

## QUANTITATIVE RISK ANALYSIS

### 7.1 HAZARDS ANALYSIS & RISK ASSESSMENT

#### 7.1.1 . Introduction

Industrial plants deal with materials, which are generally hazardous in nature by virtue of their intrinsic chemical properties or their operating temperatures or pressures or a combination of these. Fire, explosion, toxic release or combinations of these are the hazards associated with industrial plants using hazardous chemicals. More comprehensive, systematic and sophisticated methods of **Safety Engineering**, such as, **Hazard Analysis** and **Quantitative Risk Assessment** have now been developed to improve upon the integrity, reliability and safety of industrial plants.

The primary emphasis in safety engineering is to reduce risk to human life, property and environment. Some of the more important methods used to achieve this are:

- **Quantitative Risk Analysis:** Provides a relative measure of the likelihood and severity of various possible hazardous events by critically examining the plant process and design.
- **Work Safety Analysis:** The technique discerns whether the plant layout and operating procedures in practice have any inherent infirmities.
- **Safety Audit:** Takes a careful look at plant operating conditions, work practices and work environments to detect unsafe conditions.

Together, these three broad tools attempt to minimize the chances of accidents occurring. Yet, there always exists, no matter how remote, probability of occurrence of a major accident. If the accident involves highly hazardous chemicals in sufficiently large quantities, the consequences may be serious to the plant, to surrounding areas and the populations residing therein.

#### 7.1.2 Risk Assessment

A three 'levels' risk assessment approach has been adopted for the **KAHAN CHEM PVT.LTD.** proposed project to be set up at Plot no. 3323, Phase -IV, GIDC Vatva, Ahmedabad-382445, Gujarat. The risk assessment levels are generally consistent with the practices encountered through various assignments for medium and large chemical complexes. The brief outline of the three-tier approach is given below:

##### **Level 1 – Risk Screening**

This is top-down review of worst- case potential hazards/risks, aimed primarily at identifying plant sites or areas within plant, which pose the highest risk. Various screening factors considered include:

- Inventory of hazardous materials;
- Hazardous Materials properties;
- Storage conditions (e.g. temperature and pressure);
- Location sensitivity (distance to residential areas / populace).

The data / information is obtained from plant. The results provide a relative indication of the extent of hazards and potential for risk exposure.

### Level 2 – Major Risk Survey (Semi - Quantitative)

The survey approach combines the site inspection with established risk assessment techniques applied both qualitative as well quantitative mode. The primary objective is to identify and select major risks at a specific location in the plant considering possible soft spots / weak links during operation / maintenance. Aspects covered in the risk usually include:

- Process Hazards;
- Process Safety Management Systems;
- Fire Protection and Emergency response equipment and programs.
- Security Vulnerability;
- Impact of hazards consequences (equipment damage, business interruption, injury, fatalities);
- Qualitative risk identification of scenarios involving hazardous materials;
- Risk reduction measures.

Selection of critical scenarios and their potential of damage provide means of prioritization mitigate measures and allocate the resources to the areas with highest risks.

### Level 3 – Quantitative Risk Assessment (Deterministic)

This is the stage of assessment of risks associated with all credible hazards (scenarios) with potential to cause an undesirable outcome such as human injury, fatality or destruction of property. The four basic elements include:

- Hazards identification utilizing formal approach (Level 2, HAZOP etc.);
- Frequency Analysis. Based on past safety data (incidents / accidents); Identifying likely pathway of failures and quantifying the toxic / inflammable material release;
- Hazards analysis to quantify the consequences of various hazards scenarios (fire, explosion, BLEVE, toxic vapour release etc.). Establish minimum value for damage (e.g. IDLH, over pressure, radiation flux) to assess the impact on environment.
- Risk Quantification: Quantitative techniques are used considering effect / impact due to weather data, population data, and frequency of occurrences and likely hood of ignition / toxic release. Data are analysed considering likely damage (in terms of injury / fatality, property damage) each scenario is likely to cause.

QRA provides a means to determine the relative significance of a number of undesired events, allowing analyst and the team to focus their risk reduction efforts where they will be beneficial most.

**KAHAN CHEM PVT. LTD.** has been incorporated with main object to manufacture Synthetic Organic Dyes, which have a good export potential as well.

Table 7.1 gives the list of products (and their monthly production capacity) to be manufactured in the proposed **KAHAN CHEM PVT. LTD.** Table 7.2 gives the list of bulk storage of materials.

**Table 7.1 KAHAN CHEM PVT. LTD. Products Details**

Sr. No.	Name of Product	M.W (g/mol)	CAS NO.	Production Capacity MT/Month		
				Existing	Proposed	Total
1	Para Amino Azo Benzene (Solvent yellow-1) ( Crude )	197	11000/60-09-3	3.0	9.0	12.0 MT/Month
2	Ortho Amino Azo Toluene (Solvent Yellow-3 or	225	11160/97-56-3	0.0		

	Garnet Base Or 2-Amino 5-Azo Toluene or Toluazo toluidine )( Crude )					
3	Basic Magenta (Basic Violet-2) ( Crude )	366.5	42520/3248-91-7	0.0	8.0	8.0 MT/Month
4	N-Phenyl Beta Napthylamine (Crude )	219.28	135-88-6	0.0	3.0	3.0 MT/Month
Total				3.0	20.0	23.0 MT/Month

**Table 7.2. Raw Material Bulk Storage**

Sr. No.	Name of the raw material	State Solid, Liquid or Gas	Storage	Size
1.	Aniline Oil	Liquid	200 * 1 MS Drum	3000 kg
2.	HCl	Liquid	Tanker	8000
3.	Sodium Nitrite	Solid	Bag	1 MT
4.	Caustic Soda Flakes	Solid	Bag	1 MT
5.	Solvent	Liquid	Drum	360 Kg
6.	Ortho Toluidine	Liquid	Drum	5 MT
7.	Formaldehyde	Liquid	Carbois	420 Kg
8.	Mono Chloro Benzene ice	Liquid	Drum	2 MT

### 7.1.3 Risk Screening Approach

**Proposed Plant:** Risk screening of KAHAN CHEM PVT. LTD. was undertaken through data / information provided by KAHAN CHEM PVT. LTD. of major / bulk storages of raw materials and other chemicals were collected. MSDS of hazardous chemicals were studied vis their inventories and mode of storage. The chemicals stored in bulk (liquid or gaseous) and defined under MSHIC Rule will be considered for detailed analysis.

Hazardous materials have been defined under MSIHC Rules (1989) - 2 (e) which means.

(i) Any chemical which satisfies any of the criteria laid down in Part I of Schedule I and is listed in Column 2 of Part II of this Schedule;

**Toxic Chemicals:** Chemicals having the following values of acute toxicity and which owing to their physical and chemical properties, are capable of producing major accident hazards:

**Table 7.3 Hazardous Waste Analysis**

S. No	Toxicity	Oral Toxicity LD <sub>50</sub> (mg/kg)	Dermal Toxicity LD <sub>50</sub> (mg/kg)	Inhalation Toxicity LC <sub>50</sub> (mg/l)	Remarks
1	Extremely Toxic	>5	< 40	< 0.5	-
2	Highly Toxic	>5 – 50	> 20 – 200	< 0.5 – 2.0	-
3	Toxic	>50 - 200	> 200 - 1000	> 2 - 10	-

### Flammable chemicals:

- i. **Flammable gases;** 20°C and at standard pressure of 101.3 K Pa are:
  - a. Ignitable when in a mixture of 13% or less by volume with air, or;
  - b. Have a flammable range with air of at least 12% points regardless of the lower flammable limits.

- ii. **Extremely flammable liquids:** chemicals which have a flash point lower than or equal to 23°C and the boiling point less than 35°C
- iii. **Very Highly flammable liquids:** chemicals which have a flash point lower than or equal to 23°C and the boiling point higher than 35°C;
- iv. **Highly Flammable Liquid:** Chemicals, which have a flash point lower than or equal to 60°C but higher than 23°C.
- v. **Flammable liquids:** chemicals, which have a flash point higher than 60°C but lower than 90°C.

#### **Explosives:**

Explosive means a solid or liquid or pyrotechnics substance (or a mixture of substances) or an article.

- Which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to surroundings;
- Which is designed to produce an effect by heat, light, sound, gas or smoke, or a combination of these as the result of non-detonative self-sustaining exothermic chemical reaction.
- any chemical listed in Column 2 of Schedule 2;
- any chemical listed in Column 2 of Schedule 3;

KAHAN CHEM PVT. LTD. will be manufacturing 4 products. None of the products are listed under “List of hazardous and Toxic Chemicals” category under MSIHC Rules, 1989. None of the raw materials (stored in bulk) coming under hazardous category as specified by MSIHC Rules.

#### **Hazards Analysis & Risk Assessment**

Accidental risk involves the occurrence or potential occurrence of some accident consisting of an event or sequence of events resulting into fire, explosion or toxic hazards to human health and environment. The hazard potential and estimation of consequences in case of its accidental release are the issues of immediate relevance to be considered. It is therefore, imperative to carry out Maximum Credible Accident (MCA) analysis at the first stage, which identifies vulnerable areas around the facility and suggests a set of recommendations to improve safety. The work undertaken consists of the following stages:

- Collection of relevant data on project description and proposed activities.

##### **7.1.4 Hazard Identification and Risk Assessment (HIRA)**

The regulations require the employer, in consultation with employees, to identify:

- a. All reasonably foreseeable hazards that may cause a major accident; and
- b. The kinds of major accidents that may occur, the likelihood of a major accident occurring and the likely consequences of a major accident.

HIRA must address potentially rare events and situations that ensure the full range of major accidents and their causes. To achieve this, employers should:

- a. Identify and challenge assumptions and existing norms of design and operation to test whether they may contain weaknesses;
- b. Think beyond the immediate experience.
- c. Recognize that existing controls and procedures cannot always be guaranteed to work as expected; and learn lessons from similar organizations and businesses.

The HIRA worksheet is presented as below.

**Table 7.4 Hazards and Risk Assessment Worksheet**

<b>Hazard Description</b>	<b>Consequences</b>
Unloading of raw materials from Trucks.	<ol style="list-style-type: none"> <li>1. Fall of material causing injury to person.</li> <li>2. Leakage/Spillage of chemical causing fire &amp; explosion in case of flammable chemicals.</li> <li>3. Exposure to hazardous chemicals such as carcinogenic may lead to health hazards.</li> <li>4. Ergonomic hazards in case of manual handling of materials</li> </ol>
Store of Raw Material.	<ol style="list-style-type: none"> <li>1. Spillage &amp; Leakage</li> <li>2. Fire &amp; Explosion</li> <li>3. Fall of containers if stacked high.</li> <li>4. Inhalation of chemicals.</li> </ol>
Transportation of solvents/chemicals to production area	<ol style="list-style-type: none"> <li>1. Spill &amp; leak</li> <li>2. Inhalation of vapours.</li> <li>3. Fire &amp; Explosion</li> <li>4. Ergonomic hazards to person</li> <li>5. Chemical/Solvent splash</li> </ol>
Charging of Raw Material in to reactors	<ol style="list-style-type: none"> <li>1. Fire &amp; Explosion due to static</li> <li>2. Inhalation of Vapour.</li> <li>3. Physical Injury</li> <li>4. Spill &amp; Leak</li> </ol>
Boarding & packing of the Finished product	<ol style="list-style-type: none"> <li>1. Inhalation of Vapour.</li> </ol>
Movement of Trucks	<ol style="list-style-type: none"> <li>1. Hit &amp; run over by Truck (Facility).</li> <li>2. Properly Damage due to hitting of moving trucks.</li> <li>3. Fire inside trucks cabin</li> </ol>

Considering the risk with the activities, company will provide the followings in order to mitigate the risk:

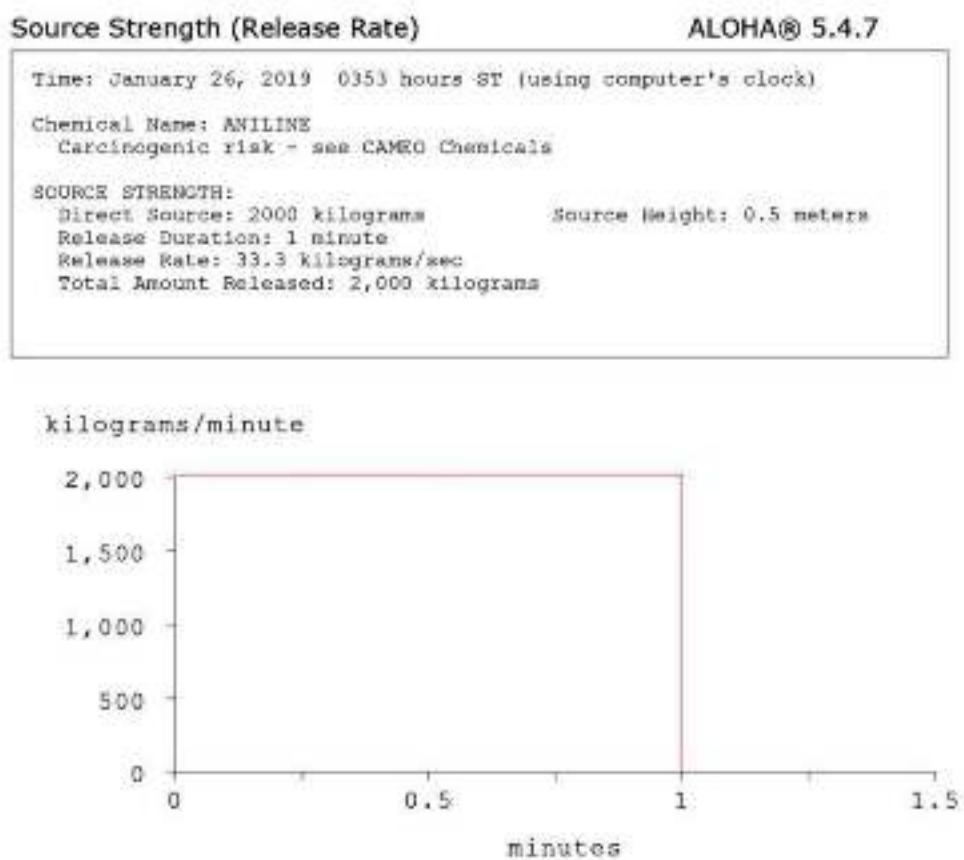
1. Ventilation system
2. Fire Extinguishers
3. Summary of MSDS of chemicals will be displayed.

4. Spill control kit
5. Smoke detectors
6. Training to employees
7. Personal Protective Equipment (PPE)
8. Display of cautionary Signboard
9. Dust collection system
10. Speed limit policy within plant area

## 7.2 Incidents Impacts

The identified failure scenarios (Table 7.7) have been analysed (Using ALOHA and EFFECT Modules) for the impact zones considering damage due to thermal and toxic impacts. Each incident will have Impact on the surrounding environment which in extreme case may cross plant boundary.

**Figure 7.1.ANILINE 1**



## Toxic Threat Zone

ALOHA® 5.4.7

Time: January 26, 2019 0353 hours ST (using computer's clock)

Chemical Name: ANILINE

Carcinogenic risk - see CAMEO Chemicals

Wind: 14 miles/hour from NNW at 5 meters

### THREAT ZONE:

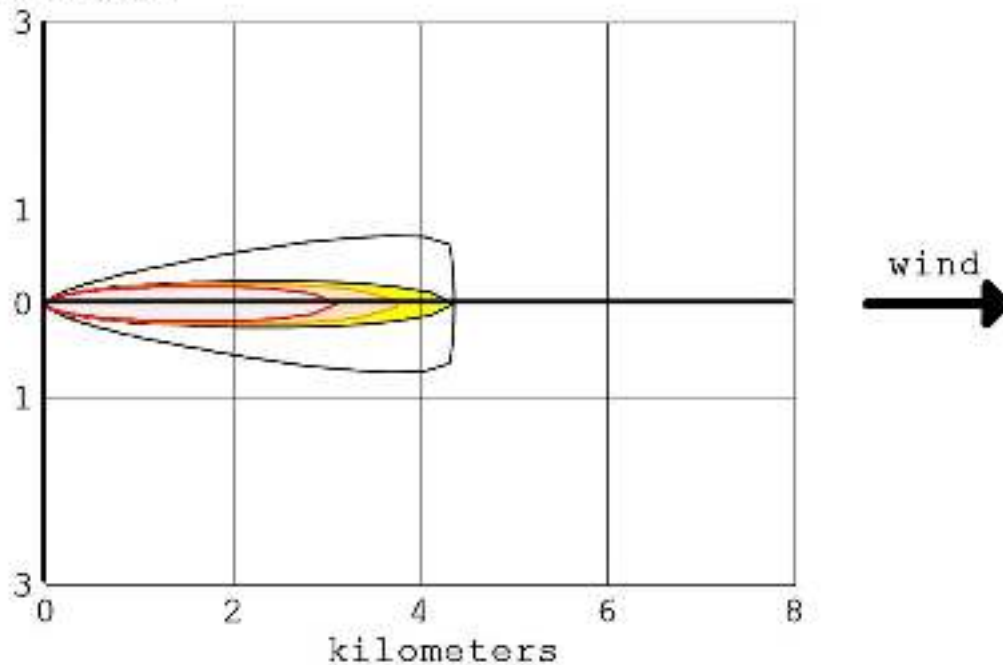
Model Run: Heavy Gas

Red : 3.1 kilometers --- (20 ppm = AEGL-3 [60 min])

Orange: 3.8 kilometers --- (12 ppm = AEGL-2 [60 min])

Yellow: 4.4 kilometers --- (8 ppm = AEGL-1 [60 min])

kilometers



- greater than 20 ppm (AEGL-3 [60 min])
- greater than 12 ppm (AEGL-2 [60 min])
- greater than 8 ppm (AEGL-1 [60 min])
- wind direction confidence lines

## Text Summary

ALOHA® 5.4.7

### SITE DATA:

Location: KAHAN CHEM PVT LTD, AHMEDABAD, INDIA  
Building Air Exchanges Per Hour: 1.19 (unsheltered single storied)  
Time: January 26, 2019 0353 hours ST (using computer's clock)

### CHEMICAL DATA:

Chemical Name: ANILINE  
CAS Number: 62-53-3 Molecular Weight: 93.13 g/mol  
AEGL-1 (60 min): 8 ppm AEGL-2 (60 min): 12 ppm AEGL-3 (60 min):  
20 ppm  
IDLH: 100 ppm LEL: 13000 ppm UEL: 110000 ppm  
Carcinogenic risk - see CAMEO Chemicals  
Ambient Boiling Point: 183.5° C  
Vapor Pressure at Ambient Temperature: 7.69e-004 atm  
Ambient Saturation Concentration: 774 ppm or 0.077%

### ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)

Wind: 14 miles/hour from NNW at 5 meters  
Ground Roughness: open country Cloud Cover: 0 tenths  
Air Temperature: 23° C Stability Class: D  
No Inversion Height Relative Humidity: 54

### SOURCE STRENGTH:

Direct Source: 2000 kilograms Source Height: 0.5 meters  
Release Duration: 1 minute  
Release Rate: 33.3 kilograms/sec  
Total Amount Released: 2,000 kilograms

### THREAT ZONE:

Model Run: Heavy Gas  
Red : 3.1 kilometers --- (20 ppm = AEGL-3 [60 min])  
Orange: 3.8 kilometers --- (12 ppm = AEGL-2 [60 min])  
Yellow: 4.4 kilometers --- (8 ppm = AEGL-1 [60 min])



Figure 7.2. ANILINE 2

# Flammable Threat Zone

ALOHA® 5.4.7

Time: January 26, 2013 0353 hours ST (using computer's clock)

Chemical Name: ANILINE

Carcinogenic risk - see CAMEO Chemicals

Wind: 14 miles/hour from NNW at 5 meters

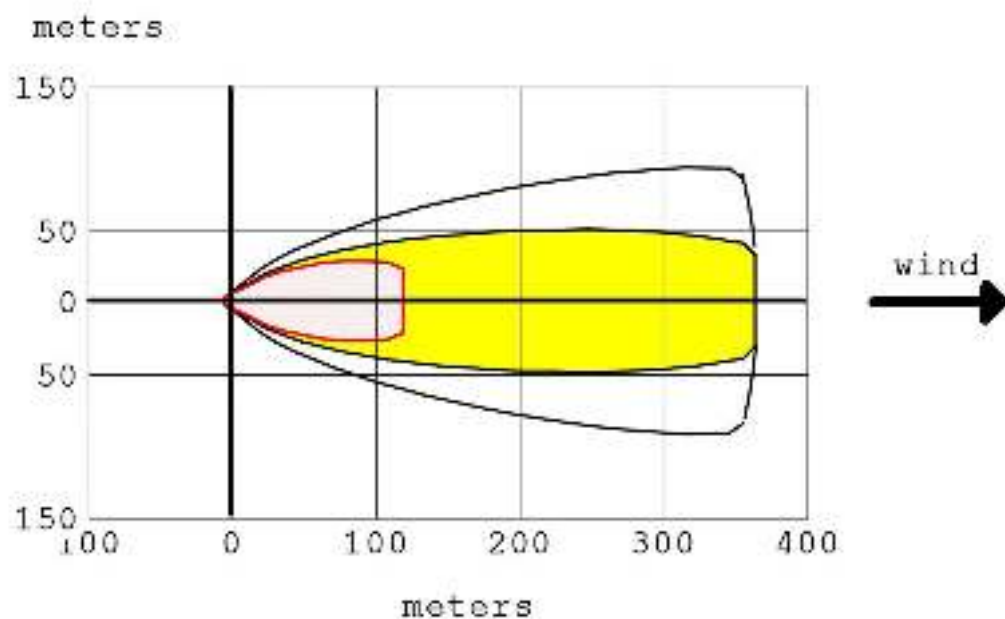
## THREAT ZONE:

Threat Modeled: Flammable Area of Vapor Cloud

Model Run: Heavy Gas

Red : 120 meters --- (7800 ppm = 60% LEL = Flame Pockets)

Yellow: 364 meters --- (1300 ppm = 10% LEL)



- greater than 7800 ppm (60% LEL = Flame Pock
- greater than 1300 ppm (10% LEL)
- wind direction confidence lines

Figure 7.3. ANILINE

Overpressure (Blast Force) Threat Zone

ALOHA® 5.4.7

Time: January 26, 2019 0353 hours SP (using computer's clock)

Chemical Name: ANILINE

Carcinogenic risk - see CAMEO Chemicals

Wind: 14 miles/hour from NNW at 5 meters

THREAT ZONE:

Threat Modeled: Overpressure (blast force) from vapor cloud explosion

Type of Ignition: ignited by spark or flame

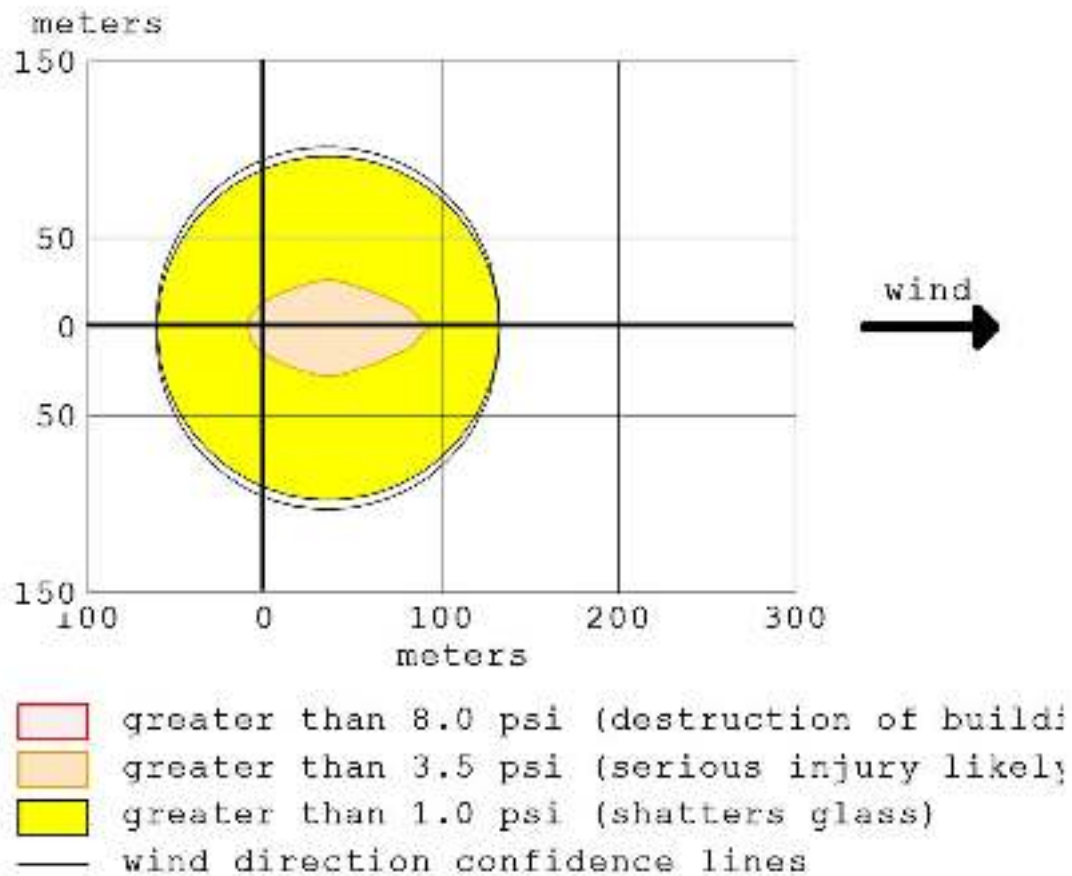
Level of Congestion: congested

Model Run: Heavy Gas

Red : LOC was never exceeded --- (8.0 psi = destruction of buildings)

Orange: 34 meters --- (3.5 psi = serious injury likely)

Yellow: 124 meters --- (1.0 psi = shatters glass)



### **7.2.1 Consequential Impacts**

The consequential impacts from each incident scenarios can be through thermal, over pressure wave and toxic route. The damage can be on plant personnel (and neighbouring residents in case incident crosses boundary), property and also loss in production.

### **7.2.2 Thermal and Explosion Hazards**

Incidents involving thermal hazards are mainly due to raw material fire (due to spillage). The impact (1<sup>st</sup> degree burn) is limited to <10 m only (i.e. within plant boundary). However, the consequences can go to worse if the incidents lead to domino effect to other tanks. Many of the raw materials stored are inflammable as well as toxic.

### **7.2.3 Toxic Hazards**

Toxic hazards are mainly due to xylidine etc. The impact may cross the plant boundary (if not controlled in time). Only plant personnel (~ 5 or 6 personnel maximum) are likely to face impact depending upon wind direction.

### **7.2.4 Other Hazards**

The other hazards in the plant include (but not limited to):

- Other toxic hazards due to acids / other toxic spillages (mainly limited to spillage area only.).
- Mechanical hazards due to machines / equipment.
- Hazards due to individual soft spots like walking casually and noticing a pit and falling or colliding/ stumbling or slipping (not noticing a wet place etc.).

### **7.2.5 Other Toxic Hazards**

Acid spillage-its impact will be limited to spillage area. The spillage if comes in contact with metal parts will produce hydrogen which is highly flammable gas. Any person moving in area and getting splash will get the injury. In addition, the spillage will cause pollution problem. The spillage is to be collected and neutralized for toxic contents before disposal.

### **7.2.6 General Control Measures**

Since some of the substances in use at KAHAN CHEM PVT.LTD. are hazardous with fire potential and also toxic in nature, it is necessary to use appropriate control measures recommended for such substances:

### **7.2.7 Flammable Gas Fires**

Fire control generally consists of directing, diluting and dispersing the inflammable gas/vapour to prevent contact with persons, to prevent it from infiltrating structures if the leak is out door, and to avoid its contact with ignition sources while, if possible, simultaneously stopping the flow of gas. Water in the form of spray, applied from hoses or monitor nozzles or by fixed water spray system may act as a good carrier fluid for inflammable vapours/gases.

### **7.2.8 Commonly Recommended Control Measures**

A number of preventive control measures for hazardous occurrences have been analysed and discussed above. Some more salient points are enumerated below:

- All storage tanks in the tank farm should be dried. Other operation and maintenance features shall be based on established best safety practices.
- Concentration detectors for hazardous chemical vapours (e.g. organic solvents/chemicals etc.) fire Smoke / heat detectors and fire alarm should be installed at all strategic locations in the plant.
- A schedule for preventive maintenance including health survey of all plant equipment should be adhered to as far as possible.
- Ensure the absence of ignition sources in storage area.
- Ensure placement of firefighting facilities, such as, carbon dioxide, dry chemical powder and foam type fire extinguishers in addition to fire hydrant system, at strategic locations. Spill control measures, such as, removal of all ignition sources from the spill area and ventilating the area as well as soaking the spilled material with paper, towel or mud and letting the volatile substance evaporate slowly in a safe area.

- Compulsory use of protective clothing, non-sparking tools and warning signs during critical operations and maintenance.
- Training / refresher courses on safety information's / norms.
- Eyewash and showers should be put up at strategic places for use during emergencies.

A group of plant personnel should be trained in first aid, rescue, firefighting and emergency control measures. These personnel will form core group/emergency squad who will fight the emergency and also act as rescue and first aid team.

In order to ensure communication from isolated places/locations Walkie-Talkie be made available to persons working in these areas. This will considerably improve the effectiveness of emergency management.

There is no substitute for training-mock drills and these must be held at regular interval keeping the following objectives in mind:

- Real time mock-drill should be carried out for probable/likely hazardous situation (after the plant is successfully commissioned).
- Target to be set up for various tasks and events during an emergency.
- Weak links should be marked and corrective action taken to improve effectiveness during emergency.
- KAHAN CHEM PVT. LTD. team already understand the implication and hazards in dyes Industry and has implemented most of the measures in the organization Proposed plants.

#### **7.2.9 Occupational Health and Safety**

Occupational Health and Safety (OHS) are of prime importance more so in hazardous industries. Industries have various types of hazards and QRA is carried out to understand the hazards potential from various incidents. Pre-emptive steps can be planned to safeguards from likely causes. Some of the Frequent causes of accidents

- Fire and explosion: explosives, flammable material
- Hazards from Toxic Materials
- Mechanical Hazards such as:
  - Being struck by falling objects
  - Caught in between machine parts
  - Snapping of cables, ropes, chains, slings
  - Handling heavy objects
- Electricity Hazards
  - Electrocution
  - Short circuits and consequential fire.
  - Poor illumination etc.
- Other Hazards:
  - Falls from height inside industrial units or on the ground
  - Struck by moving objects; Slipping on wet surfaces
  - Sharp objects
  - Oxygen deficiency in confined spaces; Lack of personal protective equipment (PPE), housekeeping practices, safety signs
- Consequential hazards due to extreme Temperatures;
- Consequential hazards due to vibration
- Consequential hazards due to radiation;
- Many more hazards.

#### **7.2.10 Hazardous substances and wastes**

- Heavy and toxic metals
- Lack of hazard communication (storage, labelling, material safety data sheets)
- Batteries, fire-fighting liquids
- Welding fumes

- Volatile organic compounds (solvents)
- Inhalation in confined and enclosed spaces

#### **7.2.11 Ergonomic and psychosocial hazards**

- Many of the hazards are as result of working environment.
- Repetitive strain injuries, awkward postures, repetitive and monotonous work, excessive workload
- Long working hours, shift work, night work, temporary employment (Long working hours, shift work, night work, temporary employment, Mental stress, human relations) which results in less attention at work place and consequential incidents and accidents.
- Lack of education and training / awareness is another prime cause of accidents.
- Considering above, QRA analysis and also the nature of activities at KAHAN CHEM PVT. LTD. the following steps for OHS activities have been suggested:
- Employee's health check-up: pre-employment and periodic check-up during employment. The health check-up observations should be informed to employees.
- The health should include any impact due to hazards at work place including (but not limited to) due to noise, heat, illumination, dust, any other chemicals, metals being suspected in environment and going into body of workers either through inhalation, ingestion or through skin absorption and steps taken to avoid musculo-skeletal disorders (MSD), backache, pain in minor and major joints, fatigue etc.
- Training and refresher courses on safety to all employees.
- Employees should be made aware of the hazards in the plant and the preventive actions to be safe from such hazards.

#### **7.2.12 Response to Injuries:**

Based on a survey of possible injuries, a procedure for response to injuries or exposure to hazardous substances should be established. All staff should have minimum training to such response and the procedure ought to include the following:

- Immediate first aid, such as eye splashing, cleansing of wounds and skin, and Bandage etc.
- Immediate reporting to a responsible designated person
- If possible, retention of the item and details of its source for identification of possible hazards.
- Medical surveillance
- Recording of the incident
- Investigation, determination and implementation of remedial action

#### **7.2.13 Emergency Facilities:**

- KAHAN CHEM PVT. LTD. does not need DMP or Emergency Management Planning as per norms (MSIHC Rules). However, Emergency facilities should be developed considering the likely hazards in the plant and sincerely implemented. Mock drills for various scenarios should be carried out and results of the drills should be recorded. Weak links in the mock drills should be strengthened.
- KAHAN CHEM PVT. LTD. will have a well-equipped first aid post. It will also have staff personnel trained in first aid. Injured personnel will be immediately rushed to hospital after giving first aid. All employees will have regular medical check-up as per norms.
- An emergency vehicle / ambulance will always (round the clock) available for meeting any eventuality.

### **7.3 Conclusion & Recommendations**

The hazard analysis and risk assessment of few possible selected incident scenarios indicates that such incidents mostly are not limited to plant battery limits and have impact on adjoining plants. There are possibilities of domino effect and the secondary scenario not predictable can be worse than the primary one. No scenario (either thermal or toxic hazards scenarios) are crossing the KAHAN CHEM PVT. LTD. plant boundaries. The direction of impact will be in down wind direction (wind direction and speed vary with season).

Some of the recommendations for Tank farm storage system are as given below:

- Provision of flame detectors/ thermal sensors at strategic locations in the tank farm area.
  - Auto water deluge system on each bulk storage tank for inflammable liquids. The system should automatically start taking signal from flame detectors or thermal relay.
  - Fixed foam system with adequate capacity.
- Toxic Hazards are due to Hazardous organic chemicals. Regular 'Hazard Survey' ensures the detection of leakage in the plant.
- Hazardous chemicals spillage/ leakage can have adverse impact in large area. In house 'capability building' to attend hazardous scenarios is to be taken up through mock drills.
- Human Factors: KAHAN CHEM PVT. LTD. should have well equipped fire station and also safety department – safety practices. Human factors role in safety cannot be ignored. Odd hours working and over / long hours' work can drain out individual. It shows in lack of efficiency and also the lack of apt attention the modern chemical complex demand. They are to be closely looked into and avoided.
- 'Safety' has unique features:
- If no accident has happened so far probability of incident / accident occurring increases.
  - 'No accident' / good safety record develops complacency inertia/ over confidence in the team. This attitude gives rise to gaps / soft spots in the system giving chances to incidents / accidents.
  - Safety requires novelty. Routine training practices get stale with no positive results. Look for novel scheme of training/ safety practices to build up fresh impetus in safety. Involvement of employees with refreshed outlook for safety is to be achieved.

## **7.4 Disaster Management Plan**

### **7.4.1. Introduction to Disaster Management Plan**

The various controls including engineering, procedural and administrative are provided to control the manufacturing activities at the industries; however, things may go wrong even with the best arrangements. The Disaster Management Plan is prepared to control and minimize the effect of any emergency which may occur within the industrial premises affecting the employees or the people in the surrounding; it may also affect the environment.

The disaster/emergency may arise as a natural calamity such as Floods, Earthquakes, etc. or may be a Man-Made Disaster such as a Leakage/Spillage of Hazardous Chemicals/Gases or Fire and Explosion.

A Disaster Management Plan is an action plan drawn to fix responsibility and actions to be taken by various groups to contain the disaster/emergency incident within shortest possible time and with minimum losses to people, material, property and environment.

It is the responsibility of the establishment/Industry that the disaster/emergency plan is widely circulated for benefit / training of all the employees within the premises and the individuals residing in the surrounding areas of the premises. It is the responsibility of all the individuals in their respective areas to ensure the success of this plan.

#### **7.4.1.1. Objective**

The main objectives of preparing the On Site / Off Site Emergency Plan are:

1. To define and assess emergencies, including risk and environmental impact assessment.
2. To establish the procedures to handle emergency situation that may arise due to spillage and fire while handling plant & equipment.
3. To control and contain incidents within shortest possible time and to restore normalcy.
4. To safeguard employees and people in vicinity and to minimize damage/loss to property or/and the environment.
5. To inform employees, the general public and the authority about the hazards/risks assessed, safeguards provided, residual risk if any and the role to be played by them in the event of emergency.

6. To be ready for 'mutual aid' if need is arisen to help neighbouring unit. Normal jurisdiction of an OEP is the own premises only, but looking to the time factor in arriving the external help or off-site plan agency; the jurisdiction must be extended outside to the extent possible in case of emergency occurring outside.
7. To establish procedures to appraise District Administration / Civil authorities/ and mutual aid centres etc. in order to ensure prompt relief for execution of Emergency Response Plan.
8. To secure the safe rehabilitation of affected areas and to restore normalcy.
9. To provide authoritative information to the news media.
10. To preserve records, equipments etc., and to organize investigation into the cause of the emergency and preventive measures to stop its recurrence.
11. To ensure safety of the works before personnel re-enter and resume work.
12. To work out a plan with all provisions to handle emergencies and to provide for emergency preparedness and the periodical rehearsal of the plan.

#### **7.4.1.2. Definition**

**An emergency** could be defined as any situation which presents a threat to safety of persons or/and property. It may require outside help also.

**A major emergency** occurring at a work is one which may affect one or several sections of the plant and possibly extend beyond the factory boundaries that may cause serious injuries, loss of life, and extensive damage to property or serious disruption outside the works. It will require the use of outside resources to handle it effectively.

**Disaster** is a catastrophic situation in which the day-to-day patterns of life are, in many instances, suddenly disrupted and people are plunged into helplessness and suffering and as a result need protection, clothing, shelter, medical and social care and other necessities of life, such as -

1. Disasters resulting from natural phenomena like earthquakes volcanic eruptions, storm, surges, cyclones, tropical storms, floods, landslides, forest fires and massive insect infestation. Also in this group, violent drought which will cause a creeping disaster leading to famine, disease and death must be included.
2. Second group includes disastrous events occasioned by man, or by man's impact upon the environment, such as armed conflict, industrial accidents, factory fires, explosions and escape of toxic gases or chemical substances, river pollution, mining or other structural collapses; air, sea, rail and road transport accidents, aircraft crashes, collisions of vehicles carrying inflammable liquids, oil spills at sea, and dam failures.

**The on-site emergency plan** deals with measures to prevent and control emergencies within the factory and not affecting outside public or environment.

**The off-site emergency plan** will deal with measures to prevent and control emergencies affecting public and the environment outside the premises. The manufacturer should provide the necessary information on the nature, extent and likely effects of such incidents.

#### **Level of disasters**

The NDMA Guidelines categorize the levels of disasters, based on the ability of various authorities to deal with them. In order to facilitate the responses and assistance to States and Districts, the levels of disasters have been defined as follows:

1. **L0 level** denotes normal times which will be utilized for close monitoring, documentation, prevention and preparatory activities. Training on search and rescue, rehearsals, evaluation and inventory updation for response activities will be carried out during this time.
2. **L1 level** specifies disaster that can be managed at the District level, however, the State and Centre will remain in readiness to provide assistance if needed.
3. **L2 level** disaster situations are those which require assistance and participation of State, mobilization of its resources for management of resources.
4. **L3 level** disaster situation is in case of large scale disaster where the State and District authorities have been overwhelmed and require assistance from the Central Government for

reinstating the State and District machinery as well as for rescue, relief, other response and recovery measures. In most cases, the scale and intensity of the disaster as determined by the concerned technical agencies like Indian meteorological department (IMD)/ Indian National Centre for Ocean Information Services (INCOIS) are sufficient for the declaration of L3 disaster.

#### **7.4.1.3. Scope**

The KAHAN CHEM PVT. LTD. has prepared Disaster Management Plan in order to provide proper guidance to plant operating personnel to confidently handle any accidental spillage or fire / explosion / bursting of vessel/tank or any natural calamity or sabotage.

With this objective comprehensive information has been gathered and analyzed on the SO Chemicals and Intermediates handling plant and equipment which includes the hazardous properties of materials/chemicals, 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).

The potential hazards which may cause emergency includes:

- Chemical Fire / Explosion in the plant or storage area
- Electrical Fire in the plant or storage area.
- Accidental spillages and leakages during handling of material and plant / equipment failure causing severe health hazard due to employees exposure to the hazardous substances.

#### **7.4.1.4. 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 Disaster Management Plan describes the Organization & procedures for dealing with potential accidents arising from the operations of KAHAN CHEM PVT. LTD.

Experiences of accidents that have occurred in various other similar plants were considered in the preparation of DMP especially storing & handling the materials identical to this plant. This plan will need periodic review & modification following emergency exercise, or include any new information relating to changes to the facilities.

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 known to the employees and to the general public living in the vicinity of the plant.

Its objective is to reduce the severity of loss following particular hazardous incidents. At the same time, it must be clearly understood that it is not a substitute for maintaining good standards for working consistency with the requirements of safety and health inside the plants.

#### **7.4.2. Information on risk evaluation preliminary hazard analysis**

The DMP is needed to respond to a variety of emergencies / disasters:

##### **i. Disasters due to emergency on account of:**

- a. Fire or Explosion
- b. Electrical Fire
- c. Spillages and Leakages



- a. **Fire or explosion:** The organization is storing & handling Dyes which can ignite if exposed to source of heat / ignition. The various sources of heat / ignition include hot work, mechanical frictions, naked flames, static electricity, hot surfaces etc.
- b. **Electrical Fire:** The Electrical fire may be caused due to generation of static charge during charging of materials. Also dry grass is normally avoided in the premises and it will be ensured that there is no grass (dry) at any point of time by ensuring better housekeeping
- c. **Spillages and Leakages:** During handling of material and plant / equipment failure causing severe health hazard due to employees exposure to the hazardous substances. Spillages and leakages of flammable substances may also lead to fire.

**ii. Disaster due to natural calamities such as:**

- a. Flood
- b. Landslides & Mud flow
- c. Earth quake
- d. Heat Wave:

**iii. Disaster due to external factors such as:**

Sabotage, Civil Riots or War, Terrorism: No solution can be offered to eliminate either terrorist threats or planted bombs, but one can be well or badly prepared to cope with them when such incidents happen. It is essential for organizations to design and implement both good physical security and a comprehensive bomb threat response plan.

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.

### **7.4.3. Disaster preparedness**

This section highlights the Organization for disaster preparedness. For an Industry storing / handling flammable substances, it is essential to prepare a good effective disaster plan to control On Site – Off Site emergencies and to mitigate losses. The disaster management plan (emergency response plan) ensures that all available resources, facilities etc., are enforced into services at right time to tackle 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 spillage 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 (Emergency Response Plan) highlights the flow of information and co-operation among various action groups within the factory. Off-site Emergency Plan indicates various action groups at district levels which will be engaged in case of off-site emergency.

Emergency organization and arrangement include:

#### **7.4.3.1. Emergency Organization**

This section 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 Site Main Controller, Incident Controller: Services Coordination includes Fire & Safety, Security, Engineering Services (Maintenance), Environment, Lab (QC/QA), HR & Admin, Account & Finance, Store & purchase and Process.

All such key personnel shall be available in all the office timings and shall be called during emergency on holidays.

#### **7.4.3.2. Safe Assembly Points**

2 No. Assembly Point is provided, opposite to Reception Building and near to Security Cabin.

The safe assembly points are selected considering the distance from the hazardous/flammable storage, wind direction, capacity to accommodate the required number of people and availability of other resources in that area.

In case of emergency, it will be necessary to evacuate all personnel from effected area, except personnel who will be directly involved in dealing with the incident. On evacuation people will go to designated assembly points.

#### **7.4.3.3. Emergency Control Centre (ECC)**

During Working Hours, the Emergency Control Centre (ECC) is situated at Reception Building, and during Non-Working Hours the Emergency Control Centre (ECC) is situated at Security Cabin from where the operation to handle the emergency are directed and coordinated.

The ECC is equipped with all necessary emergency equipment, communication arrangement to receive and transmit information and directions from and to the incident controller and areas of the works as well as outside. 1 Direct Line with Emergency Contact Numbers is available at both the places.

The emergency contact numbers for the mutual aids like nearest police station, fire station, hospital, ambulance service etc. & list of emergency team members and various activity coordinators displayed at the emergency control center, security gate and other prominent locations.

Emergency Control Centre has the following facilities:

- a. List of telephone numbers for external & internal communication
- b. Plans of the location
- c. Stationeries
- d. Copies of the on-site and off-site emergency plans
- e. Details and location plans of firefighting equipment such as fire extinguisher, fire hoses & nozzles etc.
- f. Details and location plans of safety equipment such as SCBA, gum boots, gloves, goggles, cover all etc.

#### **7.4.3.4. Emergency Warning System**

A siren audible in all parts of the facility, to warn the people for the evacuation with different sounds for declaration of emergency or emergency call off is provided along with 12 No hooters associated with manual call point are provided at prominent locations. Warning system is always kept in working order.

The mode of siren for evacuation is wailing pitch. On hearing the siren, people will disperse from the work area and will evacuate to safe assembly points. Proper instruction is given to all the employees about the rising of siren and the emergencies. The same instructions are also displayed at prominent places within the plant area.

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

#### 7.4.3.5. Medical Services and First Aid

KAHAN CHEM PVT. LTD. will provide transport for Occupational and Health Centre at the facility and has services of visiting doctor.

Transportation will be available for emergency evacuation and transportation of people to nearest Medical College and Hospital from the plant.

The First aid team will play critical role in attending the victims in case of any accident.

First Aid boxes are provided at prominent locations & trained first-aid are available in all working shifts. The list of trained first aiders is displayed at prominent locations and is also available at security gate office.

In case of any medical assistance other than first aid, the Admin In-charge/ Site- SHE representative will arrange for a vehicle to shift the casualty to the company accredited hospital, or call an ambulance to mobilize the casualty to the medical center/ hospital.

#### 7.4.3.6. Transport and Evacuation Arrangements

In a major emergency, it is essential to evacuate personnel from affected areas and to further evacuate non-essential workers from areas likely to be affected, should the emergency escalate. Transportation will be available for emergency evacuation and transportation of people and for Material transport, third party tempo is available.

#### 7.4.3.7. Communication and help from external emergency services

Communication is a critical factor in handling an emergency. To control the situation by the earliest possible action. 1 Direct Line with list of emergency contact numbers is provided at emergency control center as well as at security gate.

The external emergency services which can be contacted for help during emergency include:

**Table No. 7.5 Emergency Contact details**

SN	Services/Authorities	Telephone no.	Res No	Mobile no
1	District Collector (DC)	079-27551681, 079-27560511, 079-27552144	-	-
2	Control Room Vatva GIDC	0253-2309715, 0253-2309718	-	-
3	Range IG, Ahmedabad	079-26891143	-	9978405089
4	Police Station, Vatva GIDC	079-25830004	-	-
5	Vatva Police Station	079-25710074, 079-29094035	-	-
6	Fire brigade office, Maninagar	079- 25470221	-	-
7	L.G. Hospital, Maninagar	079 2546 1380	-	-

The above emergency services telephone numbers are displayed at emergency control room and prominent locations within the plant.

#### **7.4.3.8. Other Arrangements:**

##### **● Power Supply Interruption**

For Emergency, Plant Operations and Emergency Lighting provisions are made according to requirements.

##### **● Electrical Supply**

Electricity is considered as a major cause of fire in industries. To prevent fires due to electricity, adequate control measures are provided which includes regular inspections and preventive maintenance. To prevent other electrical accidents such as electric shock etc. the adequate safety precautions implemented including provision of Fuse, MCB, ELCB, rubber mats in front of panels, proper laying of cables, etc.

##### **● Trade Waste Disposal**

Organization will be more concerned for environment protection and pollution abatement at all times. Provision will be made to dispose Solid wastes. The company will dispose off all solid waste in safe manner.

#### **7.4.3.9. Emergency Action**

Though it will be an impractical to describe all the foreseeable scenarios involving flammable/combustible materials 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 will depend on the several factors, such as the place of incident, quantity of material involved, the amount of release, the nature of material, the wind direction, the wind velocity, temperature of surrounding, time of day, prevailing season and weather condition.

##### **● In case of Fire**

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 through nearest MCP
- 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 message of incident attend to the main controller & raise the all clear siren.
- Collect the photograph and other evidence to cause fine.

● **In Case of spillage of chemicals/materials while unloading & loading activity Tankers/Tanks inside the factory premises:**

Special instruments for storing, Handling & emergency actions in case of spillage of chemicals/materials are given separately in MSDS.

Following are the general guideline for action:

- Use PPE's like SCBA/Gas mask/Respirator & evacuate the area.
- Designated area will be provided for tanker parking.

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.

● **In case of Flood / Earthquake:**

In case of natural calamity like flood, Strom or earth quake (remote possibility) the management may seek outside help. The help may be for firefighting, Evacuation (of surrounding population), Medical treatment, shelter, food, transport or communications.

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.

● **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.

### ● **General action plan**

- 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 area with sand / earth.
- Flush the affected body parts with plenty of water and seek medical help.

#### **7.4.3.10. 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 will be used for movement of personnel, movement of rescue, medical aid.

#### **7.4.3.11. Traffic Control**

The Security In-charge or Guard shall contact Service Coordinator and shall make himself available at main gate for traffic control till local authorities' help is available.

Unwanted traffic and public gathering shall be controlled & avoided by security personnel till local help from police is available.

#### **7.4.3.12. Public Relations**

Inevitably a major incident will attract the attention of the press, television and radio services and anxious inquiries from friends and relatives will be flooding the factory. It is essential to make arrangements for authoritative release of information to them. SMC/IC who is familiar with procedures of dealing with such situations, shall take charge of public Relations, information etc. He will be the sole authoritative source of information to the news media and others.

#### **7.4.3.13. Declaration of cessation of emergency**

Only the Main Site Controller in consultation with Incident Controller and The Service coordinator (Emergency Fire, Rescue & Security Coordinator etc.) will declare the cessation of emergency ensuring that all the spillage is 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 will be 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 will follow for declaring the cessation of an emergency.

All clear signed shall be given by SMC / Incident Controller.

#### **7.4.3.14. Plan appraisal and updating**

The Onsite Emergency Plan Mock drills will be conducted for the appraisal and updating the Onsite Emergency Plan.

The Onsite Emergency Plan Mock drills will review the adequacy and effectiveness of the arrangements made / provided for emergency planning and will cover:

- Awareness and promptness of action taken by the employees.
- The adequacy of evacuation routes and safe assembly points.
- The adequacy of fire fighting system and equipment.
- The adequacy of leak / spillage control system and equipment.
- The adequacy of transport and medical arrangements.
- The adequacy of personal protective equipment and safety equipment etc.

Any inadequacy observed during the mock drill will be corrected and incorporated, the Onsite Emergency Plan will be updated and any changes made in the Onsite Emergency Plan will be made known to all.

#### **7.4.4. Safety and mitigating measures**

Safety is major consideration for KAHAN CHEM PVT. LTD. and the Industry is committed to mitigate the risk. Important mitigating measures will be provided to contain and control the emergency are outlined below:

##### **7.4.4.1. Fire Prevention and Protection measures**

Fire is the major risk at KAHAN CHEM PVT. LTD. because of storage handling and use of flammable substances within the premises as raw material and products. Adequate control measures are provided to detect and fight fires. The major firefighting arrangements provided includes

Fire Detection and Alarm system: in Production block, Good Store/Raw Material Store, Q.C. Building and Solvent Store areas.

Firefighting Arrangement: fire hydrant system consisting of 10 Nos. of fire hydrants have been installed and 10 Nos. of Fire Extinguishers, consisting CO<sub>2</sub> Type, Dry Chemical Powder Type and Foam Type, are installed at various locations in the premises.

The nearest fire brigade station is situated at Maninagar approx. 10 km north.

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

- Fire Water Supply
- Fire Hydrant system, Fire sprinkler system with smoke/fire detectors
- Water Pump (Hydrant Pump)
- Portable Fire Extinguishers

##### **7.4.4.2. Equipments and Process safety**

KAHAN CHEM PVT. LTD. will comply the statutory requirements and provide safety measures. The following points to be considered:

- Guard shall be provided on moving parts of machineries.
- Adequate ventilation or other engineering controls shall be provided to keep the airborne contaminants below their respective threshold limit value.

- Lifting tools, tackles and machines and pressure systems will be tested and examined as per statutory requirement.
- Proper earthing and bonding shall be provided etc.

#### **7.4.5. Post emergency planning**

- All evidences should be collected and accident should be investigated.
- Before restart up of the activities, assess the situation and ensure that it is safe to restart the plant activities.
- Re-start the plant in the standard sequence.

#### **7.4.6. Health, Safety and Environmental Protection**

The policy of the company is to manufacture, handle and dispose off all substances safely and without creating unacceptable risk to human health or the environment.'

Company is committed to complete safety and accident prevention policies for ensuring the elimination of risk, accidents by conscientious involvement in Safety and Health Programme. The Industry will;

- Establishment and maintain programme to ensure that laws and regulations applicable to its products and operations are known as obeyed.
- Develop its own standards where laws or regulations may not be adequately protective and adopt, where necessary, its own standard where laws do not exist.
- Stop manufacturing any product or any operation if hazards of the same, to the human beings and environment are unacceptable.
- Each and every employee is expected to adhere to the spirit as well as letters of company policy.
- Any hazards, adverse situation or environmental risk which comes to their attention should be promptly reported for the corrective measures.
- Safety has been accepted as complete and separate functions like other functions such as production, maintenance, marketing, etc.
- Auditing is necessary for an effective health and safety programme, and periodical auditing will be carried out.
- We believe safety is a team work and each and every employee of the company is responsible and accountable for the safety.

##### **7.4.6.1. 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.
- Promptly report concerns about possible violation of this policy to the persons listed or to your manager.

##### **7.4.6.2. Managers responsible for a facility, activity, product or service will:**

- 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.



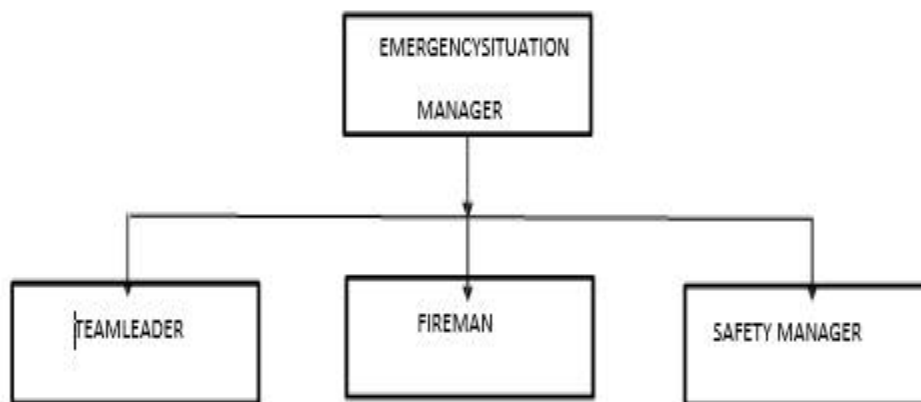
- Implement effective programs, training and best practices for health, safety and environment protection and for the elimination or reasonable reduction of materials.
- Regularly assess plant operations & management. Establish measurements to ensure compliance with this policy and applicable laws & 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 redesigned 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 of this policy.
- Promptly report to medical Services, Environmental Program & your assigned legal counsel any,
- Emergency evacuation, communicable disease or other serious health incident.
- Work related employee fatalities & 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 dust/chemical fumes & other information requested by medical services or Environmental programs.

#### 7.4.6.3. Training and rehearsing

All employees should know the details of Disaster Management plan and they must receive initial training in emergency procedures. 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, 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.

#### EMERGENCYMANAGEMENTCHART



## EMERGENCY AND EVACUATION PROCEDURES

Incident	Initial Response	Emergency Contacts	Staff Responsibilities	Follow Up Action
<b>Bushfire</b> Note: Management Procedures for Bushfire – actions appropriate to individual businesses will need to be considered (for example, whether it has been decided to stay and defend the property or to leave immediately).  See more detail in Section 5.1 on Bushfire.	Evacuate guests according to emergency services instructions, (e.g. which access roads are safe for vehicle traffic). Remove vehicles from around buildings. (Insert here: management procedures for bushfire)	Country Fire Authority;  SES;  Police	Remain calm. Follow instruction of regional emergency services. Listen to radio broadcasts. Ensure safety of staff and guests. Prevent unnecessary delays in evacuation (do not waste time removing property or equipment). Clear vehicles from vicinity. Create clear access for emergency services. Record names and contact details of all people on the property.	Contact guests who were on site. Debrief with management, other staff and fire services. Replenish fire fighting equipment. Implement identified changes to procedure if necessary. Finalise incident report. Contact insurer if necessary.
Serious personal injury or accident e.g. heart attack, broken bone or severe cut	Apply first aid, contact emergency services, reassure patient (family and friends). Call Key Management contact.	Ambulance;  Local Hospital/Doctor.  Closest first aid trained person.	Remain calm and professional. Limit impact on other guests. Record details of incident.	Contact patient to check condition. Debrief with management and staff. Re-stock first aid kit. Implement identified changes to procedure if necessary. Finalise incident report. Contact insurer.