestion					
76	Sodium Borohydride	H4BNa	Solid	Amine like	37.82	NA	Decomposes	NA	50	Stable	Skin, eye irritation	White	1.07	NA	NA	NA
77	NaOH flakes	NaOH	Solid	Odorless	40	NA	318	1390	NA	Stable	Corrosive	White	2.13	NA	NA	NA
78	Methanol	CH3OH	Liquid	Alcohol	32.04	NA	-97.6	64.5	NA	Stable	Flammable	colorless	0.7915	36.50	6.72	NA
79	Benzoyl Chloride	C7H5OCl	Liquid	Pungent	140.57	72	-1	197.2	NA	Stable	Corrosive and Irritant to skin, eye Inhalation & ingestion	colorless	1.2188	4.9	1.2	NA
80	Nitric acid	HNO3	Liquid	acrid odour	63.01	NA	-41	120.5	>90	Stable	Corrosive and Irritant to skin, eye Inhalation & ingestion	clear to yellow	1.41	NA	NA	0.29
11	**Divelporex Sodium**															
81	Valproic acid	NA	Liquid	NA	NA	NA	NA	NA	NA	Stable	Skin, eye irritation	colorless	1	NA	NA	NA
82	Sodium hydroxide	NaOH	Solid	Odorless	40	NA	318	1390	NA	Stable	Corrosive	White	2.13	NA	NA	NA
83	Methanol	CH3OH	Liquid	Alcohol	32.04	NA	-97.6	64.5	NA	Stable	Flammable	colorless	0.7915	36.50	6.72	NA
84	Activated carbon	C	Solid	Odorless	NA	NA	NA	4827	NA	Stable	NA	Black	NA	NA	NA	NA
12	**Sertaconazole**															
85	2,4 [Dichlorophenyl]-2-(1-Imidazole Ethanol)	C11H10Cl2N2O	NA	NA	NA	NA	134-138	NA	NA	NA	NA	NA	NA	NA	NA	NA

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
86	1-(Bomomethyl)-7-chloro-1-Benzothiopen	C9H6	NA	NA	261.566	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
87	Toluene	C6H5CH3	Liquid	Aromatic , hydrocarbon	NA	40	NA	231	2.6 to 7.5 gm/kg	Stable	Irritant	Clear	0.86	7.1	1.2	0.2-5.0
88	Acetone	C3H6O	Liquid	Pungent	58.09	-17	-93.35	56.1	2500	Stable	Flammable	Colorless	0.7910-0.7930 at 20^{0}C	12.8	2.6	NA
89	NaoH flakes	NaOH	Solid	Odorless	40	NA	318	1390	NA	Stable	Corrosive	White	2.13	NA	NA	NA
90	Methanol	CH3OH	Liquid	Alcohol	32.04	NA	-97.6	64.5	NA	Stable	Flammable	colorless	0.7915	36.50	6.72	NA
91	Tetra Butyl Ammonium Bromide	C16H36NBr	Solid	NA	322.38	NA	103.5	NA	NA	Stable	Irritant to skin, eye Inhalation & ingestion	NA	NA	NA	NA	NA
92	Carbon	C	Solid	NA	12.1	NA	3651.6	4826.6	NA	Stable	Irritant to skin, eye	Black	2-2.5	NA	NA	NA
93	Nitric acid 70 %	HNO3	Liquid	acrid odour	63.01	NA	-41	120.5	>90	Stable	Corrosive and Irritant to skin, eye Inhalation & ingestion	clear to yellow	1.41	NA	NA	0.29
13	**Chlorzoxazone**															
94	4-Chloro 2-Amino	C6H6NOCl	NA	NA	143.57	NA	NA	NA	NA	NA	Irritant to skin, eye	NA	NA	NA	NA	NA

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
	Phenol															
95	HCL 30 %	HCl	Liquid	Acidic	6.46	NA	-46	51	700	Stable	Corrosive	Colorless	1.18	NA	NA	0.25 to 10
96	Urea	(NH2)2CO	Solid	Odorless	60.06	NA	132.7	NA	8471	Stable	NA	White	1.323	NA	NA	NA
97	Carbon	C	Solid	NA	12.1	NA	3651.6	4826.6	NA	Stable	Irritant to skin, eye	Black	2-2.5	NA	NA	NA
98	Hyflow	SiO 2	Solid	odorless	NA	NA	NA	NA	NA	Stable	NA	slight grey	2.3	NA	NA	NA
99	Methanol	CH3OH	Liquid	Alcohol	32.04	NA	-97.6	64.5	NA	Stable	Flammable	colorless	0.7915	36.50	6.72	NA
100	Acetic acid	C2-H4-O2	Liquid	Pungent	60.05	39	16.6	118	3310	Stable	Irritant to skin, eye Inhalation & ingestion	Colorless	1.049	19.9	4	0.48
14	**Levothyroxine Sodium**															
101	3,5 Di - Iodo l-Tyrosine	C9-H9-I2-N-O3	Solid	NA	432.97	NA	185	NA	NA	Stable	Irritant to skin, eye Inhalation & ingestion	White	NA	NA	NA	NA
102	Ethanol	CH3CH2OH	Liquid	Alcohol-like	46.07	12.78	-114.1	78.5	7060	Stable	Irritant to skin, eye Inhalation & ingestion	Colorless	0.789	19	3.3	100
103	Sulphuric Acid	H2SO4	Liquid	Odorless	98.08	NA	-35 to 10.36	270-340	2140	Stable	Corrosive	Colorless	1.84	NA	NA	NA
104	Sodium bi Carbonate	NaHCO3	Solid	Odorless	NA	NA	NA	NA	4220	Stable	Skin, eye irritation	White	2.22	NA	NA	NA
105	Managanes mono hydrate	MnSO4.H20	Solid	Odorless	169.01	NA	700	850	NA	Stable	Irritant to skin, eye Inhalation & ingestion	Red	2.95	NA	NA	NA
106	Boric acid solution	H3BO3	Solid	Odorless	61.83	NA	169	300	2660	Stable	Irritant to skin, eye Inhalation & ingestion	White	1.435	NA	NA	NA

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
107	Acetic acid	C2-H4-O2	Liquid	Pungent	60.05	39	16.6	118	3310	Stable	Irritant to skin, eye Inhalation & ingestion	Colorless	1.049	19.9	4	0.48
108	HCL 30 %	HCl	Liquid	Acidic	6.46	NA	-46	51	700	Stable	Corrosive	Colorless	1.18	NA	NA	0.25 to 10
109	NaOH solution	NaOH	Solid	Odorless	40	NA	318	1390	NA	Stable	Corrosive	White	2.13	NA	NA	NA
110	SMBS solution	Na2S2O5	Solid	odor of sulfur dioxide	190.13	NA	150	NA	1131	Stable	Irritant to skin, eye Inhalation & ingestion	White to yellowish.	1.4	NA	NA	NA
15	**Sitagliptin Phosphate Monohydrate**															
111	Boc-Butanoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
112	Pyrazine Hydrochloride	C5H5N HCl	Solid	NA	115.56	-	33-36 to 140-146	222-224	NA	Stable hygroscopic	NA	NA	NA	NA	NA	NA
113	Dicyclohexyl Carbodimide	C13H22N2	Powder	Sweet	208.22	>110	93.2 to 95	251.6 to 255.2	NA	Stable	NA	NA	1.325	NA	NA	NA
114	1-Hydroxybenzotriazole	C6H5N3O.xH2O	Solid	NA	135.13	NA	156	NA	NA	Stable	Skin, eye irritation	NA	NA	NA	NA	NA
115	Triethylamine	C6H15N	Liquid	Fishy	101.19	-11	-115	90	460	Stable	Flammable	Colorless	NA	8.0	1.2	NA
116	Methylene	C-H2-	Liqu	NA	84.93	NA	-96.7	39.75	1600	Stable	Skin, eye	NA	1.32	19	12	214

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
	Dichloride	Cl2	id								irritation					
117	Sodium Bicarbonate	NaHCO3	Solid	Odorless	NA	NA	NA	NA	4220	Stable	Skin, eye irritation	White	2.22	NA	NA	NA
118	Methanolic HCl (13-17%)	NA	Liquid	Alcoholic	NA	12	-97.8	64.5	5628	Stable	Skin, eye irritation	Colorless	0.8	36.5	6	100
119	Sodium Hydroxide	NaOH	Solid	Odorless	40	NA	318	1390	NA	Stable	Corrosive	White	2.13	NA	NA	NA
120	Sodium Chloride	NaCl	Solid	Slight	58.44	NA	801	1465	3000	Stable	Skin, eye irritation	White	2.16	NA	NA	NA
121	Activated Carbon	C	Solid	Odorless	NA	NA	NA	4827	NA	Stable	NA	Black	NA	NA	NA	NA
122	Hyflow Super Cell	SiO 2	Solid	odorless	NA	NA	NA	NA	NA	Stable	NA	slight grey	2.3	NA	NA	NA
123	Ortho-Phosphoric Acid	H3O4P	Viscous Liquid	Odorless	98	NA	21	158	1530	Stable	Cause severe burn	Clear	1.680	NA	NA	NA
124	Isopropyl Alcohol	C3H8O	Liquid	Odor like rubbing alcohol	60.1	12	-88.5	82	5,045	Stable	Irritating	Colorless	NA	NA	NA	NA
125	Heptane	C7H16	Liquid	Hydrocarbon. Gasoline-like	100.21	-4	-90.7	98.4	NA	Stable	Skin, eye irritation	Colorless	0.6838	6.7	1.05	150

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16	**Sitagliptin (Phosphate Anhydrous)**															
126	Boc-Butanoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
127	Pyrazine Hydrochloride	C5H5N HCl	Solid	NA	115.56	-	33-36 to 140-146	222-224	NA	Stable hygroscopic	NA	NA	NA	NA	NA	NA
128	Dicyclohexyl Carbodimide	C13H22 N2	Powder	Sweet	208.22	>110	93.2 to 95	251.6 to 255.2	NA	Stable	NA	NA	1.325	NA	NA	NA
129	1-Hydroxybenzotriazole	C6H5N 3O.xH2 O	Solid	NA	135.13	NA	156	NA	NA	Stable	Skin, eye irritation	NA	NA	NA	NA	NA
130	Triethylamine	C6H15 N	Liquid	Fishy	101.19	-11	-115	90	460	Stable	Flammable	Colorless	NA	8.0	1.2	NA
131	Methylene Dichloride	C-H2-Cl2	Liquid	NA	84.93	NA	-96.7	39.75	1600	Stable	Skin, eye irritation	NA	1.32	19	12	214
132	Sodium Bicarbonate	NaHCO 3	Solid	Odorless	NA	NA	NA	NA	4220	Stable	Skin, eye irritation	White	2.22	NA	NA	NA
133	Methanolic HCl (13-17%)	NA	Liquid	Alcoholic	NA	12	-97.8	64.5	5628	Stable	Skin, eye irritation	Colorless	0.8	36.5	6	100
134	Sodium Hydroxide	NaOH	Solid	Odorless	40	NA	318	1390	NA	Stable	Corrosive	White	2.13	NA	NA	NA
135	Sodium Chloride	NaCl	Solid	Slight	58.44	NA	801	1465	3000	Stable	Skin, eye irritation	White	2.16	NA	NA	NA

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
136	Activated Carbon	C	Solid	Odorless	NA	NA	NA	4827	NA	Stable	NA	Black	NA	NA	NA	NA
137	Hyflow Super Cell	SiO 2	Solid	odorless	NA	NA	NA	NA	NA	Stable	NA	Slight Grey	2.3	NA	NA	NA
138	Ortho-Phosphoric Acid	H3O4P	Viscous Liquid	Odorless	98	NA	21	158	1530	Stable	Cause severe burn	Clear	1.680	NA	NA	NA
139	Isopropyl Alcohol	C3H8O	Liquid	Rubbing alcohol	60.1	12	-88.5	82	5,045	Stable	Irritating	Colorless	NA	NA	NA	NA
140	Heptane	C7H16	Liquid	Hydrocarbon. Gasoline-like	100.21	-4	-90.7	98.4	NA	Stable	Skin, eye irritation	Colorless	0.6838	6.7	1.05	150
17	**Sesagliptin**															
141	Azabicyclic ester	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
142	Methane sulphonic acid	NA	Liquid	No odor	NA	NA	20	100	NA	Stable	Corrosive	Colorless	1.3	NA	NA	NA
143	Iso Propyl alcohol	C3H8O	Liquid	Rubbing alcohol	60.1	12	-88.5	82	5,045	Stable	Irritating	Colorless	NA	NA	NA	NA
144	Boc-adamantic acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
145	Azabicycli	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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	c salt															
146	HOBT hydrate	C6H5N3O.xH2O	Solid	NA	135.13	NA	156	NA	NA	Stable	Skin, eye irritation	NA	NA	NA	NA	NA
147	EDC.HCl	C8-H17-N3.HCl	Solid	Odorless	191.71	NA	111	NA	NA	Stable	Skin, eye irritation	NA	NA	NA	NA	NA
148	Di-isopropylethylamine	C8-H19-N	Liquid	NA	129.25	10	<-50	127	NA	Stable	Irritant to skin, eye Inhalation & ingestion	Colorless to light yellow	0.724	NA	NA	NA
149	Isopropyl acetate	C5H10O2	Liquid	Fruity	102.14	2	-73.4	89	6750	Stable	Skin, eye irritation	Colorless	0.87	7.8	1.8	0.045
150	Acetonitrile	CH3CN	Liquid	Aromatic	41.05	2	-46	81.6	2460	Stable	Irritant to skin, eye Inhalation & ingestion	Colorless	0.783	4.4	16	NA
151	Conc.HCl	HCl	Liquid	Acidic	6.46	NA	-46	51	700	Stable	Corrosive	Colorless	1.18	NA	NA	0.25 to 10
152	Potassium bicarbonate	KHCO3	Solid	NA	100.12	NA	NA	NA	NA	Stable	Skin, eye irritation	NA	2.17	NA	NA	NA
153	Sodium chloride	NaCl	Solid	Slight	58.44	NA	801	1465	3000	Stable	Skin, eye irritation	White	2.16	NA	NA	NA
154	Purified water	H2O	Liquid	Odorless	18.02	NA		100	NA	Stable	Non Hazardous	Colorless	1	NA	NA	NA
155	Ethyl Nicotinate	C8H9O2N	Liquid	NA	151.17	NA	8	223	NA	Stable	Irritant to skin, eye Inhalation & ingestion	NA	NA	NA	NA	NA
156	Tri-fluoro-acetic	(F3CCO)2O	Liquid	NA	210.04	NA	-65	40	NA	Stable	Irritant to skin, eye Inhalation &	NA	1.487	NA	NA	NA

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	anhydride										ingestion					
157	TMEDA	C6H16N2	Liquid	NA	116.21	17.2	-55°	121	1020	Stable	Skin, eye irritation	Colorless to light yellow	0.7765	NA	NA	NA
158	Potassium carbonate	K2CO3	Solid	Odorless	138.21	NA	891	NA	2570	Hygroscopic	Skin, eye irritation	NA	2.43	NA	NA	NA
159	Methanol	CH3OH	Liquid	Alcohol	32.04	NA	-97.6	64.5	NA	Stable	Flammable	colorless	0.7915	36.50	6.72	NA
160	Acetone	C3H6O	Liquid	Pungent	58.09	-17	-93.35	56.1	2500	Stable	Flammable	Colorless	0.7910-0.7930 at 20^{0}C	12.8	2.6	NA
18	**Warfarin Sodium**															
161	4-Hydroxy Coumarin	C19-H16-O4	Solid	Odorless	308.33	NA	161	NA	1.6	Stable	Irritant to skin, eye Inhalation & ingestion	White	NA	NA	NA	NA
162	Benzal acetone	C10-H10-O	Solid	NA	NA	60	39	260	2031	Stable	Skin, eye irritation	NA	NA	NA	NA	NA
163	Toluene	C6H5CH3	Liquid	Aromatic , Hydrocarbon	NA	40	NA	231	2.6 to 7.5	Stable	Irritant	Clear	0.86	7.1	1.2	0.2-5.0
164	Isopropanol	C3H8O	Liquid	Rubbing alcohol	60.1	12	-88.5	82	5,045	Stable	Irritating	Colorless	NA	NA	NA	NA
165	NaOH	NaOH	Soli	Odorl	40	NA	318	1390	NA	Stable	Corrosive	White	2.13	NA	NA	NA

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	flakes		d	ess												
19	**Glyclazide**															
166	Octane Hydrochloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
167	p-Toluene sulphonyl urea	C12-H18-N2-O3-S	Solid	Odorless	270.35	NA	128.5	NA	2490	Stable	Irritant to skin, eye Inhalation & ingestion	White	1.245	NA	NA	NA
168	Carbon	C	Solid	NA	12.1	NA	3651.6	4826.6	NA	Stable	Irritant to skin, eye	Black	2-2.5	NA	NA	NA
169	Methylene di chloride	C-H2-Cl2	Liquid	NA	84.93	NA	-96.7	39.75	1600	Stable	Skin, eye irritation	NA	1.32	19	12	214
170	Aceto nitrile	CH3CN	Liquid	Aromatic	41.05	2	-46	81.6	2460	Stable	Irritant to skin, eye Inhalation & ingestion	Colorless	0.783	4.4	16	NA
171	Hyflow	SiO 2	Solid	Odorless	NA	NA	NA	NA	NA	Stable	NA	slight grey	2.3	NA	NA	NA
20	**Etam Sylate**															
172	1,4-Dihydro – Quinone	C6H4O2	Solid	Pungent	108	77	115.7	NA	130	Stable	Irritation to eye, skin, inhalation, ingestion	Yellow	1.318	NA	NA	0.1
173	Sulphuric acid	H2SO4	Liquid	Odorless	98.08	NA	-35 to 10.36	270-340	2140	Stable	Corrosive	Colorless	1.84	NA	NA	NA
174	Methanol	CH3OH	Liquid	Alcohol	32.04	NA	-97.6	64.5	NA	Stable	Flammable	colorless	0.7915	36.50	6.72	NA
175	Di -ethyl Amine	(CH3CH2)2NH	Liquid	Ammoniacal	73.14	18	-50	55.5	540	Stable	Irritation to eye, skin, inhalation, ingestion	Colorless	0.71	10.1	1.8	NA
21	**Fluconazole**															
176	Di Fuoro	C6H4F2	Liqu	NAa	114.10	NA	NA	NA	NA	Stable	Irritation to eye,	clear	1.157	NA	NA	NA

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	Benzene		id								skin, inhalation, ingestion	colorless to pale yellow	-1.160			
177	Aluminum Chloride	AlCl3	Solid	Strong odor	133.34	NA	194	NA	NA	Hygroscopic	Skin, eye irritation	White	2.440	-	-	-
178	Chloro acetyl chloride	C2H2Cl2O	Liquid	Pungent	112.95	NA	-22	105	208 oral	Stable under normal condition	Irritation to eye, skin, inhalation, ingestion	Colorless to light yellow	NA	NA	NA	NA
179	4-Amino Triazole	C2 H4 N4	Solid	NA	84.08	> 149	84	NA	13600	Hygroscopic	Irritation to eye, skin, inhalation, ingestion	NA	NA	NA	NA	NA
180	Methylene di chloride	C-H2-Cl2	Liquid	NA	84.93	NA	-96.7	39.75	1600	Stable	Skin, eye irritation	NA	1.32	19	12	214
181	Isopropyl Alcohol	C3H8O	Liquid	Rubbing alcohol	60.1	12	-88.5	82	5,045	Stable	Irritating	Colorless	NA	NA	NA	NA
182	Sodium Nitrite	NaNO2	Solid	Odorless	69	NA	271	320	180	Stable	Irritation to eye, skin, inhalation, ingestion	White to slightly yellowish	2.2	NA	NA	NA
183	Potassium Carbonate	K2CO3	Solid	Odorless	138.21	NA	891	NA	2570	Hygroscopic	Skin, eye irritation	NA	2.43	NA	NA	NA
184	HCl	HCl	Liquid	Acidic	6.46	NA	-46	51	700	Stable	Corrosive	Colorless	1.18	NA	NA	0.25 to 10

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185	NaOH flakes	NaOH	Solid	Odorless	40	NA	318	1390	NA	Stable	Corrosive	White	2.13	NA	NA	NA
186	Trimethyl sulphonium iodide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
187	1, 2, 4-Triazole	C2H3N3			69.07	NA			1750		Irritation to eye, skin, inhalation, ingestion			NA	NA	
188	Ethyl acetate	C4H8O2	Liquid	Fruity	88.11	-4	83.5	75-78	620	Stable	Flammable	Colorlss	0.902	11.5	2.0	50
189	Methylene di chloride	C-H2-Cl2	Liquid	NA	84.93	NA	-96.7	39.75	1600	Stable	Skin, eye irritation	NA	1.32	19	12	214
190	Toluene	C6H5CH3	Liquid	Aromatic , hydrocarbon	NA	40	NA	231	2.6 to 7.5 gm/kg	Stable	Irritant	Clear	0.86	7.1	1.2	0.2-5.0
191	Carbon	C	Solid	NA	12.1	NA	3651.6	4826.6	NA	Stable	Irritant to skin, eye	Black	2-2.5	NA	NA	NA
22	**Gabapentin**															
192	Cycopentane DI anhydride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
193	Ammonia solution 25%	NH4OH	Liquid	Pungent	NA	NA	-94 to -62	23	NA	Stable	Corrosive	Colorless	NA	NA	NA	As low as 5 ppm
194	Ethyl acetate	C4H8O2	Liquid	Fruity	88.11	-4	83.5	75-78	620	Stable	Flammable	Colorlss	0.902	11.5	2.0	50
195	HCl 30 % solution	HCl	Liquid	Acidic	6.46	NA	-46	51	700	Stable	Corrosive	Colorless	1.18	NA	NA	0.25 to 10
196	Hypochlorite 15 %	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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197	Acetone	C3H6O	Liquid	Pungent	58.09	-17	-93.35	56.1	2500	Stable	Flammable	Colorless	0.7910-0.7930 at 200C	12.8	2.6	NA
198	NaOH lye	NaOH	Solid.	Odorless	NA	NA	12	140	NA	Stable	corrosive, irritant	Colorless	1.53	NA	NA	NA
199	Methanol	CH3OH	Liquid	Alcohol	32.04	NA	-97.6	64.5	NA	Stable	Flammable	colorless	0.7915	36.50	6.72	NA
200	Isopropanol	C3H8O	Liquid	Rubbing alcohol	60.1	12	-88.5	82	5,045	Stable	Irritating	Colorless	NA	NA	NA	NA
201	Carbon	C	Solid	NA	12.1	NA	3651.6	4826.6	NA	Stable	Irritant to skin, eye	Black	2-2.5	NA	NA	NA
23	**Lidocaine Base**															
202	2,6-Xylidine	C8H11N	Liquid	Aromatic	121.18	91	10-12	214	840 oral	Stable under normal condition	Harmful to eye, skin, inhalation, ingestion	Yellowish to Red	0.984	6.9	1.3	NA
203	Chloroacetyl chloride	C2-H2-Cl2-O	Liquid	Pungent	112.95	NA	105	-22	220	Stable	Irritation to eye, skin, inhalation, ingestion	Colorless to light yellow	NA	NA	NA	0.011
204	Sodium carbonate	Na2CO3	Solid	Odorless	105.99	NA	851	NA	NA	Stable	NA	White	NA	NA	NA	NA
205	Toluene	C6H5CH3	Liquid	Aromatic , hydrocarbo	NA	40	NA	231	2.6 to 7.5 gm/kg	Stable	Irritant	Clear	0.86	7.1	1.2	0.2-5.0

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				n												
206	Diethylamine	(CH3CH2)2NH	Liquid.	Ammoniacal	73.14	18	-50	55.5	540	Stable	Irritation to eye, skin, inhalation, ingestion	Colorless	0.71	10.1	1.8	NA
207	Sodium carbonate	Na2CO3	Solid	Odorless	105.99	NA	851	NA	NA	Stable	NA	White	NA	NA	NA	NA
208	Acetone	C3H6O	Liquid	Pungent	58.09	-17	-93.35	56.1	2500	Stable	Flammable	Colorless	0.7910-0.7930 at 20^{0}C	12.8	2.6	NA
209	Activated carbon	C	Solid	Odorless	NA	NA	NA	4827	NA	Stable	NA	Black	NA	NA	NA	NA
210	Hyflow supercell	SiO 2	Solid	odorless	NA	NA	NA	NA	NA	Stable	NA	slight grey	2.3	NA	NA	NA
24	**Lidocaine Hydrochloride**															
211	2,6-Xylidine	C8H11N	Liquid	Aromatic	121.18	91	10-12	214	840 oral	Stable under normal condition	Harmful to eye, skin, inhalation, ingestion	Yellowish to Red	0.984	6.9	1.3	NA
212	Chloroacetyl chloride	C2-H2-Cl2-O	Liquid	Pungent	112.95	NA	105	-22	220	Stable	Irritation to eye, skin, inhalation, ingestion	Colorless to light yellow	NA	NA	NA	0.011
213	Sodium carbonate	Na2CO3	Solid	Odorless	105.99	NA	851	NA	NA	Stable	NA	White	NA	NA	NA	NA
214	Toluene	C6H5CH3	Liquid	Aromatic , hydrocarbo	NA	40	NA	231	2.6 to 7.5 gm/kg	Stable	Irritant	Clear	0.86	7.1	1.2	0.2-5.0

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				n												
215	Diethylamine	(CH3CH2)2NH	Liquid.	Ammoniacal	73.14	18	-50	55.5	540	Stable	Irritation to eye, skin, inhalation, ingestion	Colorless	0.71	10.1	1.8	NA
216	Sodium carbonate	Na2CO3	Solid	Odorless	105.99	NA	851	NA	NA	Stable	NA	White	NA	NA	NA	NA
217	Acetone	C3H6O	Liquid	Pungent	58.09	-17	-93.35	56.1	2500	Stable	Flammable	Colorless	0.7910-0.7930 at 20^{0}C	12.8	2.6	NA
218	Hydrochloric acid	HCl	Liquid	Acidic	6.46	NA	-46	51	700	Stable	Corrosive	Colorless	1.18	NA	NA	0.25 to 10
219	Activated carbon	C	Solid	Odorless	NA	NA	NA	4827	NA	Stable	NA	Black	NA	NA	NA	NA
220	Hyflow supercell	SiO 2	Solid	odorless	NA	NA	NA	NA	NA	Stable	NA	slight grey	2.3	NA	NA	NA
25	**Bisoprolol Hemifumarate**															
221	Parahydroxy benzaldehyde	C7H6O2	Solid	NA	122.12	NA	118	NA	NA	Stable	Irritant to skin, eye Inhalation & ingestion	NA	NA	NA	NA	NA
222	NaOH flakes	NaOH	Solid	Odorless	40	NA	318	1390	NA	Stable	Corrosive	White	2.13	NA	NA	NA
223	Sodium Borohydride	H4BNa	Solid	Amine like	37.82	NA	Decomposes	NA	50	Stable	Skin, eye irritation	White	1.07	NA	NA	NA
224	Hydrochloric acid	HCl	Liquid	Acidic	6.46	NA	-46	51	700	Stable	Corrosive	Colorless	1.18	NA	NA	0.25 to 10
225	Acetic acid	C2-H4-O2	Liquid	Pungent	60.05	39	16.6	118	3310	Stable	Irritant to skin, eye Inhalation &	Colorless	1.049	19.9	4	0.48

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
											ingestion					
226	2-Isopropoxyethanol	C5H12O2	Liquid	Odorless	104.0828	43	-60	142-144	4900	Stable at room temp.	Flammable	Clear	0.904	13	1.6	NA
227	Amberlyst-15	NA	Solid	None reported	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
228	Pottassium Carbonate	K2CO3	Solid	Odorless	138.21	NA	891	NA	2570	Hygroscopic	Skin, eye irritation	NA	2.43	NA	NA	NA
229	Methylene di Chloride	C-H2-Cl2	Liquid	NA	84.93	NA	-96.7	39.75	1600	Stable	Skin, eye irritation	NA	1.32	19	12	214
230	Sodium Sulphate Anhydrous	Na2SO4	Solid	Odorless	142.06	NA	888	1100	5989	Stable	NA	White	2.671	NA	NA	NA
231	Hyflosupercel	SiO 2	Solid	odorless	NA	NA	NA	NA	NA	Stable	NA	slight grey	2.3	NA	NA	NA
232	Epichlorohydrine	C3H5ClO	Liquid	Chloroform like	92.48	28	-57	115-117	NA	Stable	Flammable	Colorless	1.1870	3.80	21	NA
233	Sodium Hydroxide Flakes	NaOH	Solid	Odorless	40	NA	318	1390	NA	Stable	Corrosive	White	2.13	NA	NA	NA
234	Methanol	CH3OH	Liquid	Alcohol	32.04	NA	-97.6	64.5	NA	Stable	Flammable	colorless	0.7915	36.50	6.72	NA
235	Monoisopropyl Amine	(CH3)2CH2NH2	Liquid	Strong ammonia odor	NA	-32	-90	32	<173	Stable	Flammable	Colorless	0.69	12	2.3	1
326	Acetone	C3H6O	Liquid	Pungent	58.09	-17	-93.35	56.1	2500	Stable	Flammable	Colorless	0.7910-0.7930 at	12.8	2.6	NA

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
													20^{0}C			
327	Fumaric Acid	C4H4O4	Powder	Odorless	116.07	230	295-300	No. info. Is available	NA	Stable under control	Irritation to eyes	white	NA	NA	NA	NA
238	Activated Carbon	C	Solid	Odorless	NA	NA	NA	4827	NA	Stable	NA	Black	NA	NA	NA	NA
26	**Mtehyl Cyanocobalamine**															
239	Cyanocobalamin	C63H88CoN14O14P	Crystaline powder	odorless	1355.38	NA	>300	>300	NA	Stable	NA	Dark Red	NA	NA	NA	NA
240	Cobalt Chloride(II) hexahyrate	CoCl2.6H2O	Solid	NA	237.9196	Non combustible	87	1048.9	80	Stable	Corrosive	Purple	1.924	NA	NA	NA
241	Dimethyl Carbonate	C3H6O3	Liquid	Pleasant	90.08	18	2	90	13000	Stable	Flammable	Colorless	1.069	NA	NA	NA
242	Sodium Borohydride	H4BNa	Solid	Amine like	37.82	NA	Decomposes	NA	50	Stable	Skin, eye irritation	White	1.07	NA	NA	NA
243	Sodium Hydroxide	NaOH	Solid	Odorless	40	NA	318	1390	NA	Stable	Corrosive	White	2.13	NA	NA	NA
244	Acetone	C3H6O	Liquid	Pungent	58.09	-17	-93.35	56.1	2500	Stable	Flammable	Colorless	0.7910-0.7930 at 20^{0}C	12.8	2.6	NA
245	Methanol	CH3OH	Liquid	Alcohol	32.04	NA	-97.6	64.5	NA	Stable	Flammable	colorless	0.7915	36.50	6.72	NA

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
27	**Sertranil Hydrochloride**															
246	Alpha Napthol	C10H7OH	Solid	NA	144.17	161	96	288	1870	Stable	Irritation to eye, skin, inhalation, ingestion	NA	1.0954	NA	NA	NA
247	1,2 Dichloro Benzene	C6H4Cl2	Liquid	Pleasant	147	66	-17.6	180	500	Stable	Irritation to eye, skin, inhalation, ingestion	Colorless to light yellow	1.3059	9.2	2.2	2
248	Aluminum Chloride	AlCl3	Solid	Strong odor	133.34	NA	194	NA	NA	Hygroscopic	Skin, eye irritation	White	2.440	NA	NA	NA
249	Methanol	CH3OH	Liquid	Alcohol	32.04	NA	-97.6	64.5	NA	Stable	Flammable	colorless	0.7915	36.50	6.72	NA
250	Water	H2O	Liquid	Odorless	18.02	NA	NA	100	NA	Stable	Non Hazardous	Colorless	1	NA	NA	NA
251	Monomethyl amine	CH3NH2	Liquid	NA	31.06	-10	-93.5	-6.3	NA	Stable	Irritation to eye, skin, inhalation, ingestion	Colorless	0.656	21	5	NA
252	Sodium Borohydride	H4BNa	Solid	Amine like	37.82	NA	Decomposes	NA	50	Stable	Skin, eye irritation	White	1.07	NA	NA	NA
253	HCl 30%	HCl	Liquid	Acidic	6.46	NA	-46	51	700	Stable	Corrosive	Colorless	1.18	NA	NA	0.25 to 10
254	Ethyl acetate	C4H8O2	Liquid	Fruity	88.11	-4	83.5	75-78	620	Stable	Flammable	Colorlss	0.902	11.5	2.0	50
255	Carbon	C	Solid	NA	12.1	NA	3651.6	4826.6	NA	Stable	Irritant to skin, eye	Black	2-2.5	NA	NA	NA
256	Hyflow	SiO 2	Solid	odorless	NA	NA	NA	NA	NA	Stable	NA	slight grey	2.3	NA	NA	NA
257	D[-] Mandelic acid	C6H5CH(OH)COOH	Solid	NA	NA	NA	119	NA	NA	Stable	Irritation to eye, skin, inhalation, ingestion	NA	1.3	NA	NA	NA

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
258	Sodium carbonate	Na2CO3	Solid	Odorless	105.99	NA	851	NA	NA	Stable	NA	White	NA	NA	NA	NA
259	Sodium Hydroxide	NaOH	Solid	Odorless	40	NA	318	1390	NA	Stable	Corrosive	White	2.13	NA	NA	NA
28	**Flubiprofen**															
260	Sodium Nitrite	NaNO2	Solid	Odorless	69	NA	271	320	180	Stable	Irritation to eye, skin, inhalation, ingestion	White to slightly yellowish	2.2	NA	NA	NA
261	Isobutanol	(CH3)2CHCH2OH	Liquid	Sweetish and musty	74.12	28	-108	108	2460	Stable	Irritation to eye, skin, inhalation, ingestion	Colorless	0.806	1.2	10.9	40
262	HCl	HCl	Liquid	Acidic	6.46	NA	-46	51	700	Stable	Corrosive	Colorless	1.18	NA	NA	0.25 to 10
263	Potassium Carbonate	K2CO3	Solid	Odorless	138.21	NA	891	NA	2570	Hygroscopic	Skin, eye irritation	NA	2.43	NA	NA	NA
264	Urea	(NH2)2CO	Solid	Odorless	60.06	NA	132.7	NA	8471	Stable	NA	White	1.323	NA	NA	NA
265	Caustic Lye	NaOH	Solid	Odorless	40	NA	318	1390	NA	Stable	Corrosive	White	2.13	NA	NA	NA
266	2-Fluoro 4-Bromo acetanilide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
267	Toluene	C6H5CH3	Liquid	Aromatic , hydrocarbon	NA	40	NA	231	2.6 to 7.5 gm/kg	Stable	Irritant	Clear	0.86	7.1	1.2	0.2-5.0

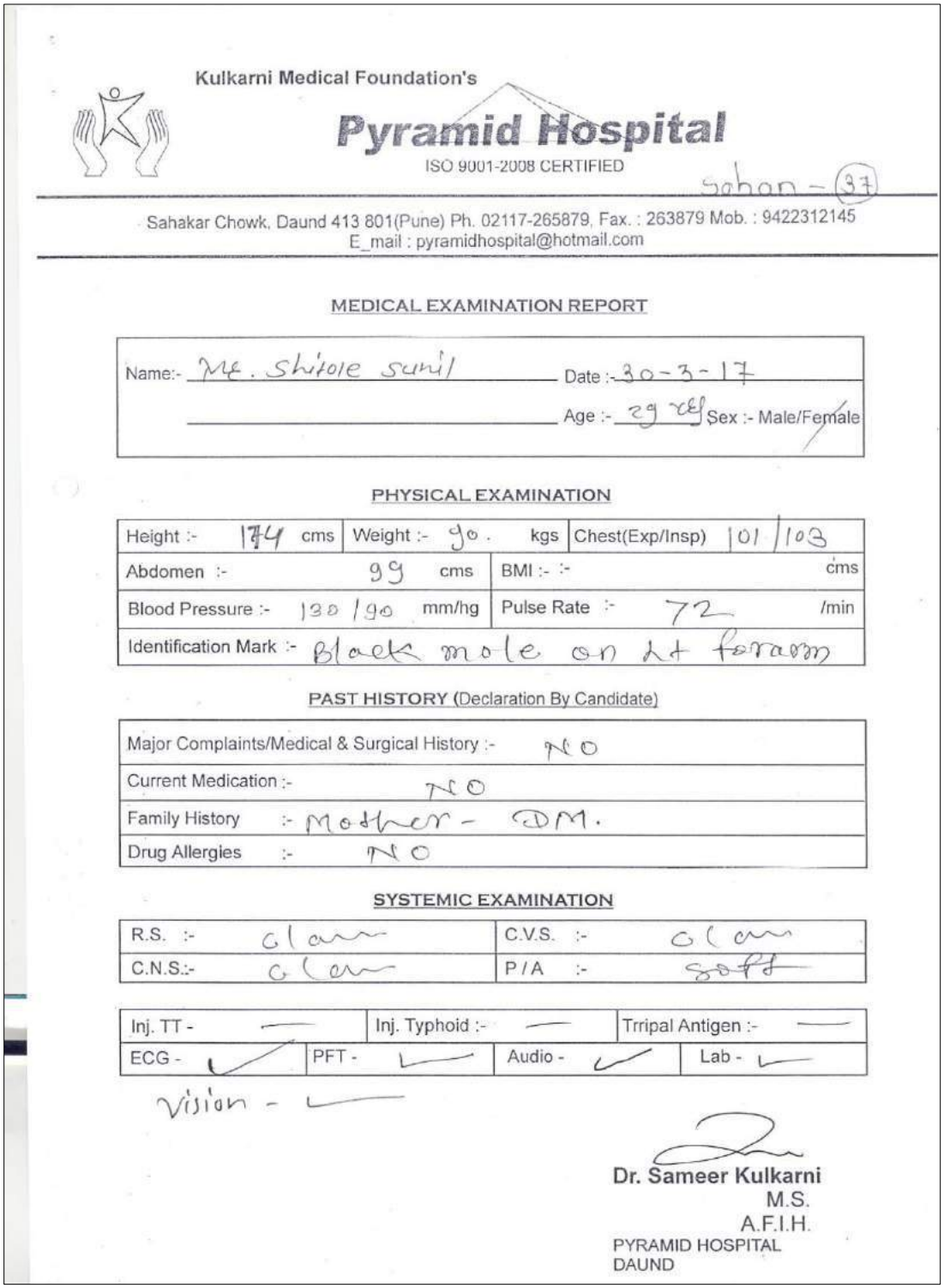
Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
268	Cupric Chloride	CuCl2	Solid	Odorless	170.48	NA	100	992.78	NA	Stable	Irritation to eye, skin, inhalation, ingestion	Bluish-green	2.54	NA	NA	NA
269	Sulphuric acid	H2SO4	Liquid	Odorless	98.08	NA	-35 to 10.36	270-340	2140	Stable	Corrosive	Colorless	1.84	NA	NA	NA
270	Isopropanol	C3H8O	Liquid	Rubbing alcohol	60.1	12	-88.5	82	5,045	Stable	Irritating	Colorless	NA	NA	NA	NA
271	Methanol	CH3OH	Liquid	Alcohol	32.04	NA	-97.6	64.5	NA	Stable	Flammable	colorless	0.7915	36.50	6.72	NA
272	Acetone	C3H6O	Liquid	Pungent	58.09	-17	-93.35	56.1	2500	Stable	Flammable	Colorless	0.7910-0.7930 at 20^{0}C	12.8	2.6	NA
273	2-Bromo Propanoic acid	C3-H5-Br-O2	Solid	NA	152.98	100	25	203	NA	Stable	Irritation to eye, skin, inhalation, ingestion	Solid	1.65	NA	NA	NA
274	Sodium Methoxide Solution	CH3ONa	Solid	NA	54.03	33	>126	NA	2037	Stable	Irritation to eye, skin, inhalation, ingestion	White	1.1	7.3	36	NA
275	Magnesium Turnings	NA	Solid	Odorless	24.31	NA	651	1100	NA	Stable	Irritation to eye, skin.	Silver-white	1.74	NA	NA	NA
276	Cobalt Chloride Hexahydrate	CoCl2.6H2O	Solid	NA	237.9196	Non combustible	87	1048.9	80	Stable	Corrosive	Purple	1.924	NA	NA	NA
277	Ethanol	CH3CH2OH	Liquid	Alcohol-like	46.07	12.78	-114.1	78.5	7060	Stable	Irritant to skin, eye Inhalation &. ingestion	Colorless	0.789	19	3.3	100
278	Hyflow	SiO 2	Soli	odorle	NA	NA	NA	NA	NA	Stable	NA	slight	2.3	NA	NA	NA

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
			d	ss								grey				
279	Pet. Ethar	NA	Liquid	Slight	NA	-18	NA	60	NA	Stable	Irritant to skin, eye Inhalation &. ingestion	Clear Colorless	0.7	1.1	5.9	
280	Carbon	C	Solid	NA	12.1	NA	3651.6	4826.6	NA	Stable	Irritant to skin, eye	Black	2-2.5	NA	NA	NA
281	Tetra Hydro Furan	C4H8O	Liquid	Petroleum distillate	72.11	-21	-108	66	1650	Hygroscopic	Skin, eye irritation	Colorless	0.880	11.8	2.0	NA
29	**Dilitiazem**															
282	Para Anisaldehyde	C8H8O2	Liquid	NA	136.16	108	-1	248	1510	Stable	Irritation to eye, skin.	Colorless to light yellow	1.119	NA	NA	NA
283	Methyl Chloro acetate	C3H5ClO2	Liquid	Na	108.52	NA	NA	127 - 130	240	Stable	Irritant to skin, eye Inhalation &. ingestion	NA	1.232	NA	NA	NA
284	SMO Liquid	CH3ONa	Solid	NA	54.03	33	>126	NA	2037	Stable	Irritation to eye, skin, inhalation, ingestion	White	1.1	7.3	36	NA
285	Toluene	C6H5CH3	Liquid	Aromatic , Hydrocarbon	NA	40	NA	231	2.6 to 7.5 gm/kg	Stable	Irritant	Clear	0.86	7.1	1.2	0.2-5.0
286	2-Amino Thiophenol	C6-H7-N-S	Solid	NA	125.19	79	24.5	234	NA	Stable	Irritant to skin, eye Inhalation &. ingestion	Yellow to red	1.168	NA	NA	NA
287	Acetonitrile	CH3CN	Liquid	Aromatic	41.05	2	-46	81.6	2460	Stable	Irritant to skin, eye Inhalation	Colorless	0.783	4.4	16	NA

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
											&. ingestion					
289	Tartaric acid	HOOC(CHOH)2COOH	Solid	Odorless	150.09	210	168	NA	NA	Stable	Irritant to skin, eye Inhalation &. ingestion	White	1.76	NA	NA	NA
290	Methanol	CH3OH	Liquid	Alcohol	32.04	NA	-97.6	64.5	NA	Stable	Flammable	colorless	0.7915	36.50	6.72	NA
291	p-toluene sulphonic acid	C7-H8-O3-S	Solid	Characteristic	190.22	230	107	140	2570	Stable	Irritation to eye, skin, inhalation, ingestion	White	0.72	NA	NA	NA
292	Xylene	C6H4(CH3)2	Sweetish	Sweetish	106.17	24	-47.4	138	4300	Stable	Irritation to eye, skin, inhalation, ingestion	Colorless	0.864	7	1	1
293	DMF	HCON(CH3)2	Liquid	Amine like	73.09	57.778	-61	153	2800	Stable	Irritation to eye, skin, inhalation, ingestion	Colorless to light yellow	0.949	2.2	15.2	100
294	DAMC HCl															
295	Tetra Butyl ammonium Bromide	C16H36NBr	Solid	NA	322.38	NA	103.5	NA	NA	Stable	Irritant to skin, eye Inhalation &. Ingestion	NA	NA	NA	NA	NA
296	Activated carbon	C	Solid	Odorless	NA	NA	NA	4827	NA	Stable	NA	Black	NA	NA	NA	NA
297	Potassium Carbonate	K2CO3	Solid	Odorless	138.21	NA	891	NA	2570	Hygroscopic	Skin, eye irritation	NA	2.43	NA	NA	NA
298	Methane sulphonic acid	NA	Liquid	No odor	NA	NA	20	100	NA	Stable	Corrosive	Colorless	1.3	NA	NA	NA
299	Acetic anhydride	(CH3CO)2)	Liquid	Strong	102.09	49	-73.1	139.9	1780	Stable	Irritant to skin, eye Inhalation	Light	1.08	2.7	10.3	0.1

Sr. No.	Raw materials	Formula	State	Odor	Mol. Wt (g/mole)	Flash Point (^{0}C)	Melting Point (^{0}C)	Boiling Point (^{0}C)	LD_{50} (mg/kg)	Stability	Hazard	Color	Sp. Gr. (g/cc)	UEL %	LEL %	Odor threshold (ppm)
											&. Ingestion					
300	Pyridine	C5H5N	Liquid	Sharp	79.1	20	-42	115.3	891	Stable	Irritant to skin, eye Inhalation &. Ingestion	Colorless to light yellow	0.98272	12.4	1.8	NA
301	Isopropanol	C3H8O	Liquid	Rubbing alcohol	60.1	12	-88.5	82	5,045	Stable	Irritating	Colorless	NA	NA	NA	NA
302	IPA/HCl	NA	Liquid	NA	NA	11.67	-89.5	82.22	1562	Stable	Skin, eye irritation	NA	0.7855	2	12	50

Annexure {V}: Sample of Medical reports of workers for existing plant



Kulkarni Medical Foundation's

Pyramid Hospital

ISO 9001-2008 CERTIFIED

Sohan – 37

Sahakar Chowk, Daund 413 801(Pune) Ph. 02117-265879, Fax. : 263879 Mob. : 9422312145
E_mail : pyramidhospital@hotmail.com

MEDICAL EXAMINATION REPORT

Name:- Mr. Shitole Sunil Date :- 30-3-17

Age :- 29 yrs Sex :- Male/Female

PHYSICAL EXAMINATION

Height :-	174 cms	Weight :-	90. kgs	Chest(Exp/Insp)	101 / 103
Abdomen :-	99 cms			BMI :- :-	cms
Blood Pressure :-	130 / 90 mm/hg			Pulse Rate :-	72 /min
Identification Mark :-	Black mole on Lt forearm				

PAST HISTORY (Declaration By Candidate)

Major Complaints/Medical & Surgical History :-	NO
Current Medication :-	NO
Family History :-	Mother - DM.
Drug Allergies :-	NO

SYSTEMIC EXAMINATION

R.S. :-	Clear	C.V.S. :-	Clear
C.N.S.:-	Clear	P/A :-	Soft

Inj. TT -	—	Inj. Typhoid :-	—
Trripal Antigen :-	—		
ECG - ✓	PFT - ✓	Audio - ✓	Lab - ✓

Vision - ✓

Dr. Sameer Kulkarni
M.S.
A.F.I.H.
PYRAMID HOSPITAL
DAUND

Kulkarni Medical Foundation's

Pyramid Laboratory

ISO 9001-2008 CERTIFIED

Pyramid Hospital, Sahakar Chowk, Daund 413 801. (Pune) Ph. 02117-265879

NAME:-MR SUNIL SHITOLE AGE:29/M
REF BY:- SOHAN HEALTH CARE DATE 30.03.17

HAEMOGRAM

INVESTGATIONS	PATIENT'S VALUE	REFERENCE RANGE
1)Haemoglobin	12.9 gm%	14.00-16.00gm%
2)WBC COUNT	7,600/cumm	4,000-10,000/cumm
3)DIFFERENTIAL COUNT		
Neutrophils	68%	40- 70 %
Eosinophils	02%	01- 05 %
Basophils	00%	00- 01 %
Lymphocytes	27%	20- 40 %
Monocytes	03%	01- 06 %
4) BLOOD GROUP	"B"RH+VE	

BLOOD SUGAR

NO	TEST	RESULT	NORMAL VALUE
1	BSL(R)	101MG/DL	70-140 MG/DL
2	URINE SUG	NIL	

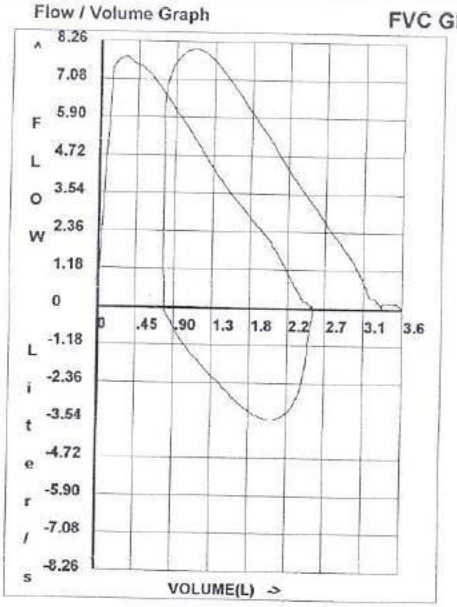
Mrs. Sharada M. Baldota
B.Sc.DMLT (R.No.005/1301)
Pathologist
Pyramid Hospital
Daund,Dist.Pune

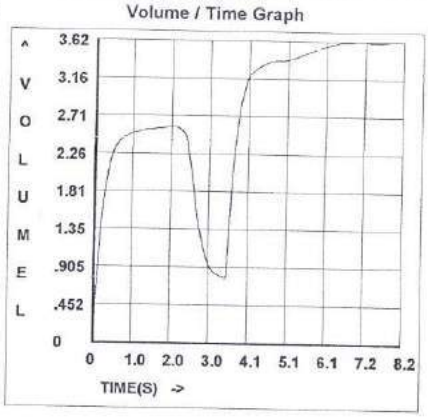
PYRAMID HOSPITAL
A/P SAHAKAR CHOWK, DAUND, PUNE 414801
Ph: 02117265879

FVC TEST REPORT

ID No.	: 2194		
Patient Name	: SOHAN MR SUNIL SHITOLE		Report Date : 10-04-2017
Age(yrs.)	: 29 Sex: M	Weight(Kg): 90	Eth. Corr.(%) : 80
Indications	:		Height(cm): 174 BSA(m^2): 2.05
Comments	:		

FVC GRAPHS





TEST RESULTS

Date of Test ->	30/03/2017		
Time of Test ->	16:02:38		
Parameter (U)	Pred.	Actual	%Pred.
FVC (L)	3.943	3.621	91.83
FEV0.5 (L)		2.27	
FEV1 (L)	3.321	2.507	75.48
FEV1/FVC %	81.99	69.23	84.43
PEF (L/s)	7.669	8.264	107.7
PIF (L/s)		3.621	
FEF25-75% (L/s)	3.863	1.643	42.53
Vmax25% (L/s)	6.552	7.057	107.7
Vmax50% (L/s)	4.276	3.157	73.83
Vmax75% (L/s)	1.958	3.064	156.4
FET100% (s)		8	
EST. Lung Age (Yrs.)		64	

INTERPRETATION: Mild Obs ESA Obs
This may be clinically co - related.

PYRAMID HOSPITAL DAUND

SpiroWin(c)99-07 GENESIS www.genesismedicals.com

PYRAMID HOSPITAL

AUDIOGRAM

Case No: S-37 **Date:** 30/03/2017

Patient's Name: Shitole Sunil

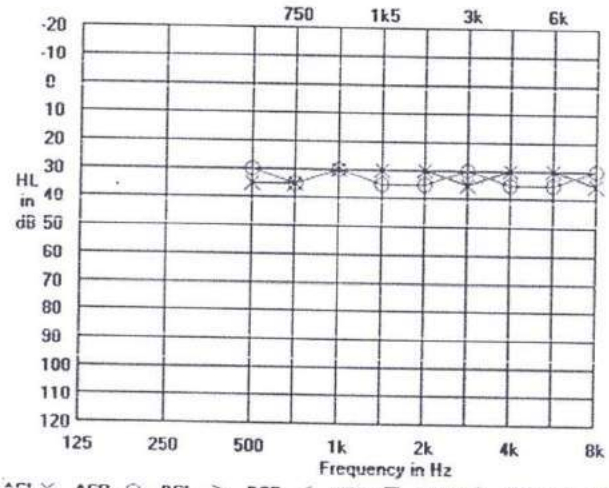
Age: 29 **Sex:** M

Patient's Address:

kurkhumb

Phone No:

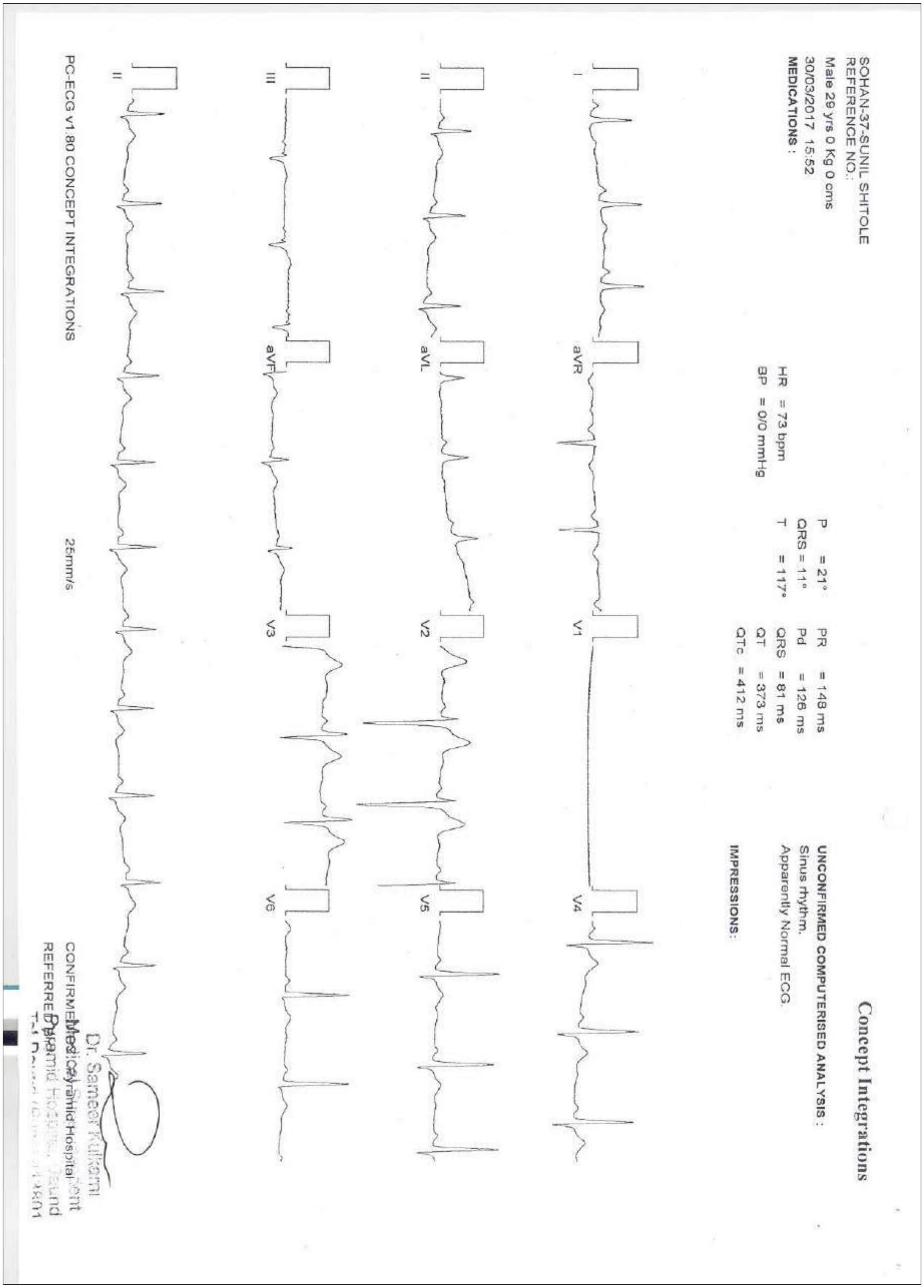
Referred By: SOHAN PVT. LTD.



CURRENT FILE :

Interpretation: AUDIOMETRY TEST IS WITHIN NORMAL LIMIT

PYRAMID HOSPITAL DAUND


SOHAN-37-SUNIL SHITOLE
REFERENCE NO.:
Male 29 yrs 0 Kg 0 cms
30/03/2017 15:52
MEDICATIONS :
HR = 73 bpm
BP = 0/0 mmHg
P = 21°
QRS = 11°
T = 117°
PR = 148 ms
Pd = 126 ms
QRS = 81 ms
QT = 373 ms
QTc = 412 ms
Concept Integrations
UNCONFIRMED COMPUTERISED ANALYSIS :
Sinus rhythm.
Apparently Normal ECG.
IMPRESSIONS :
I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II
PC-ECG v1.80 CONCEPT INTEGRATIONS
25mm/s
CONFIRMED BY
REFERRED BY
Dr. Sameer Kulkarni

Annexure {VI}

ON SITE EMERGENCY PLAN

Sohan Healthcare Pvt Ltd

Prepared on January 2014

Onsite Emergency Plan

(As nearer as to schedule 11 prescribed under rule 13 of the manufacturer, storage &

Import of hazardous chemicals Rules, 1989 & S-41B [4] of factories Act.1948)

- **Name & address of persons furnishing information**
  Mr. Dayanand P. Biradar

  Production Manager

  Sohan Healthcare Pvt. Ltd.

  D-30,MIDC Kurkumbh

  Tal-Daund, Dist-Pune-413802.

LOCATION

The plant located at Kurkumbh is 13 km away from the nearest railway station, Daund. The plant is connected by road through National Highway-9 Pune Solapur.

1. IDENTIFICATION OF EXPECTED HAZARD

The hazardous chemical is Mix-xylene and Methanol furnace oil and wood (Briquettes), diesel.

However, Mix-Xylene and Methanol for processing of Metformine HCl & wood (Briquettes) & Furnace oil for Steam generating boiler and diesel for DG set are hazardous commodities. Mix-xylene & Methanol are an inflammable liquid and it is stored far away from main limits with secured fencing underground storage tank and vent applies flame arrestor and handled safely.

In view of the above the likely hazards analysis is given below in the following table:

Sr. no	Plant unit	Hazard due to	Nature of Hazards	Controllable (C)	Uncontrollable (NC)
1.	Mix-Xylene	Fire	Minor: As the quantity is less	(C)	
2.	Methanol	Fire	Minor: As the quantity is less	(C)	

3.	Diesel	Fire	Minor: As the quantity is less	(C)	
4.	Furnace oil	Fire	Minor: As the quantity is less	(C)	
5.	Wood	Fire	Minor: As the quantity is less	(C)	

2. HAZARD CONTROL /SAFETY MEASURES

The vapor of mix-xylene/methanol will not burn if some source of heat is not there to reach the ignition Temperature of mix-xylene 26.85 to 31.85 °C & methanol 12°C . Moreover if the concentration of vapour does not reach either **LEL** (Lower Explosion Limit) or **UEL** (Upper Explosion Limit) explosion will not occur. Therefore, the following safety measures are incorporated in the design as well as Operation of the plant to maintain safe work condition.

1. MIX-XYLENE & METHANOL HANDLING AREA

Mix-Xylene is stored in underground tank (15 kl capacity of tank). The area is around 80 mts. from the main building and is a restricted place. The tanks are open to atmosphere so that in case of any leakage the concentration of gas reduces quickly and there is no build up of vapour. The equipment is maintained by the provider of xylene Supplier. The 1" line connected to water system in case of any emergency. All electrical equipment is flame proof. There are 03 nos. Fire Water Hydrant pump along with Hose Pipe sets, sand filled buckets for any emergency situation.

2. ELECTRICAL SYSTEM

20 Earthling Pits are identified in the factory to ensure proper earthling of Electrical equipments and plants. The earth pits are maintained and Tests are performed as per rules. The motor control centre (MCC) for all the power driven equipment and lighting is housed in separate rooms. Electrical drives and switches are located in safe zone. All motors are dust proof and duly earthed. Floor rubber mats are provided in front of all Electrical Panels.

3. PROCESS CONTROL SYSTEM

The process control system is adequately stopped so as to ensure that in case of any Power failure the process valves closed manually Then DG starts automatically for power generation then again open process valves and start system smoothly.

Boiler: We have a 1.5 M ton capacity of IBR Industrial Boiler in use with maximum pressure of 17.5kg/ $cm^2$and its inspection done by boiler inspector on 06-03-2013 next due date of inspection is 05.03.2014.

4. EMERGENCY CONTROL ROOM

In the event of an emergency, Emergency crew members will start functioning from this office. It is located at admin building. And in case of B C or holiday Emergency Control room will be at main gate

A. Emergency Team:

1. The selected persons from emergency control room will have a thorough knowledge of plant operations.

2. Normally a team of at least 2 persons would always be available in the emergency control room.

3. The Emergency team have identified following employees during any emergency,

Mr. Dayanand P.Biradar : Production Manager

Mr. U. P. Singh: Production Manager

Mr. N.H.Kittad: QA Manager

Mr. B.V. Biradar – Q.C Manager

Mr. S.B. Pol : Executive - Production

Mr A.V. Barkade: Executive -Production

Mr. Sunil Jadhav: Asst. Manager Maintenance

Mr. D.B.More : Electrical Engineer

Mr. Sanjay Ingale: Officer- Production.

Mr.S.M.Khedkar: Officer-Production

Mr. U.V. Kharade : Officer –Production

Mr. D.G.Ghadge : Security Officer

Mr. S.D. Dake : Security Officer

Mr. R.D. Shitole : First Class Boiler Attainder

Mr. A.M.Bhagwat : Store Incharge

B. Functioning: The emergency control room will keep a close liaison with other vital controls and will interact with the following agencies.

AGENCY PHONE NO.

1. Managing Director 020-26806911, 9850411431(M)
2. Manager Production 02117-235333, 8975759002 (M)
3. Assist. Manager Maintenance 02117-235333, 9881133341 (M)
4 Dound Police Station 02117-262333
5. Kurkumbh Fire Brigade 02117-262998, 262999

6. Ambulance Alkyl Amines 02117-235175

7. MSEB kurkumbh Power Station 02117-235123

8. Labouer Inspector Shri Kumbhar sahib 9850420131

9. Sub-Divisional Officer, kurkumbh 02117-235219/20

C. Facilities

The following facilities are provided in the Central Control Room

1. Telephone connection

2. Related Telephone Directories

3. Display board of important telephone numbers

4. Plant layout drawing

5. Emergency Lights

6. One vehicle will be made available for use by the Central Control Room as may be necessary and also emergency First –aid- kit.

D. **ACTION PLAN**

1. Emergency actions should be coordinated by the Officer at site from theEmergency Operations Centre i.e. Central Control Room or Main Gate (when the plant is closed).

2. The Officer at site will seize initiative and contain problem as far as possible (e.g. evacuate site ,verbally warn people in the immediate area, blow siren, halt production / dispatch/distribution)

3. Immediately move personnel to designated safe assembly area and arrange exit (if required)

4. Combat the situation by trained personnel.

5. Conduct initial analysis of the situation, assessing emergency characteristics and determining level of emergency or crisis.

6. Notify management (MD, WM, PM, Security cum Safety Officer) from safe area to report incident and intimate SDO / Police / Fire Brigade /Hospital & Inspector of Factories.

7. If necessary initiate shutdown procedures like;

a) Shutting down heating ,ventilation and air conditioning systems to stop the spread of smoke ,fire and or contaminants.

b) Shutting down key processes including utilities.

TRAINING OF EMERGENCY RESPONSE PERSONNEL:

A Training plan has been prepared for the Emergency Response personnel of SHPL, Kurkumbh. Mock drills are performed periodically to assess the performance and provide training for improvement as and when required . Our concern persons are also attain live Fire Mock drills organized by neighboring industries to upgrade their knowledge & experience.

4. EVACUATION ROUTES /ASSEMBLY POINT:

In case of any emergency situation (like liquid leakage, Fire etc) there may be a necessity of evacuating of personnel from the premises. They will be asked to assemble at Office Gate through blowing of siren /Public address system from the control room. One Key of the Office Gate will be kept at the Office Gate Security Room.

VISITORS/ OUTSIDERS IN PLANT AREA : All the Visitors/ Outsiders entering the Plant will be advised by the Security to read the Instructions for Visitors /Outsiders which detail Do's and Don'ts in case of Emergency Situation. No one should smoke inside the Plant

Visitor's Pass : To control over visitors/outsiders, we issue Visitor Pass

5. FIRST-AID SERVICES

First aid box kept at Emergency Control Center

6. FIRE FIGHTING SERVICES

A. Precautions

None of the proposed raw material used are of hazardous nature as per the status. However xylene, Methanol and Diesel for process & power generating set are hazardous commodities. Xylene is stored in U/Ground tank and directly transfers through pressure pump to reciever15 kl capacity of each tank (xylene, methanol) in a restricted place with proper fencing. Our Diesel requirement in a month is very less (around 1200lts) and is stored in barrels in a separate room by taking necessary safety care.

B. FIRE FIGHTING ARRANGEMENTS:

C. FIRE FIGHTING FACILITIES INSTALLED:

a) On-ground Water Tank 100 M^3 capacity

b) Fire Pumps: Capacity 200 M^3 /Hr at 7 Kg/C M^2 Pressure one driven by 75 KW Motor and the other driven by 320KVA Diesel generator Located at the utility area and its Connection given to 200 M^3/Hr at 7 Kg/CM^3 .

c) Overhead Tank 1 No. 1.5 cuM capacity at a height of 15 Metres.

f) Fire Hydrants : 2 Nos. inside the plant and another 4 Nos. spread all around the Factory.

D. Maintenance of Fire Fighting Equipments: Fire Fighting Equipments are maintained on quarterly basis by m/s Naaz safety services Aurangabad.

7. EMERGENCY PROVISIONS

In case of any fire or emergency all emergency telephone numbers are written down at the security gate and a telephone is located at the security gate.

8. FIRE FIGHTING AND SAFETY

Name of Safety Committee members & Telephone nos. are as under:

Name Mobile No. Office Ext.No.

Mr. S.B.Pol 09970040035

Mr. S.M.Khedkar 09763867411

Mr. A.V. Barkade 07385577304

Mr. U.V.Kharade: 08308803898

Mr. D.B. More: 09921248254

Mr.G.M.Chauhan 09881088936

Mr. S.N. Ingale : 09766726616

Mr.P.G.Totare : 08380069720

The First-Aid Fire fighting system envisaged for the plant is of portable extinguisher type located at suitable points in the plant and other areas. The following categories of Portable extinguishers are provided in the plant.

Type Capacity Service Area

Carbon dioxide 4.5, 5, 10 Kg 9, 50 lts Laboratory, Control room, Raw material storage area, Main Process area, Office, Block area etc. In areas around the plant, hydrants are provided. The services of the Nearest fire brigade are available for supplementing the plant fire fighting system in caseof emergency.

LIST OF FIRE EXTINGUISHERS AT SHPL FACTORY

We have Fire Extinguishers for all types of Fire located throughout the plant in logical manner as advised by Experts. Also we have Fire Hoses and Nozzles located suitably near the Hydrants .Mock Fires and drills are done at regular intervals involving all employees including the Security Personnel. Fire Extinguishers and accessories are also checked and maintained by Competent Party like m/s Naaz safety services, Aurangabad.

VENTILATION: We have 1 Ventilation unit in the factory including centrifuge area and crystallizer area.

9. POTENTIAL FOR EMERGENCY SITUATION/ ACCIDENT AT NEARBY FACILITIES.

a) Railway Lines are far away and therefore this is not a cause for potential emergency situation

b) Road (NH-9) is almost ½ Km away and no potential emergency situation is foreseen.

c) Nearby Factories viz. Alkyl Amine chemicals ltd, Peral organics Ltd, Cipla ltd have been intimated to inform us the emergency condition in their plants, in case of emergency situation thus received will be dealt for evacuation and assembly routes as per (evacuation Route/ Assembly Point).

d) Smoking: Smoking is strictly restricted in company premises.

Sohan Healthcare Pvt.ltd

D-30 MIDC Kurkumbh

Daund Dist-Pune 413802

Report Sheet of Fire Extinguisher Lactation Wise with Refilling Date.

2013.

Report Sheet of Fire Extinguisher location wise with refilling Date -2013

SR. NO.	FIRE EXTINGUISHERS NO.	CAPACITY	LOCATION	Date of Refilling	Due Date
1.	FEx -01	DCP -10Kg	Raw material room-store.	19.02.2013	18.02.2014
2.	FEx -02	DCP -10Kg	MCC Room Near non IBR Boiler	19.02.2013	18.02.2014
3.	FEx -03	DCP -10Kg	Methanol and Xylene tank.	19.02.2013	18.02.2014
4.	FEx -04	DCP -10Kg	Passage between store and process area.	19.02.2013	18.02.2014
5.	FEx -05	DCP -10Kg	C/F No 5,6 &7	19.02.2013	18.02.2014
6.	FEx -06	DCP -10Kg	Transformer area.	19.02.2013	18.02.2014
7.	FEx -07	DCP -5 Kg	Near Pharma (FBD) room	19.02.2013	18.02.2014
8.	FEx -08	DCP -5 Kg	Near R-08	19.02.2013	18.02.2014
9.	FEx -09	DCP -5 Kg	R & D	26.08.2013	25.08.2014
10.	FEx -10	DCP -5 Kg	R & D	26.08.2013	25.08.2014
11.	FEx -11	M. Foam (9 Lit.)	C/F No 5,6 &7	24.08.2013	23.08.2014
12	FEx -12	M. Foam (9 Lit.)	Air Compressor No -1 &2	24.08.2013	23.08.2014
13	FEx -13	M. Foam (9 Lit.)	First Floor (Near Hoist)	24.08.2013	23.08.2014
14	FEx -14	M. Foam (50 Lit.)	Ground Floor (Near Hoist)	24.08.2013	23.08.2014
15	FEx -15	M. Foam (50 Lit.)	First Floor (Near Hoist)	24.08.2013	23.08.2014
16	FEx -16	CO2 (4.5 Kg)	Process area first floor.(Near Reactor)	24.08.2013	23.08.2014
17	FEx -17	CO2 (4.5 Kg)	Near R -10	24.08.2013	23.08.2014
18	FEx -18	CO2 (4.5 Kg)	QC Department	24.08.2013	23.08.2014

FIRE SYSTEM

Sr.No	ZONE	AREA	SMOKE DETECTOR	FIRE ALARAM
1.	A ZONE	QA/QC LAB		
	1.	Chemical lab	02	-
	2.	Instrument lab	02	-
	3.	Passage	-	01
2.	B ZONE	PLANT AREA		
	1.	Reactor area ‘G’ floor	01	01
	2.	Reactor area 1st floor	01	01
3.	C ZONE	PHARMA AREA		
	1.	Ground floor CF-05/06/07	01	
	2.	Pharma Area	01	01
4.	D ZONE			
	1.	In-between pharma and BSR passage	-	01
	2.	Approved material room	02	
	3.	Raw material entry passage	-	01
	4.	Reject Room	01	
	5.	Raw material Room	01	01

Annexure {VII}

Fire Hydrant System for Sohan Healthcare Pvt Ltd