QUANTITATIVE RISK ASSESSMENT

1.0 INTRODUCTION
M/s. SETCO Chemicals (I) Pvt Limited is located in Vapi G.I.D.C area of Valsad district, Gujarat State. M/s SETCO Chemical Pvt Limited is engaged in the manufacturing of Resin and different type of Inks. The manufacturing process involves various unit operations and unit processes. The production facility at Vapi is commenced during year 2004. Unit requires to handle various raw materials and to assess risk hazardous and it’s preventive. The risk assessment study has been conducted for identification of hazards, to calculate damage distance and to spell out risk mitigation measures.

1.1 SCOPE OF STUDY
The scope of work is to carry out risk analysis for the proposed activities of plant covering all the hazardous chemicals to be handled and stored at the plant after activities.

1.1.1 Study Objective
The objective of the risk analysis includes the following:
- Identification of hazards
- Selection of credible scenarios.
- Consequence analysis of selected accidents scenarios.
- Risk mitigation Measures.
- Quantitative risk assessment

1.1.2 Study Approach
The risk assessment study broadly comprised of the following steps:
- System Description
- Identification of Hazards
- Selection of Credible Accident scenario
- Consequence analysis
- Risk Mitigation Measures
1.2 SYSTEM DESCRIPTION
This step comprises the compilation of the location, design and operational information needed for evaluation of risk.

1.2.1 Risk Reduction Measures
Based on hazard identification and consequence analysis, risk reduction measures were suggested to reduce risk and enhance safety at the plant.

QRA is carried for Toluene, Methyl ethyl ketone, Methanol, Xylene, Isopropyl alcohol, mineral Turpentine.

1.2.2 Hazard Identification
Mapping the process by step by step in a specific workplace area, tasks in process or activities making up a task by utilizing the existing company documentation. The actual hazard likely to be encountered will vary depending upon equipment and structured being design. A selection of principal hazard to be considered would include trapped by something collapsing or overturning, stuck by moving vehicle, contact with electricity or an electric discharge, Stuck by falling/ flying objects., Contact with moving machinery, leakage slippage of waste or raw material.

<table>
<thead>
<tr>
<th>S= Severity (Hazard Severity)</th>
<th>P= Probability (Probability of Hazard)</th>
<th>N=No of persons will get affected</th>
<th>D=Asset Damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1= (unlikely to have an adverse impact on employees safety and health)</td>
<td>1 = Less likely. Can occur once / once in a year</td>
<td>1= 1 person</td>
<td>1= Inside the premises, negligible impact, can be corrected immediately with less than Rs 1000 as correction expense</td>
</tr>
<tr>
<td>2 = Minor (unlikely to result in a near miss accident or to have a minor impact on employees health)</td>
<td>2 = May be possible. Exposure occurs few times in Quarter</td>
<td>2= 2 Person</td>
<td>2= Can cause property damage which can be corrected with upto Rs 1 lakh expense</td>
</tr>
<tr>
<td>3= Moderate (likely to result in a near miss accident or to have a minor impact on</td>
<td>3 = Likely occurrence. Exposure occurs few times in a month.</td>
<td>3= 5-10 person</td>
<td>3= Can cause damage resulting in stoppage of the production operation, with</td>
</tr>
<tr>
<td>$= Severity (Hazard Severity)</td>
<td>$P= $Probability (Probability of Hazard)</td>
<td>$N= $No of persons will get affected</td>
<td>$D= $Asset Damage</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------------------</td>
<td>---------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>employees health or first aid)</td>
<td>4 = Serious (Likely to result in a accident with minor injuries or to have a moderate impact on employees health or reportable accident)</td>
<td>4 = More than 10 person</td>
<td>Rs. 1 to Rs.10 lakh as correction expense</td>
</tr>
<tr>
<td>4 = Serious (Likely to result in a accident with minor injuries or to have a moderate impact on employees health or reportable accident)</td>
<td>4 = Likely occurrence. Exposure occurs few times in a week.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 = Extremely serious (likely to result in a serious accident or to have a serious impact on employees health or death)</td>
<td>5 = High probability. Occurs very frequently, many times in a Day. Highly certain, Constant and continuous exposure exists</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 = Extremely serious (likely to result in a serious accident or to have a serious impact on employees health or death)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Score= Total Risk Score (R) = Severity (S) x Probability (P) x No. Of Person affected (N) x Asset Damage (A)

Significant Risk

$=Total score=200 & >200

Instructions /Toolbox talk, Training & additional measures or Objectives and Programs to be formulated to reduce the risk level to tolerable level.

No significant Risk

$= Total score <200
<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Activity</th>
<th>Hazard</th>
<th>Risk Rating</th>
<th>Existing Control</th>
<th>Recommendations</th>
</tr>
</thead>
</table>
| 1     | Unloading of Raw Material from Trucks. | • Fall from Height  
• Fall of material causing injury to person.  
• Crush Injury  
• Leakage/Spillage of chemical causing fire & explosion in case of flammable chemicals.  
• Chemical from injury. | 4 1 3 1 12 | Trained & Experience persons are deployed.  
Required PPEs are provided.  
Work is planned during day time.  
SOP is made.  
First aid box & safety shower are available.  
Fire Extinguishers are provided. | • Tool box talk to be given before start up.  
• SOP to be modified for adding HES requirement.  
• No hot work around unloading area.  
• Unloading to be started after parking the vehicle & driver remain out of driver’s cabin with key.  
• Training on ‘Safe Material Handling’ to be imparted. |
| 2     | Store of Raw Material.          | • Spillage & Leakage  
• Fire & Explosion  
• Fall of containers if stacked high.  
• Inhalation of | 2 1 2 2 8 | Air Ventilators are provided on roof.  
Fire Extinguishers are provided.  
No Electrical supply.  
Identification of | • Ventilation to be provided at ground floor level.  
• Cautionary Signboard indicating restricted entry. Hazardous properties to be displayed.  
• Foam trolley with nozzle is to be
<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Activity</th>
<th>Hazard</th>
<th>Risk Rating</th>
<th>Existing Control</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>S  P  N  A</td>
<td>Total Risk (R)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 3     | Transportation of solvents/chemicals to reaction floor using hoist. | • Spill & leak  
• Inhalation of vapour.  
• Fire & Explosion  
• Physical hazardous to person  
• Chemical/Solvent splash. | 2 2 5 1 | 20 | Drums/containers are transported using standard trolley.  
Hoist is dedicated for transport material.  
Trained & Experienced person.  
PPEs like dust respirators, Hand gloves etc. being used. | Spill & leak kit is to be kept at site  
SOP to be made. |
| 4     | Charging of Raw Material in to reactors. | • Fire & Explosion  
• Inhalation of Vapour.  
• Physical Injury | 2 4 4 3 | 96 | Trained & Experienced person.  
SOP is available.  
PPEs like dust mask, | SOP to be reviewed & HSE requirement to be added.  
Spill leak kit to be made available.  
Fire blanket to be made available. |
<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Activity</th>
<th>Hazard</th>
<th>Risk Rating</th>
<th>Existing Control</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>S  P  N  A</td>
<td>Total Risk (R)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Boarding &amp; packing of the Finished product.</td>
<td>• Spill &amp; Leak</td>
<td>1  2  4  1</td>
<td>8</td>
<td>Apron, Safety Gloves etc. being used.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Supervision.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mechanical ventilation is to be provided.</td>
</tr>
<tr>
<td>6</td>
<td>Movement of Trucks</td>
<td>• Hit &amp; run over by Truck (Facility).</td>
<td>2  2  2  1</td>
<td>6</td>
<td>PPEs are provided.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Properly Damage due to hitting of moving trucks.</td>
<td></td>
<td></td>
<td>Dust collection is in place.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fire inside trucks cabin</td>
<td></td>
<td></td>
<td>Supervision</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Traffic Hazardious</td>
<td></td>
<td></td>
<td>Trained &amp; Experienced person</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Display of cautionary Signboard.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Vehicle checking using check list before entry.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Area Identification having stopper.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SOP to be prepared.</td>
</tr>
</tbody>
</table>
1.3 METHODOLOGY ADOPTED FOR QRA

Consequences of loss of containment can lead to hazardous situation in any industry handling potentially hazardous materials. Following factors govern the severity of consequence of the loss of containment.

- Intrinsic properties: flammability, toxicity and reactivity.
- Dispersive energy: pressure, temperature and state of matter.
- Quantity present
- Environmental factors: weather (wind speed, wind direction, atmospheric temperature & pressure).

Consequence analysis and calculations are effectively performed by computer software using models validated over a number of applications. Consequence modeling is carried out by **PHAST (version 6.53) of DNV Software, UK.**

PHAST uses the Unified Dispersion Model (UDM) capable of describing a wide range of types of accidental releases. The Model uses a particularly flexible form, allowing for sharp-edged profiles, which become more diffuse downwind.

PHAST contains data for a large number of chemicals and allows definition of mixtures of any of these chemicals in the required proportion. The calculations by PHAST involve following steps for each modeled failure case:

- Run discharge calculations based on physical conditions and leak size.
- Model first stage of release (for each weather category).
- Determine vapor release rate by flashing of liquid and pool evaporation rate.
- Dispersion modeling taking into account weather conditions.
- In case of flammable release, calculate size of effect zone for fire and explosion.
- The hazardous materials considered in this study are mostly flammable liquids.
Flow chart for consequence analysis is shown in the form of event tree for release of flammable liquid.

Figure 1.1: Methodology Adopted for the Study
1.4 METEOROLOGICAL CONDITION

The consequences of released flammable material are largely dependent on the prevailing weather conditions. For the assessment of major scenarios involving release of flammable materials, the most important meteorological parameters are those that affect the atmospheric dispersion of the escaping material. The crucial variables are wind direction, wind speed, atmospheric stability and temperature. Rainfall does not have any direct bearing on the results of the risk analysis; however, it can have beneficial effects by absorption / washout of released materials. Actual behavior of any release would largely depend on prevailing weather condition at the time of release. For the present study we have used the meteorological data of SETCO Chemicals (I) Pvt. Ltd.

1.4.1 ATMOSPHERIC PARAMETERS

The atmospheric parameters which are considered while conducting this study are as under:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atmospheric Temperature</td>
<td>35 deg Celsius</td>
</tr>
<tr>
<td>Average Wind Speed</td>
<td>1.2 m/s and 5 m/s</td>
</tr>
<tr>
<td>Scenarios Taken</td>
<td>50 mm Leak of the Storage tank, Catastrophic Rupture of the Storage Tank</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>60%</td>
</tr>
<tr>
<td>Stability Class</td>
<td>E and F</td>
</tr>
</tbody>
</table>

1.4.2 WEATHER CATEGORY

One of the most important characteristics of atmosphere is its stability. Stability of atmosphere is its tendency to resist vertical motion or to suppress existing turbulence. This tendency directly influences the ability of atmosphere to disperse pollutants emitted into it from the facilities. In most dispersion scenarios, the relevant atmospheric layer is that nearest to the ground, varying in thickness from a few meters to a few thousand meters. Turbulence induced by buoyancy forces in the atmosphere is closely related to the vertical temperature gradient.

Temperature normally decreases with increasing height in the atmosphere. The rate at which the temperature of air decreases with height is called Environmental Lapse Rate (ELR). It will vary from time to time and from place to place. The atmosphere is said to be stable, neutral or unstable according to ELR is less than, equal to or greater than Dry Adiabatic Lapse Rate (DALR), which is a constant value of 0.98°C/100 meters.
Pasquill stability parameter, based on Pasquill – Gifford categorization, is such a meteorological parameter, which describes the stability of atmosphere, i.e., the degree of convective turbulence. Pasquill has defined six stability classes ranging from `A' (extremely unstable) to `F' (moderately stable). Wind speeds, intensity of solar radiation (daytime insulation) and nighttime sky cover have been identified as prime factors defining these stability categories. When the atmosphere is unstable and wind speeds are moderate or high or gusty, rapid dispersion of pollutants will occur. Under these conditions, pollutant concentrations in air will be moderate or low and the material will be dispersed rapidly. When the atmosphere is stable and wind speed is low, dispersion of material will be limited and pollutant concentration in air will be high. In general, worst dispersion conditions (i.e. contributing to greater hazard distances) occur during low wind speed and very stable weather conditions.

1.5 HAZARDS & DAMAGE CRITERIA OF MATERIALS
The release of flammable liquid can lead to different types of fire or explosion scenarios. These depend on the material released, mechanism of release, temperature and pressure of the material and the point of ignition. Types of flammable effects are as follows.

1.5.1 Hazards associated with Flammable materials
a. Pool fire
The released flammable material which is a liquid stored below its normal boiling point, will collect in a pool. The geometry of the pool will be dictated by the surroundings. If the liquid is stored under pressure above its normal boiling point, then a fraction of the liquid will flash into vapor and the remaining portion will form a pool in the vicinity of the release point. Once sustained combustion is achieved, liquid fires quickly reach steady state burning. The heat release rate is a function of the liquid surface area exposed to air. An unconfined spill will tend to have thin fuel depth (typically less than 5 mm) which will result in slower burning rates. A confined spill is limited by the boundaries (e.g. a dyke area) and the depth of the resulting pool is greater than that for an unconfined spill.

b. Flash fire:
It occurs when a vapor cloud of flammable material burns. The cloud is typically ignited on the edge and burns towards the release point. The duration of flash fire is very short (seconds), but it may continue as jet fire if the release continues. The overpressures generated by the combustion are not considered significant in terms of damage potential to persons, equipment
or structures. The major hazard from flash fire is direct flame impingement. Typically, the burn zone is defined as the area the vapor cloud covers out to half of the LFL. This definition provides a conservative estimate, allowing for fluctuations in modeling. Even where the concentration may be above the UFL, turbulent induced combustion mixes the material with air and results in flash fire.

c. Jet Fire:
Jet flames are characterized as high-pressure release of gas from limited openings (e.g. due to small leak in a vessel or broken drain valve). Boiling liquid expanding vapor explosion (BLEVE) or fireball: A fireball is an intense spherical fire resulting from a sudden release of pressurized liquid or gas that is immediately ignited. The best known cause of a fireball is a boiling liquid expanding vapor explosion (BLEVE). Fireball duration is typically 5 – 20 seconds.

d. Vapor cloud explosion
When a large quantity of flammable vapor or gas is released, mixes with air to produce sufficient mass in the flammable range and is ignited, the result is a vapor cloud explosion (VCE). Without sufficient air mixing, a diffusion-controlled fireball may result without significant overpressures developing. The speed of flame propagation must accelerate as the vapor cloud burns. Without this acceleration, only a flash fire will result.

**Unconfined Vapour Cloud Explosion**

**Definition:** Type of explosion in a liquefied hydrocarbons or other flammable gas cloud in a non-confined space (within and/or beyond the premises)

**Factor Affecting Formation Of Vapour Cloud**
- Type of leaked oil- Lesser the flash point of flammable liquid, more will be the generation of vapor cloud
- Rate of leakage:- More the rate –more will be vapor formation
- Wind velocity- more vapor formation may result due to heavy wind but the cloud will drift in the direction of the wind
- Type of enclosure:- A solid wall will hold more vapor as compared to a fenced boundary
- Type of nearby vegetation - More is vegetation near the leak site, more vapors will be trapped. More is the height of the plants; more will be the quantity of vapor trapped
EFFECT OF UNCONFINED VAPOUR CLOUD EXPLOSION

When the vapor cloud is ignited, following may result:-

- Blast waves
- Shock waves
- Fire Ball
- Multiple fires

Above may causes huge loss of life and property and may also damage the onsite disaster mitigation resources making it an offsite emergency.

MANAGEMENT OF VAPOUR CLOUD

- Don’t switch off or switch on any electrical or heat generating source like DG and Compressor
- Any hot job inside or outside the station premises should be immediately stopped
- Declare station emergency and evacuate the station as per evacuation
- Stay upwind
- Try to close the valve by remote operation if leakage is from the valve otherwise isolate the oil supply to leak tank/piping/valve
- If not possible to isolate the valve by remote, wear BA set and close the valve locally. Don’t try to approach site without BA set otherwise asphyxiation will lead to collapse and death
- When the clouds gets ignited causing an explosion, follow the management procedure

The formation of vapor clouds is relatively higher in spillages observed in lighter hydrocarbons i.e. MS, Naphtha and LPG. The formation of vapor cloud in crude installation (Terminal Station location) is expected due to spillage of crude oil in tank dyke area. The crude oil contains many low temperature boiling hydrocarbons (Hydrocarbons having high vapor pressure). Hence any accidental spillage of crude oil will result into evaporation of these lighter components from the crude oil. The evaporation will take place by removal of the vapors above the pool by the wind. The amount of vapor, which is removed, depends on: partial vapor pressure of the liquid, wind velocity, pool area and ambient temperature.

VAPOR CLOUD FORMATION & ITS EFFECT

When a cloud of flammable vapor burns, the combustion may give rise to an overpressure or it may not. If there is no overpressure, the event is a vapor cloud fire, or flash fire: and if there is overpressure, it is vapor cloud explosion.
A vapor cloud explosion is one of the most serious hazards in the process industries. Vapor cloud explosions do occasionally occur and they are generally very destructive.

A feature of vapor cloud is that it may drift some distance from the point where the leak has occurred and thus threaten a considerable area. Such types of vapor cloud find an ignition source and can create overpressure and blast effects which can cause severe damage at considerable distance from the source of leak.

1.5.2 Hazards Associated with Explosive Chemicals

Damage Criteria
Damage estimates due to thermal radiations and overpressure have been arrived at by taking into consideration the published literature on the subject. The consequences can then be visualized by the superimposing the damage effects zones on the proposed plan site and identifying the elements within the project site as well as in the neighboring environment, which might be adversely affected, should one or more hazards materialize in real life.
Thermal damage
The effect of thermal radiation on people is mainly a function of intensity of radiation and exposure time. The effect is expressed in terms of the probability of death and different degrees of burn. The following tables give the effect of various levels of heat flux.

FATAL RADIATION EXPOSURE LEVELS

**Table 1.2: Fatal Radiation Exposure Level**

<table>
<thead>
<tr>
<th>RADIATION LEVEL (kW/m²)</th>
<th>FATALITY</th>
<th>1%</th>
<th>50%</th>
<th>99%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>EXPOSURE IN SECONDS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.0</td>
<td>150</td>
<td>370</td>
<td>930</td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>30</td>
<td>80</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>37.5</td>
<td>8</td>
<td>20</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

OVERPRESSURE DAMAGE:

**Table 1.3: Overpressure Damage Criteria**

<table>
<thead>
<tr>
<th>OVER PRESSURE</th>
<th>MECHANICAL DAMAGE TO EQUIPMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bar</strong></td>
<td><strong>K Pa</strong></td>
</tr>
<tr>
<td>0.0014</td>
<td>0.14</td>
</tr>
<tr>
<td>0.0021</td>
<td>0.21</td>
</tr>
<tr>
<td>0.0028</td>
<td>0.28</td>
</tr>
<tr>
<td>0.0069</td>
<td>0.69</td>
</tr>
<tr>
<td>0.0103</td>
<td>1.03</td>
</tr>
<tr>
<td>0.0207</td>
<td>2.07</td>
</tr>
<tr>
<td>0.0276</td>
<td>2.76</td>
</tr>
<tr>
<td>0.03-0.069</td>
<td>3.4-6.9</td>
</tr>
<tr>
<td>0.048</td>
<td>4.8</td>
</tr>
<tr>
<td>0.069</td>
<td>6.9</td>
</tr>
<tr>
<td>Probability</td>
<td>Likelihood</td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>0.138</td>
<td>13.8</td>
</tr>
<tr>
<td>0.09</td>
<td>9.0</td>
</tr>
<tr>
<td>0.138</td>
<td>13.8</td>
</tr>
<tr>
<td>0.207</td>
<td>20.7</td>
</tr>
<tr>
<td>0.158</td>
<td>15.8</td>
</tr>
<tr>
<td>0.172</td>
<td>17.2</td>
</tr>
<tr>
<td>0.207</td>
<td>20.7</td>
</tr>
<tr>
<td>0.207-0.276</td>
<td>20.7-27.6</td>
</tr>
<tr>
<td>0.276</td>
<td>27.6</td>
</tr>
<tr>
<td>0.345</td>
<td>34.5</td>
</tr>
<tr>
<td>0.345-0.482</td>
<td>34.5—48.2</td>
</tr>
<tr>
<td>0.482</td>
<td>48.2</td>
</tr>
<tr>
<td>0.482-0.551</td>
<td>48.2—55.1</td>
</tr>
<tr>
<td>0.62</td>
<td>62.0</td>
</tr>
<tr>
<td>0.689</td>
<td>68.9</td>
</tr>
</tbody>
</table>
1.6 CONSEQUENCE ANALYSIS

INTRODUCTION
The consequence analysis is carried out to determine the extent of spread (dispersion) by accidental release which may lead to jet fire, pool fire, catastrophic ruptures resulting in generation of heat radiation, overpressures, explosions etc.

In order to form an opinion on potentially serious hazardous situations and their consequences, consequence analysis of potential failure scenarios are conducted. It is qualitative analysis of hazards due to various failure scenarios. In consequence analysis, each failure case is considered in isolation and damage effects predicted, without taking into account the secondary events or failures it may cause, leading to a major disastrous situation. The results of consequence analysis are useful in developing Disaster Management Plan and in developing a sense of awareness among operating and maintenance personnel. It also gives the operating personnel and population living in its vicinity, an understanding of the hazard they are posed to.

1.6.1 SELECTED FAILURE CASES
Earlier, it was the practice to select a particular item in a unit as failure scenario, e.g. catastrophic rupture of storage tank. Such selection is normally subjective on following parameters:

- Properties of material which are Flammable.
- The likely severity of consequence in the event of accidental release based on inventory, operated pressure & operated temperature.
- The probability of failure of storage tanks used in the tank farm.

6.6.2 EFFECT OF RELEASE
When hazardous material is released to atmosphere due to any reason, a vapor cloud is formed. Direct cloud formation occurs when a gaseous or flashing liquid escapes to the atmosphere.
### 1.7 List of Chemicals for QRA Study

#### Table 1.4: List of Chemicals for QRA Study

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Name of chemical</th>
<th>Cas #</th>
<th>Flammability</th>
<th>State</th>
<th>Auto-ignition °C</th>
<th>Flash point °C</th>
<th>Boiling point °C</th>
<th>Lower flammable limit (LEL %)</th>
<th>Upper flammable limit (UEL %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Toluene</td>
<td>108-88-3</td>
<td>flammable</td>
<td>Liquid</td>
<td>480</td>
<td>4.4444°</td>
<td>110.6</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>2.</td>
<td>Methyl ethyl ketone</td>
<td>78-93-3</td>
<td>Flammable</td>
<td>Liquid</td>
<td>404</td>
<td>-9°C</td>
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<td>1330-20-7</td>
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<td>Liquid</td>
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<td>Name of chemical</td>
<td>Cas #</td>
<td>Flammability</td>
<td>State</td>
<td>Auto-ignition °C</td>
<td>Flash point °C</td>
<td>Boiling point °C</td>
<td>Lower flammable limit (LEL %)</td>
<td>Upper flammable limit (UEL %)</td>
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<td>mineral Turpentine</td>
<td>8006-64-2</td>
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<td>Liquid</td>
<td>253</td>
<td>35</td>
<td>165</td>
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# 1.8 List of Raw Material

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<tr>
<th>S.No.</th>
<th>Products</th>
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<th>Consumption Batch in Kgs</th>
<th>Consumption Day in Kgs</th>
<th>Storage Facility</th>
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<td>1</td>
<td>Alkyd Resin</td>
<td>Vegetable fatty acids/Oils</td>
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<td>%</td>
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## 1.9 QRA RESULT

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<th>S. No.</th>
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<th>Weather data</th>
<th>50 mm Leak</th>
<th>Catastrophic Rupture</th>
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<td>@1.5F</td>
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<td>Weather data</td>
<td>50 mm Leak</td>
<td>Catastrophic Rupture</td>
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<td>ignition(bar)</td>
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For Ethyl Acetate

50 mm leak
Dispersion
Early pool fire
Flash fire
Study Folder: 50mm leak
Audit No: 403
Model: 50mm leak
Material: Ethyl Acetate
Weather

Flash fire
Study Folder: 50mm leak
Model: 50mm leak
Material: Ethyl Acetate
Weather

Late explosion
M/s. SETCO CHEMICALS (I) PVT. LTD.
ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Green Circle Inc. QUANTITATIVE RISK ASSESSMENT 34
Study Folder: 50mm leak
Model: 50mm leak
Material: Ethyl Acetate
Worst Cases @: 0.02068 bar
Weather

Legend:
- Category 1.5/F
- Category 1.5/D
- Category 5/D
- Weather

Late Explosion Overpressure vs Distance

Overpressure (gauge bar)

Distance Downwind (m)
Study Folder: 50mm leak
Audit No. 403
Model: 50mm leak
Material: Ethyl Acetate
Worst Cases @ 0.02068 bar
Weathers

Late Explosion Worst Case Radii

- Category 1.5/F Radius
- Category 1.5/D Radius
- Category 5/D Radius
- Weather Radius

Distance Crosswind (m)
Distance Downwind (m)
Study Folder: 50mm leak
Audit No. 403
Model: 50mm leak
Material: Ethyl Acetate
Weathers

Intensity Radii for Late Pool Fire

- Category 1.5/F 4 kW/m²
- Category 1.5/D 4 kW/m²
- Category 5/D 4 kW/m²
- Weather 4 kW/m²

Distance Crosswind (m)
Distance Downwind (m)
Max Concentration
Audit No: 403
Averaging Time: Flammables (19.76 s)
Concentration: 5000 ppm
Height: 0 m
Material: Ethyl Acetate
Model: 50 mm leak
Study Folder: 50 mm leak

Weathers
- Category 1.5F
- Category 1.5D

Models
- Setco chemicals
Maximum Concentration

- Goud Footprint:
  - Audit No.: 405
  - Averaging Time: Flammable (18.75 s)
  - Height: 0 m
  - Material: Ethyl Acetate
  - Model: Catastrophic rupture
  - Study Folder: Catastrophic rupture
  - Weather: Weather

- Concentration at Time: 16.46 s
  - 5000 ppm
  - Effect Zone @ 5000 ppm
  - 10000 ppm
  - Effect Zone @ 10000 ppm

- Models
- SETCO chemicals
Catastrophic rupture
Early explosion
Flash fire
Late explosion
Max. Concentration
Study Folder: Catastrophic rupture
Audit No. 405
Model: Catastrophic rupture
Weather: Weather
Material: Ethyl Acetate
Averaging Time: 18.75 s
Height: 0 m
Concentration

4705 13 m^2 @ 5000 ppm
2396 87 m^2 @ 1e+004 ppb
173 185 m^2 @ 7e+004 ppb
DISASTER MANAGEMENT PLAN

1.0 OBJECTIVE

The objective of the plan is to down steps to handle emergency situation that may arise due to leakage/spillage, explosion and fire of the various chemicals, fuels in the plant and any adverse effect on employees and public at large is minimized and normalcy is restored within shortest possible time.

This Disaster Management Plan is prepared to meet such grave emergency which can occur due to big fire in the plant, missile hit due to air raid, heavy leakage of flammable liquid or gas or explosion (internal or external cause) in any plant.

Emergency Response Plan (action plan) has been drawn to fix responsibility & actions to be taken by various groups to meet & contain the emergency within shortest possible time & with minimum loss to men, materials, machines & property. It is responsibility of all individuals in their respective areas to ensure success of this plan. This plan is circulated for benefit / training of all individuals working in M/s. Setco chemicals (I) Pvt. Ltd. – Vapi.

The major functions & objectives to formulate the plan are:

(I.) To mobilize the available / trained manpower and handle the emergency from:
- On-site (within factory)
- Off-site (through outside agencies).

(II.) To ascertain urgently likely area of influence and take actions for warnings, control of disaster with minimum damage to men, material, machines and evacuation of employees / public, identify the persons affected / dead, arrange first aid / medical help to the victims.

(III.) Inform relatives of the casualties provide authoritative information to News Media & others; preserve relevant records & equipments needed as evidence in any subsequent inquiry.

(IV.) Appraise District Administration / Civil authority’s etc. order to ensure prompt relief for execution of Emergency Response Plan.

This document sets out the emergency plans for all levels of accident ranging from a local incident within the site boundary to a situation that requires outside support. The objectives of the emergency plan are:
To protect lives of working personnel and nearby population.
To contain the hazards and to control their spread.
To minimize the impact on the environment.
To minimize the loss to plant and production.

1.1 DEFINITION AND SCOPE
A major emergency is defined as one, which may affect one or several sections of the plant and possibly extend beyond the factory boundaries. It may cause serious injuries, loss of life or extensive damage to property. The potential hazards may be due to following:

- Spillage / Leakage of solvents/ gas.
- Leakage or Toxic Release of Gas.
- Fire or explosion in the plant or storage area.

The Disaster Management Plan has been prepared in order to provide proper guidance to plant operating personnel to confidently handle any accidental leakage / spillage of the solvents or fire / explosion / bursting of vessel or any natural calamity or sabotage. With this objective comprehensive information has been assembled in the following pares on the solvents, fuel oil and chemicals used (Hazardous) about its properties, fire hazards, safety appliances, safety measures incorporated in the plant, emergency procedures and finally regarding the constitution & responsibility of Emergency Rescue Team (Emergency Response & Management Team / Task Force).

1.2 METHODOLOGY
A major emergency occurring at a plant is one that may cause serious injuries, loss of life, extensive damage to property or environment or serious disruption inside or outside the plants. This may demand the rescue and relief measures on a war footing to handle it effectively and quickly. Within the high-risk technology industries, the need for well-planned measures should be self-evident.

No matter how well a process is controlled and safeguarded by instruments and process safety procedures, it is inevitable that there is a residual risk, which is capable of causing a variety of emergencies.

The Factories Act, 1948 as amended in the year 1987 under section 41B requires that every occupier shall draw up a Disaster Management Plan and detailed disaster control measures for his plant and make them know to the employees and to the general public living in the vicinity of the plant. According to MFR, it is statutory for the industries to submit Disaster Management Plan with relevant details.
Its objective is to reduce the severity of loss following particular hazardous incidents. At the same time, must be clearly understood that it is not a substitute for maintaining good standards for working consistence with the requirements of safety and health inside the plants.

1.3 INTRODUCTION

The Disaster Management Plan describes the Organization & procedures for dealing with potential accidents arising from the operations of M/s. Setco chemicals (I) Pvt. Ltd.

Experience of accidents that have occurred in various other chemicals manufacturing plants was considered in the preparation of this Plan especially storing & handling the hazardous chemicals identical to this plant. This plan is need periodic review & modification following emergency exercise, or include any new information relating to changes to the facilities.

The workforce inside the plant is exposed to various systems, pipelines & vessels and process equipments which, if not properly operated & maintained could cause serious accidents affecting life & properties in the vicinity of accident site. In addition to these, the inventory and transportation of the chemicals may create chance of accidents. This Plan is needed to respond to a variety of emergencies / disasters:

I) Disasters due to emergency on account of:
   - Fire
   - Bursting or Explosion
   - Oil spillage
   - Spillage or leakage of toxic materials
   - Release of toxic gas
   - Electrocution

II) Disaster due to natural calamities such as:
   - Flood
   - Earth quake
   - Storm / cyclone
   - Cloud burst / lightening

III) Disaster due to external factors such as:
   - Food poisoning / water poisoning
   - Sabotage
   - Civil Riots or War
The action plan responding to an emergency situation depends very much on the level of the emergency which, itself is defined by the consequences arising from the types of hazard identified. The organization & duties of the Emergency Team & the action plans for each of the disaster levels is included in this document.

The plant is provided with various safety & disaster control facilities to prevent & control any disastrous occurrences. Measures for preventing & controlling disaster are outlined in following sections. It also includes information on the plant facilities & its location.

This Disaster Management Plan describes the organization and procedures for dealing with potential accidents arising from the operations of M/s. Setco Chemicals (I) Pvt. Ltd.

This plan is need periodic review in case of modification following emergency exercises, or to include any new information relating to changes to the plant facilities.

### 1.4 DETAILS ABOUT SITE

M/s. Setco chemicals (I) Pvt. Ltd. is situated on plot no. 788/1, 40 shed area, GIIDC estate, Vapi, Dist- Valsad. Production of Printing inks, Retarder, Foil wash & Ink medium. The plant is situated on a large size plot area 8801 sq. mts. The unit has started their production since year-2013.

### 1.5 PLANT LAYOUT AND DETAILS

#### Storage Area

All existing storages are above ground and there is proposal for underground storage of major solvents. All chemicals are either flammable or corrosive.

#### Utility

Utilities required are Power and Water. Company is planning following activities at the new Project to demonstrate its total commitment to the environment by reducing the carbon footprints:

- Rain Water Harvesting
- Effluent Treatment Plant

### 1.6 EMERGENCY ORGANIZATION

This chapter is devised to suggest the organization for emergency preparedness. Key personnel to combat emergency are nominated with specific responsibilities according to set procedures and making best use of the resources available and to avoid confusion. Such key personnel include Chief Emergency Controller, Site controller, other key personnel such as First Aiders, Fire fighting staff, support staff and communication staff, advisory staff.
All such key personnel shall be available in all the office timings and shall be called during emergency in holidays.

In order to achieve above objectives the role of key personnel is clearly defined to avoid confusions & to meet the emergency effectively. Chief Disaster Controller is responsible in total for any emergency control. He is overall in-charge & is assisted by functional co-coordinators like Production, Safety, Admin etc. As per the emergency preparedness chart the success of control of an emergency situations depends upon their timely action. The action for these persons & emergency DO’S And Don’ts are given in this session.

A. Chief Disaster Controller
B. Site Controller
C. Incident Controller
D. HSE Co coordinators
E. Security Personnel
F. Rescue Team
   1. Mechanical
   2. Electrical/Instrumentation
   3. Stores
   4. Administration
   5. Off Duty Employees
   6. Telephone Operator
   7. Finance

ROLE OF KEY PERSONNEL

1.6.1 Chief Disaster Controller

After the hearing the Emergency siren the CDC will take the charge of Emergency Control Center & he will be followed the following actions.

1. Declaration of Emergency, Evacuation, All Clear, Dispatch etc.
2. Establishing Emergency Control Centre. [ECC]
3. Taking final decision for course of action.
4. Communication to head office.
5. Disclosure of information to press and at other places.
6. Direct all operations and call the external help from Emergency Control Centre.
7. Call the members of the MUTUAL AID.
8. Report the event to the nearest District Police Station, Fire Brigade, Civil Defense force, District Emergency Officer, Factory Inspector and other voluntary body to assist to the task.
9. Arrange to call the experts / the suppliers.
10. Works as Liaison officer between outside agencies like Fire brigade & Police etc. Give advice on specialized technical aspects of the material involved and internal details of the factory.
11. Give all clearance signals when everything becomes normal.

SITE CONTROLLER
Senior Manager Production
After hearing the Emergency siren the Site Controller will run towards the Assembly point or Incident place.

1. On arrival, immediately assess the scale of emergency and decide if a major emergency exists or is likely.
2. Activate the On Site Action Plan depending on the type of emergency.
3. Assume the responsibility of the Chief Disaster Controller till the arrival of the Chief Disaster Controller.
4. Direct the shutdown and evacuation of the plant. Identify the areas likely to be affected by the emergency.
5. Give advice, information as requested by the head of the Fire Brigade, Police & Mutual Aid members.
6. Make available the copies of “ON SITE EMERGENCY PLAN”.
7. Brief the Chief Disaster Controller when arrives on the location.

INCIDENT CONTROLLER
Concern area In charge / Shift Officer
After the hearing the Emergency siren the Incident Controller will run towards the Assembly point & allot the work to all members as per the emergency.

1. Act as a link between Site & Chief Disaster Controllers.
2. Take decision related to isolation, resources, deployment, rescue, dispatch etc. and arrange the man power for fire fighting, rescue operation etc.
3. Liaise with other departments like Safety, Services for effective & smooth co-ordination of activities.
4. Extend technical help based on process parameters, hazards of chemicals etc.
5. Control / stop all loading, unloading operation in the section.
6. Give proper message to Messenger to convey to CDC.
HSE CO-ORDINATOR

HSE HEAD

In addition to his general duties of maintaining order of administration he shall discharge following duties:

He Shall,

1. Assist the emergency operation in safe manner.
2. Advise/assist the first aid squad operation and handling of casualties.
3. Advice based on hazard involved in situation to avoid escalation of situation.
5. Keep the antidote & other medicines ready in Security Cabin through First Aiders.
6. Execute all directions and instructions of Chief Disaster Controller regarding.
   - Calling mutual aid members.
   - Specialist from the supplying company.

For efficient and successful operation of the plan statutory agencies listed below should be actively involved for guidance and help.

- Fire Brigade
- Police Authorities
- Collector
- Directorate of Industrial Safety & Heath
- Gujarat Pollution Control Board.
- District Health Authorities.
- Non Government Organizations.
- Local Leaders.

7. Supervise the duties of the Security Personnel.
8. If injuries and casualties do occur then he shall obtain names and address of the injured and dead.
   - Arrange for the medical aid. Talk to the hospital and doctors, report about the type of injury / burn injuries and or toxic effects.
   - Report to the hospital and make arrangement for likely more cases of the injuries.

He shall appoint other personnel from the factory like Stores, Eng. Dept., QA & QC etc. to assist him.
SECURITY PERSONNEL

In addition to normal duties of maintaining security at the place work, they shall discharge following duties.

1. Control gate, allow only essential man and vehicle. Allow exit for man and vehicle with permission of CDC. Keep record of person & vehicles going out of the gate.
2. Control traffic to avoid road choking, regulate vehicle movement.
3. Depute manpower for coordinating of the affected areas.
4. On receipt of information of emergency, communicate important persons like CDC, safety services, admin etc.
5. One security helps in fire fighting.
6. Be in charge of Fire Fighting and rescue operations with assistance of essentials workers and key personnel till the arrival of Fire Brigade and Police. (These operations shall be under the direct supervisions of incident Controller)
7. Remove obstruction from the road to help Fire Brigade to proceed to fire incidence.
8. Restrict entry of unauthorized and untrained persons from the scene of incident. Also don’t allow unauthorized persons / vehicles to enter the premises.

RESCUE TEAM

Maintenance In-charge

1. Meet any immediate breakdown condition viz. Equipment failure, fire line failure etc.
2. Liaise production, Safety and utility coordinator to extend assistant in emergency handling by releasing manpower.

Electrical / Instrumentation

1. Meet electrical requirement like power isolation, Temporary power connections, requirement of emergency supply like DG, UPS etc. for essential equipments.
2. Liaise with DGVCL for requirement of power etc.
3. Release manpower to help in emergency operation, if required

Stores In-charge

2. Extend help in fire fighting if necessary.

Administration In-charge

1. Liaison with external agencies like fire brigade, hospitals, blood banks, private transports, press, local government statutory authorities, nearby industries etc.
2. Ensure the correct accounting of person for head count & give feedback to CDC.
3. In Consultation with Chief Disaster Controller release the emergency details.
4. Ensure through the person on control for only brief & authentic information release.
5. Arrange for food, refreshment for firefighting people. Make arrangement for their rest.

OFF DUTY EMPLOYESS

Employees who are on Off duty & available should immediately report to the emergency control room & await for the instructions.

TELEPHONE OPERATOR

Should ensure that all the external lines are kept free.

Finance

1. Man the cash section all the time during emergency.
2. Liaise with insurance company for information.
   i. In case of prolonged emergencies involving risk to outside areas by wind blown materials, contact the local Meteorological Office to receive early notification of impending changes in weather conditions.
   ii. Review the authorized statements prepared for the news media.
   iii. Direct for the preservation of evidence.
   iv. Control rehabilitation of affected areas and victims on cessation of the emergency. Do not restart the research activities unless it is ensured safe to start and cleared by the authorities.
   v. Determine what investigations and reporting should be carried out, and by whom, to determine the cause and (if appropriate) prevention of recurrence.
   vi. Instruct to Security personnel to raise all clear siren after confirmation of head count and emergency is over.
   vii. Site Main controller shall wear white Helmet with two red bands (Florescent) for getting identified prominently during emergency situation.

1.6.2 Incident Controller

His primary duty is to take charge at the site of the incident. In the initial stages, he is to take decisions involving the operation of the other plants or to stop or continue any process and take decisions to control the incident.

Site- SHE representative may be appointed as Site Controller for all the 24 hours of working and holidays. Shift supervisor is appointed as Alternative (Deputy) Site Controller and would take the charge in the absence of the Site controller. In case the emergency occurs at more than one place the alternative site controller would take charge as Site Controller in their respective places/ areas to prevent the danger of a disaster.
He will proceed to the scene immediately on being aware of the emergency and its location.
Assess the scale of emergency and decide whether a major emergency exists or is likely. 
On his decision, he will activate the on-site plan and if necessary the off-site emergency plan.

A. Cool the equipment or storages by spraying water or sprinkler system.
B. Direct rescue and fire fighting operations until the arrival of the outside Fire Brigade, when he is relinquish control to the Head of the Fire Brigade.
C. Search for casualties.
D. Evacuate non-essential workers to the assembly points.
E. Set up a communication point and establish telephone / messenger contact as appropriate with the emergency control center.
F. Report on all significant developments to the communication officer/ Site Main Controller.
G. Give advice and information as requested to the Head of Safety & Fire and other emergency services.
H. Brief the main Incident Controller and keep informed of developments.
I. Preserve evidences that are necessary for subsequent inquiry into the cause of the emergency and concluding preventive measures.
J. Incident controller shall wear white Helmet with one red band (Florescent) for getting identified prominently during emergency situation

1.6.3 Fire Fighting Staff
These task forces known as Fire fighting staffs is trained to handle various fire fighting equipments during emergency situations. They shall report to the Site controller for fire extinguishing related task.

On hearing of Emergency Siren, before leaving the work place inform to concerned executive & give the charge of activity then leave the place.

- Fire fighting team shall rush to the incident spot and get the feedback from the Site controller.
- As per instruction from Site Main Controller one of the fire Team member should must go to fire pump house and take the following action:
- Check the pressure of hydrant system.
- Check the Main pump is ON.
- Check the water level of fire water tank.
- Start makeup of water to the tank by opening the GIDC water inlet valve.
- If any abnormality observed it should be reported to the Site Main Controller.
- For communication utilize telephone system available in the EHS Dept.
- The team determines the origin and causes of fires. They collect evidence, interview witnesses and decide the plan.
- Report to Incident Controller.
- Take quick action as per the instructions from Incident Controller such as by cooling effect, starvation of fuel by removing supply or blanketing the material by fire retardant material to protect storages and equipment.
- Select correct fire extinguisher for fire fighting.
- Start fighting fire/ gas leak and spill control till fire brigade takes the charge.
- To help to fire brigade and mutual aid terms if it is so required.
- Keeps all fire fighting equipments in order after emergency over.
- Do not keep process / equipment in UNSAFE CONDITION.
- Do not leave emergency site unless ALL CLEAR siren blown.
- Do not use improper fire extinguisher.
- Do not be panicky.

All Fire Fighters shall wear RED colour Helmet for getting identified prominently.

### 1.6.4 Support team – Maintenance Operator

This task force known as Support team is helps the personal during emergency situations. The roles and responsibilities of the team are:

1. Direct the personal to go to the Emergency assembly points.
2. Search, Evacuation, rescue and welfare.
3. Planning of assembly points to record the arrival of evacuated personnel. Planning for outside shelters and welfare of evacuated persons there.
4. Assistance of causalities reception areas to record details of causalities.
5. Moving cars or other vehicles away from areas of risk or from the scene of the incident.
6. To have a head count of personal at both the assembly point and tally with the total persons at the time of the emergency.

### 1.6.5 Trained First Aider

This task force known as First Aid staffs are trained for emergency handling shall be available all the time in duty hours to assist the personal during emergency. On hearing of Emergency Siren, before leaving the work place inform to concerned executive & give the charge of activity then leave the place.

1. First Aid team shall rush to the assembly point and get the feedback from the Site controller about the emergency
2. As per the instruction, they rush to the area of emergency and assess the situation.
3. Approach emergency site quickly with BA set and First Aid box.
4. Diagnoses the situation and decides whether the causality shall be moved to the safe area.
5. The injured personal are moved to the safe place and give first aid as required by the situation.
6. Follow instructions of Incident Controller.
7. Move / transport the causalities to the ambulance / nearby medical center for necessary medical assistance.
8. Render first-aid to the injured person or hospitalize if required.

1.6.6 Communication Team
This task force known as Communication team helps the personal and organization. This task force known as Communication team helps the personal and organization during emergency situations. The roles and responsibilities of the team are:

1. Inform all the employees about the emergency and ask them to come to the assembly point.
2. Asking for the ambulance / fire brigade as directed by the Chief Emergency Controller.
3. Informing surrounding factories and the public as directed by the site main controller.
4. Planning of works entrances in liaison with the police to direct emergency vehicles entering the work, to control traffic leaving the work and to turn away or make alternative safe arrangements for visitors, contractors and other traffic arriving at the works.
5. Assistance at communications centers to handle outgoing and incoming calls and to act as messengers if necessary.

1.6.7. Advisory team (QA PERSONNEL)
This task force known as Advisory team helps the personal and organization during emergency situations. The role and responsibilities of the team will be:

1. Assist chief controller or site controller in their work.
2. Guide site controller to take emergency shut down in case of emergency.
3. Guide rescue team to first Aid by referring MSDS.
4. Guide fire fighting team to use correct fire extinguisher to extinguish fire.

1.6.8. Responsibility of engineering team
On hearing of Emergency Siren, before leaving the work place inform to concerned Executive & give the charge of activity then leave the place.
Engineering Team will:

1. Report to ECC at main gate security office.
2. Find out emergency location. Approach emergency site immediately.
3. Report to Incident Controller.
4. Take quick action as per the instructions from Incident Controller.
5. Maintenance Executive and the shift electrician will report to the scene of incident and close down the services, electric supply as requested by Incident Controller.

1.6.9. Responsibility of Emergency vehicle driver
On hearing of Emergency Siren or communication on phone or announcement on PA system,
1. Immediately start vehicle and reach to incident spot.
2. Rescue Team members to emergency site.
3. Take vehicle near to emergency site as directed.
4. Take note of wind direction.
5. Reverse the emergency vehicle for quick transports of injured, if any.
7. Always be on driver’s seat of the vehicle.
8. Take the injured to the hospital as directed.
9. Do not leave the vehicle.
10. Do not take the vehicle very near to the site.

1.6.10 Responsibility of Spill control team
On hearing of Emergency Siren, before leaving the work place inform to concerned executive & give the charge of activity then leave the place.
1. Report to ECC at main gate security office.
2. For minor spills, clean the spill using absorbent material and put the Contaminated material in the drums & mark it as a hazardous waste.
3. For major spills, report immediately to the concerned Executive, Department Head, ETP Operator and EHS team.
4. Try to contain the spill material in the PETP by providing bunds at outlet of the PETP. Before entering the spill area recommended PPEs to be used.
5. Warn other employees about the spill.
6. Eliminate combustible material or other source of ignition.
7. Incident Controller of the affected area shall initiate evacuation [of employees] if applicable.

1.6.11. Responsibility of EHS
1. On hearing the Emergency Siren report to Site Main Controller.
2. On demand of Site Main Controller provide necessary help such as the technical information, MSDS, dispersion calculations, outside help etc.
3. Work as per the Site Main Controller instruction.
4. EHS Team will arrive at site and guide in the use of protective and other emergency safety appliances.
5. He will mobilize Personal Protective Equipments & other safety appliances from stores / Mutual Aid Industries members.
6. He will assist Incident Controller to ensure safety of the people and the plant.
7. He will help in monitoring the hazards in case of leakage.
8. If felt necessary, he will ask Liaison Officer to call the assistance from the member establishments under MARG scheme

1.7 EMERGENCY CONTROL CENTRE (ECC)

The centralized emergency control center shall be at the security cabin near the main gate. The center is equipped to receive and transmit information and directions from and to the incident controller and areas of the works as well as outside.

The emergency contact numbers for the mutual aids like nearest police station, fire station, hospital, and ambulance service etc. should be display at the require location along with emergency control centre and security gate.

1.7.1 Emergency Control Centre Is Containing the Following Facilities:

a. A copy of ON-SITE EMERGENCY PLAN.
b. Internal and external communication.
c. Daily attendance of workmen employed in the factory.
d. List of important telephone numbers such as Police, Fire Brigade, Hospitals, and other outside Emergency Services, etc.
e. List of key Personnel with addresses and telephone numbers etc.
f. List of Mutual Aid Scheme Members
g. List of Fire and Rescue Squad Members
h. Plan of the plant showing:-
   i. Storage area of hazardous materials.
   ii. Storage of safety equipments.
   iii. Fire fighting system and additional source of water.
   iv. Site entrance, roadway and emergency exist.
   v. Assembly points.
   vi. Truck parking area.
   vii. Surrounding location.
i. Fire Extinguisher etc.

j. Fire Fighting System (layout of Fire Hydrants), List of Personal Protective Equipment.

k. Storage of hazardous material records and their Material Safety Data Sheets – (M.S.D.S.)

l. List of employees with address, telephone numbers, blood groups etc.

m. Torches/emergency light.

n. Note Book, Pad and Pencil

Trained personnel are always available in these areas who can rush to the emergency point in shortest time. Warning system is always being kept in working order.

1.8 MEDICAL ARRANGEMENTS
All details are given in Annexure-5

1.9 TRANSPORT AND EVACUATION ARRANGEMENTS
In a major emergency, it is necessary to evacuate personnel from affected areas and to further evacuate non-essential workers from areas likely to be affected should the emergency escalate.

A common siren (wailing) is provided for the evacuation of people. On hearing the siren, people is disperse from the work area. Proper instruction will be given to all the employees about the rising of siren and the emergencies.

The employees would proceed to the predetermined assembly points on hearing the siren and the support staff / security forces would be instructed to divert the people away from the affected area and towards the assembly points.

1.10 OUTSIDE ORGANIZATIONS IF INVOLVED IN ASSISTING DURING DISASTER
Type of Accidents: Major Accidents, which may require outside help are follows:-

- Leaks/Spillage of: Solvents, Chemicals.
- Bursting at: Process area and Storage area.
- Fire or Explosion at: Reactors, Storage tanks, Utilities and Transformer / Substation.

1.11 OUTSIDE HELP
- Fire brigade of the nearest area shall help the plant fire control team during fire at site.
- Police station personnel & DSP shall help the company to maintain law & order, Traffic control & evacuation operations.
• Nearest Hospital or Nursing home shall render emergency medical services to the company for the first aid & medical treatment during emergency.
• District supply officer shall ensure continuous supply of essential items, medicines (Govt. Quota) and other emergency materials during emergency.

1.12 INFORMATION ON RISK EVALUATION PRELIMINARY HAZARD ANALYSIS

Following types of hazards exists in the factory as:-
• Storage Hazard (Solvents)
• Material Handling
• Operating Hazards (Process)
• External Hazards

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<thead>
<tr>
<th></th>
<th>Natural</th>
<th>Deliberate</th>
<th>Unsafe Acts and Situations</th>
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<tbody>
<tr>
<td></td>
<td>Storm, Wind, Flood, Earthquake, Lightening</td>
<td>Sabotage, Terrorism, Civil Commotion / Armed conflicts, Air raid</td>
<td>Corrosion, Equipment failure, Design deficiency, Abnormalities in operation or maintenance, Fire / Emergency in neighborhood</td>
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1.13 HAZARDS/FORESEEABLE SCENARIOS

Though it is an impractical to describe all the foreseeable scenarios involving hazardous chemicals and the suggested action for the same, some important ones are discussed here briefly. Even in identical incidents the right course of action may not necessarily be the same every time as the actual action is depend on the several factors, such as the place of incident, quantity of chemical involved, the amount of release, the nature of chemical, the wind direction, the wind velocity, temperature of surrounding, time of day, prevailing season and weather condition.

At the Site Disaster could be of the following type,
• Fire / Explosion
• Large Spillage of hazardous chemicals.
• Release of flammable or gas resulting in fire, explosion, or gas cloud, and other forms of air pollution, thermal radiation and smoke.
• Toxic gas release from neighboring factory.
• Overturning of road tanker containing flammable / toxic materials
• Failure of piping containing flammable / toxic materials
• Fall of structure or building.
• Release of high velocity fragments of ruptured equipments due to overpressure conditions.

SAFETY RELEVANT COMPONENTS

- Pressure: PG, SRVs, Sprinkler, Interlocks & Alarm
- Fire: Fire Hydrant System, FEA,
- Spill: LI, Dyke, Interlocks, Alarm, Spare Capacity, Pumping, ETP Arrangement
- Gas release: Leak detectors, CABA.

A) In case of Fire to the Flammable Liquid / Solvents

In case of declaration of onsite emergency (Hearing of emergency siren), evacuate the area as per evacuation plan & exit signs on instruction of shift in-charge / incident controller as quickly as possible after safe shutdown of the plant. See that the wind direction is in opposite direction of assembly point by wind direction indicator. If not, change the assembly point.

Following are the general guideline for emergency action.

- Raise the alarm.
- Inform security and shift in charge.
- Carry nearest fire extinguisher & try to extinguish if possible.
- Assemble emergency team and inform other emergency members.
- Check the wind direction, then decide the assembly point and inform accordingly.
- Warn the people nearby.
- Attempt to isolate / extinguish the fire with the help of others with available appropriate extinguishers.
- Arrange fire hydrant hose and try to cool surrounding
- Cordon the area and try to shift the drum of flammable material.
- Used foam generating nozzle and create foam to extinguish fire.
- If fire beyond control call fire brigade after consultation with chief controller.
- Cool the surrounding or remove flammable material if possible.
- Take head count at site and inform to the chief controller.
- Also take head count at the assembly point and tally.
- Search for missing person if any.
- Call for mutual aid members for help, if require.
Arrange for rescue, if required.
Give first aid to the injured person and check for further treatment is required.
Give priority to saving life and preventing further injuries.
Confirm the massage of incident attend to the main controller & raise the all clear siren.
Collect the photograph and other evidence to cause fine.

B) In Case of release of Solvents/Chemicals from Tankers/Tanks inside the factory premises
This area is focused on Materials which are stored at plant site. Special instruments for storing, Handling & emergency actions in case of release of toxic & flammable material are given separately in MSDS.
Following are the general guideline for emergency action:
- Use PPE’s like SCBA/Gas mask/Respirator & evacuate the area.
- If possible shift the tanker from storage area to parking area (due to limited space availability elsewhere).

In case of declaration of onsite emergency (Hearing of emergency siren), evacuate the area as per evacuation plan & exit signs on instruction of shift in-charge / incident Controller as quickly as possible after safe shut down of the plant. See that the wind direction is in opposite direction of assembly point by wind direction indicator. If not, change the assembly point.

C) In case of Flood / Earthquake
In case of natural calamity like flood, Strom or earth quake (remote possibility) or war like situation the management may seek outside help. The help may be for fire fighting, Evacuation (of surrounding population), Medical treatment, shelter, food, transport or communications.
The responsibilities of outside organization are to render services as follows during emergency.
Following are the general guideline for emergency action:
- Close main valve
- In case the cylinders are on the ground the same be shifted to storage shed to ensure that the floodwater shall not carry the cylinders.
- Switch off electricity (main).
- Assemble outside the office, away from Electric Poles & Wires.
- Evacuate the areas after initiating (communication in working condition) off site organization.

D) In case of War/Civil riots
Following are the general guideline for emergency action:
- Intimate nearest police station & stimulate off site emergency plan
- Stop unloading / loading operations (if any)
- Intimate civil defense dept. about the situation
- Security persons shall protect & control law & order.
E) Solvents Storage & handling
Following are the general guideline for emergency action:-

- All storage tanks shall be equipped with contact DP/non-contact radar type level transmitters with feedback to main PLC/SCADA.
- All storage tanks shall be equipped with level switch which is to stop the respective transfer pump on activation at high level.
- Local temperature and pressure gauges is provided wherever applicable.
- Leakage or spillage of this solvent may lead to health hazards or fire / Explosion or toxic release.

1.14 POWER SUPPLY INTERRUPTION
In case of major electrical system failure, 250 KVA DG set is provided for emergency plant operations and emergency lighting in the premises.

1.15 HAZARD IDENTIFICATION AND RISK SUMMARY
1.15.1 Major Hazards
A brief description of the possible hazards in handling hazardous materials is given in this section.

<table>
<thead>
<tr>
<th>HAZARD</th>
<th>AREA</th>
<th>PROBABLE CAUSE OF THE ACCIDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosion</td>
<td>Boilers / Transformers / Receivers for the Air compressors</td>
<td>Malfunctioning of the Safety Valve</td>
</tr>
<tr>
<td></td>
<td>Flammable / Petroleum product storage tank / drum storage shed</td>
<td>External fire causing pressure built up in the tanks / barrels</td>
</tr>
<tr>
<td>Fire</td>
<td>H.S.D./LDO / FO / CNG Storage Area</td>
<td>Flammable vapour / air mixture and source of ignition.</td>
</tr>
<tr>
<td></td>
<td>Flammable /Petroleum product storage tank / drum storage shed/ DG/ CST tank farm /PCC/MCC/Transformer yard</td>
<td>Formation on pool in the dyke wall and source of ignition.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>External fire → Built up of internal pressure → Failure of the top cover → Tank on Fire</td>
</tr>
<tr>
<td>Spillage</td>
<td>Sulphuric Acid / manufacturing area/</td>
<td>Spillage of acid / alkali due to rupture of the pipe line, collapse of the storage tank</td>
</tr>
</tbody>
</table>

Pool Evaporation:
If the fluid, which escapes from the containment, is a liquid, then vaporization must occur before a vapor cloud is formed. The rate at which vaporization takes place determines the formation of such a vapor cloud.
1.16 OTHER AREAS OF HAZARDS AND CONTROL

1.16.1 Water Drainage

In order to avoid difficulties of storm water distribution proper drainage to the storm water/rainwater runoff system shall be designed so as to protect the plant equipments, Building & offices. No area is submerge in the flood as adequate height has been provided to all installations such as utility block, office building, Process plant, warehouses & storage area has been provided with individual dyke.

1.16.2 Electrical Supply

As the fire protection system is safety related, it is mandatory that any electrical power supply for the control, Operation or instrumentation of the system shall be from an assured supply. During monsoon season the electrical circuit (conduit wiring) sometimes comes in contact with wet or structure (in case of any breakage, loose fittings), in such case there is possibility of current leakage.

1.16.3 Fire or Bursting of Tanker

In case any vehicle/tanker/truck catches fire or burst/explodes on the road or similar events occurs inside the plant area during unloading of materials, the impact of such event shall have on the entire plant. Smoke cloud, fire, considerable heat radiation is take place apart from destabilizing civil & mechanical structures.

1.16.4 Leak/ Spillage of Toxic Liquid on Road

In case of spillage or leakage of liquid on the road, the same affect the employees of plant. In such case fire fighting system shall be kept ready near reception as well as the employees may be asked to assemble at backyard of the plant as the front area shall be directly exposed to such release. After clearing the emergency, the employees could be asked to absorb/neutralize the toxic chemicals by suitable absorbent/neutralizers.

1.16.5 Storage Hazards and Control

Storage area in the complex known as Tank farm consisting of storage of Caustic lye, Isopropyl alcohol, Toluene, Raney Nickel, Phosphoric acid and other chemicals. Storage facility is situated away from the manufacturing plants and fulfilling all the rules and regulations, all storage tanks of hazardous substances is located within the boundary wall, constant watch by security & plant personnel round the clock.

As prescribed in the relevant regulation, the entire electrical fittings shall be of fireproof (FLP) fittings. Proper enclosures in the form of bund walls are provided for all the storage tanks. All necessary fire fighting arrangements have been provided near the storage area to combat fire.
emergencies. Material Safety Data Sheets (MSDS) for all the raw materials, intermediates and final products is prepared and attached. WI for loading & handling of chemicals is properly be displayed in English & Local language near the area.

1.16.6 Process Hazards
In this section Plant-wise hazards of processes, operations and controls provided to cope up with all kinds of abnormalities. The details regarding various controls like exhausts, scrubber, vents and other operating control etc. have been mentioned.

The consequences arising from the release of a toxic material would be time dependent and would vary according to the point of release. The major difference between release of toxic and flammable materials is that toxic clouds and therefore may remain hazardous over greater distance.

Scrubbers for control of Vapor / Non-Condensable gases & fines from dryer units are installed in the plant.

1.16.7 Trade Waste Disposal
Organization is more concerned for environment protection and pollution abatement at all times. In a cohesiveness endeavor irrespective of costs involved, the company has been trying to reduce and abate pollution to its ultimate end.

The trade effluent streams from all different plants are collected in effluent plant and it is properly treated by primary, secondary & Tertiary treatment methods.

Provision is made to dispose Solid wastes. The company is dispose off all solid waste in safe manner.

1.16.8 Disaster Management
This chapter highlights the Organization for disaster preparedness. No plan is succeed without effective Disaster Management. Disaster Management Plan is a part and parcel of a good ON-SITE and OFF-SITE emergency plan, without which all resources, facilities etc., can not be put into services at a right time is the key factor in tackling an emergency.

It is not possible to envisage and detail every action which should be taken in emergency and to harness the basic elements of emergency preparedness such as Gravity of emergency, Communication of information, on-site action for process and emergency controls, Mobilization of internal and external resources for fire and toxicity control etc. Emergency Organization is set up specifying duties and responsibilities of all to make best use of all resources and to avoid confusion while tackling the emergency.
Disaster Management Plan / On-Site Emergency Plan highlight the flow of information and cooperation among various action groups within the factory. Off-site Emergency Plan indicates various action groups at district levels which is engaged in case of off-site emergency.

Emergency organization and arrangement include:

- Incident Controller
- Alternate Incident Controller
- Site Main Controller
- Emergency Teams
- Assembly Points
- Emergency Control Centre
- Fire & Toxicity control arrangements
- Medical arrangements
- Transport control arrangements
- Pollution control arrangements
- Other arrangements.

1.17 SAFETY AND MITIGATING MEASURES

1.17.1 Equipments and Process safety

- All Storage tanks is located in Dykes and equipped with high and low level indicator wherever indicated.
- Spillages and leaks from the storage tanks can be collected and transferred out and treated for safe disposal.
- Storage tank containing hazardous storage is located away from the main plant.
- All tanks is protected against overpressure by pressure relief valve
- Floor washing is collected and treated in effluent treatment plant.
- Fugitive emissions are prevented by providing single mechanical seal for pumps.
- All storage tanks is equipped with level switch which stops the respective transfer pump on activation at high level.
- Local temperature and pressure gauges is provided wherever applicable.
- The hazardous reactors are provided with seal arrangements, which are preventing leakage of fugitive emission in case of seal failure.

1.17.2 Fire Protection and Fire Fighting System

The plant is equipped with a comprehensive fire protection system. Following facilities are provided for the fire protection:-

- Fire Water Supply
- Fire Hydrant system, Fire sprinkler system with smoke/fire detectors
1.18 HAZARD CONTROL AND EMERGENCY SHUT-DOWN

1.18.1 Spillage Incident Emergency Reporting
- Location
- Name of material (spilled)
- Equipment from which the spillage occurred
- Spill control media

1.18.2 Emergency Action in Case of Spillage
- Assess the situation and blow siren depending upon the situation.
- Stop tower operation if required.
- Stop hot jobs in surrounding area; suspend operations which are likely to create sparks.
- Check wind direction and approach from upward direction.
- Inform effluent treatment plant about the possibility of hydrocarbons coming into the effluent plant.
- Be prepared for fighting if required. Start evacuation.
- Cool down surrounding equipments / vessels with water.
- Vapors traveling in down wind direction should be knocked down with the fire water spray.
- Cordon off the area if needed.
- Evacuate non-essential people from the surrounding depending upon the emergency.
- Hydrocarbon fire should be fought with foam and DCP.
- In case of liquid pool, advice fire personnel to cover it with foam.

EMERGENCY ACTION
- Check the bund wall valve for its close position.
- All personnel handling the emergency should wear PVC suit / alkali suit, gumboot, PVC hand gloves, PVC goggles.
- Isolate the sources of supply.
- Cordon off the area.
- Avoid the entry of unnecessary people.
- Start barricading the spillage area with sand / earth.
- Spilled caustic is to be collected in sealable container if possible or divert to effluent plant, neutralize the same with dil. HCL.
- Flush the affected body parts with plenty of water and seek medical help.
1.18.3 Leakage of LPG cylinder in Canteen

- Inform to superior such as Admin Manager, EHS Manager or Security Officer immediately.
- Try to stop leakage immediately.
- Keep open all doors and windows.
- Don’t make any spark producing activity such as Switch ON/OFF electric supply, if electric supply switched OFF/ON respectively.
- Apply water on cylinder.
- Evacuate the people if necessary

1.19 EMERGENCY LIGHTING AND POWER SUPPLY, ISOLATION MAP

For Emergency, Plant Operations and Emergency Lighting provisions shall be made according to requirements. DG set is provided as backup.

1.20 ALARM AND COMMUNICATION

It is necessary to communicate for (i) Recognizing the emergency, (ii) Raising of the alarm (Siren), (iii) The declaration of the emergency and (iv) The implementation of the evacuation plan, if necessary. Therefore effective signals and procedures should be devised to communicate.

Communication is a critical factor in handling an emergency. To control the situation by the earliest possible action, the practice should be that any employee can raise an emergency alarm.

The choice of a suitable alarm system is depending on local circumstances and is influenced by size of the plant, type of hazard and the existing alarms system. Essential requirements are that there should be an adequate number of readily identified points from where the alarm can be raised and these needs to be clearly indicated by sign boards and by indications in the plans.

In areas where there is high level of noise (as the case here), it may be necessary to install more than one audible alarm transmitted or flashing lights. Automatic alarms may be considered appropriate on sites.

**Note:**
1) Emergency siren to be given only if required.
2) All employees in areas other than affected to continue work unless disaster siren is blown.
3) No emergency organization member will leave the emergency spot unless `all clear’ siren blown.

Alarm & siren details are given in **Annexure-3**
1.21 ALARM AND DECLARING MAJOR EMERGENCY
In normal fire or emergency in the plant on receiving call or alarm from any plant the crew is rush to point of emergency. On assessing the condition at spot & in consultation with emergency plan coordinator Emergency siren would be sounded.

Disaster siren is given by siren installed in Main Security Gate in continuous wailing sound & instructions from fire / rescue / operations coordinator. The siren is blown as per the code displayed on the Main Gate.

1.22 PLANT ASSEMBLY POINTS
The assembly points is selected considering the distance from the hazardous place, wind direction, capacity to accommodate the required number of people and availability of the other resources in that area. In case of emergency, it is necessary to evacuate all personnel from effective area except personnel who indirectly involved in dealing with the incident. On evacuation people is go to pre assigned assembly points.
Location of Assembly Points is given in Annexure-9

In case of an EMERGENCY the employees should assemble near Assembly Point, as indicated below:-

<table>
<thead>
<tr>
<th>Engineering Team</th>
<th>Assembly Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Fighting Team</td>
<td>Assembly Point</td>
</tr>
<tr>
<td>First Aid Team</td>
<td>Assembly Point</td>
</tr>
<tr>
<td>Evacuation Team</td>
<td>Assembly Point</td>
</tr>
<tr>
<td>Spill Control Team</td>
<td>Assembly Point</td>
</tr>
</tbody>
</table>

Wind direction to be determined by the wind socks installed on top of the plant building. The Employees should run Perpendicular to the Wind Direction and not against / along.

1.23 MEDICAL SERVICES AND FIRST AID
A qualified doctor is appointed. Employees get them-self examined by the Doctor.
The First aid team is play critical role in attending the victims in case of any accident. Antidotes are available at Occupational Health Center with company doctor

1.24 HOSPITALS
There is adequate arrangement with local hospitals for any medical emergency.
1.25 FIRE

1.25.1 FIRE / FIRE FIGHTING AGENTS

1 a. Water can be used when applied in the form of spray and to keep exposed material from being damaged by the fire. It can be used to sweep the flames off the surface of liquid.

1 b. Water or foam may cause frothing when applied on flammable liquids having flash point above 100 °C. Water sprays has to be applied carefully by causing the frothing to occur on the surface and this foaming action blankets and extinguishes the fire.

1 c. Water may be used to blanket fire and accomplish extinguishing. It must be applied gently to the surface of the liquid.

1 d. Water may be ineffective except when applied gently to the surface to blanket and extinguish the fire.

2 Foam.

3. CO₂

4. Dry chemical powder.

1.25.2 Fire Extinguisher

Fire extinguishers for emergency, located at strategic positions at each process floor, storage areas, security office etc. The same are easily accessible, marked properly, and maintained regularly.

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Type of Extinguisher</th>
<th>Type</th>
<th>Capacity</th>
<th>Nos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ceasfire CE Certified MAP90</td>
<td>Dry Powder</td>
<td>6 Kgs</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Ceasfire CE Certified MAP90</td>
<td>Dry Powder</td>
<td>50 Kgs</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Ceasfire CE Certified Monnex</td>
<td>Dry Powder</td>
<td>4 Kgs</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Ceasfire CE Certified HCFC Clean Agent</td>
<td>Dry Powder</td>
<td>Proposed for Lab.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Ceasfire CE Certified CM (Automatic MAA 90)</td>
<td>Dry Powder</td>
<td>Proposed for chem. storage</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Ceasfire CE Certified wireless Detector Panel</td>
<td></td>
<td>Proposed</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Ceasfire CE Certified wireless Smoke Detector</td>
<td></td>
<td>Proposed</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Fire Hydrant with entire system</td>
<td></td>
<td>Proposed</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>U/G Water Tank</td>
<td>exiting</td>
<td>50 KL</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>U/G Water Tank</td>
<td>exiting</td>
<td>25 KL</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>U/G Water Tank</td>
<td>Proposed..</td>
<td>100 KL</td>
<td>1</td>
</tr>
</tbody>
</table>

1.25.2 FIRE HYDRANT SYSTEM
- Fire Hydrant System does not exit but there is proposal before starting the Production activity.
- Fire hydrant pumps: Electric driven separate Pumps – proposed
- Proposal for UPS System/DG Set to ensure the hydrant pump is to keep working.
- Fire Tender is available in GIDC – a) 500 meters away and b) 3 km. away.

1.25.3 Essential Workers (Fire Squad Team)
A task force of essential workers is also known as Fire Squad Team. It consists of minimum four persons from each plant Manager. Minimum 2 persons, in each shift shall be available round the clock; they are being trained to help in fire fighting, evacuation, first aid, rescue, mobilization of internal resources as per pre-determined emergency action plan.

- The team is constituted to provide necessary support / help in case of emergency.
- The team members shall gather at accident place in case of On-site emergency, all the member shall gather in ECC.
- All team members shall rush to the site with personal protective appliances on hearing siren.
- One of the fire squad members is start hydrant pump and is stay there to monitor the pump performance.
- Fire squad member is to do the following activities:
  - To help the plant people in fire fighting, gas leak a spill control.
  - To monitor the hydrant pump performance.
  - To help in emergency egg. Work e.g. isolating equipment, materials, process, providing temporary by pass lines, safe transfer of materials, urgent repairing or replacement, electrical work etc.
  - Mobilization of fire extinguishers and BA sets from other plants.
  - Search, evacuation, rescue and welfare.
  - First aid and medical help.
  - Moving tankers from areas of risk.
  - Shifting of solvents / hydrocarbon drums.
  - Cordonning off the area.

1.26 TRAINING AND REHEARSING
All employees should know the details of Disaster Management plan and they must receive initial training in emergency procedures. Then, at suitable intervals this knowledge must be exercised and the basic plan reviewed and brought up-to-date. It is essential to establish the necessary confident volunteers and better expertise, so the individuals can carry out their allocated duties. Rehearsal of evacuation should be regularly carried out efficiently and should
cause minimum disruption to the normal activities. As per MFR, 1963 Mock Drill should be conducted six monthly.
An after-mock drill report may be prepared detailing the lacunas & strong points so as to make improvements in the emergency action plan.

1.27 ACCOUNTING FOR PERSONEL
It is necessary to know for everyone Disaster Management Plan has been accounted for and that the relatives of casualties if any have been appropriately informed. Holidays and sickness absence is have to be taken into account and adequate personnel for relief is made available including replacement for some others who may be at Off-Site at the time engaged on other work.
Visitors should be accompanied by a responsible members of the works staff, designated to perform emergency duty.

1.28 PUBLIC RELATIONS
Inevitably a major incident is attracting the attention of the press, television and radio services and an anxious inquiry from friends and relatives is flooding the factory. It is essential to make arrangements for authoritative release of information to them. Manager (P, HR & Stores) who is familiar with procedures of dealing with such situations, shall take charge of public Relations, information etc. He is the sole authoritative source of information to the news media and others.

1.29 DECLARATION OF CESSATION OF EMERGENCY
The Security Officer or Guard (Emergency Fire, Rescue & Security Co-ordinator) will not signal the end of the emergency until he is satisfied that all the spillage / leakages are arrested or fires are extinguished and there is no risk of re-ignition (in case of fire). In the case of gas, the all clear Signal is declared only when the source of emission has been effectively isolated and gas clouds dispersed well below safe level. Even when the all clear Signal has been given, great care is needed while entering affected areas and no work in connection with salvage, collection of evidence should be commenced until a thorough examination of the area has been carried out. The siren code is to follow for declaring the cessation of an emergency. Sources of leakage, fire, and explosion and so on, until it has been established that no flammable materials remain where they could be ignited. All clear signed shall be given by SMC / Incident Controller.

1.30 ENVIRONMENTAL MONITORING AND ANALYSIS
Generally the gases are analyzed by portable gas detectors as Draggers Tubes. Portable gas monitors or Detection tubes may be used to detect gas after the accidental release for declaring the environmental quality safe in post-emergency phase.
1.31 POST EMERGENCY PLANNING

- Assess the situation from safety & production angle.
- Re-start the plant in the standard sequence.

* All evidences should be collected & accident should be investigated.

1.32 PLAN APPRAISAL AND UPDATING

The matters relating to review effectiveness of emergency planning should cover:

Time limit, which is essential for rescuing and evacuating personnel from the scene or confined space for carrying out any emergency measures. It is essential to check whether pre-determined time limit has been met and if not the impediments for it should be identified. For example, if 15 minutes is fixed for evacuating the people from confined space, it may be reduced to 10 minutes, if considered necessary for the safe evacuation.

To check the quantum of emergency, equipments like fire fighting equipment, personnel protective equipment etc. are required to be provided in the critical areas whether it is adequate or not. Any changes made in the plant should also be made known to all.

1.33 DETAILS OF OCCUPATIONAL HEALTH PROGRAMME

1.33.1 To which chemicals, workers are exposed directly or indirectly.

Workers will be exposed to the following raw materials.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Products</th>
<th>Name of the Raw Material</th>
<th>Consumption Batch in Kgs</th>
<th>Consumption Day in Kgs</th>
<th>Storage Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alkyd Resin</td>
<td>Vegetable fatty acids/Oils</td>
<td>2</td>
<td>20</td>
<td>Bulk Tank &amp; Drums</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phthalic anhydride or di/Polyacids</td>
<td>0.665</td>
<td>6.65</td>
<td>Poly/Paper Bags</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Benzoic or Monobasic acid</td>
<td>0.235</td>
<td>2.355</td>
<td>Poly/Paper Bags</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Glycerine/Penta</td>
<td>0.6</td>
<td>6</td>
<td>Barrels/Poly-Paper Bags</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Toluene/Xylene/MTO</td>
<td>1.7</td>
<td>17</td>
<td>Bulk Tank</td>
</tr>
<tr>
<td>2</td>
<td>Pure Phenolic Resin (Novolac Type)</td>
<td>Phenol</td>
<td>4.62</td>
<td>46.2</td>
<td>Bulk Tank/Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Formaldehyde</td>
<td>3.24</td>
<td>34.2</td>
<td>Bulk Tank/HDPE Barrels</td>
</tr>
<tr>
<td>Sr. No.</td>
<td>Products</td>
<td>Name of the Raw Material</td>
<td>Consumption Batch in Kgs</td>
<td>Consumption Day in Kgs</td>
<td>Storage Facility</td>
</tr>
<tr>
<td>---------</td>
<td>----------</td>
<td>--------------------------</td>
<td>--------------------------</td>
<td>------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>2 A</td>
<td>Pure Phenolic Resin (Resol type)</td>
<td>HCl solution</td>
<td>0.0462</td>
<td>0.462</td>
<td>Carboys</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phenol</td>
<td>2.9</td>
<td>29</td>
<td>Bulk Tank/Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Formaldehyde</td>
<td>3.488</td>
<td>34.88</td>
<td>Bulk Tank/HDPE Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NaOH Solution</td>
<td>0.0522</td>
<td>0.52</td>
<td>Carboys</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acetic Acid</td>
<td>0.06962</td>
<td>0.6962</td>
<td>Carboys</td>
</tr>
<tr>
<td>3</td>
<td>Reduced Phenolic Resin</td>
<td>Rosin</td>
<td>4</td>
<td>50</td>
<td>Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Glycerin/Penta/ or any Polyol</td>
<td>1</td>
<td>10</td>
<td>Barrels/Poly-Paper Bags</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maleic Anhydried or any other Di/Poly acid</td>
<td>0.5</td>
<td>5</td>
<td>Poly/Paper Bags</td>
</tr>
<tr>
<td>4</td>
<td>Polyurethane Resin</td>
<td>Polyls</td>
<td>3.21</td>
<td>192</td>
<td>Barrels/Poly Bags</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Isocynate</td>
<td>0.495</td>
<td>29.7</td>
<td>Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ethyl Acetate</td>
<td>1.287</td>
<td>77.22</td>
<td>Bulk Tank</td>
</tr>
<tr>
<td>5</td>
<td>MF Resin</td>
<td>Formaldehyde</td>
<td>3.28</td>
<td>32.8</td>
<td>Bulk Tank/HDPE Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urea/Melamine</td>
<td>4.207</td>
<td>42.07</td>
<td>Poly/Paper Bags</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NaOH Solution</td>
<td>0.047</td>
<td>0.47</td>
<td>Carboys</td>
</tr>
<tr>
<td>6</td>
<td>UF Resin</td>
<td>Formaldehyde</td>
<td>3.28</td>
<td>32.8</td>
<td>Bulk Tank/HDPE Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urea/Melamine</td>
<td>4.207</td>
<td>42.07</td>
<td>Poly/Paper Bags</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NaOH Solution</td>
<td>0.047</td>
<td>0.47</td>
<td>Carboys</td>
</tr>
<tr>
<td></td>
<td>Ketonic</td>
<td>Cyclohexane</td>
<td>2.5</td>
<td>25</td>
<td>Barrels</td>
</tr>
<tr>
<td>Sr. No.</td>
<td>Products</td>
<td>Name of the Raw Material</td>
<td>Consumption Batch in Kgs</td>
<td>Consumption Day in Kgs</td>
<td>Storage Facility</td>
</tr>
<tr>
<td>--------</td>
<td>--------------</td>
<td>-------------------------------------------------------</td>
<td>--------------------------</td>
<td>------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>7</td>
<td>Resin</td>
<td>Formaldehyde</td>
<td>5</td>
<td>50</td>
<td>Bulk Tank/HDPE Barrels</td>
</tr>
<tr>
<td>8</td>
<td>Acrylic Resin</td>
<td>Monomers like Methacrylates/Acrylates/Styrene</td>
<td>3</td>
<td>30</td>
<td>HDPE Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Xylene/Toluene/Butyl Acetates</td>
<td>2</td>
<td>20</td>
<td>Bulk Tank/Barrels</td>
</tr>
<tr>
<td>9</td>
<td>Emulsion</td>
<td>Styrene</td>
<td>1.04</td>
<td>10.4</td>
<td>HDPE Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>n-butylacrylate</td>
<td>0.5946</td>
<td>5.946</td>
<td>HDPE Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hydroxyethylmethacrylate</td>
<td>0.2477</td>
<td>2.477</td>
<td>HDPE Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Emulsifier</td>
<td>0.02447</td>
<td>0.2747</td>
<td>HDPE Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stabilizing Colloid</td>
<td>0.02447</td>
<td>0.2747</td>
<td>HDPE Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water</td>
<td>2.2249</td>
<td>22.49</td>
<td>HDPE Barrels</td>
</tr>
<tr>
<td>10</td>
<td>Adhesives</td>
<td>Glycols</td>
<td>1.767</td>
<td>17.67</td>
<td>Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acid</td>
<td>0.676</td>
<td>6.76</td>
<td>Carboys</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phthalic anhydride</td>
<td>0.56761</td>
<td>5.676</td>
<td>Poly/Paper Bags</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TMP</td>
<td>0.046</td>
<td>0.46</td>
<td>Poly/Paper Bags</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TERPHTHALIC ACID</td>
<td>1.346</td>
<td>13.46</td>
<td>Poly/Paper Bags</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SOLVENTS</td>
<td>1</td>
<td>10</td>
<td>Bulk Tank. Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Iso cyanate</td>
<td>2.936</td>
<td>29.36</td>
<td>Barrels</td>
</tr>
<tr>
<td>11</td>
<td>Polyster Resin</td>
<td>Dibasic Acids like Adipic Acid, Azealic Acid, Phthalic anhydride, Isophthalic acid</td>
<td>1.3</td>
<td>13</td>
<td>Poly/Paper Bags</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Polyols like trimethylol Ethane Trimethylol</td>
<td>0.5</td>
<td>5</td>
<td>Poly/Paper Bags / Barrels</td>
</tr>
</tbody>
</table>
### Table of Raw Materials and Consumption

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Products</th>
<th>Name of the Raw Material</th>
<th>Consumption Batch in Kgs</th>
<th>Consumption Day in Kgs</th>
<th>Storage Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>propane, Glycerol, Pentaerythritol etc., Glycols like Ethylene glycol, Propylene glycol, Neopentyl Glycol, Dipropylene Glycol, 1,3 Butylene Glycol</td>
<td>0.1</td>
<td>1</td>
<td>Poly/Paper Bags</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Benzoic acid or mono acid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Solvents like styrene/CIX /Butyl cellosolve</td>
<td>0.75</td>
<td>7.5</td>
<td>Barrels/ Tank</td>
</tr>
<tr>
<td>12</td>
<td>Polyamide Resins</td>
<td>Dimer Acid</td>
<td>3</td>
<td>50</td>
<td>Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fatty Acid</td>
<td>0.5</td>
<td>5</td>
<td>Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amines like EthyleneDiamines, Diethylene, Tetramine, Triethylene, Triamine etc.</td>
<td>1.8</td>
<td>18</td>
<td>HDPE Barrels</td>
</tr>
<tr>
<td>13</td>
<td>Epoxy Resin</td>
<td>EPICLOROHYDRIN</td>
<td>6.773</td>
<td>67.73</td>
<td>Barrels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BISPHENOL –A</td>
<td>1.669</td>
<td>16.69</td>
<td>Paper Bags</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NaOH Solution (40%)</td>
<td>1.484</td>
<td>14.84</td>
<td>Carboys</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Xylene/Toluene/Butanol</td>
<td>2.685</td>
<td>26.8</td>
<td>Barrels/Bulk Tank</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acetic acid</td>
<td>0.488</td>
<td>8.44</td>
<td>Carboys</td>
</tr>
</tbody>
</table>

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

**Ans.** Chemical exposure Assessment will be done. Chemical exposure Assessment Programme is as given below.

Industrial hygiene monitoring is mainly performed to provide information regarding the type and relative quantity of contaminant(s) present in the workplace. Air sampling is intended to evaluate and quantify exposure to hazardous substances handled by workers during tasks / activities within the occupational scenario. Based on the extent of exposure, appropriate
hierarchy of controls will be implemented in Risk Control Plans to prevent adverse health effects associated with hazardous chemicals. The method of sampling varies depending on the type of contaminant, its chemical properties, particle size, employee work practice, job location etc. Gravimetric or analytical method is used for analysis of the sample that depends on nature of the sample.

Personal and workplace sampling carried out for the analysis depends on the exposure. In pharmaceutical industry various processes are carried out and during operation ingredients become airborne. Hence workers involved in the process are exposed to the airborne contaminants. Air sampling analysis is carried out to know the exposure levels of these hazardous chemicals to the worker.
<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Name of chemical</th>
<th>Flammability</th>
<th>State</th>
<th>Auto-ignition °C</th>
<th>Flash point °C</th>
<th>Boiling point °C</th>
<th>Exposure limits TLV (Threshold Limit Value)</th>
<th>Lower flammable limit (LEL %)</th>
<th>Upper flammable limit (UEL %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Toluene</td>
<td>Flammable</td>
<td>Liquid</td>
<td>480</td>
<td>4.4444°</td>
<td>110.6</td>
<td>ACGIH Threshold Limit Value (TLV): 50 ppm (TWA) skin. Oral rat LD50: 636 mg/kg; skin rabbit LD50: 14100 uL/kg; inhalation rat LC50: 49 gm/m3/4H; Irritation data: skin rabbit, 500 mg, Moderate; eye rabbit, 2 mg/24H, Severe. Investigated as a tumorigen, mutagen, and reproductive effectors.</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>2.</td>
<td>Methyl ethyl ketone</td>
<td>Flammable</td>
<td>Liquid</td>
<td>404</td>
<td>-9°C</td>
<td>79.6</td>
<td>Exposure Limits: TWA: 200 STEL: 300 (ppm) from ACGIH (TLV) [United States] [1999] TWA: 150 STEL: 300 (ppm) [Australia] TWA: 590 STEL: 885 (mg/m3) from NIOSH TWA: 200 STEL: 300 (ppm) from NIOSH TWA: 590 STEL: 885 (mg/m3) [Canada] TWA: 200 STEL: 300 (ppm) from OSHA (PEL) [United States] TWA: 590 STEL: 885 (mg/m3) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Sr. No</td>
<td>Name of chemical</td>
<td>Flammability</td>
<td>State</td>
<td>Auto-ignition °C</td>
<td>Flash point °C</td>
<td>Boiling point °C</td>
<td>Exposure limits TLV (Threshold Limit Value)</td>
<td>Lower flammable limit (LEL %)</td>
<td>Upper flammable limit (UEL %)</td>
</tr>
<tr>
<td>-------</td>
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<td>---------------------------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>3.</td>
<td>Methanol</td>
<td>Flammable</td>
<td>Liquid</td>
<td>464</td>
<td>12</td>
<td>64.5</td>
<td>ACGIH Time-Weighted Average (TLV-TWA): 200 ppm - Skin Short-Term Exposure Limit (TLV-STEL): 250 ppm - Skin TLV Basis - Critical Effect(s): Headache; Eye damage; Dizziness;</td>
<td>6</td>
<td>36.5</td>
</tr>
<tr>
<td>4.</td>
<td>Xylene</td>
<td>Flammable</td>
<td>Liquid</td>
<td>464</td>
<td>24</td>
<td>138.5</td>
<td>Exposure Limits:</td>
<td>TWA: 100 (ppm) [Canada] TWA: 435 (mg/m3) [Canada] TWA: 434 STEL: 651 (mg/m3) from ACGIH [TLV] [United States] TWA: 100 STEL: 150 (ppm) from ACGIH [TLV] [United States] Consult local authorities for acceptable</td>
<td>1</td>
</tr>
<tr>
<td>Sr. No</td>
<td>Name of chemical</td>
<td>Flammability</td>
<td>State</td>
<td>Auto-ignition °C</td>
<td>Flash point °C</td>
<td>Boiling point °C</td>
<td>Exposure limits TLV (Threshold Limit Value)</td>
<td>Lower flammable limit (LEL %)</td>
<td>Upper flammable limit (UEL %)</td>
</tr>
<tr>
<td>--------</td>
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<td>---------------------------------------------</td>
<td>-------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>5.</td>
<td>Isopropyl alcohol</td>
<td>Flammable</td>
<td>Liquid</td>
<td>399</td>
<td>11.667</td>
<td>82.5</td>
<td>TWA: 983 STEL: 1230 (mg/m3) [Australia] TWA: 200 STEL: 400 (ppm) from ACGIH (TLV) [United States] [1999] TWA: 980 STEL: 1225 (mg/m3) from NIOSH TWA: 400 STEL: 500 (ppm) from NIOSH TWA: 400 STEL: 500 (ppm) [United Kingdom (UK)] TWA: 999 STEL: 1259 (mg/m3) [United Kingdom (UK)] TWA: 400 STEL: 500 (ppm) from OSHA (PEL) [United States] TWA: 980 STEL: 1225 (mg/m3) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.</td>
<td>2</td>
<td>12.7</td>
</tr>
<tr>
<td>6.</td>
<td>mineral Turpentine</td>
<td>Flammable</td>
<td>Liquid</td>
<td>539</td>
<td>35</td>
<td>165</td>
<td>TWA: 100 (ppm) from OSHA (PEL) [United States] TWA: 100 from ACGIH (TLV) [United States] [1999] TWA: 560 from ACGIH (TLV) [United States] TWA: 100 (ppm) [Australia] TWA: 150 (ppm) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.</td>
<td>0.8</td>
<td>57</td>
</tr>
</tbody>
</table>
Sampling Strategy
This plan was compiled to guide the Quantitative Assessment strategy for the site, Type of contaminant, exposure duration, workplace, API used etc. Availability of sampling instruments and media is very important to perform air sampling. Objective was very important and requires detail knowledge of such instruments. Defender was used to calibrate the air sampling pump.

Before Sampling
- The sampling pumps and calibrator were charged.
- Be ready with all necessary air sampling requirement and kept ready.
- Allow pump to run for 5 minutes prior to calibration.
- Calibrate the air sampling pump using respective media.
- Note the pre calibration flow rate.
- Fill the air sampling form for facility requirement.

Sample Collection
- Explain purpose of the sampling to employee.
- If required explain about the sampling pump to employee.
- The personal air sampling pump was mounted on the person performing the activity.
- Ensure that the cassette inlet faced down and all tubing was secured without bends.
- Open inlet of the cassette and start the pump.
- Note start time.
- Important observations were noted during the sampling.
- After completion of the sampling note down the end time.

After Sampling
- Sampling pumps were post calibrated and note down the flow rate.
- Do not forget to keep close inlet and outlet of the cassette.
- The sample must be analyzed.
Equipment Specification

Workplace Sampling: HANDY AIR SAMPLER-ENVIROTECH APM 821

SPECIFICATIONS
- Suction Pump : Built in Rotary Vane Type
- Rotameter : 0-3 LPM
- Timer
- (Battery operated) : 2 Digit Display in minutes
- Running Time : 1-199 min.
- Sampling Rate : 0.5-1.0 LPM
- Operation Time : 8 hours on fully charged batteries
- Batteries : Rechargeable maintenance free batteries
- Recharge Time : 14 hours

HANDY PERSONAL SAMPLER: Envirotech Personal Sampler APM 800

Specifications:
- Flow Rate : 0.5 – 2.0 LPM.
- Filter : 25mm dia. Filter Discs
- Batteries : Ni – Cd. rechargeable.
- Operation Time : 8 hrs. on fully charged batteries
- Recharge Time : 12 – 14 hrs.
- Size & Weight : 155 x 82 x 60 mm 1.2 kg.

1.33.3. What measures company have taken to keep these chemicals within PEL/TLV.
Good Ventilation, water seals, Personal Monitoring and sampling.

1.33.4. How the workers are evaluated concerning their exposure to chemicals during pre-placement and periodical medical monitoring.

Ans: Pre Medical Examinations:
1. Worker's baseline health status with thorough medical, environmental, and occupational histories.
2. A physical examination, and physiologic and laboratory tests appropriate for the anticipated occupational risks. These should concentrate on the function and integrity of the skin, liver, kidneys, and respiratory system.
3. Medical surveillance for respiratory disease should be conducted
4. Skin should be examined for chronic disorder
**Periodic Medical Examination:**

1. The interviews, examinations, and medical screening tests should focus on Examination of Respiratory system, Liver & Kidney.

2. Skin should be examined for chronic disorder Biological monitoring involves sampling and analyzing body tissues or fluids to provide an index of exposure to a toxic substance or metabolite.
1.33.5. What are onsite and offsite emergency plan during chemical disaster.

![EMERGENCY MANAGEMENT CHART FOR ON SITE EMERGENCY](chart)

**Advisory Team CP - QA**
- Chief Controller
  - Plant Incharge / Shift Supervisor
- Site Controller
  - Safety Officer / Shift Supervisor
- Communication Team
  - ILE – DLE / Security
- In Case of Offsite Emergency District Collector to Initiate Response Team

**Team A**
- Fire Fighting
  - All Plant Operators

**Team B**
- Supporting Team
  - Maintenance Operator operators

**Team C**
- Rescue Team
  - Trained First-Aider

**Task Completion**
- Report to ECC
- Investigation & Report preparation
A brief description of the possible hazards in handling hazardous materials is given below.

1) Leakage & Spillage of:
   A. Toluene
   B. Xylene
   C. Phenol
   D. Formaldehyde
   E. HCl solution
   F. NaOH Solution
   G. Acetic Acid
   H. Ethyl Acetate
   I. Urea/Melamine
   J. Cyclohexane
   K. Styrene
   L. n-butylacrylate
   M. Acid

2) Fire & Explosion of:
   A. Compressor
   B. Solvents Storage
   C. Flash Fire
   D. Panel(Electrical)
1.33.6. EMERGENCY ORGANIZATION

This chapter is devised to suggest the organization for emergency preparedness. Key personnel to combat emergency are nominated with specific responsibilities according to set procedures and making best use of the resources available and to avoid confusion. Such key personnel include Chief Emergency Controller, Site controller, other key personnel such as First Aiders, Fire fighting staff, support staff and communication staff, advisory staff. All such key personnel shall be available in all the office timings and shall be called during emergency in holidays.

OFF SITE EMERGENCY

OUTSIDE ORGANIZATIONS IF INVOLVED IN ASSISTING DURING DISASTER

1.33.7. Details of occupational health surveillance programme.

Occupational Health Programme is being developed. The Company is committed to promoting the health, safety and well-being of its workers, employees, visitors and contractors. The Industry will strive to develop and implement best practices in occupational and environmental hygiene principles.

The Industry has developed and implemented a comprehensive Occupational Hygiene Program (OHP) devoted to the recognition, evaluation and control of those environmental factors, arising in or from the work place that may cause illness, injury, or discomfort. To help reduce the risk of hazardous exposures, ensure regulatory compliance, and improve working conditions, appropriate occupational hygiene practices will be applied to the Industrial operations. The Occupational Hygiene Program clearly defines and stipulates the responsibilities.
of all workplace parties involved in its development, administration and implementation of the program.

The Occupational Hygiene Program includes the following elements:

a. Organizational Commitment;
b. Occupational Hygiene Process;
c. Roles and Responsibilities;
d. Training and Education;
e. Annual Program Review;
f. Definitions; and,
g. References.

**Purpose and Scope**

The Occupational Hygiene Program provides information to departments, supervisors and workers to allow for informed decision-making regarding exposure to hazardous agents in the workplace.

This program outlines how worker exposures hazards will be addressed in the workplace including the interpretation of technical data, conducting research, and assist in the development of guidelines and procedures that support workplace health and wellness. A hazard may be chemical, biological or physical in nature:

1. Chemical hazard - is any chemical capable of causing bodily injury or illness;
2. Biological hazard - is any biological organism that is infectious or pathological to humans; and
3. Physical hazard - arises from the interaction of matter and energy related to the science of physics such as sounds, light, vibration, and radiation that could result in an occupational injury or illness.

**Supporting Programs & Standards**

There are a number of occupational hygiene related hazards that have regulatory requirements. For these hazards, additional programs or standards have been developed and will work in conjunction with this program. These programs or standards include, but are not limited to the:

1. Respiratory Protection Program;
2. Hearing Conservation Program;
3. Laboratory Safety Program;
4. Indoor Environmental Quality Program;
5. Lock Out - Control of Hazardous Energy;
6. Personal Protective Equipment Program;
Occupational Hygiene Process
To ensure occupational hygiene issues are addressed in a consistent manner, concerns will be handled according to the process outlined in Figure 1 (Progression of Occupational Hygiene Issues Flowchart). An explanation of this process is found in the following sub-sections.

Hazard Assessment
Formal Hazard Assessment & Control Process
The document specifies the responsibilities, procedures, and requirements for proactively completing job hazard assessments. The occupational hygiene process is engaged when a chemical, biological, or physical hazard is identified on this hazard assessment.

Reporting a Hazard
Basic steps -
1. Hazard Identification
2. Hazard Recognition
3. Hazard Evaluation
4. Hazard Control

Level of Risk
A competent person must conduct the hazard assessment and include a qualitative evaluation of the risk associated with the identified occupational hygiene hazard. Hazards that pose an acceptable level of risk will not be addressed further. The criterion for determining if the risk level is acceptable is based on the potential health effects that would result from the quantities being used and the duration of exposure. If the substance/agent poses an unacceptable risk, or the risk level is unknown, further action is required.

Can Hazard be controlled?
If the hazard can be readily minimized or eliminated through the implementation of a control, the control should be implemented according to the hierarchy of controls in accordance. If controls are implemented, their effectiveness needs to be verified or monitored to complete the process.

Walkthrough Survey
Once it has been established that the hazard requires further investigation, Environment, Health and Safety dept. (EH&S) will conduct a walkthrough survey with the supervisor of the area. The walkthrough survey is not a site inspection but rather a technical review of the operations, workers, and materials in a workplace used to more clearly identify potential health hazards and help guide a qualitative assessment of their severity.
The walkthrough survey should document the following:

- a. Name of department or process;
- b. Nature of operation;
- c. Raw materials and quantities used;
- d. Equipment and machinery used;
- e. Health hazards identified and routes of exposure;
- f. Controls present;
- g. Number of workers exposed and their position; and,
- h. Items for follow-up after survey.

The walkthrough survey should also include a review of any prior walkthrough surveys, incident/accident reports, past monitoring data, and materials safety data sheets (MSDSs). Where relevant, interviews with workers and spot samples may also be included.

**Establishing Priority**

Where there are multiple hazards to be dealt with in the work area being assessed, it is important to assign priority in how they will be addressed so that those that pose the greatest risk or hazard are addressed first. The priority of addressing identified substances/agents will be based on the severity of health effects if exposure occurs, qualitative evaluation of exposure, number of workers affected, and level of existing controls.

**Exposure Assessment**

**Sampling Strategy**

The information collected during the walkthrough survey will be used to determine what action is required to quantitatively determine worker exposure. A quantitative evaluation of exposure will require some degree of monitoring. The exact type of monitoring conducted will be determined by evaluating the:

1. Duration of worker exposure;
2. Number of exposed workers;
3. Sampling methods available and their limits of detection;
4. Degree of accuracy required in the results;
5. Number of samples required to achieve representative results;
6. Cost; and,  
7. Regulatory requirements.  

Using these factors, Environment, Health and Safety will develop a sampling strategy outlining how, where, and the number of samples that will be collected. Environment, Health and Safety will work collaboratively with the supervisor to determine the best method for conducting the sampling. Where appropriate resources and equipment are available, internal resources may be used to conduct the sampling. External occupational hygiene contractors and resources may be required as determined on a case-by-case basis.  

**Sampling Methodology**  
Before sampling is conducted, the supervisor is required to notify their workers of the pending monitoring. If personal sampling is required, the workers must also be made aware that they will be required to wear sampling equipment. The workers are required to cooperate with monitoring and not intentionally contaminate collected samples.  
Sampling methods shall be conducted in accordance with the National Institute for Occupational Safety and Health (NIOSH) Manual of Analytical Methods or any other relevant standards. For sampling techniques that require the use of an external laboratory for analysis, only accredited laboratories may be used.  

**Sampling Results and Assessment**  
Where Environment, Health and Safety has conducted monitoring, the consultant will evaluate the sample results. Where the monitoring was conducted by another internal resource, Environment, Health and Safety will assist that resource in evaluating the results. When a third party is used to conduct the monitoring, the external occupational hygiene contractor will evaluate the sampling results. Environment, Health and Safety may perform a technical review and provide supplemental interpretation of reports prepared by outside contractors where warranted.  
Sampling results will be made available to the supervisor within 30 days of receiving the final laboratory analysis results. The results will be made immediately available if there is an excursion of an Occupational Exposure Limit (OEL).  

**Written Documentation**  
The final sampling results may be made available in report or memo format depending on the extent of sampling conducted. Where Environment, Health and Safety conducted the sampling, the consultant will interpret the analysis results and provide the written report or memo.
Determination of Exposure Level
Determining whether results from monitoring indicate an acceptable exposure level will be based on the Occupational Exposure Limits (OELs).
Where occupational exposure limits do not exist, other recognized standards and professional judgement will be used to determine at which point hazard controls are required.
Where the exposure results are below the action level, the exposure level will be deemed acceptable. However, recommendations for controls may still be made to address workers’ comfort or due diligence issues.
Where the exposure results are above the action level, the implementation of, or modification to, hazard controls must be made. Where an OEL has been exceeded, the affected worker is to be informed of the nature and extent of the excess exposure and immediately protected from further excess exposures.
Where the exposure results cannot be clearly interpreted, further exposure assessment will be required.

Implementation of Controls
When recommending controls for identified and assessed hazards, the hierarchy of controls will be used; preference will first be given to Engineering controls, then Administrative controls, and lastly Personal Protective Equipment. Each supervisor is responsible for notifying the Occupational Hygiene Consultant, in writing, when the recommended controls have been implemented. The hazard assessment form must also be updated to reflect any changes in control measures.

Additional Exposure Assessments
To evaluate the effectiveness of a control, additional exposure assessments of the substance/agent may be required. If additional assessments are required, Environment, Health and Safety will develop a monitoring strategy and schedule.
Additional exposure assessment may also be required after new processes, equipment, or products are introduced.
Where additional exposure assessment is not required, no further action is necessary.

Monitoring Schedules
Monitoring schedules must be developed for substances/agents that cannot be eliminated and require additional exposure assessments. A monitoring schedule will specify the substance/agent(s) to be monitored, the frequency of monitoring, and how the monitoring is to be conducted. This schedule may specify continuous monitoring or periodic follow-up monitoring as a means to evaluate the applicable operation. The affected
department/supervisor and Environment, Health and Safety will keep a copy of the monitoring schedule. The schedule may be adjusted if changes are made to the operation, resulting in a change in the hazard assessment.

Roles and Responsibilities
In order for the occupational hygiene process to work effectively, the roles and responsibilities of each department (supervisor, worker, Occupational Hygiene Consultant, etc.) must be clearly defined:

Directors and Department Heads
Ensure that the Occupational Hygiene Program and all its components are implemented, administered and enforced;
Ensure resources are available for the implementation of this program and,
Ensure that all potentially exposed workers are provided with appropriate controls, including personal protective equipment.

Supervisors (includes Faculty Members)
Conduct hazard assessments;
Implement controls in accordance with legislation requirements;
Be knowledgeable in the appropriate government regulations, safety standards, and prudent safety practices to protect workers;
Notify Environment, Health & Safety (EH&S) of occupational hygiene issues;
Follow any monitoring schedules that have been established;
Provide access to their areas for walkthrough surveys and monitoring, where required;
Inform Environment, Health and Safety when recommended hygiene controls have been implemented.

Workers
Attend required training sessions on workplace hazards;
Participate in personnel monitoring, audiometric testing and respiratory fit testing, where required;
Wear personal protection equipment, where required (also applies to students, visitors and guests);
Ensure that personal protection equipment is in a sanitary condition and proper working order by following proper maintenance procedures and inspections; and,
Report workplace hazards and defective or damaged personal protective equipment to the appropriate supervisor.
Environment, Health and Safety Dept.

- Conduct initial inquiry of hygiene issues;
- Collect spot samples;
- Conduct walkthrough surveys;
- Develop monitoring strategies and schedules;
  - Arrange for and coordinate competent occupational hygiene contractors, where required;
- Complete, review, or provide interpretation of reports where required;
- Conduct monitoring where feasible;
- Maintain a database of monitoring results;
- Perform statistical analysis of data;
- Work with supervisors through the exposure assessment process;
- Provide department/supervisors with monitoring schedules;
- Review quality assurance measures for sample collection;
- Monitor regulations, research data, etc. for emerging issues;
- Provide training on the use of monitoring equipment where necessary;
- Maintain occupational hygiene equipment belonging to EH&S; and,
- Maintain an exposure assessment plan.

Education and Training

Education and training, although similar, are different:

1. Education refers to the theoretical instruction of workers in general information such as the different types of hazards and how to control those hazards.
2. Training refers to the practical application of site-specific information such as safe work instructions, standard operating procedures, and emergency response protocols.

Both education and training are an important part of understanding and controlling the hazards that may be present.

Preventative Maintenance and Inspection

Maintenance of a Hygiene Database

Environment, Health & Safety dept. will maintain a central database of sampling records. The database will be used to address future exposure assessment issues, develop monitoring schedules, and prioritize exposure monitoring. The database will include location, date, conditions under which sampling was conducted, sampling method used, and sampling results. The records will be retained in the database for a minimum of 10 years.

It is the responsibility of each department/supervisor to forward sampling records to Environment, Health & Safety for maintenance of the database.
Maintenance of Hygiene Equipment

Department Responsibility

Each department is responsible for maintaining and inspecting their own hygiene equipment, such as gas monitors. Guidance on maintaining the equipment can be obtained by referencing the manufacturer’s instructions or contacting Environment, Health & Safety Dept. Environment, Health and Safety dept will maintain and inspect their own equipment.

Equipment Storage

Hygiene equipment will be stored in a manner that keeps it free from damage and contamination. A competent worker may perform minor repairs and preventative maintenance. The equipment’s manufacturer or an approved vendor will complete major repairs and regular factory calibrations as needed.

Calibration & Documentation

Records of maintenance, repairs, and calibration must be kept on file for the life of the instrument.

Annual Program Review

The Occupational Hygiene Program will be reviewed annually by Environment, Health & Safety:

- To ensure its contents continue to meet regulatory requirements;
- To evaluate the effectiveness of the process/program; and,
- To evaluate the roles and responsibilities of the program.

Environment, Health & Safety dept. must retain the current copy of the Occupational Hygiene Program.

Definitions

Administrative Control: Encompasses the use of management involvement, training, job rotation, reduction of exposure time, preventive maintenance, and housekeeping in an effort to control worker exposures. Examples include safety rules and enforced safe work procedures, training, lock-out tag out processes to de-energize equipment prior to working on it, immunizations, etc.

Biological Hazard: is any biological organism that is infectious or pathological to humans.

Chemical Hazard: is any chemical capable of causing bodily injury or illness.

Engineering Control: Encompasses the use of process change, substitution, isolation, ventilation and source modification in order to control worker exposures by reducing the quantity of
contaminants released into the workplace. Examples include chemical fume hoods, biological safety cabinets, interlock systems, automated systems, etc.

**Hazard:** is a situation, condition, process, material or thing that may cause an injury or illness to a worker.

**Material Safety Data Sheets (MSDSs):** are technical bulletins which provide detailed hazard and precautionary information on a controlled product.

**Occupational Exposure Limit (OEL):** Refer to the definition of Threshold Limit Value (TLV).

**Personal Protective Equipment (PPE):** Involves the use of devices designed to protect individuals from hazards in the workplace. Examples include gloves, goggles or safety glasses, hearing protection, steel-toed shoes, lab coats, etc.

**Physical Hazard:** arises from the interaction of matter and energy related to the science of physics such as sounds, light, vibration, and radiation that could result in an occupational injury or illness.

**Route of Exposure:** the way in which a substance/agent enters the body. The four primary routes of exposure/entry are inhalation, absorption (through skin and eyes), ingestion and injection.

**Supervisor:** an individual that directs or oversees a person, group, department, organization, or operation.

**Threshold Limit Value (TLV):** a term used by ACGIH to express the airborne concentration of a material to which nearly all persons can be exposed day after day, without adverse effects. A maximum limit of exposure to an air contaminant. Three types of limits in common use are:

- **Exposure Limit - TWA** - The Time-Weighted Average concentration for a normal 8-hour work day or 40-hour work week to which nearly all workers can be repeatedly exposed without adverse effect.

- **Exposure Limit - STEL** - The Short-Term Exposure Limit, i.e. the maximum concentration to which workers can be periodically exposed for a period up to 15 minutes without suffering from irritation, chronic or irreversible tissue change, or narcosis of sufficient degree to increase accident proneness, or impair ability for self-rescue.

- **Exposure Limit - C** - The Ceiling concentration of an airborne substance that must not be exceeded at any time. This limit is applied to substances that are predominantly irritant or fast-acting and for which the TWA is inappropriate.

**Walkthrough Survey:** a technical review of the operations, workers, and materials in a workplace used to more clearly identify potential health hazards and help guide a qualitative assessment of their severity.

**Worker:** any person engaged in work at the industry, including workers, contracted workers.
Checklist:

Walkthrough Survey Checklist

The following is a general list of items that may be investigated during a walkthrough survey:
Where hazards are identified, they must be eliminated or controlled to the extent reasonably practicable.

<table>
<thead>
<tr>
<th>Investigated Items</th>
<th>Available (Y/N)</th>
<th>Reviewed (Y/N)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work related absence data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor plan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency and duration of each operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fugitive emissions created during the process</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incident data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Layout of equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lighting levels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance procedures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manual handling techniques</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSDS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of male and female employees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occurrence of odours, tastes, irritation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPE in use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous monitoring results and conditions of monitoring</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process flowchart</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw materials, intermediates, and by-products</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Season variations in process</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequence of operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventilation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worker habits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Walkthrough Survey Form

Walkthrough Survey Form

Department: ____________________________  Location: ____________________________
Date: ____________________________  Site Contact: ____________________________

<table>
<thead>
<tr>
<th>Name of Department, process, or workstation</th>
<th>Nature of Operation (brief description)</th>
<th>Materials and Quantities Used</th>
<th>Equipment and Machinery</th>
<th>Identified Hazards, Exposure Duration and Routes</th>
<th>Personal Protective Equipment Used</th>
<th>Administrative and Engineering Controls</th>
<th>No. of Employees Exposed (= Professionals)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation or Follow-up Required:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1.34 EVACUATION PLAN
On hearing the siren all employees shall evacuate the area by safely closing down all operation as per instructions from their Incident Controller or in nighttime Shift supervisor. After gathering at assembly points, shift-in-charge should take the roll call & ensure that no person is left trapped. The Rescue Coordinator or Guard (who is inside the plant for duty) shall ensure that none is trapped inside the plant. Security guards shall ensure total evacuation. Main gate is used for movement of personnel, movement of rescue, medical aid.

1.35 TRAFFIC CONTROL
The Security In-charge or Guard shall contact Chief Executive Officer and shall make himself available at main gate for traffic control till local authorities help is available. In case of diverting the traffic of Road or stoppage, Security Guard shall co-ordinate with Chief Executive Officer with outside agencies as Police, etc.
Unwanted traffic and public gathering shall be controlled & avoided by security personnel till local help from police is available.

1.36 OTHER ARRANGEMENTS
The details about fire & toxicity control arrangement, medical Services, Transport and Evacuation Arrangements, Pollution Control arrangements shall be provided. All such key personnel (Annexure – 8,) shall be available and shall be called during emergency at any time. The telephone numbers of the important persons, persons to be contacted in case of emergency along with their duties in case of emergency shall be displayed at different location in the plant area.

1.37 PROCEDURES FOR IMPLEMENTING PLANT MODIFICATIONS
1. Operations Department (Process & Maintenance) is to initiate a plant change, work request and attach a proper sketch on a standard tracing as shown in appendix given below.
2. Managing Director is to discuss and review the process and safety aspects of plant modifications with Advisor, Production Manager, Shift Supervisor, and Project Manager before endorsing the sketch for safety aspects.
3. Each plant modification shall be recorded in a register showing a date of issue and serial no of job.
4. Production Manager / Factory Manager is make necessary corrections as recommended in safety audit reports & would update operating manuals.
List of Rescue / Safety Equipments
(Respiratory & Non-respiratory)

- Safety helmets is procured & issued
- Safety hand gloves is provided
- Safety goggle is provided
- Face shields is provided
- Gum Boots, PVC Shoes

1.38 HEALTH, SAFETY AND ENVIRONMENTAL PROTECTION
Company is committed to achieve environmental, health & safety (EHS) excellence. This is a responsibility of management & employer in all function. Company is striving to provide a safe and healthy working environment & the communities in which we do business. Our programs must combine clear leadership by management, the participation of all employees and functions, and the use of appropriate technology in developing and distributing company products & services.
Requirements:

- Comply with applicable environmental, health, & safety laws and regulations.
- Take appropriate measures to prevent workplace injuries & illness, and to provide employees with a safe & healthy working environment. Consider evolving industry practices, regulatory requirements and social standards of care.
- Eliminate unreasonable, risk form facilities, products, services and activities.
- To the extent practicable, reduce the use and release of toxic and hazardous materials.
- Research and where appropriate, implement advanced technology, design and production facilities, products, services & activities.
- Research and where appropriate, implement advanced technology in the design, production and services and to prevent pollution and conserve, recover and recycle raw material.

Employee responsibility

- Follow the policy and applicable laws and regulation to protect your own health and safety as well as that of other workers, the public and the environment.
- Present ideas that support the goals of policy.
- Prompt report concerns about possible violation of this policy to the persons listed or to your manager.

Additional responsibility of leaders:

MD will make sure this policy is a part of an overall policy compliance program as described.

MD is:

- Consult with adequacy of their health, safety and environmental programs.
- Implement monitoring and auditing system at the plant and business levels designed to detect violations & assure compliance with law and this policy.
- Regularly evaluate the effectiveness of managers & other senior employees on their implementation of this policy and environmental, health & safety programs.

Managers responsible for a facility, activity, product or service are:

- Communicate responsibility with employees, communities, customers and government agencies regarding environmental health and safety issue.
- Cooperate with the public, government and other interested parties to develop appropriate regulatory and public policies that protect employee and public health and the environment.
- Implement effective programs, training and best practices for health, safety and environment protection and for the elimination or reasonable reduction of toxic and hazardous materials.
- Regularly assess plant operations & management. Establish measurements to ensure compliance with this policy and applicable laws & regulations, when appropriate; review assessment results with environmental programs.
- Ensure that an employee with EHS responsibilities is appropriately screened before appointment and that continued appropriateness for their position is periodically reviewed.
- Develop appropriate program for safety reviews of new and re-designed products prior to sale and distribution to customers. Monitor after-sale safety performance to identify and address significant product safety issues.
- Work cooperatively with, contractors, business partners & suppliers to ensure that our relationships with them are supportive for this policy.
- Promptly report to medical Services, Environmental Program & your assigned legal counsel any,
- Emergency evacuation, communicable disease or other serious health indent which may have exposed employees to health hazardous.
- Work related employee facilities & other serious safety incidents requiring a report to a governmental agency.
- Information regarding a report to a governmental agency or any governmental allegations of substantial violations of environmental laws or regulations.
- Legal proceedings alleging significant property damage or personal injury from environmental contamination or exposure to hazardous substances & other information requested by medical services or Environmental programs.
**List of Annexure**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Annexure No.</th>
<th>Details</th>
</tr>
</thead>
<tbody>
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<td>Plant Lay out</td>
</tr>
<tr>
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<td>Annexure-2</td>
<td>External Telephone Number</td>
</tr>
<tr>
<td>3.</td>
<td>Annexure-3</td>
<td>Alarms &amp; Sirens</td>
</tr>
<tr>
<td>4.</td>
<td>Annexure-4</td>
<td>Mutual Aid Arrangement</td>
</tr>
<tr>
<td>5.</td>
<td>Annexure-5</td>
<td>Medical arrangement</td>
</tr>
<tr>
<td>6.</td>
<td>Annexure-6</td>
<td>Mutual Aid Arrangement</td>
</tr>
<tr>
<td>7.</td>
<td>Annexure-7</td>
<td>Essential workers</td>
</tr>
<tr>
<td>8.</td>
<td>Annexure-8</td>
<td>Key Personnel</td>
</tr>
<tr>
<td>9.</td>
<td>Annexure-9</td>
<td>Safe Assembly Points</td>
</tr>
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</table>
Annexure-1, Plant Lay-Out
### Annexure-2, External Telephone Number

#### EXTERNAL TELEPHONE NUMBERS AND ADDRESS

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>Telephone No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Brigade</td>
<td>VAPI GIDC., - 1</td>
<td>101/2430101/2431545</td>
</tr>
<tr>
<td></td>
<td>VAPI GIDC. - 2</td>
<td>0250- 2431300/6550501</td>
</tr>
<tr>
<td></td>
<td>VAPI TOWN FIRE BRIGADE</td>
<td>2460100/2453378/2451891</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(R) 30006 61</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(M) 9727774596/9727774597</td>
</tr>
<tr>
<td>DY.S.P. Vapi, Police St. - Vapi Town</td>
<td></td>
<td>34491</td>
</tr>
<tr>
<td>Police St.- GIDC, Vapi</td>
<td></td>
<td>2461080/224661100</td>
</tr>
<tr>
<td>D.S.P.-Valsad</td>
<td></td>
<td>2401201</td>
</tr>
<tr>
<td>Dy. S.P. Valsad</td>
<td></td>
<td>02632 - 254222/253333</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(R) 253093</td>
</tr>
<tr>
<td></td>
<td></td>
<td>02632-253082 (R) 243694</td>
</tr>
<tr>
<td>AMBULANCE GVK EMRI-108 A.J.Yadav</td>
<td></td>
<td>108</td>
</tr>
<tr>
<td>Pidilite Industries Bhalag md. Ltd.</td>
<td></td>
<td>2424580 / 2453590</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0260 - 2430520/240517/2400669</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0260 - 2400055/2400061</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24004434 (R) 2425408</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(M) 9825143785</td>
</tr>
<tr>
<td>Haria Hospital-Vapi</td>
<td>Haria Hospital-Vapi</td>
<td>102/2430209/2400604</td>
</tr>
<tr>
<td>Jan Seva Hospital</td>
<td>Jan Seva Hospital</td>
<td>2400053/6424580</td>
</tr>
<tr>
<td>Manav Health Trust, Pardi</td>
<td>Manav Health Trust, Pardi</td>
<td>0260 - 2400081/234</td>
</tr>
<tr>
<td>NIR. Haria Hospital</td>
<td>NIR. Haria Hospital</td>
<td>0260 - 2374422</td>
</tr>
<tr>
<td>Jay Matadi Trust N/R 21 St Century</td>
<td></td>
<td>0260 - 6532060</td>
</tr>
<tr>
<td>Ramdeo N/R Janseva Hospital</td>
<td>Ramdeo N/R Janseva Hospital</td>
<td>(M) 9824141720</td>
</tr>
<tr>
<td>PP. Eye Hospital</td>
<td>PP. Eye Hospital</td>
<td>9825574040</td>
</tr>
<tr>
<td>Dr. Pant Hospital</td>
<td>Dr. Pant Hospital</td>
<td>9925473414</td>
</tr>
<tr>
<td>Mikas Org. Ltd.</td>
<td>Mikas Org. Ltd.</td>
<td>9377101042</td>
</tr>
<tr>
<td></td>
<td>Sadvichar Parivar</td>
<td>02632-2434000/2434001</td>
</tr>
<tr>
<td>Collector-Valsad</td>
<td>Collector-Valsad</td>
<td>2425203/2430525</td>
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<tr>
<td></td>
<td></td>
<td>2429085/2432251</td>
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<tr>
<td>Additional Collector</td>
<td>Additional Collector</td>
<td>22690450</td>
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<td>SDM- Valsad</td>
<td>SDM- Valsad</td>
<td>02632 - 243417253613</td>
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<td></td>
<td></td>
<td>(R) 253060</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(M) 9978406225</td>
</tr>
<tr>
<td></td>
<td></td>
<td>02632 - 244366 (R) 244476</td>
</tr>
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<td></td>
<td></td>
<td>(M) 9978405525</td>
</tr>
<tr>
<td></td>
<td></td>
<td>02632-249239 (R) 249238</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(M) 9978405527</td>
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</tbody>
</table>
# Annexure-3, Alarms & Sirens

## ALARMS & SIRENS

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name &amp; location</th>
<th>No. of floors</th>
<th>Area of each floor</th>
<th>Sr.No. of the alarm point</th>
<th>Type of the alarm or siren</th>
<th>Its period of checking</th>
<th>The alarm (signal) is heared (seen)</th>
<th>Type of emergency</th>
<th>Type of alarm or siren</th>
<th>Duration at sounding</th>
<th>Type or sound of alarm /siren</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Electrical siren will be installed</td>
<td>G.F</td>
<td>Whole plant &amp; factory</td>
<td>1</td>
<td>Main Gate</td>
<td>Monthly &amp; SHIFT CHANGE</td>
<td>ENTIRE PLANT</td>
<td>FIRE *</td>
<td>ELECTRIC SIREN</td>
<td>Pause &amp; repeat</td>
<td>Single siren</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Electrical siren</td>
<td></td>
<td></td>
<td>GAS LEAK</td>
<td></td>
<td>Pause &amp; repeat</td>
<td>Wailing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EXPLOSION</td>
<td></td>
<td>30 sec. once Pause &amp; repeat</td>
<td>Single siren</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ALL CLEAR</td>
<td></td>
<td>60 sec. once Pause &amp; repeat</td>
<td>Single siren</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>continuous for 2 minutes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Single siren</td>
</tr>
</tbody>
</table>
### Annexure -4, Mutual Aid Arrangement (A)

<table>
<thead>
<tr>
<th>Name &amp; address of the factories &amp; fire stations</th>
<th>Approx. distance</th>
<th>Contact Person</th>
<th>Approx. distance</th>
<th>Contact Telephone numbers</th>
<th>FFE available</th>
<th>PPE available</th>
<th>No. of experts &amp; trained persons available</th>
<th>Decontamination substance available</th>
<th>Gas detector available</th>
<th>Other equipments available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Brigade, GIDC., Vapi</td>
<td>05 km</td>
<td>I/c.</td>
<td>2431545</td>
<td>2430101 / 101</td>
<td>All types</td>
<td>Adequate</td>
<td>Adequate</td>
<td>Yes</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Shiv Shakti Acid &amp; Chemicals</td>
<td>1.0 Km</td>
<td></td>
<td>2430711</td>
<td>9825130249</td>
<td>Yes</td>
<td>12 Nos</td>
<td>All general personal protective equipments</td>
<td>dozens</td>
<td>None</td>
<td>None</td>
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<tr>
<td>Nath Industrial Chemicals</td>
<td>1.0 Km</td>
<td></td>
<td>3254525</td>
<td>9374992165</td>
<td>Yes</td>
<td>12 Nos</td>
<td>dozens</td>
<td>More than one trained person in each of these units, because solvents &amp; acids, alkali are used at all above units</td>
<td>None</td>
<td>SCBA - 2</td>
</tr>
<tr>
<td>Police Station GIDC</td>
<td>1.0 km</td>
<td></td>
<td>2401201</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>None</td>
<td>SCBA - 3</td>
</tr>
<tr>
<td>Haria Hospital Ambulance</td>
<td>1.0 km</td>
<td></td>
<td>240053</td>
<td>108 / 102</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
## Annexure -5, Medical arrangement

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Name &amp; Location</th>
<th>Telephone</th>
<th>In charge person</th>
<th>Facilities &amp; Equipments</th>
<th>Antidotes available</th>
<th>First Aides available</th>
<th>Accommodation available</th>
<th>Place of Availability</th>
<th>Capacity</th>
<th>Facilities</th>
<th>Drivers's name &amp; address</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>First Aid Box</td>
<td>2422905</td>
<td>Stores l.t.c.</td>
<td>GIDC, VAPI</td>
<td>Yes</td>
<td>no</td>
<td>1 person with fire</td>
<td>Ambulance</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>stores</td>
<td>2422906</td>
<td>VAPI</td>
<td>provided</td>
<td></td>
<td></td>
<td>brigade</td>
<td>co with</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2422907</td>
<td></td>
<td>for rest</td>
<td></td>
<td></td>
<td></td>
<td>Alarm</td>
<td>stretcher</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>ESIC D-1</td>
<td>2421598</td>
<td>GIDC, VAPI</td>
<td>Primary</td>
<td>Yes</td>
<td>Yes</td>
<td>1 to 2 persons</td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GIDC, VAPI</td>
<td></td>
<td>VAPI</td>
<td>medical help</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>JANSEVA HOSP</td>
<td>2460081</td>
<td>GIDC, VAPI</td>
<td>All medical</td>
<td>yes</td>
<td>Yes</td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>VAPI</td>
<td>2460082</td>
<td>VAPI</td>
<td>facilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>HARIA HOSP. I/C</td>
<td>2400053</td>
<td>GIDC, VAPI</td>
<td>All facilities</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>2 do.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2430654</td>
<td></td>
<td>VAPI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>21ST CENTURY</td>
<td>2429350</td>
<td>VAPI</td>
<td>do-</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>1 do.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HOSP</td>
<td>2429351</td>
<td>VAPI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Annexure - 6, Mutual Aid Arrangement (B)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name, address &amp; of the factories outside transport centres including Bus &amp; Railway Stn.</th>
<th>Distance</th>
<th>Phone number</th>
<th>In charge person</th>
<th>Name &amp; Designation</th>
<th>Residence</th>
<th>Sr. No.</th>
<th>Type &amp; number</th>
<th>Capacity</th>
<th>No. &amp; type of public warning instruments</th>
<th>Driver’s name &amp; address</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fire Brigade GIDC., Vapi</td>
<td>1 Km</td>
<td>2431546 2430101/101</td>
<td>-</td>
<td>-</td>
<td></td>
<td>26</td>
<td>CAR</td>
<td>2</td>
<td>Nil</td>
<td>Self driven</td>
</tr>
<tr>
<td>2</td>
<td>ShivShakti Acid &amp; Chemicals</td>
<td>1 Km</td>
<td>2430711 9825130249</td>
<td>-</td>
<td>-</td>
<td></td>
<td>26</td>
<td>CAR</td>
<td>2</td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Nath Industrial Chemicals</td>
<td>1 Km</td>
<td>3254525 9374992165</td>
<td>-</td>
<td>-</td>
<td></td>
<td>26</td>
<td>CAR</td>
<td>2</td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Police Station GIDC</td>
<td>1 Km</td>
<td>2401201</td>
<td>-</td>
<td>-</td>
<td></td>
<td>26</td>
<td>CAR</td>
<td>2</td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Haria Hospital Ambulance</td>
<td>1.5 Km</td>
<td>240053 108/102 2430206</td>
<td>-</td>
<td>-</td>
<td></td>
<td>26</td>
<td>Van</td>
<td>2</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>
### Annexure-7, Essential workers

<table>
<thead>
<tr>
<th>Shifts</th>
<th>Group No. (any one gr. will be available in each shift &amp; on holiday on call)</th>
<th>Sr. No.</th>
<th>Name and designation</th>
<th>Trained for [see items (1) to (16) page 28 - 29]</th>
<th>Place of availability in the factory</th>
<th>Residence address</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>1</td>
<td>SHAKTI SINGH Prod. Officer RAJINDER PRAJAPATI Prod. Officer DURGA VIJAY Supervisor GOPAL PATIL Operator</td>
<td>First Aid Fire Fighting Evacuation of co-workers at safe area Rescue Operations</td>
<td>As per the company records</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SECOND SHIFT IS NOT OPERATED SECURITY WATCHMEN WILL BE AVAILABLE</td>
<td>2</td>
<td></td>
<td>First Aid Fire Fighting Evacuation of co-workers at safe area Rescue Operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>THIRD SHIFT IS NOT OPERATED SECURITY WATCHMEN WILL BE AVAILABLE</td>
<td>3</td>
<td></td>
<td>First Aid Fire Fighting Evacuation of co-workers at safe area Rescue Operations</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Annexure-8, Key Personnel

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Shifts</th>
<th>Name</th>
<th>Designation</th>
<th>Qualification</th>
<th>Place of availability</th>
<th>Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SAFETY</td>
<td>Mr. N.B.</td>
<td>Works Manag</td>
<td>Highly Qualified</td>
<td>Plant</td>
<td>As per Annexure - 1</td>
</tr>
<tr>
<td>2</td>
<td>SECURITY</td>
<td>Contract</td>
<td>Watch Mes</td>
<td>Qualified</td>
<td>Main Gate</td>
<td>As per Co. Records</td>
</tr>
<tr>
<td>3</td>
<td>FIRE &amp; GAS</td>
<td>Mr. N.B.</td>
<td>Works Manag</td>
<td>Highly Qualified</td>
<td>Plant</td>
<td>As per Annexure - 1</td>
</tr>
<tr>
<td>4</td>
<td>CONTROL</td>
<td>Mr. N.B.</td>
<td>Works Manag</td>
<td>Highly Qualified</td>
<td>Plant</td>
<td>As per Annexure - 1</td>
</tr>
<tr>
<td>5</td>
<td>POLLUTICN</td>
<td>Mr. N.B.***</td>
<td>Works Manag</td>
<td>Highly Qualified</td>
<td>Plant</td>
<td>As per Annexure - 1</td>
</tr>
<tr>
<td>6</td>
<td>MEDICAL</td>
<td>Mr. N.B.</td>
<td>Works Manag</td>
<td>Highly Qualified</td>
<td>Plant</td>
<td>As per Annexure - 1</td>
</tr>
<tr>
<td>7</td>
<td>PRODUCTION</td>
<td>Mr. N.B.</td>
<td>Works Manag</td>
<td>Highly Qualified</td>
<td>Plant</td>
<td>As per Annexure - 1</td>
</tr>
<tr>
<td>8</td>
<td>PERSONNEL</td>
<td>Mr. N.B.</td>
<td>Works Manag</td>
<td>Highly Qualified</td>
<td>Plant</td>
<td>As per Annexure - 1</td>
</tr>
</tbody>
</table>
### Annexure -9, Safe Assembly Points

<table>
<thead>
<tr>
<th>Sr.No. of the assembly point</th>
<th>Location</th>
<th>Accommodation capacity</th>
<th>Name &amp; designation</th>
<th>Place of availability</th>
<th>Phone number</th>
<th>PPE that may be required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 At the Main Gate Assembly Point NO. 1</td>
<td>Near Main Gate</td>
<td>100 Persons</td>
<td>Security Watchman &amp; Non essential Workers will be available</td>
<td>Main Gate</td>
<td>0260-2422905 2422906 &amp; 2422907</td>
<td>Fire Extinguishers fire suit. General PPE's First Aid Kit</td>
</tr>
<tr>
<td>1 More than 30 Met from plant</td>
<td>Opposite end of the unit as per marked in Annexure-3</td>
<td>100 Persons</td>
<td>Security Watchman &amp; Non essential Workers will be available</td>
<td>Opposite End</td>
<td>0260-2422905 2422906 &amp; 2422907</td>
<td>As Per Annexure-17</td>
</tr>
<tr>
<td>2 Another End More than 30 Mt. from plant</td>
<td>Opposite End</td>
<td>100 Persons</td>
<td>Security Watchman &amp; Non essential Workers will be available</td>
<td>Opposite End</td>
<td>0260-2422905 2422906 &amp; 2422907</td>
<td>As Per Annexure-17</td>
</tr>
</tbody>
</table>