CHAPTER 7. ADDITIONAL STUDIES

7.1. Public Hearing

"Public Consultation" refers to the process by which the concerns of local affected persons and others who have plausible stake in the environmental impacts of the project or activity are ascertained with a view to taking into account all the material concerns in the project or activity design as appropriate.

M/s. Jyoti Resins & Adhesives Ltd. has request for amendment in ToR for exemption of Public Hearing for proposed expansion project. The proposal was considered in the 33rdMeeting of the EAC on dated 24th January, 2018. Accordingly, MoEF & CC, New Delhi has issued letter (vide no. F.No.J-11011/429/2017-IA-II (I)) on dated 7th May, 2018 and recommended for "Exemption from the public hearing as per the provisions contained in Para 7 (ii) of the EIA Notification, 2006".

7.2. Risk Assessment

7.2.1. Objective of the Study

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.

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.

7.2.2. 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 wouldinclude 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 7.1 **Action Plan for Consumption, Storage & Transportation of Raw Materials**

S. No.	Raw materials	Unit	Existing	Proposed	Total after expansion	Storage Facility with Capacity for Raw material
1.	VAM (Vinyl Acetate Monomer)	KL	275.843	413.765	689.608	Drum (200KL), 18 nos.
2.	GH-17(Poly Vinyl Alcohol)	MT	24.000	36.000	60.000	Bag (20KG), 1200 nos.
3.	Pva-173(Poly Vinyl Alcohol)	MT	23.843	35.765	59.608	Bag (20KG), 1192 nos.
4.	P.P.S (Potassium per Sulfate)	MT	0.847	1.271	2.118	Bag (20KG), 42 nos.
5.	S.B.C.(Sodium bi Carbonate	MT	0.586	0.879	1.465	Bag (50KG), 10 nos.
6.	D.B.P.(Di butyl Phthalate)	KL	7.826	11.739	19.565	Drum (200KL), 39 nos.
7.	Octanol	KL	2.908	4.362	7.270	Drum (200KL), 14 nos.
8.	Formaldehyde	KL	1.173	1.760	2.933	Drum (200KL), 6 nos.

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

Sr. No.	Activity	Hazard	Risk Rating					Existing Control	Recommendations
			S	P	N	A	Total Risk (R)		
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	Dedusting of Raw Material Containers.	• Dust Insulation • Electrical Shock • Feet Injury one to fall of blower	1	2	4	1	8	• Dust mask, Hand gloves, safety shoes are provided. • Only Trained & Experienced person are deployed. • SOP is available.	• Blower & its cable to be inspected regularly and report to be maintained.
3	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.	• 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

Sr. No.	Activity	Hazard	Risk Rating					Existing Control	Recommendations
			S	P	N	A	Total Risk (R)		
		fumes.						• Identification of chemicals displayed.	provided. • Spill control kit to be provided. • Smoke detectors to be installed.
Production Department									
4	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.
5	Charging of Raw Material in to reactors .	• Fire & Explosion • Inhalation of Vapour. • Physical Injury • Spill & Leak	2	4	4	3	96	• Trained & Experienced person. • SOP is available. • PPEs like dust mask, Apron,	• SOP to be reviewed & HSE requirement to be added. • Spill leak kit to be made available. • Fire blanket to be made available. • Mechanical ventilation is to be

Sr. No.	Activity	Hazard	Risk Rating					Existing Control	Recommendations
			S	P	N	A	Total Risk (R)		
								Safety Gloves etc. being used. • Supervision.	provided.
6	Boarding & packing of the Finished product.	• Dusting	1	2	4	1	8	• PPEs are provided. • Dust collection is in place. • Supervision • Trained & Experienced person	• Display of cautionary Signboard.
7	Movement of Trucks	• Hit & run over by Truck (Facility). • Properly Damage due to hitting of moving trucks. • Fire inside trucks cabin • Traffic Hazardous.	2	2	2	1	6	_	• Vehicle checking using check list at gate before entry. • Area Identification having stopper. • SOP to be prepared.

1. **Vinyl Acetate Monomer (VAM)Drums**

Scenario details		5 mm leak			25 mm leak			100 mm leak			Catastrophic Rupture		
Weather Category		1.5 F	5 D	1.5 D	1.5 F	5 D	1.5 D	1.5 F	5 D	1.5 D	1.5 F	5 D	1.5 D
Flash Fire Envelope (m)													
Furthest Extent. (ppm)	**13000**	0	1	1	6	1	5	20	10	19	297	121	315
	26000	0	0	0	4	1	1	14	5	12	191	47	188
Thermal Damage Distance by Late Pool Fire (m)													
Radiation Intensity (KW/m^2)	**4**	5	6	5	21	21	20	77	74	74	819	823	814
	12.5	3	4	3	12	14	12	46	49	45	518	538	515
	37.5	2	NA	NA	5	5	5	21	24	20	317	361	315
Thermal Damage Distance by Jet Fire (m)													
Radiation Intensity (KW/m^2)	**4**	NR	NR	NR	NR	NR	NR	8	7	8	NH	NH	NH
	12.5	NR	NR	NR	NR	NR	NR	6	5	6	NH	NH	NH
	37.5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NH	NH	NH
Maximum Distance at Overpressure Level (m)													
Overpressure (bar)	**0.02068**	NH	NH	NH	NH	NH	NH	78	30	37	623	216	548
	0.1379	NH	NH	NH	NH	NH	NH	35	15	17	360	101	337
	0.2068	NH	NH	NH	NH	NH	NH	32	14	15	342	94	325

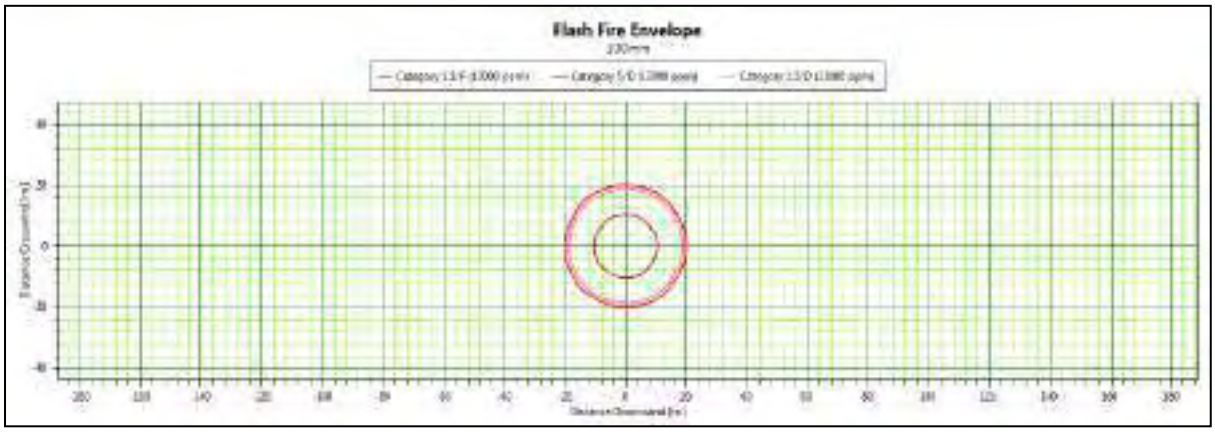


Figure 7.1 **Flash fire In case of 100 mm leak of VAM Drums**

Figure 7.2 **Flash fire In case of 100 mm leak of VAM Drums**

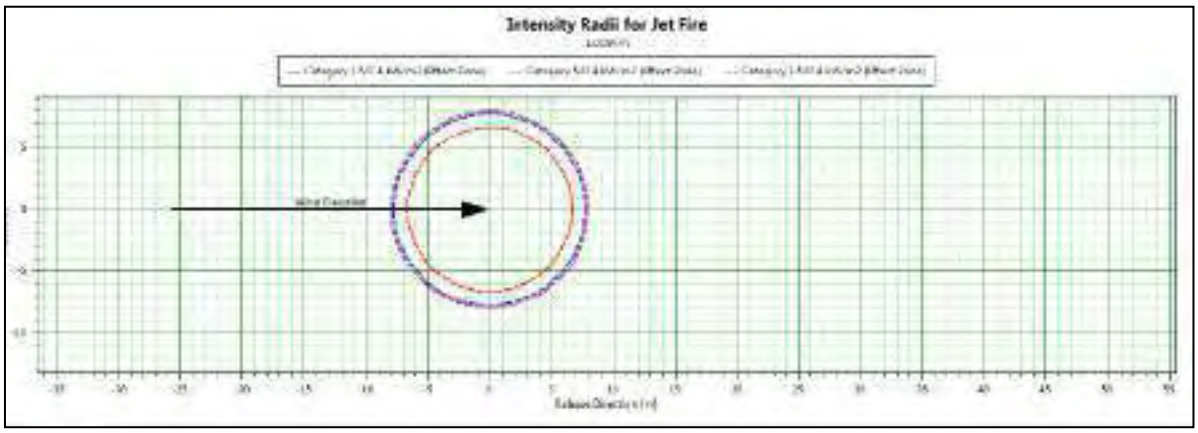


Figure 7.3 **Intensity Radii for Jet Fire In case of 100 mm leak of VAM Drums**

Figure 7.4 **Intensity Radii for Jet Fire In case of 100 mm leak of VAM Drums**

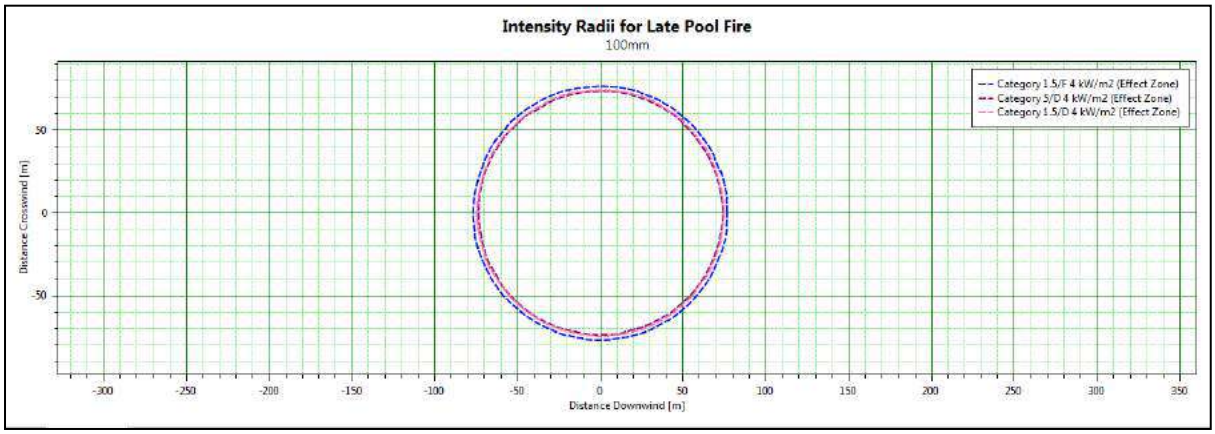


Figure 7.5 **Intensity Radii for Late Pool Fire In case of 100 mm leak of VAM Drums**

Figure 7.6 **Intensity Radii for Late Pool Fire In case of 100 mm leak of VAM Drums**

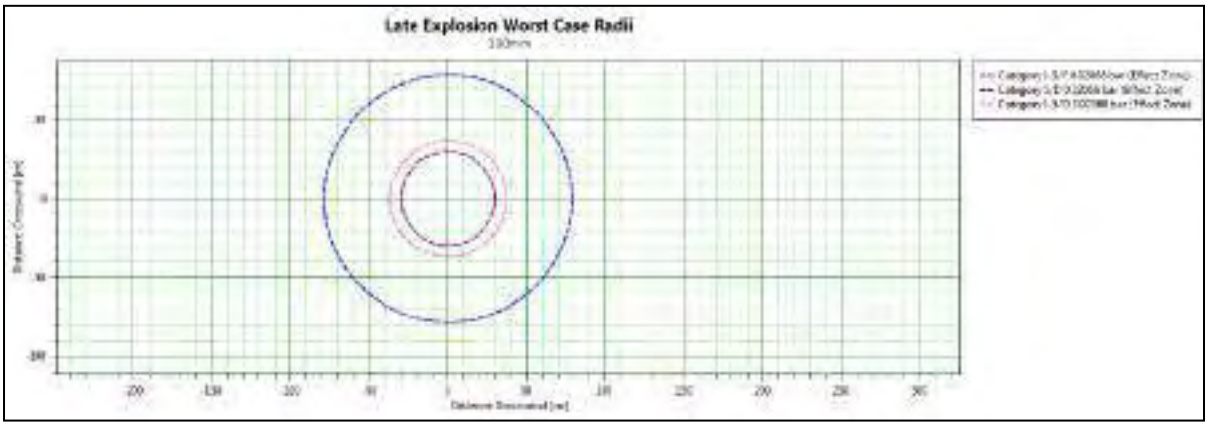


Figure 7.7 **Late Explosion Worst Case Radii for 100 mm leak of VAM Drums**

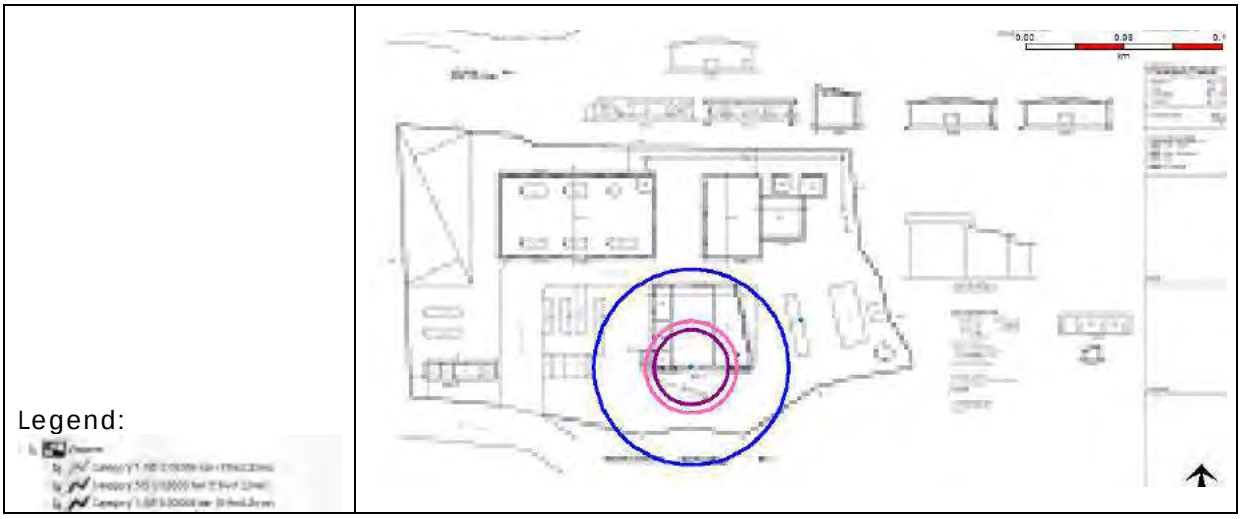


Figure 7.8 **Late Explosion Worst Case Radii for 100 mm leak of VAM Drums**

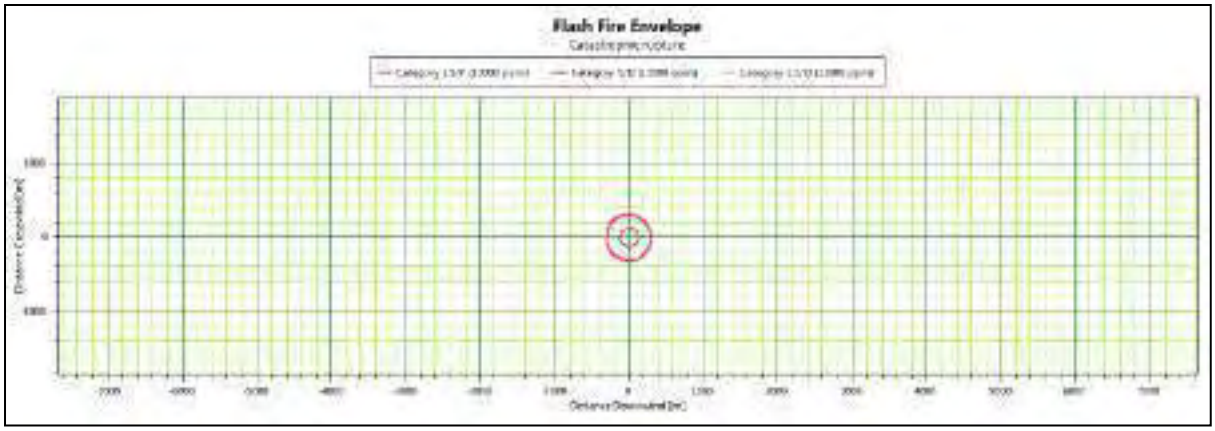


Figure 7.9 **Flash Fire in Case of Catastrophic rupture of VAM**

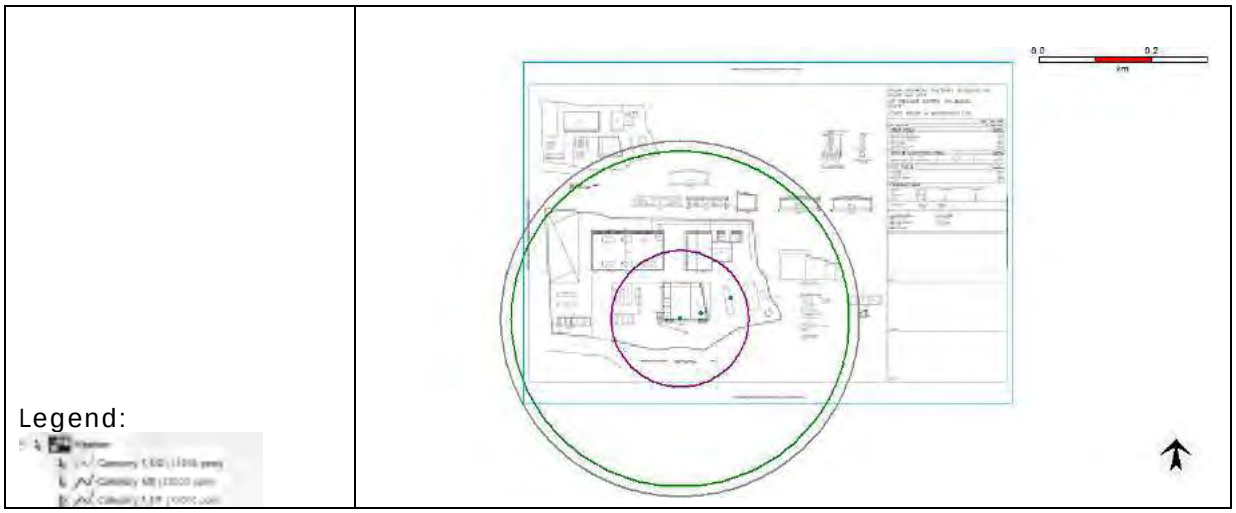


Figure 7.10 **Flash Fire in Case of Catastrophic rupture of VAM**

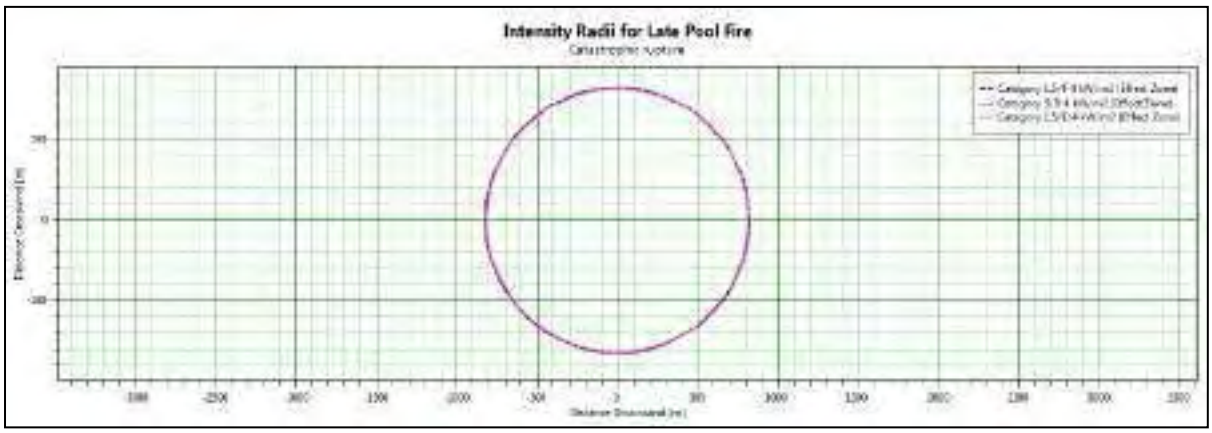


Figure 7.11 **Intensity Radii for late Pool Fire in Case of Catastrophic rupture of VAM**

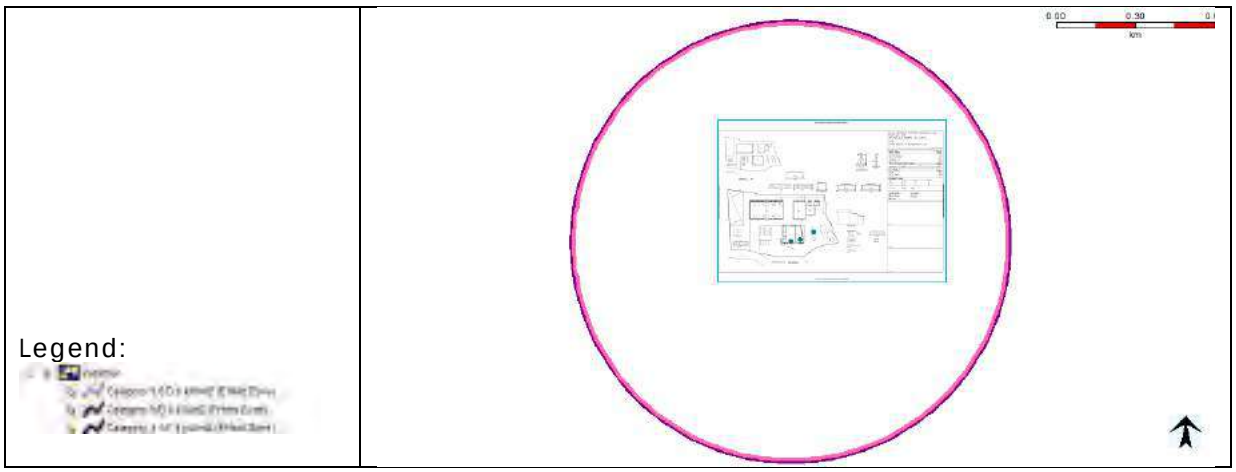


Figure 7.12 **Intensity Radii for late Pool Fire in Case of Catastrophic rupture of VAM**

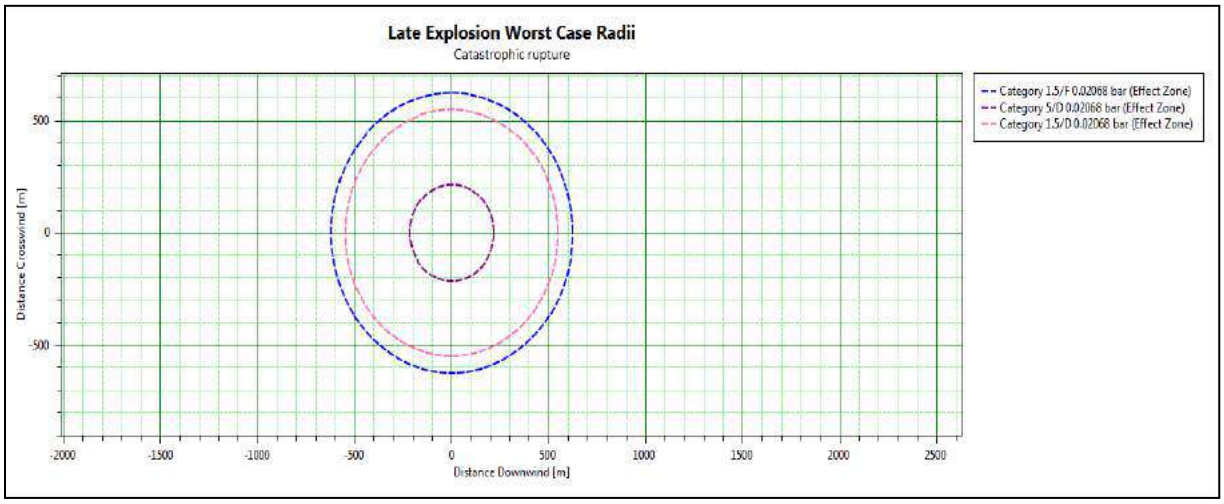


Figure 7.13 **Late Explosion Worst Case Radii in Case of Catastrophic rupture of VAM**

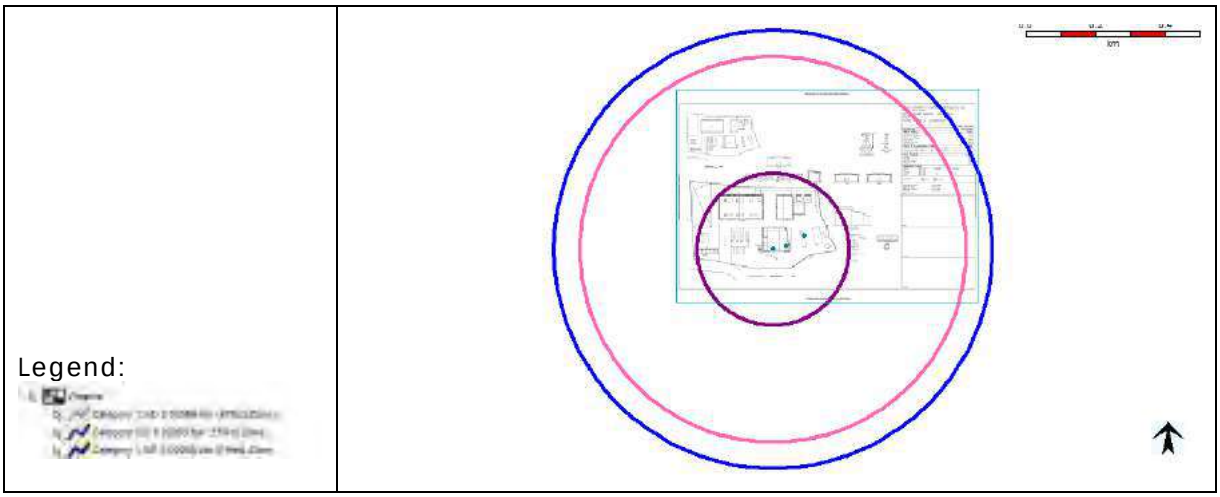


Figure 7.14 **Late Explosion Worst Case Radii in Case of Catastrophic rupture of VAM**

2. Octanol

Scenario details		5 mm leak			25 mm leak			100 mm leak			Catastrophic Rupture		
Weather Category		1.5 F	5 D	1.5 D	1.5 F	5 D	1.5 D	1.5 F	5 D	1.5 D	1.5 F	5 D	1.5 D
Flash Fire Envelope (m)													
Furthest Extent. (ppm)	**7500**	1	1	1	1	1	1	1	1	1	30	127	35
	15000	0	1	0	1	1	1	1	1	1	26	69	27
Thermal Damage Distance by Late Pool Fire (m)													
Radiation Intensity (KW/m^2)	**4**	9	10	9	23	26	24	43	49	43	43	48	42
	12.5	6	7	6	14	18	14	19	22	19	19	22	19

Scenario details		5 mm leak			25 mm leak			100 mm leak			Catastrophic Rupture		
Weather Category		1.5 F	5 D	1.5 D	1.5 F	5 D	1.5 D	1.5 F	5 D	1.5 D	1.5 F	5 D	1.5 D
	37.5	3	5	4	6	7	6	NR	NR	NR	NR	NR	NR
Thermal Damage Distance by Jet Fire (m)													
Radiation Intensity (KW/m^2)	4	NR	NR	NR	NR	NR	NR	NR	NR	NR	NH	NH	NH
	12.5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NH	NH	NH
	37.5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NH	NH	NH
Maximum Distance at Overpressure Level (m)													
Overpressure (bar)	0.02068	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH
	0.1379	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH
	0.2068	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH

Note: NR-Not Reached, NH-No Hazard

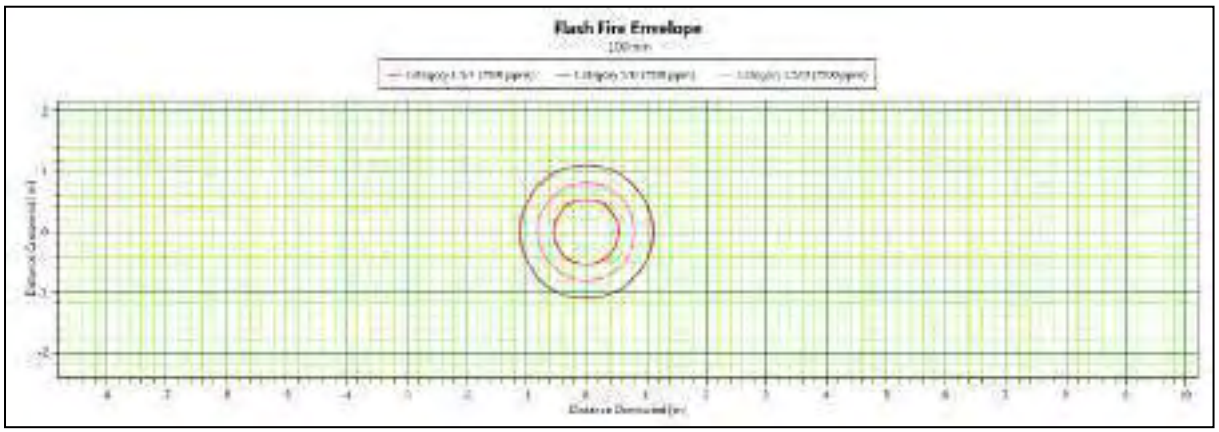


Figure 7.15 **Flash fire In case of 100 mm leak of Octanol**

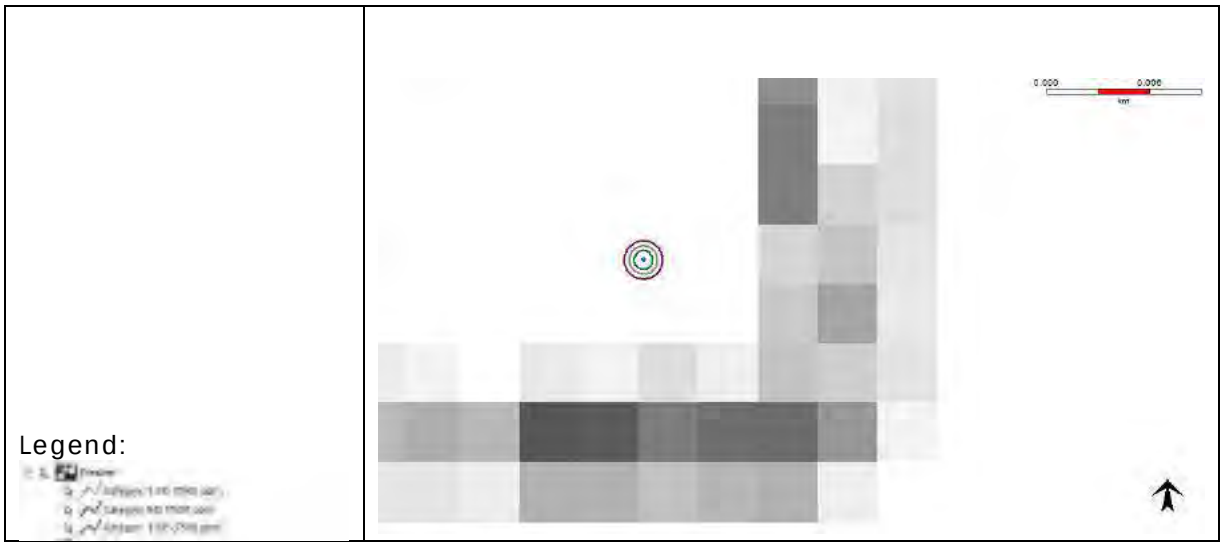


Figure 7.16 **Flash fire In case of 100 mm leak of Octanol**

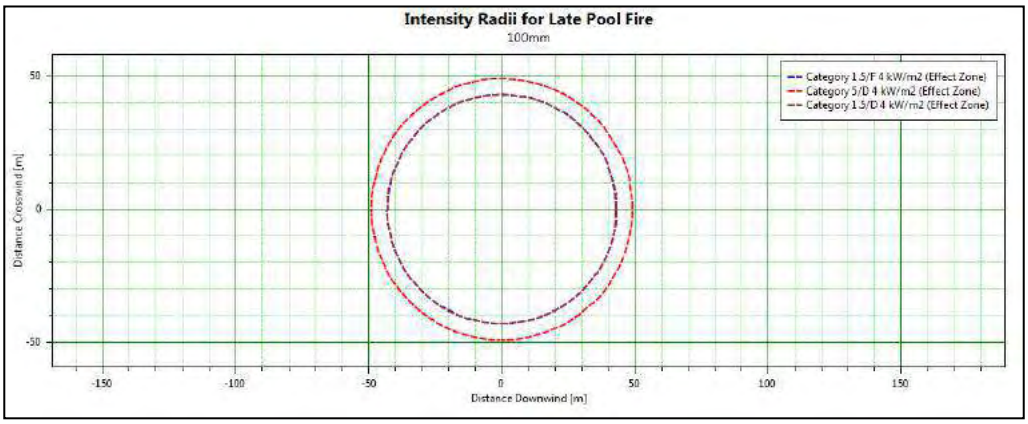


Figure 7.17 **Intensity Radii for late Pool Fire in case of 100 mm leak of Octanol**

Figure 7.18 **Intensity Radii for late Pool Fire in case of 100 mm leak of Octanol**

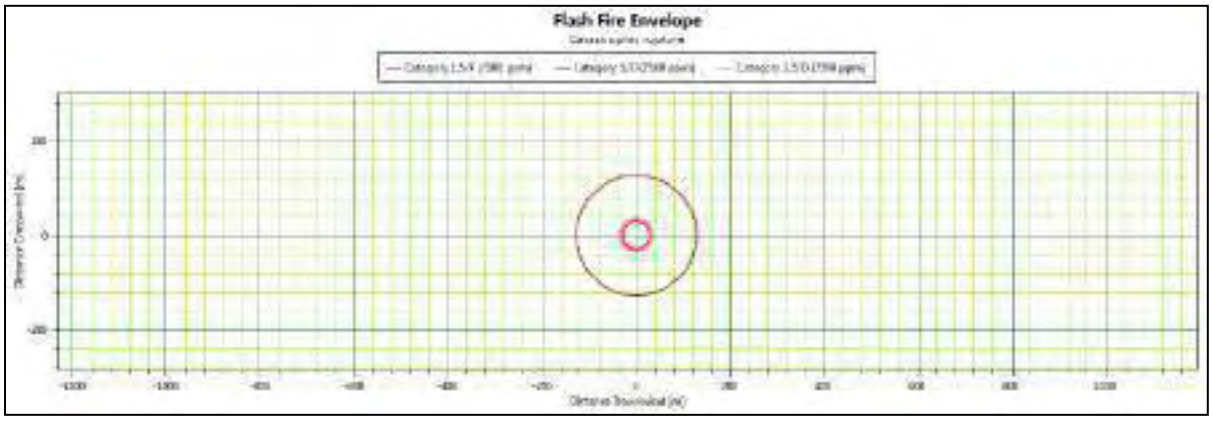


Figure 7.19 **Flash Fire in Case of Catastrophic rupture of Octanol**

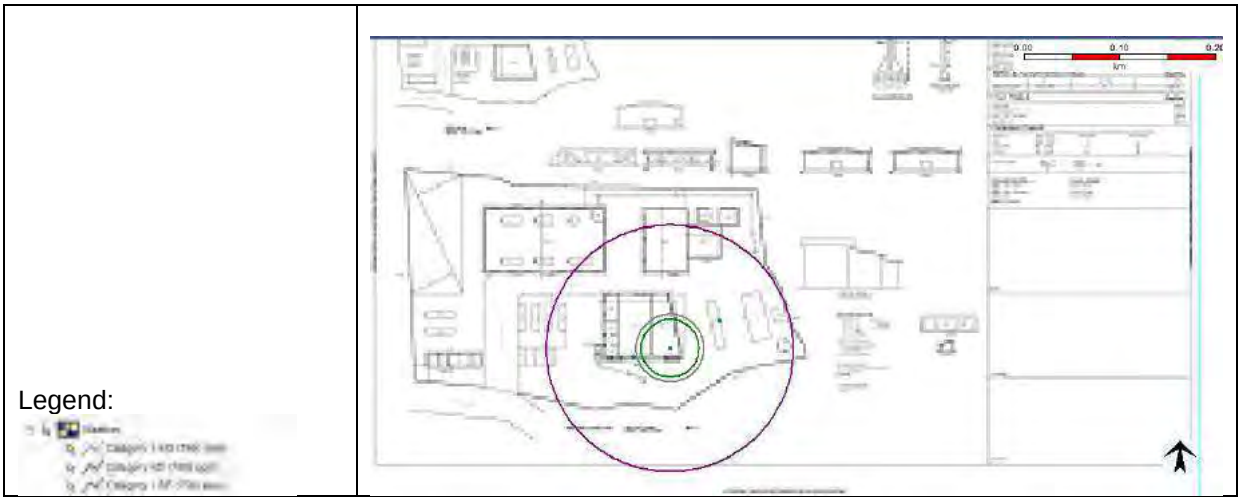


Figure 7.20 **Flash Fire in Case of Catastrophic rupture of Octanol**

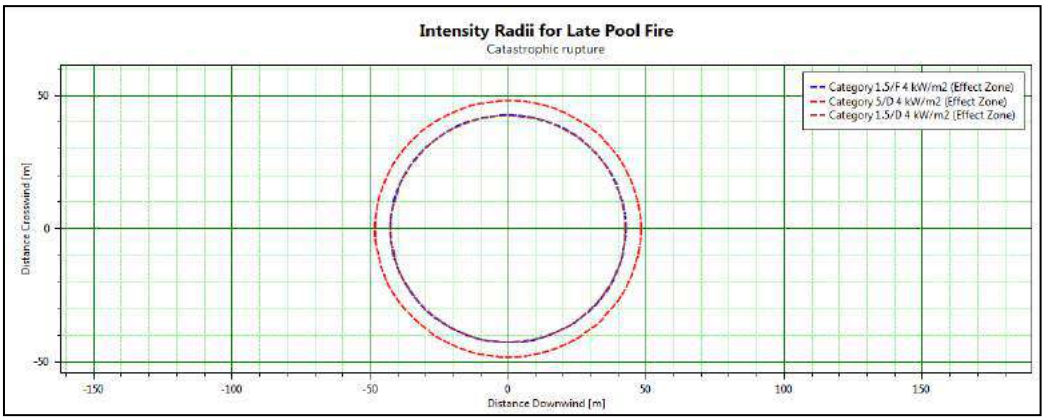


Figure 7.21 **Intensity Radii for Late Pool Fire in Case of Catastrophic rupture of Octanol**

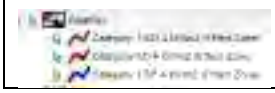
Legend: 	

Figure 7.22 **Intensity Radii for Late Pool Fire in Case of Catastrophic rupture of Octanol**

3. Formaldehyde

Scenario details		5 mm leak			25 mm leak			100 mm leak			Catastrophic Rupture		
Weather Category		1.5 F	5 D	1.5 D	1.5 F	5 D	1.5 D	1.5 F	5 D	1.5 D	1.5 F	5 D	1.5 D
Flash Fire Envelope (m)													
Furthest Extent. (ppm)	**7500**	1	1	1	1	1	1	1	1	1	26	101	85
	15000	0	1	0	1	1	1	1	1	1	23	53	52
Thermal Damage Distance by Late Pool Fire (m)													
Radiation Intensity (KW/m^2)	**4**	9	10	9	23	26	24	34	37	34	34	37	34
	12.5	6	7	6	14	18	14	17	22	17	17	21	17
	37.5	3	5	4	6	7	6	NR	NR	NR	NR	NR	NR
Thermal Damage Distance by Jet Fire (m)													
Radiation Intensity (KW/m^2)	**4**	NR	NR	NR	NR	NR	NR	NR	NR	NR	NH	NH	NH
	12.5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NH	NH	NH
	37.5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NH	NH	NH
Maximum Distance at Overpressure Level (m)													
Overpressure (bar)	**0.02068**	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH
	0.1379	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH
	0.2068	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH	NH

Note: NR-Not Reached, NH-No Hazard

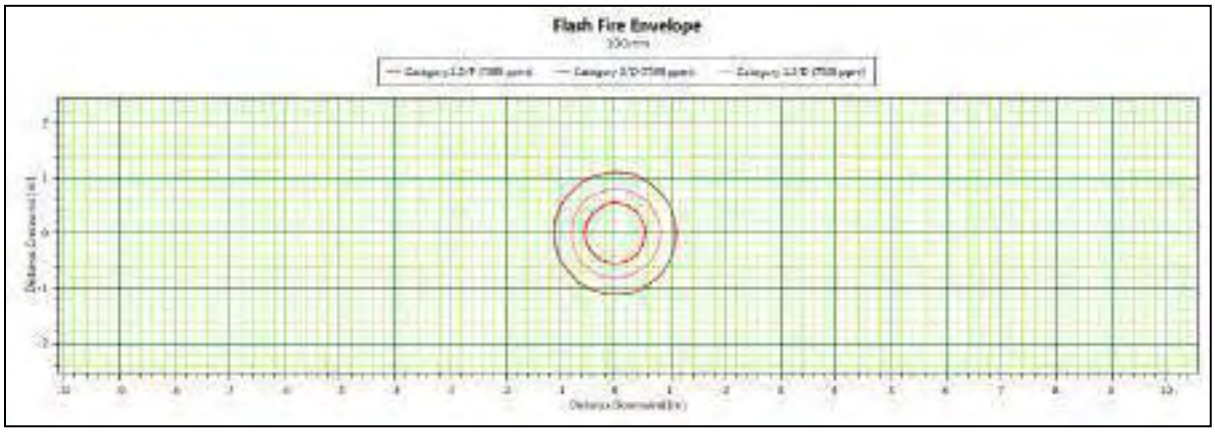


Figure 7.23 **Flash fire In case of 100 mm leak of Formaldehyde**

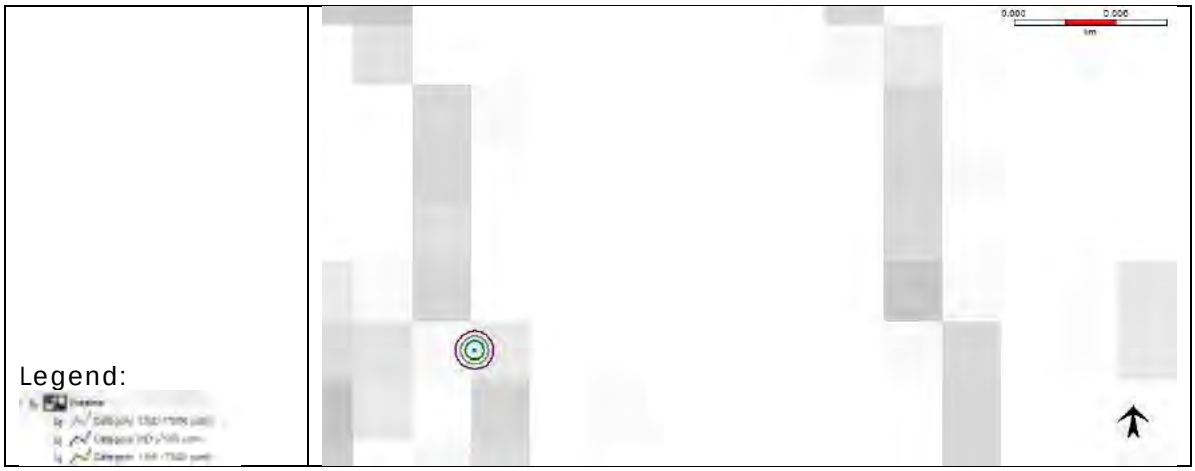


Figure 7.24 **Flash fire In case of 100 mm leak of Formaldehyde**

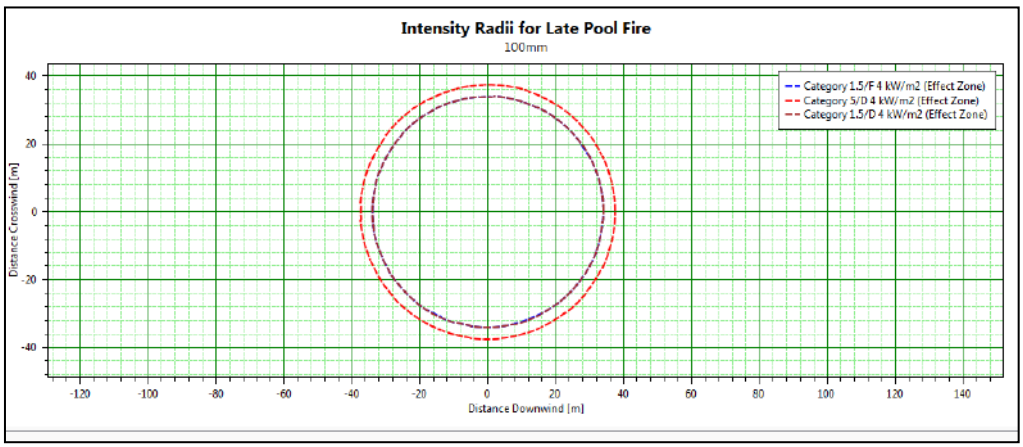


Figure 7.25 **Intensity Radii for late Pool Fire In case of 100 mm leak of Formaldehyde**

Figure 7.26 **Intensity Radii for late Pool Fire In case of 100 mm leak of Formaldehyde**

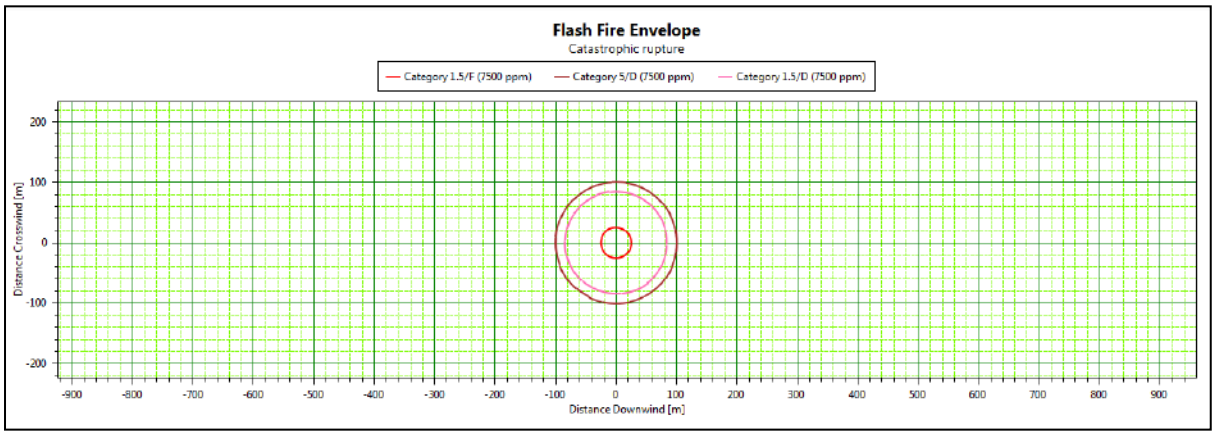


Figure 7.27 **Flash Fire in Case of Catastrophic rupture of Formaldehyde**

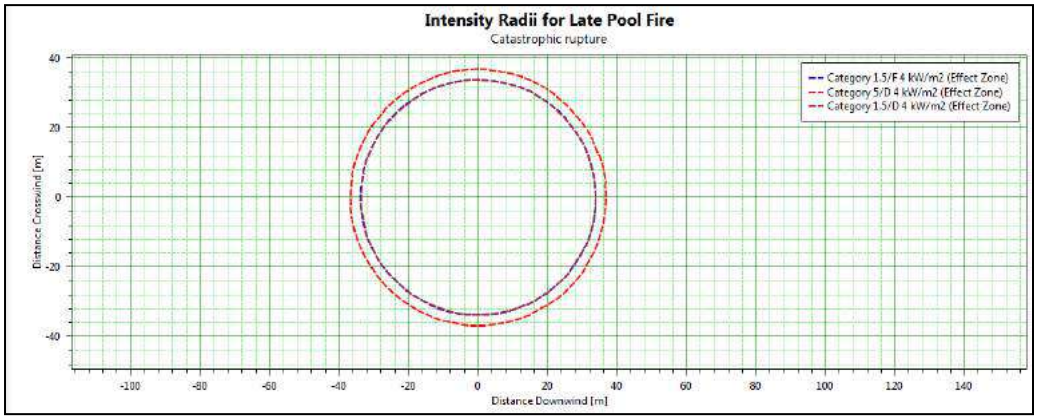


Figure 7.28 **Intensity Radii for Late Pool Fire in Case of Catastrophic rupture of Formaldehyde**

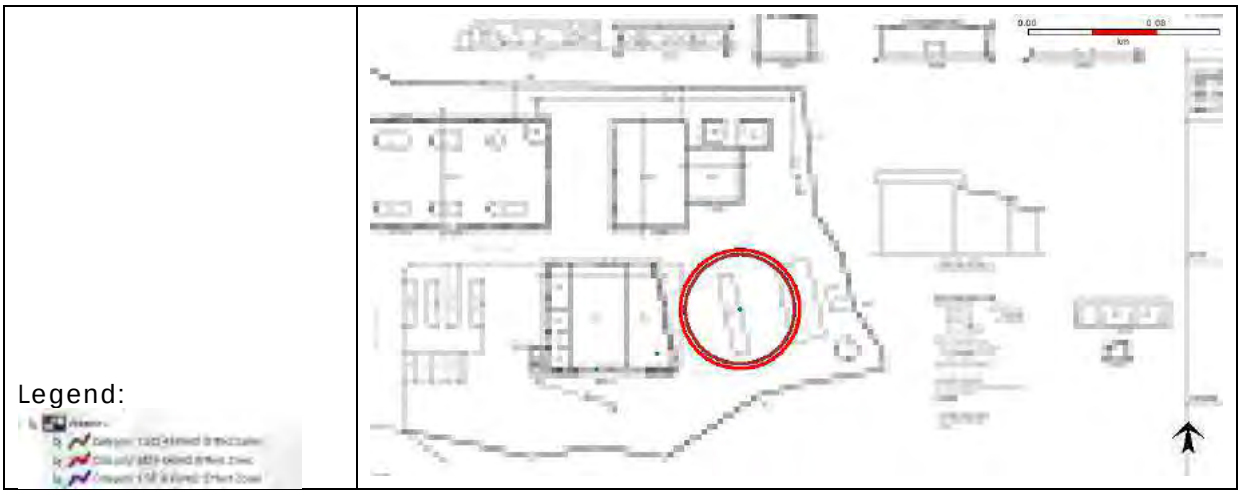


Figure 7.29 **Intensity Radii for Late Pool Fire in Case of Catastrophic rupture of Formaldehyde**

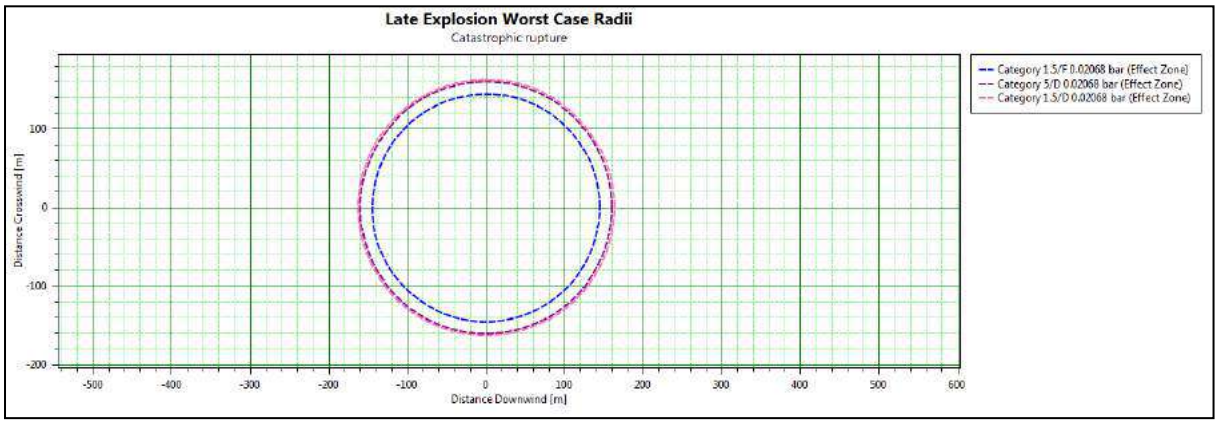


Figure 7.30 **Late Explosion Worst Case Radii in Case of Catastrophic ruptures of Formaldehyde**

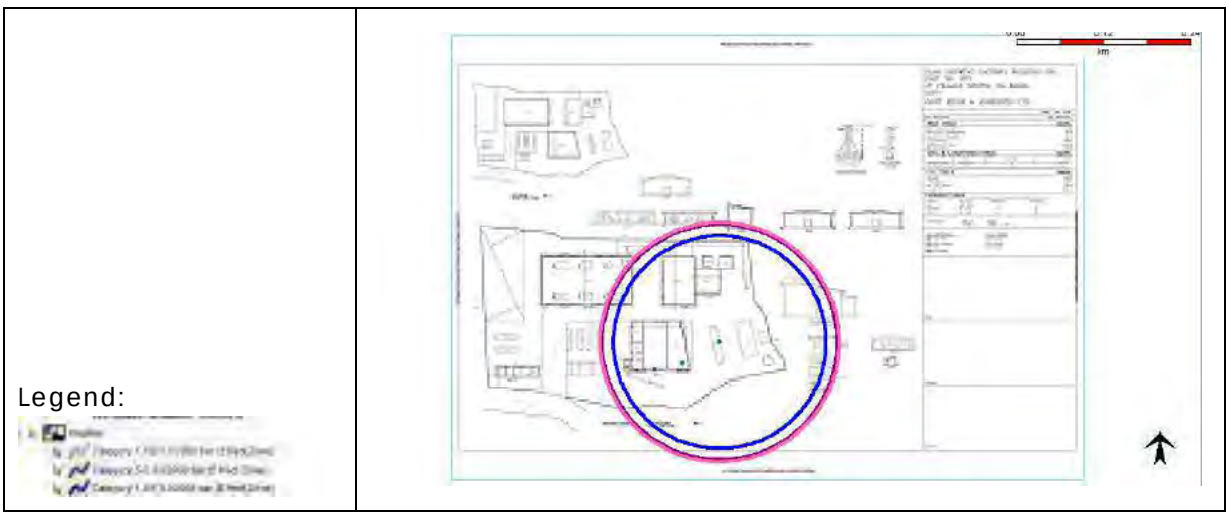


Figure 7.31 **Late Explosion Worst Case Radii in Case of Catastrophic ruptures of Formaldehyde**

7.2.3. CONCLUSIONS & RECOMMENDATIONS

Conclusions:

- This has been observed that pool fire is credible scenario in case of leakage from the drums/tanks.
- Pool fire radiation level of 4kW/m2 due to catastrophic rupture goes beyond the facility.
- Overpressure result of 0.02 bars for Vinyl Acetate due to catastrophic rupture of Acetone covers the entire facility.

Recommendations of QRA study

- Procedures should be developed for handling of toxic/ flammable materials and should be followed.
- LEL detectors, toxic gas detectors should be provided near tanks which store flammable/toxic material; however, adequacy of number of detectors should be studied. Detectors should be placed at vulnerable areas.
- Active fire protection systems like deluge system should be in place for tank farm area. It should cover entire tank farm area.
- Fire hydrants should be placed such that it should cover entire area.
- Water monitor system for storage tanks should be placed such that it should cover entire tank farm area
- Ignition sources should not be allowed within the plant area in any circumstances.
- It is suggested to construct dyke wall for other storage tanks which stores flammable liquid. Construction of Dyke/bund will help in minimizing the area of pool thus results in mitigating the severity of consequences.
- The capacity of dykes should be such that it should contain 110% inventory of storage tanks.
- Smoke detectors should be in placed in office areas and control room. However, adequacy of the same should be studied
- Hydraulic testing of pipes and storage tanks should be carried out.
- Regular inspection and maintenance of valves should be carried out to ensure effective operability.
- Regular maintenance and inspection for equipments should be done.
- Good safety management, strict adherence to safety management procedures and competency assurance will reduce the risk

7.3. Disaster Management Plan

7.3.1. Disasters

A disaster is a catastrophic situation in which suddenly, people are plunged into helplessness and suffering and, as a result, need protection, clothing, shelter, medical and social care and other necessities of life.

Disasters can be divided into two main groups. In the first, are disasters resulting from natural phenomena like earthquakes, volcanic eruptions, storm surges, cyclones, tropical storms, floods, avalanches, landslides, forest fires. The second group includes disastrous events occasioned by man, or by man's impact upon the environment. Examples are armed conflict, industrial accidents, radiation 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 which can reach catastrophic dimensions in terms of human loss.

There can be no set criteria for assessing the gravity of a disaster in the abstract since this depends to a large extent on the physical, economic and social environment in which it occurs. However, all disasters bring in their wake similar consequences that call for immediate action, whether at the local, national or international level, for the rescue and relief of the victims. This includes the search for the dead and injured, medical and social care, removal of the debris, the provision of temporary shelter for the homeless, food, clothing and medical supplies, and the rapid re- establishment of essential services.

7.3.2. Objectives of Disaster Management Plan

The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities. For effective implementation of the Disaster Management Plan, it should be widely circulated and personnel trained through rehearsals/drills.

The Disaster Management Plan should reflect the probable consequential severalties of the undesired event due to deteriorating conditions or through 'Knock on' effects. Further the management should be able to demonstrate that their assessment of the consequences uses good supporting evidence and is based on currently available and reliable information, incident data from internal and external sources and if necessary the reports of outside agencies.

To tackle the consequences of a major emergency inside the plant or in the immediate vicinity of the plant, a Disaster Management Plan has to be formulated and this planned emergency document is called "Disaster Management Plan". The objective of the Industrial

Disaster Management Plan is to make use of the combined resources of the plant and the outside services to achieve the following:

- Effect the rescue and medical treatment of casualties;
- Safeguard other people;
- Minimize damage to property and the environment;
- Initially contain and ultimately bring the incident under control;
- Identify any dead;
- Provide for the needs of relatives;
- Provide authoritative information to the news media;
- Secure the safe rehabilitation of affected area; and
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the Emergency.

In effect, it is to optimize operational efficiency to rescue, rehabilitate and render medical help and to restore normalcy.

7.3.3. Emergencies

I. General, Industrial, Emergencies

The emergencies that could be envisaged in the plant and fuel storage are as follows:

1. A situation of fire at the Hydrogen Plant;
2. A situation of fire at the tank farm of all storages;
3. Slow isolated fires;
4. Fast spreading fires;
5. Structural failures;
6. Contamination of food/water; and
7. Sabotage/Social disorder.

SOP for unloading of Flammable Chemical Tanker

A motor carrier who transports hazardous materials by a tanker tank must ensure that the tanker is attended by a qualified person at all times during unloading. However, the carrier's obligation to ensure attendance during unloading ceases when:

(i) The carrier's obligation for transporting the materials is fulfilled;

(ii) The tanker has been placed upon the consignee's premises; and

(iii) The motive power has been removed from the tanker and removed from the premises.

While unloading the person shall ensure that no static charge should be developed during transfer of material to storage tank.

II. Specific Emergencies Anticipated

Fire and Explosion

Fire consequences can be disastrous, since they involve huge quantities of fuel either stored or in dynamic inventory in pipe lines or in nearby areas. Preliminary hazard analysis has provided a basis for consequence estimation. Estimation can be made by using various pool fire, tank fire consequence calculations. During the study of Risk Assessment, the nature of damages is worked out and probability of occurrence of such hazards is also drawn up.

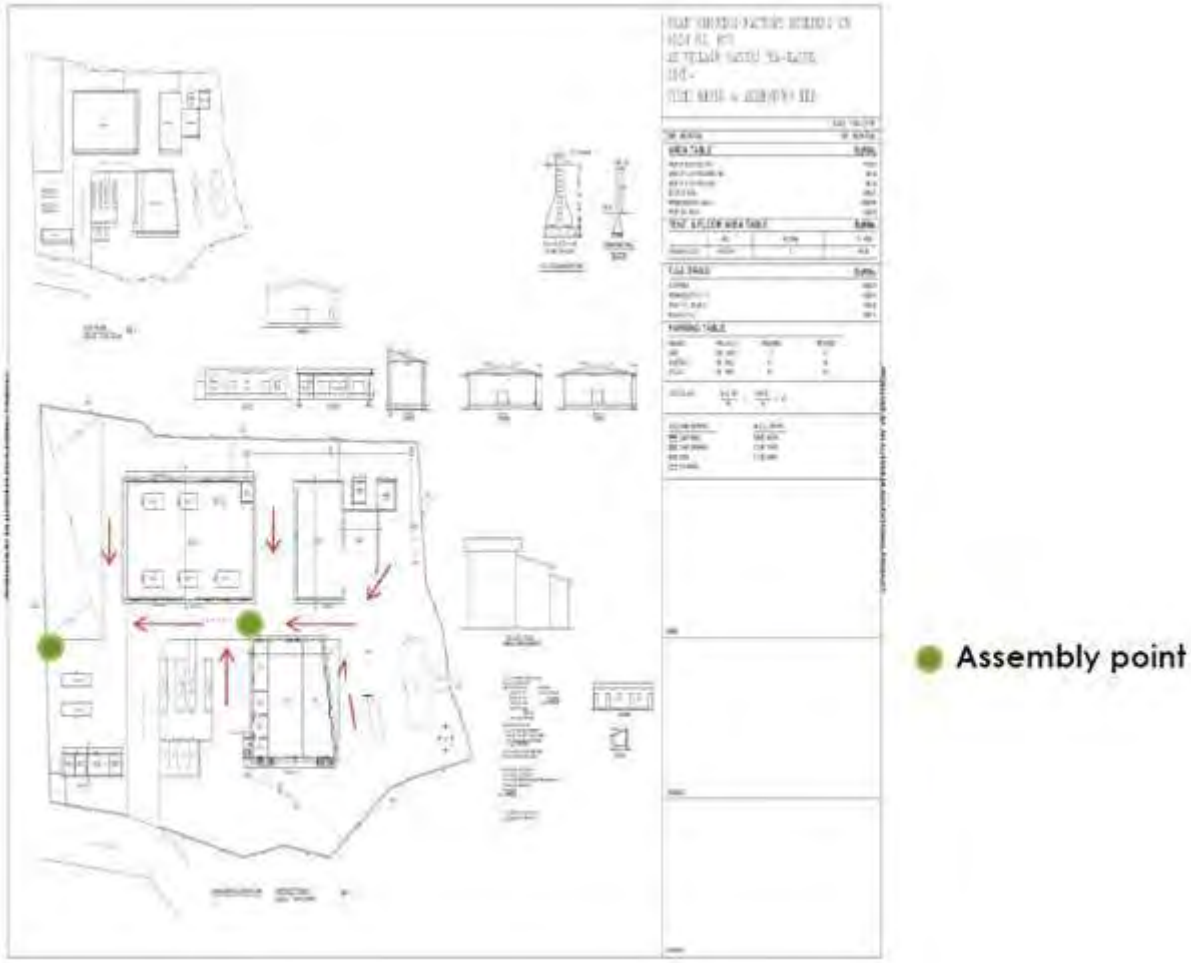


Figure 7.32 **Plant Layout showing Safe Assembly Point and fire evacuation plan**

7.3.4. Emergency Organization

It is recommended to setup an Emergency Organization. A senior executive who has control over the affairs of the plant should lead the Emergency Organization. He shall be designated as Site Controller. General Manager [O & M] shall be designated as the Incident Controller. In the case of stores, utilities, open areas, which are not under the control of the Production Heads, Senior Executive responsible for maintenance of utilities would be designated as Incident Controller. All the Incident Controllers would be reporting to the Site Controller.

Each Incident Controller, by himself, organizes a team responsible for controlling the incidence with the personnel under his control. Shift In-charge would be the reporting officer, who would bring the incidence to the notice of the Incidence Controller and Site Controller.

Emergency Co-coordinators would be appointed who would undertake the responsibilities like firefighting, rescue, rehabilitation, transport and provide essential and support services. For this purposes, Security In-charge, Personnel Department, Essential services personnel would be engaged. All these personnel would be designated as Key personnel.

In each shift, electrical supervisor, electrical fitters, pump house in-charge, and other maintenance staff would be drafted for emergency operations. In the event of power or communication system failure, some of staff members in the office/plant offices would be drafted and their services would be utilized as messengers for quick passing of communications. All these personnel would be declared as essential personnel.

A. Emergency Communication

Whoever notices an emergency situation such as fire, growth of fire, leakage etc would inform his immediate superior and Emergency Control Center. A place nearer to the Gate House Complex shall be identified as Emergency Control Center. The person on duty in the Emergency Control Center would appraise the Site Controller. Site Controller verifies the situation from the Incident Controller of that area or the Shift In-charge and takes a decision about an impending On Site Emergency. This would be communicated to all the Incident Controllers, Emergency Co-ordinators. Simultaneously, the emergency warning system would be activated on the instructions of the Site Controller.

7.3.5. Emergency Responsibilities

The responsibilities of the key personnel are appended below:

I. Site Controller

On receiving information about emergency he would rush to Emergency Control Center (ECC) and take charge of ECC and the situation. His responsibilities would be as indicated below:

1. Assesses the magnitude of the situation on the advice of Incident Controller and decides;
    A. Whether the affected area needs to be evacuated;
    B. Whether personnel who are at assembly points need to be evacuated;
2. Declares Emergency and orders for operation of emergency siren;
3. Organizes announcement by public address system about location of emergency;
4. Assesses which areas are likely to be affected, or need to be evacuated or are to be alerted;
5. Maintains a continuous review of possible development and assesses the situation in consultation with Incident Controller and other Key Personnel as to whether shutting down the plant or any section of the plant is required and if evacuation of persons is required;
6. Directs personnel for rescue, rehabilitation, transport, fire, brigade, medical and other designated mutual support systems locally available, for meeting emergencies;
7. Controls evacuation of affected areas, if the situation is likely to go out of control or effects are likely to go beyond the premises of the factory, informs the District Emergency Authority, Police, Hospital and seeks their intervention and help;
8. Informs Inspector of Factories, Deputy Chief Inspector of Factories, CECB and other statutory authorities;
9. Gives a public statement if necessary;
10. Keeps record of chronological events and prepares an investigation report and preserves evidence; and
11. On completion of On Site Emergency and restoration of normalcy, declares all clear and orders for all clear warning.

II. Incident Controller

1. Assembles the incident control team;

2. Directs operations within the affected areas with the priorities for safety to personnel minimize damage to the plant, property and environment and minimize the loss of materials;
3. Directs the shutting down and evacuation of plant and areas likely to be adversely affected by the emergency;
4. Ensures that key personnel help is sought;
5. Provides advice and information to the Fire and Security Officer and the Local Fire Services as and when they arrive;
6. Ensures that all non-essential workers/staff of the affected areas are evacuated to the appropriate assembly points, and the areas are searched for casualties;
7. Has regard to the need for preservation of evidence so as to facilitate any inquiry into the causes and circumstances, which caused or escalated the emergency;
8. Co-ordinates with emergency services at the site;
9. Provides tools and safety equipment to the team members;
10. Keeps in touch with the team and advices them regarding the method of control to be used; and
11. Keeps the Site Controller of Emergency informed of the progress being made.

III. Emergency Coordinator - Rescue, Fire Fighting

1. On knowing about emergency, rushes to ECC;
2. Helps the Incident Controller in containment of the emergency;
3. Ensure fire pumps are in operating condition and instructs pump house operator to ready for any emergency with standby arrangement;
4. Guides the firefighting crew i.e. firemen, trained plant personnel and security staff;
5. Organizes shifting the firefighting facilities to the emergency site, if required;
6. Takes guidance of the Incident Controller for firefighting as well as assesses the requirements of outside help;
7. Arranges to control the traffic at the gate and the incident area;
8. Directs the security staff to the incident site to take part in the emergency operations under his guidance and supervision;
9. Evacuates the people in the plant or in the nearby areas as advised by Site Controller;
10. Searches for casualties and arranges proper aid for them;
11. Assembles search and evacuation team;
12. Arranges for safety equipment for the members of this team;
13. Decides which paths the evacuated workers should follow; and

14. Maintains law and order in the area, and if necessary seeks the help of police.

IV. Emergency Coordinator-Medical, Mutual Aid, Rehabilitation, Transport and Communication

1. In the event of failure of electric supply and thereby internal telephone, sets up communication point and establishes contact with the ECC;
2. Organizes medical treatment to the injured and if necessary will shift the injured to nearby hospitals;
3. Mobilizes extra medical help from outside, if necessary;
4. Keeps a list of qualified first aid providers for the plant and seeks their assistance;
5. Maintains first aid and medical emergency requirements;
6. Makes sure that all safety equipment is made available to the emergency team;
7. Assists Site Controller with necessary data to coordinate the emergency activities;
8. Assists Site Controller in updating emergency plan, organizing mock drills, verification of inventory of emergency facilities and furnishing report to Site Controller;
9. Maintains liaison with Civil Administration;
10. Ensures availability of canteen facilities and maintenance of rehabilitation center.
11. Liaises with Site Controller/Incident Controller;
12. Ensures transportation facility;
13. Ensures availability of necessary cash for rescue/rehabilitation and emergency expenditure;
14. Controls rehabilitation of affected areas on discontinuation of emergency; and
15. Makes available diesel/petrol for transport vehicles engaged in emergency operation.

V. Emergency Coordinator - Essential Services

1. Assists Site Controller and Incident Controller;
2. Maintains essential services like Diesel Generator, Water, Fire Water, Compressed Air/Instrument Air, power supply for lighting;
3. Plans alternate facilities in the event of power failure, to maintain essential services such as lighting, etc;
4. Organizes separate electrical connections for all utilities and emergency services so that in the event of emergency or fires, essential services and utilities are not affected;
5. Gives necessary instructions regarding emergency electrical supply, isolation of certain sections etc. to shift in-charge and electricians; and

6. Ensures availability of adequate quantities of protective equipment and other emergency materials, spares etc.

VI. General Responsibilities of Employees during an Emergency

During an emergency, which becomes more enhanced and pronounced when an emergency warning is raised, the workers who are in-charge of process equipment should adopt safe and emergency shut down and attend to any prescribed duty as essential employee. If no such responsibility is assigned, he should adopt a safe course to assembly point and await instructions. He should not resort to spreading panic. On the other hand, he must assist emergency personnel towards meeting the objectives of DMP.

7.3.6. Emergency Facilities

I. Emergency Control Center (ECC)

The following information and equipment are to be provided at the Emergency Control Center (ECC).

1. Intercom, telephone;
2. P and T telephone;
3. Self-contained breathing apparatus;
4. Fire suit/gas tight goggles/gloves/helmets;
5. Hand tools, wind direction/velocities indications;
6. Public address megaphone, hand bell, telephone directories;
7. (internal, P and T) plant layout, site plan;
8. Emergency lamp/torch light/batteries;
9. Plan indicating locations of hazard inventories, plant control room, sources of safety equipment, work road plan, assembly points, rescue location vulnerable zones, escape routes;
10. Hazard chart;
11. Emergency shut-down procedures;
12. Nominal roll of employees;
13. List of key personnel, list of essential employees, list of Emergency Co-ordinators;
14. Duties of key personnel;
15. Address with telephone numbers and key personnel, emergency coordinator, essential employees; and
16. Important address and telephone numbers including Government agencies, neighboring industries and sources of help, outside experts, fuel fact sheets and population details around the factory.

II Assembly Point

One assembly points, depending upon the plant location, would be identified wherein employees who are not directly connected with the disaster management would be assembled for safety and rescue. Emergency breathing apparatus, minimum facilities like water etc. would be organized.

In view of the size of plant, different locations would be ear marked as assembly points. Depending upon the location of hazard, the assembly points are to be used.

III Fire Fighting Facilities

First Aid and sufficient number of Fire extinguishers suitable for emergency should be maintained in the plant. This would be as per statutory requirements. Fire alarms would be located in the bulk storage areas.

IV Location of Wind Sock

Wind socks shall be installed at appropriate places in the plant to indicate direction of wind for emergency escape.

V Emergency Medical Facilities

General first aid materials for dealing with chemical burns, fire burns etc would be maintained in the emergency control room. To provide necessary first aid facilities, the first aid training will also be given to the employees. Necessary specific medicines for emergency treatment of Patient's Burns would be maintained. Breathing apparatus and other emergency medical equipment would be provided and maintained. The unit will appoint the medical officer for the regular medical examination of the employee. The project site is located only 6 km away from Ahmedabad city, in case of any emergency Government and private hospital would be approached. Names of Medical Personnel, Medical facilities in the area would be prepared and updated.

VI Ambulance

There is availability of personal vehicles to transport injured or affected persons to the hospital. Number of persons would be trained in first aid so that, in every shift first aid personnel would be available.

7.3.7. Emergency Actions

7.3.7.1 *Emergency Warning*

The emergency would be communicated both to the personnel inside the plant and the people outside. An emergency warning system shall be established for this purpose.

7.3.7.2 *Emergency Shutdown*

There are number of facilities, which can be provided to help deal with hazardous conditions, when a tank is on fire. The suggested arrangements are:

1. Stop feed;
2. Dilute contents;
3. Remove heat;
4. Deluge with water; and
5. Transfer contents.

Whether a given method is appropriate depends on the particular case.

7.3.7.3 *Evacuation of Personnel*

There could be a number of persons in the storage area and other areas in the vicinity. The area would have adequate number of exits, staircases. In the event of an emergency, unconnected personnel have to escape to assembly point. Operators have to take emergency shutdown procedure and escape. Time Office shall maintain a copy of deployment of employees in each shift, at ECC. If necessary, persons can be evacuated by rescue teams.

7.3.7.4 *All Clear Signal*

Also, at the end of an emergency, after discussing with Incident Controllers and Emergency Co- coordinators, the Site Controller orders an all clear signal. When it becomes essential, the SiteController communicates to the District Emergency Authority, Police, and Fire Service personnel regarding help required or development of the situation into an Off-Site Emergency.

7.3.8. General

7.3.8.1 *Employee Information*

During an emergency, employees would be warned by raising siren in specific pattern. Employees would be given training of escape routes and taking shelter. Employees would be provided with information related to fire hazards, antidotes and first aid measures. Those who would be designated as key personnel and essential employees should be given training for emergency response.

7.3.8.2 *Public Information and Warning*

The industrial disaster effects related to this plant may mostly be confined to the plant area. The detailed risk analysis has indicated that the pool fire effects would not be felt outside. However, as an abundant precaution, the information related to Chemical in use would be furnished to District Emergency Authority for necessary dissemination to general public and

for any use during an offsite emergency. Plants of this size and nature have been in existence in our country for a long time.

7.3.8.3 *Co-ordination with Local Authorities*

Keeping in view of the nature of emergency, two levels of coordination are proposed. In the case of an On Site Emergency, resources within the organization would be mobilized and in the event extreme emergency local authorities help would be sought.

In the event of an emergency developing into an offsite emergency, local authority and District Emergency Authority (normally the Collector) would be appraised and under his supervision, the Off Site Disaster Management Plan would be exercised. For this purpose, the facilities that are available locally, i.e. medical, transport, personnel, rescue accommodation, voluntary organizations etc. would be mustered. Necessary rehearsals and training in the form of mock drills would be organized.

7.3.8.4 *Mutual Aid*

Mutual aid in the form of technical personnel, runners, helpers, special protective equipment, transport vehicles, communication facility etc. would be sought from the neighboring industries.

7.3.8.5 *Mock Drills*

Emergency preparedness is an important part of planning in Industrial Disaster Management. Personnel would be trained suitably and prepared mentally and physically in emergency response through carefully planned, simulated procedures. Similarly, the key personnel and essential personnel would be trained in the operations.

7.3.8.6 *Important Information*

Once the Plant goes on stream, important information such names and addresses of key personnel, essential employees, medical personnel outside the plant, transporters address, address of those connected with Off Site Emergency such as Police, Local Authorities, Fire Services, District Emergency Authority would be prepared and maintained. The on-site emergency organization chart for various emergencies is shown in Figure-A

7.3.9. OFF-SITE EMERGENCY PREPAREDNESS PLAN

The task of preparing the Off-Site Emergency Plan lies with the District Collector; however the off-site plan will be prepared with the help of the local district authorities. The proposed plan will be based on the following guidelines.

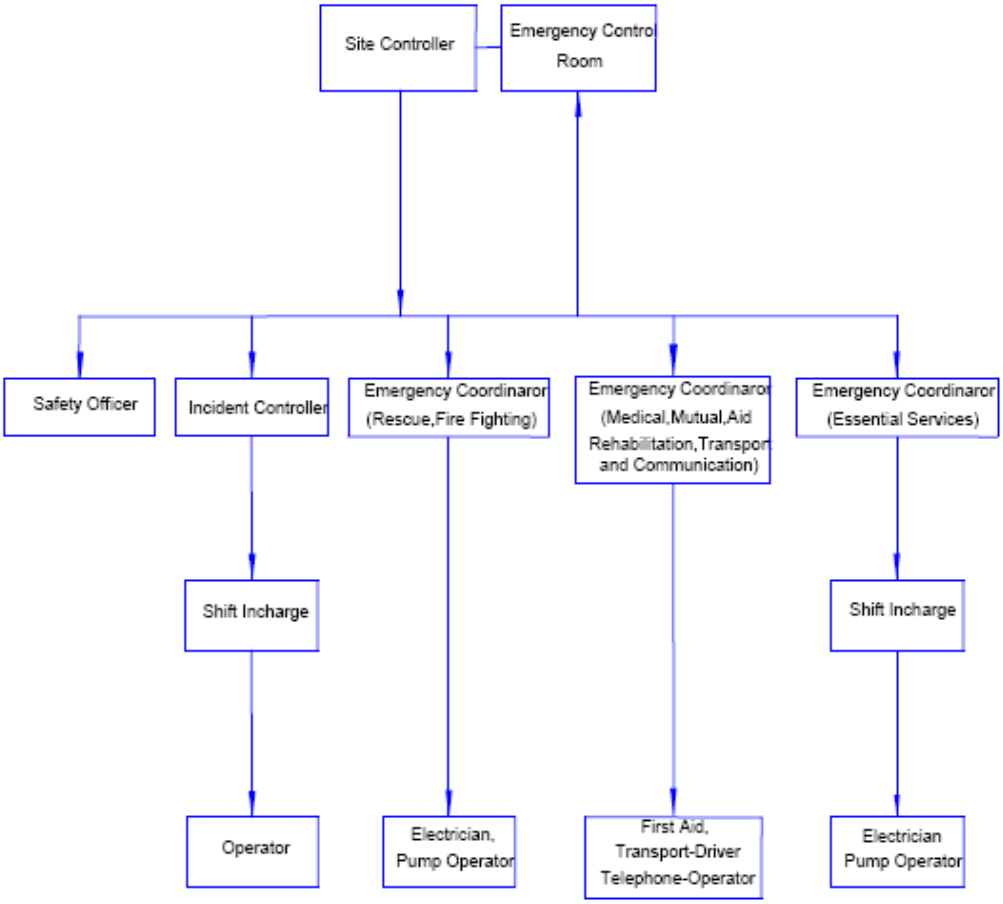


Figure 7.1 **On-Site Emergency Organization Chart**

7.3.9.1 *Introduction*

Off-site emergency plan would follow the on-site emergency plan. When the consequences of an emergency situation go beyond the plant boundaries, it becomes an off-site emergency. Off- site emergency is essentially the responsibility of the public administration. However, the plant management will provide the public administration with the technical information relating to the nature, quantum and probable consequences on the neighboring population.

The off-site plan in detail will be based on those events, which are most likely to occur, but other less likely events, which have severe consequence, will also be considered. Incidents which have very severe consequences yet have a small probability of occurrence would also be considered during the preparation of the plan. However, the key feature of a good off-site

emergency plan is flexibility in its application to emergencies other than those specifically included in the formation of the plan.

The roles of the various parties who will be involved in the implementation of an off-site plan are described below. Depending on local arrangements, the responsibility for the off-site plan would either rest with the plant management or with the local authority. Either way, the plan would identify an emergency co-ordinating officer, who would take the overall command of the off-site activities. As with the on-site plan, an emergency control center would be setup within which the emergency co-ordination officer can operate.

An early decision will be required in many cases on the advice to be given to people living "within range" of the accident - in particular whether they should be evacuated or told to go indoors. In the latter case, the decision can regularly be reviewed in the event of an escalation of the incident. Consideration of evacuation may include the following factors:

In the case of a major fire but without explosion risk (e.g. an oil storage tank), only houses close to the fire are likely to need evacuation, although a severe smoke hazard may require this to be reviewed periodically; and

If a fire is escalating and in turn threatening a store of hazardous material, it might be necessary to evacuate people nearby, but only if there is time; if insufficient time exists, people should be advised to stay indoors and shield them from the fire. This latter case particularly applies if the installation at risk could produce a fireball with very severe thermal radiation effects.

Although the plan will have sufficient flexibility built in to cover the consequences of the range of accidents identified for the on-site plan, it will cover in some detail the handling of the emergency to a particular distance from each major hazard works.

7.3.9.2 *Aspects Proposed to be considered in the Off-Site Emergency Plan*

The main aspects, which should be included in the emergency plan, are:

- **Organization**

Detail of command structure, warning systems, implementation procedures, emergency control centers. Names and appointments of incident controller, site main controller, their deputies and other key personnel.

- **Communications**

Identification of personnel involved, communication center, call signs, network, list of telephone numbers.

- **Specialized Knowledge**

Details of specialist bodies, firms and people upon whom it may be necessary to call e.g. those with specialized fuel knowledge, laboratories.

- **Voluntary Organizations**

Details of organizers, telephone numbers, resources etc.

Fuel Information

Details of the hazardous substances stored and a summary of the risk associated with them.

- **Meteorological Information**

Arrangements for obtaining details of weather forecasts and weather conditions prevailing at that time.

- **Humanitarian Arrangements**

Transport, evacuation centers, emergency feeding, treatment of injured, first aid, ambulances and temporary mortuaries.

- **Public Information**

Arrangements for (a)dealing with the media press office; (b) informing relatives, etc.

Assessment of Emergency Plan

Arrangements for:

(a) Collecting information on the causes of the emergency;

(b) Reviewing the efficiency and effectiveness of all aspects of the emergency plan.

7.3.9.3 *Role of the Emergency Coordinating Officer*

The various emergency services would be coordinated by an emergency Coordinating officer (ECO), who will be designated by the district collector. The ECO would liaison closely with the site main controller. Again depending on local arrangements, for very severe incidents with major or prolonged off-site consequences, the external control would be passed to a senior local authority administrator or even an administrator appointed by the central or state government. The ECO will be equipped with address and phone numbers of important agencies.

7.3.9.4 *Role of the Local Authority*

The duty to prepare the off-site plan lies with the local authorities. The emergency planning officer (EPO) appointed should carry out his duty in preparing for a whole range of different emergencies within the local authority area. The EPO should liaison with the plant, to obtain the information to provide the basis for the plan. This liaison should ensure that the plan is continually kept upto date.

It will be the responsibility of the EPO to ensure that all those organizations which will be involved off site in handling the emergency, know of their role and are able to accept it by having for example, sufficient staff and appropriate equipment to cover their particular responsibilities. Rehearsals for off-site plans should be organized by the EPO.

7.3.9.5 *Role of Police*

Formal duties of the police during an emergency include protecting life and property and controlling traffic movements.

Their functions should include controlling bystanders, evacuating the public, identifying the dead and dealing with casualties, and informing relatives of death or injury.

7.3.9.6 *Role of Fire Authorities*

The control of a fire should be normally the responsibility of the senior fire brigade officer who would take over the handling of the fire from the site incident controller on arrival at the site. The senior fire brigade officer should also have a similar responsibility for other events, such as explosions. Fire authorities in the region should be apprised about the location of all stores of flammable materials, water and foam supply points, and fire-fighting equipment. They should be involved in on-site emergency rehearsals both as participants and, on occasion, as observers of exercises involving only site personnel.

7.3.9.7 *Role of Health Authorities*

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

For major fires, injuries should be the result of the effects of thermal radiation to a varying degree, and the knowledge and experience to handle this in all but extreme cases may be generally available in most hospitals.

Major off-site incidents are likely to require medical equipment and facilities additional to those available locally, and a medical "mutual aid" scheme should exist to enable the assistance of neighboring authorities to be obtained in the event of an emergency.

7.3.9.8 *Role of Government Safety Authority*

This will be the factory inspectorate available in the region. Inspectors are likely to satisfy themselves that the organization responsible for producing the off-site plan has made adequate arrangements for handling emergencies of all types including major emergencies. They may wish to see well-documented procedures and evidence of exercise undertaken to test the plan. In the event of an accident, local arrangements regarding the role of the factory inspector will apply. These may vary from keeping a watching brief to a close involvement in advising on operations.

7.3.9.9 *Personal Protective Equipment*

I. Clothing

Chemical-resistant clothing and protective gloves with material suitable for handling various hazardous chemicals.

II. Eye Protection

Employees will use splash-proof goggles while dealing with hazardous chemicals. An eye-wash fountain or an eye wash kit for in case of emergency.

III. First Aid:

Prompt action will be taken in case of any kind of spillage or leakage. In case of any kind of chemical spill or leak, following actions will be taken:

Breathing

Person will be moved to the fresh air at once (in case of inhalation). If breathing stops, artificial respiration will be performed. Affected person will be kept warm and resting and medical attention will be provided immediately.

Eye Exposure

Eyes will be washed immediately with large amounts of water for at least 15 minutes, lifting the upper and lower lids. Medical attention will be provided immediately. Workers shall not be allowed wearing Contact lenses while working in the premises near the area of risk of hazardous spill or leak.

Skin Exposure

Skin contaminated with acid or any kind of chemical will be flushed with soap and water for at least 15 minutes (or as recommended in the MSDS of the chemical). If strong concentrations of gas or solution penetrate clothing, then cloths will be removed and skin will be flushed with water. Medical attention will be provided immediately.

Swallowing

In case of swallowing, if the person is conscious, large amounts of water or milk will be given. Medical attention will be provided immediately. Material safety data sheet (MSDS) will be referred or a physician will be called.

Spill Management

If any solvents spill or leak occurs, following actions will be taken:

- Fire officer or the local fire department will be intimated. Untrained persons or those without proper personal protective equipment will not allowed enter in affected areas. Evacuation and restriction of people from the hazardous area of release of chemical.
- Stop or control the source of exposure.
- Ventilation of contaminated atmospheres by opening windows to disperse the fumes.
- If the exposure is from the spill of a solution, collection of the spilled material. Dilution and neutralize of the spill if possible and disposal in a secured landfill.

7.3.9.10 *OCCUPATIONAL HEALTH AND SAFETY*

For large industries, where multifarious activities are involved during construction, erection, testing, commissioning, operation and maintenance, the men, materials and machines are the basic inputs. Along with the boons, industrialization generally brings several problems like occupational health and safety.

The industrial planner, therefore, has to properly plan and take steps to minimize the impacts of industrialization and to ensure appropriate occupational health and safety including fire plans. All these activities again may be classified under construction and erection, and operation and maintenance.

I. **Occupational Health**

Occupational health needs attention both during construction and erection and operation and maintenance phases. However, the problem varies both in magnitude and variety in the above phases.

Construction and Erection

The occupational health problems envisaged at this stage can mainly be due to constructional accident and noise. To overcome these hazards, in addition to arrangements to reduce it within TLV's, necessary protective equipments shall also be supplied to workers.

Operation and Maintenance

The problem of occupational health, in the operation and maintenance phase is primarily due to noise which could affect hearing. The necessary personal protective equipments will be given to all the workers. The working personnel shall be given the following appropriate personnel protective equipment’s.

1. Industrial Safety Helmet;
2. Crash Helmets;
3. Face shield with replacement acrylic vision;
4. Zero power plain goggles with cut type filters on both ends;
5. Zero power goggles with cut type filters on both sides and blue color glasses;
6. Cylindrical type earplug;
7. Ear muffs;
8. Canister Gas mask;
9. Self-contained breathing apparatus;
10. Leather apron;
11. Aluminized fiber glass fix proximity suit with hood and gloves;
12. Boiler suit;
13. Safety belt/line man's safety belt;

14. Leather hand gloves;
15. Acid/Alkali proof rubberized hand gloves;
16. Canvas cum leather hand gloves with leather palm;
17. Lead hand glove;
18. Electrically tested electrical resistance hand gloves; and
19. Industrial safety shoes with steel toe.

Full-fledged hospital facilities will be available round the clock for attending emergency arising out of accidents, if any. All working personnel will be medically examined at least once in every year and at the end of his term of employment. Pre and Post-employment Medical check-up is being already carried out and the same shall be followed after the said expansion. This is in addition to the pre-employment medical examination.

II. Safety Plan

Safety of both men and materials during construction and operation phases is of concern. Safety plan shall be prepared and implemented in the proposed expansion of plant. The preparedness of an industry for the occurrence of possible disasters is known as emergency plan. The disaster in the plant is possible due to collapse of structures and fire/explosion etc. Keeping in view the safety requirement during construction, operation and maintenance phases, and the plant has formulated safety policy with the following regulations:

1. To allocate sufficient resources to maintain safe and healthy conditions of work;
2. To take steps to ensure that all known safety factors are taken into account in the design, construction, operation and maintenance of plants, machinery and equipment;
3. To ensure that adequate safety instructions are given to all employees;
4. To provide wherever necessary protective equipment, safety appliances and clothing and to ensure their proper use;
5. To inform employees about materials, equipment or processes used in their work which are known to be potentially hazardous to health or safety;
6. To keep all operations and methods of work under regular review for making necessary changes from the point of view of safety in the light of experience and up to date knowledge;
7. To provide appropriate facilities for first aid and prompt treatment of injuries and illness at work;
8. To provide appropriate instruction, training, retraining and supervision to employees in health and safety, first aid and to ensure that adequate publicity is given to these matters;

9. To ensure proper implementation of fire prevention methods and an appropriate firefighting service together with training facilities for personnel involved in this service;
10. To organize collection, analysis and presentation of data on accident, sickness and incident involving people injury or injury to health with a view to taking corrective, remedial and preventive action;
11. To promote through the established machinery, joint consultation in health and safety matters to ensure effective participation by all employees;
12. To publish/notify regulations, instructions and notices in the common language of employees;
13. To prepare separate safety rules for each type of occupation/processes involved in a plant; and
14. To ensure regular safety inspection by a competent person at suitable intervals of all buildings, equipments, work places and operations.

GENERAL SAFETY MEASURES

1. Proper ventilation system will be provided at storage and processing areas of chemicals so that to maintain PEL valves of chemicals and solvents.
2. Good housekeeping, disposal methods will be followed to control the fugitive emissions of chemicals.
3. In order to prevent the work men from facing the musculo -skeletal disorders, backache, pain in minor and major joints etc, and manual carrying of heavy materials will be avoided. All liquid raw materials/solvents will be transferred through closed piping system either by pumping or by gravity, to reduce the carrying load on work men against gravity. Safe carrying weights (up to 15 kgs) only allowed to be carried by work men. Stair cases with suitable gradient will be constructed in the work sheds. Material handling trolleys will be provided to carry/handle the solid materials from one place to other.
4. Employees will be educated, trained and, informed about the chemicals and their properties by displaying the material safety data sheets (MSDS) in the processing areas.
5. Awareness about potential hazards, work hazards, fire hazards, and health hazards associated with the chemicals which are being used by the industry will be developed among the employees.

Apart from the above, the following general safety precautions will be implemented in the plant.

6. Shielding guards will be provided to all belt pulleys, couplings and all moving parts of the machinery.
7. All electrical cables and electrical equipment will be properly grounded and earthed.
8. Poster display regarding safety, health and environmental protection will be arranged in the plant to make awareness of safety and health.
9. All responsible employees will be educated and trained to handle the firefighting equipment.
10. NO SMOKING policy will be strictly implemented in the entire plant area.
11. Emergency exits will be provided at the selected places.
12. No employee will be allowed to expose to a noise level greater than 85dB(A) for a period of more than 8 hours per day without hearing protection.
13. Periodical health checkup of employees will be held as a part of occupational health surveillance.
14. One shower type eye wash will be provided in the plant area.
15. Fire extinguisher will be provided where ever is needed.
16. All flammable chemicals and solvents will be kept away from ignition sources and heat.
17. Storage of chemicals will be as per their compatibility.
18. Proper exhaust ventilation will be provided to the process area to maintain the airborne concentrations and solvents below their TLV values.

III. Safety Organization

Construction and Erection Phase

A qualified and experienced safety officer shall be appointed. The responsibilities of the safety officer include identification of the hazardous conditions and unsafe acts of workers and advice on corrective actions, conduct safety audit, organize training programs and provide professional expert advice on various issues related to occupational safety and health. He is also responsible to ensure compliance of Safety Rules/ Statutory Provisions. In addition to employment of safety officer by CPC, every contractor, who employs more than 25 workers, shall also employ one safety officer to ensure safety of the worker, in accordance with the conditions of contract.

Operation and Maintenance Phase

When the construction is completed the posting of safety officers shall be in accordance with the requirement of Factories Act and their duties and responsibilities shall be as defined there off.

IV. Safety Circle

In order to fully develop the capabilities of the employees in identification of hazardous processes and improving safety and health, safety circles would be constituted in each area of work. The circle would consist of 5-6 employees from that area. The circle normally shall meet for about an hour every week.

V. Safety Training

A full-fledged training center shall be set up at the plant. Safety training shall be provided by the Safety Officers with the assistance of faculty members called from Professional Safety Institutions and Universities. In addition to regular employees, limited contractor labors shall also be provided safety training. To create safety awareness safety films shall be shown to workers and leaflets shall be distributed. Some precautions and remedial measures proposed to be adopted to prevent fires are:

1. Compartmentalization of cable galleries, use of proper sealing techniques of cable passages and crevices in all directions would help in localizing and identifying the area of occurrence of fire as well as ensure effective automatic and manual firefighting operations;
2. Spread of fire in horizontal direction would be checked by providing fire stops for cable shafts;
3. Reliable and dependable type of fire detection system with proper zoning and interlocks for alarms are effective protection methods for conveyor galleries;
4. Housekeeping of high standard helps in eliminating the causes of fire and regular fire watching system strengthens fire prevention and firefighting; and
5. Proper fire watching by all concerned would be ensured.

VI. Health and Safety Monitoring Plan

The health of all employees shall be monitored once in a year for early detection of any ailment due to exposure to heat, fumes and noise. Pre and Post-employment Medical Check-up for all the employees will be carried out regularly.

7.3.10. SOCIAL IMPACT ASSESSMENT

7.3.10.1 *Impact*

I. Impact on population composition

The population composition of a place changes due to various factors viz, topography, availability of water, agricultural practices, economic development, transport facilities and migration of people. Migration of people brings changes in population size, sex ratio, adult-child ratio and size & composition of labor force. The industry is a proposed new project in

which local people will be employed directly and it will also help in generating various indirect jobs helping in creating an employment cycle.

As most of the people will be employed locally, therefore, there will be less influx of people from outside in the study area. At present per household size is 5 to 6 persons. As the local people will be employed there will be minimal impact on the population of the study area. However, a significant increase in population can be expected through indirect jobs as and when the proposed new project will expand.

II. Impact on employment generation

The existing project consisting a total of 20 employees. Additional 30 Employees are proposed to be employed during expansion.

Employment will be given to local people to the extent possible. However, the local people cannot be employed in the proposed expansion project as it is synthetic organic industry and requires an expertise and highly skilled jobs and qualification of the people in the study area do not match the requirement. However, recruitment of local people wherever suitable will be done and at least 80% reservation for recruitment of local people has been planned by proponent.

The proposed new will generate various indirect employments which will help people locally, regionally mainly and later nationally. They will be involved in various job activities such as packing, warehousing, transportation, advertisement, direct selling, bulk selling etc. This will involve many people to generate income.

III. Impact on Local, Regional and National Environment

The major impact will be locally especially in the study area. The proponent will focus on the manufacturing of Synthetic resins. With the coming up of industry it will lead to a quick and long term impact locally and regionally especially. With the increasing rate of employment in the region the development in terms of standard of living, education etc. will increase. Later, when the industry will increase it will contribute to the national level though marginally.

7.3.10.2 *Mitigation / management measures Corporate Social Responsibility (CSR)*

Corporate Social Responsibility (CSR) is a concept whereby organizations take responsibility for their impact on society and environment. It is also known as Corporate Responsibility, Corporate Citizenship, Responsible Business and Sustainable Responsible Business (SRB). As is the case in many countries, the private sector is generally more active in this area than the governmental/public sector.

Since the mid-1990s nearly all leading corporate in India are involved in Corporate Social Responsibility (CSR) programmes in areas like education, health, livelihood creation, skill development, and empowerment of weaker sections of the society. Notable efforts have

come from the Tata Group, Infosys, Bharti Enterprises, Coca Cola India, PepsiCo and ITC Welcome group, among others. India has been named among the top ten Asian countries paying increasing importance towards corporate social responsibility (CSR). The Corporate India has spread its CSR activities across 20 states and Union territories. About 36 per cent of the CSR activities are concentrated in the state of Maharashtra, followed by about 12 per cent in Gujarat, 10 per cent in Delhi and 9 per cent in Tamil Nadu.

The Government of India has finalized plans to ensure that Public Sector companies actively participate in CSR initiatives. It was expected that 2-5 per cent of the company's net profits would be funded in such projects.

The project proponent has planned various Corporate Social activities in the study area for the proposed expansion project in Sanand taluka of Ahmedabad district.

1. The proponent will organize medical camps in the study region. In the survey it was reported by the interviewee that Diarrhoea, anemia, etc. are the common health problems in the study region. The medical camps for these diseases will be organized. The medical camp for vaccination of children against six major diseases will also be organized.
2. The proponent will carry out plantation all along the road side in nearby villages and development of garden/greenbelt on government barren land/common plots.
3. The unit will organize education aids & scholarship to poor students for higher education.
4. The unit will give their adequate and reasonable contribution for the local religious and social programs in the nearby villages.
5. Company will also cooperate and participate in the various activities conducted by the government for the socio-economic development and welfare of the society such as;
    1. Participate in the medical camp organized in the villages.
    2. Participate and cooperate in animal husbandry camp.
    3. Participate in the Forestry Programme of state government.
    4. Participate and Cooperate in Education Camp of state government.
    5. Award scholarship to students for higher education.
    6. Participate and Cooperate in Education Camp of state government.
    7. Award scholarship to students for higher education.
    8. Participate in the national programme organized on 15th August and 26th January.
    9. Participate in new school admission campaign.
    10. Participate in Cleanliness Camp of state government.

7.3.11. Details of occupational health programme.

7.3.11.1 *To which chemicals, workers are exposed directly or indirectly.Workers will be exposed to the following raw materials.*

Sr. No.	Raw Materials	Unit	Quantity Requirement, MT/Month	Storage/ Transportation Facility For Raw Material.
1.	VAM (Vinyl Acetate Monomer)	KL	689.608	Drum (200KL), 18 nos.
2.	GH-17(Poly Vinyl Alcohol)	MT	60.000	Bag (20KG), 1200 nos.
3.	Pva-173(Poly Vinyl Alcohol)	MT	59.608	Bag (20KG), 1192 nos
4.	P.P.S (Potassium per Sulfate)	MT	2.118	Bag (20KG), 42 nos.
5.	S.B.C.(Sodium bi Carbonate	MT	1.465	Bag (50KG), 10 nos.
6.	D.B.P.(Di butyl Pthalete)	KL	19.565	Drum (200KL), 39 nos.
7.	Octanol	KL	7.270	Drum (200KL), 14 nos.
8.	Formaldehyde	KL	2.933	Drum (200KL), 6 nos.
9	Water	KL	263.165	50 Tankers.

7.3.11.2 *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.

Sr. No	Name of chemical	Flammability	State	Flash point °C	Boiling point °C	Toxicity Level	Lower explosive limit (LEL %)	Upper explosive limit (UEL %)
1.	VAM (Vinyl Acetate Monomer)	Flammable liquid	Liquid	-8	72	• Acute oral toxicity LD50 rat: 2900 mg/kg (RTECS) • Acute dermal toxicity LD50 rabbit: 2.335 mg/kg (RTECS) **Note :- Threshold Limit Values:** 8 hr Time Weighted Avg (TWA): 10 ppm; 15 min Short Term Exposure Limit (STEL): 15 ppm. A3; Confirmed animal carcinogen with unknown relevance to humans.	2.6	13.4
2.	GH-17(Poly Vinyl Alcohol)	Non flammable	Solid	More than	NA	• Acute toxicity rat: LD50 > 2000mg/kg • Skin Rat : LD50 > 2000 mg/kg	NA	NA
3.	Pva-173(Poly Vinyl Alcohol)	Non flammable	Powder	NA	NA	• None Established	NA	NA

Sr. No	Name of chemical	Flammability	State	Flash point °C	Boiling point °C	Toxicity Level	Lower explosive limit (LEL %)	Upper explosive limit (UEL %)
4.	P.P.S (Potassium per Sulfate)	Non flammable	Solid	NA	NA	• Oral, rat: LD50 = 802 mg/kg	NA	NA
5.	S.B.C.(Sodium bi Carbonate	Non flammable	Solid	NA	NA	• Acute oral toxicity LD50 rat: 3360 mg/kg	NA	NA
6.	D.B.P.(Di butyl Pthalete)	May be combustible at high temperature	Viscose liquid	157	340	• Acute oral toxicity LD50 rat: 3474 mg/kg • Acute oral toxicity LD50 rat: >20000mg/kg rabbit	0.5	
7.	Octanol	Non flammable	Liquid	81	195	• Oral mouse LD50: 1790mg/kg • Oral mouse LD50: 50000mg/kg	NA	NA

Sr. No	Name of chemical	Flammability	State	Flash point °C	Boiling point °C	Toxicity Level	Lower explosive limit (LEL %)	Upper explosive limit (UEL %)
8.	Formaldehyde	Flammable	Liquid	64-85	96	• Oral LD50 (rat): 800 mg/kg • Inhalation LC50 (rat): 590 mg/m3	7	73

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. The filter to be used for particular contaminant was PVC i.e. Polly vinyl chloride.

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
- (Battry 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.

7.3.11.3 *What measures company has taken to keep these chemicals within PEL/TLV.JIT Inventory, Good Ventilation, water seals, Personal Monitoring and sampling.*

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

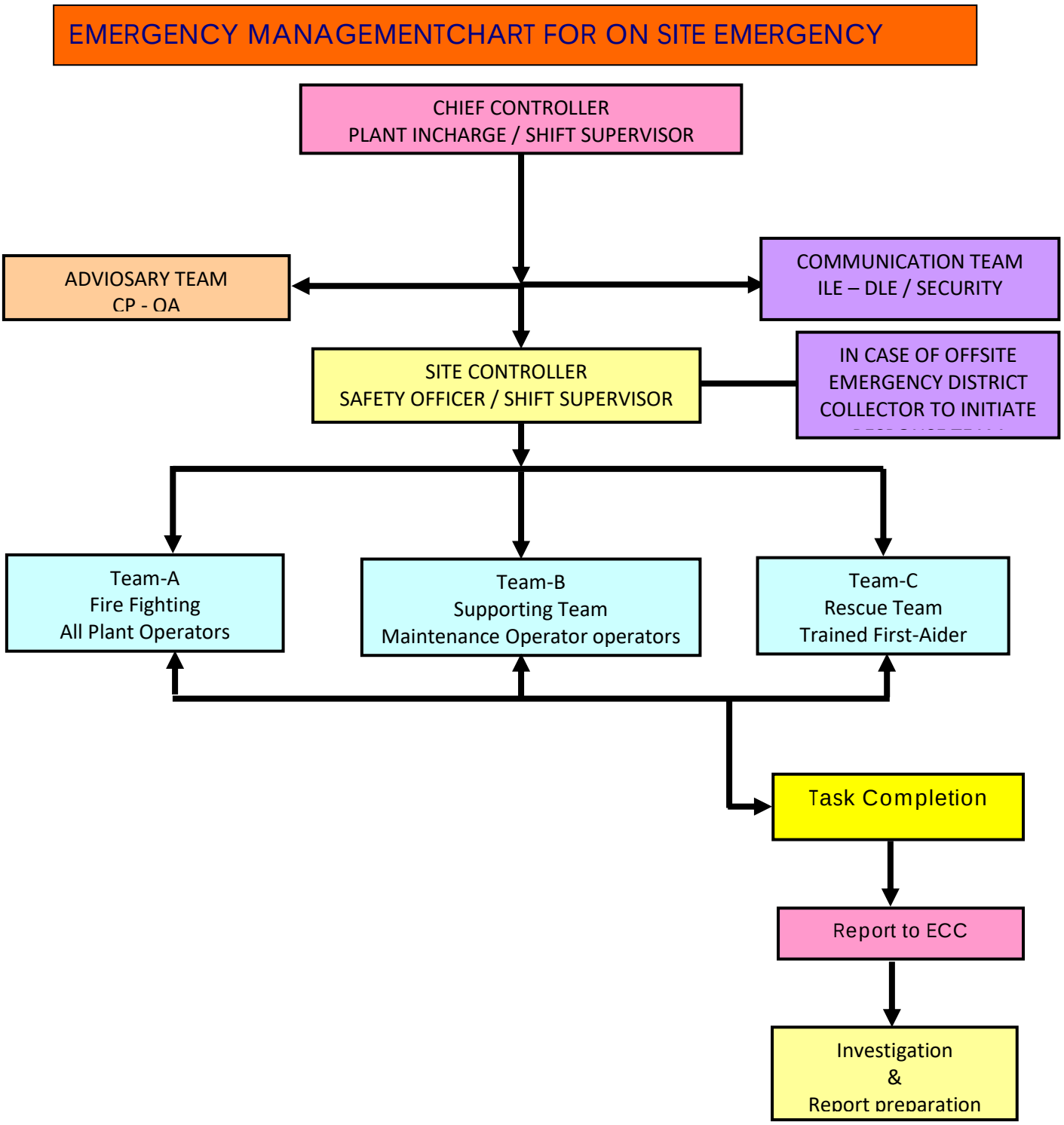
Ans: Pre Medical Examinations:

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

7.3.11.5 *What are onsite and offsite emergency plan during chemical disaster.*



ROLE	Responsible Person/ Department	
	General	Alternative
Chief Emergency Controller	Plant In-charge	Shift In-charge
Site Controller	Safety officer	
Team - A (Fire Fighting)	Shift Production Team	
Team - B (Support Team)	All Maintenance	
Team - C (Rescue Team)	All Trained First Aiders	
Advisory Team	All QA staff	
Communication Team	Logistics / Security Team	

A brief description of the possible hazards in handling hazardous materials is given below.

1) Leakage & Spillage of:

A. VAM(Vinyl Acetate Monomer),
B. Di-Butyl Pthalate
C. Octanol
D. Formaldehyde
E. GH-17 (Poly Vinyl Alcohol)
F. Potassium per Sulfate
G. Sodium bi Carbonate

2) Fire & Explosion of:

A. Compressor
B. Solvents Storage
C. Flash Fire
D. Panel(Electrical)

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, Firefighting 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.

ROLE OF KEY PERSONNEL

Chief Emergency Controller

He has overall responsibility for direction operation and calling outside help for emergency control center. As he is required to take decisions by collaboration between all processes heads, the factory manager (Leader- Conversion Processes) of the Jyoti Resins & Adhesives Ltd. shall act as the Chief Emergency Controller.

The duties and responsibilities of Chief Emergency Controller are as follow. Being aware of the emergency immediately he will go to the emergency control room. (Security cabin)

1. Over all in-charge of the situation and takes responsibility for overall control.
2. Decide whether a major emergency exist and on declaration of a major emergency in consultation with the Site Controller. Ensure that the outside emergency services and mutual help are called, the off-site plan gets activated and if necessary, nearby factories and population are informed. Inform about the situation to other manufacturing locations.
3. Ensure that the key personnel are called in.
4. Exercise direct operational control of those parts of the works outside the affected area. Continually review and assess possible developments to determine the most probable course of events.
5. If necessary, direct for evacuation of neighboring population.
6. Ensure that casualties are receiving adequate attention. Arrange for hospitalization of victims and additional help if required. Ensure that the relatives are communicated.
7. Inform and liaise with the Chief Officers of the Fire and Police Services, District Emergency Authority and with the Factory Inspectorate and experts on health and safety. Provide advice on possible effects on areas outside the factory.

8. In the case of prolonged emergencies involving risk to outside areas by windblown materials, contact the local Meteorological Office to receive early notification of impending changes in weather conditions.
9. Review the authorized statements prepared for the news media.
10. Direct for the preservation of evidence.
11. 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 bythe authorities.

Site Controller

A. His primary duty is to take charge at the site of the incident. In the initial stages he will 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 will be 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.

1. He will proceed to the scene immediately on being aware of the emergency and its location.
2. 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.

B. Assume the duties of the Chief Emergency Controller till his arrival. For this purpose he will depute his alternative (deputy) Site controller at the site of scene and he will go to the control center.

1. Direct and evacuation of all personal likely to be affected by the emergency.
2. Ensure that the outside emergency services, including mutual aid, have been called in if necessary.
3. Ensure that key personnel have been called in.

C. Direct all processes/ functions within the affected areas with the following priorities.

1. Secure the safety of personnel.
2. Minimize damage to property and the environment.

D. Direct rescue and firefighting operations until the arrival of the outside Fire Brigade, when he will relinquish control to the Head of the Fire Brigade.

E. Search for casualties.

F. Evacuate non-essential workers to the assembly points.

G. Set up a communications point and establish telephone / messenger contact as appropriate with the emergency control center.

H. Give advice and information as requested to the Head of Safety & Fire and other emergency services.

I. Brief the main Incident Controller and keep informed of developments.

J. Preserve evidences that will be necessary for subsequent inquiry into the cause of the emergency and concluding preventive measures.

Team – A (FIRE FIGHTING STAFF – PLANT OPERATOR)

These task forces known as Firefighting staffs will be trained to handle various firefighting equipments during emergency situations. They shall report to the Site controller for fire extinguishing related task.

1. First Aid team shall rush to the incident spot and get the feedback from the Site controller.
2. The team determines the origin and causes of fires. They collect evidence, interview witnesses and decide the plan.
3. Select correct fire extinguisher for firefighting.
4. Fighting fire/ gas leak and spill control till fire brigade takes the charge.
5. To help to the fire brigade and mutual aid terms if it is so required.

Team – B (SUPPORT TEAM – MAINTENANCE OPERATOR)

This task force known as Support team will help 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.

Team – C (TRAINED FIRST AIDER)

This task force known as First Aid staffs are trained for emergency handling shall be available all the times in duty hours to assist the personal during emergency. First Aid team shall rush to the assembly point and get the feedback from the Site controller about the emergency

1. As per the instruction, they rush to the area of emergency and assess the situation.
2. Diagnoses the situation and decides whether the causality shall be moved to the safe area.
3. The injured personal are moved to the safe place and give first aid as required by the situation.
4. Move / transport the causalities to the ambulance / nearby medical center for necessary medical assistance.

Team-D (COMMUNICATION TEAM)

This task force known as Communication team will help 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:

- Inform all the employees about the emergency and ask them to come to the assembly point.
- Asking for the ambulance / fire brigade as directed by the Chief Emergency Controller.
- Informing surrounding factories and the public as directed by the site main controller.
- Planning of works entrances in liaise 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.
- Assistance at communications centers to handle outgoing and incoming calls and to act as messengers if necessary.

Team-E-Advisory Team (QA PERSONNEL)

This task force known as Advisory team helps the personal and organization during emergency situations. The roles and responsibilities of the team will be:

1. Assist chief controller or site controller in their work.
2. Guide site controller to take emergency shout down in case of emergency.

3. Guide rescue team to first Aid by referring MSDS.
4. Guide firefighting team to used correct fire extinguisher to extinguish fire.

Emergency Plan for few scenarios:

A. In case of failure of Ammonia storage tank / Cylinders/ Ammonia Pipeline

Following are the general guideline for emergency action.

1. Raise the alarm
2. Start the fire monitor and adjust the flow rate of water over the leak point.
3. Declare the emergency and follow the role & responsibility.
4. Check the wind direction, decide the assembly point.
5. One of security should collect all the visitors & contract labors to the assembly point.
6. Inform to the all surrounding unit & nearby unit.
7. Assess the leak situation & confirm the location of leak.
8. Arrange SCBA, spark proof tool, other required PPE's with the help of supporting team B.
9. Try to attend the leak of the proper PPE's and with the help of advisory team & incident team.
10. Take head count at site and inform to the chief controller.
11. Also take head count at the assembly point and tally.
12. Search for missing person if any.
13. Give first aid to the person who need it and check for further treatment or hospitalization required.
14. Confirm the massage of incident attend to the main controller & raise the all clear siren.
15. Collect the photograph and other evidence to cause fine.

B. 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.

1. Raise the alarm through nearest MCP
2. Inform security and shift in charge.

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

C. In Case of release of Solvents/Chemicals from Tankers/Tanks/ Pipe lines inside the factory premises:

This area is focused on Methanol & Butanol, Sulphuric acid, Hydrochloric Acid & Ammonium Hydroxide etc 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.

EMERGENCY CONTROL CENTRE (ECC)

The centralized emergency control center will be situated at the security cabin near the main gate from which the operation to handle the emergency are directed and coordinated. The center will be 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, ambulance service etc. will be displayed at the required location along with emergency control centre and security gate.

Emergency Control Centre Will Contain the Following Facilities:

a. Adequate number of external telephones
b. Adequate number of internal telephones.
c. Plans of the location
d. Stationeries
e. Copies of this on-site and off-site emergency plans.

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

Fire extinguishers of suitable types and hydrants will be provided at almost all the places of plant.

MEDICAL ARRANGEMENTS

First Aid boxes & first-aider list will be kept at security cabin. In case of any medical assistance other than first aid, the Admin in charge/ Site- SHE representative arrange for a vehicle to shift the casualty to the below mentioned hospital, or call an ambulance to mobilize the casualty to the medical center.

TRANSPORT AND EVACUATION ARRANGEMENTS

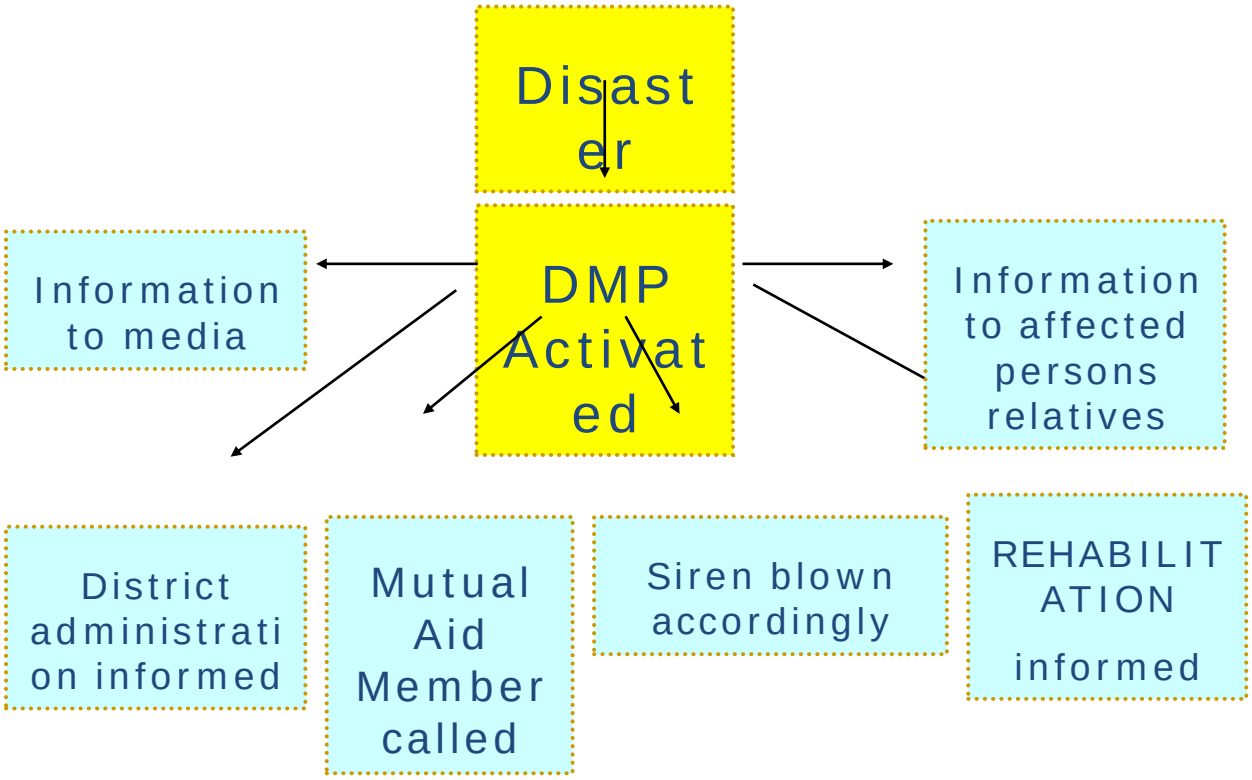
In a major emergency, it will be necessary to evacuate personnel from affected areas and to further evacuate non-essential workers from areas likely to be affected should the emergency escalate.

A common siren (wailing) will be provided for the evacuation of people. On hearing the siren, people will 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.

Ref: Rule 13 of MSIHC for onsite Emergency

OFF SITE EMERGENCY



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.

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 firefighting, Evacuation (of surrounding population), Medical treatment, shelter, food, transport or communications.

The responsibilities of outside organization will be to render services as follows during emergency.

Following are the general guideline for emergency action:

1. Close main valve
2. 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.
3. Switch off electricity (main).
4. Assemble outside the office, away from Electric Poles & Wires.
5. 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:

1. Intimate nearest police station & stimulate off site emergency plan
2. Stop unloading / loading operations (if any)
3. Intimate civil defense dept. about the situation
4. Security persons shall protect & control law & order.

MUTUAL AID SCHEME

Outside organization if involved in assisting during onsite emergency.

Responsibility assigned

Regular mocks are being conducted 6 monthly to ensure preparedness for handling emergency. For detailed information on the key responsibilities please refer point 2 of this schedule.

Besides this following administrative agencies and organizations shall be involved to perform their respective activities to bring the emergency situation under control.

1. District Collectorate
2. DSP
3. Dy. Director (IS&H)
4. Chief Medical Officer

5. Dy. Conservator

MARG has been formed under the guidance and leadership of Joint & Deputy Director of Industrial Safety & Health (DISH) in various Industrial Estates with an object to avail mutual aid from the Member Industries.

It is essential that:

1. Each MARG Member maintains a list of equipment that can be spared which should be kept updated.
2. Each MARG Member has competent adviser.
3. There should be an effective system of informing neighboring communities of any industrial emergency and what to do in case of the emergency.
4. Meet regularly.
5. Share Information.
6. Discuss major Accidents, Emergencies to learn lesson from them.
7. Have regular joint drills based on Onsite emergency plans & off site emergency plan.
8. Communicate, share, and participate with other MARG Members.
9. Communicate with emergency responders like city fire brigade, hospitals, Ambulance service& police etc.
10. Standardize terminology used to identify the key emergency management groups and personnel, for example-Emergency co –coordinators, Site controller, etc.
11. Ensure availability of services of competent advisor.

Responsibilities of MARG Members related to Emergency Management:

1. Each MARG Member to ensure that individual emergency response plans and procedures are developed and tested at frequent intervals.
2. During the rehearsals, appoint 2-4 independent observers.
3. After each rehearsal, have a review meeting and record the minutes/response time.
4. Note down any feedback or suggestion for improvement of the plan.
5. Periodically review and revise the on-site emergency plan.
6. Update the same and
7. Communicate to all stakeholders.

OUTSIDE HELP

Police Department

1. The police should assist in controlling of the accident site, organizing evacuation and removing of any seriously injured people to hospitals.

2. Co-ordination with the transport authorities, civil defence and home guards
3. Co-ordination with army, navy, air force and state fire services
4. Arrange for post mortem of dead bodies
5. Establish communication center

Fire Brigade

1. The fire brigade shall organize to put out fires and provide assistance as required.
2. Hospitals and Doctors
3. Hospitals and doctors must be ready to treat any injuries.
4. Co-ordinate the activities of Primary Health Centers and Municipal Dispensaries to ensure required quantities of drugs and equipment's
5. Securing assistance of medical and paramedical personnel from nearby hospitals/institutions
6. Temporary mortuary and identification of dead bodies

Media

1. The media should have ready and continuous access to designated officials with relevant information, as well as to other sources in order to provide essential and accurate information to public throughout the emergency and to help avoid confusion
2. Efforts should be made to check the clarity and reliability of information as it becomes available, and before it is communicated to public
3. Public health authorities should be consulted when issuing statements to the media concerning health aspects of chemical accidents
4. Members of the media should facilitate response efforts by providing means for informing the public with credible information about accidents involving hazardous substances

Non-Governmental Organizations (NGO)

1. NGO's could provide a valuable source of expertise and information to support emergency response efforts. Members of NGOs could assist response personnel by performing specified tasks, as planned during the emergency planning process. Such tasks could include psychological & social assistance to members of community and response personnel.
2. Duties of NGO are listed below:
3. Evacuation of personnel from the affected area
4. Arrangements at rallying posts and parking yards

5. Rehabilitation of evacuated persons
    1. Co-ordination with other agencies such as police, medical, animal husbandry, agriculture, electricity board, fire services, home guards and civil defence.
    2. Establishing shelters for rescue, medical, fire fighting personnel.

Ref: Rule 14 of offsite MSIHC for offsite Emergency

7.3.11.6 *Liver function tests (LFT) during pre-placement and periodical examination.*

LFT will be conducted in the consultation of Occupational Doctor. Evaluations should be conducted frequently as recommended by an experienced occupational health physician

7.3.11.7 *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:

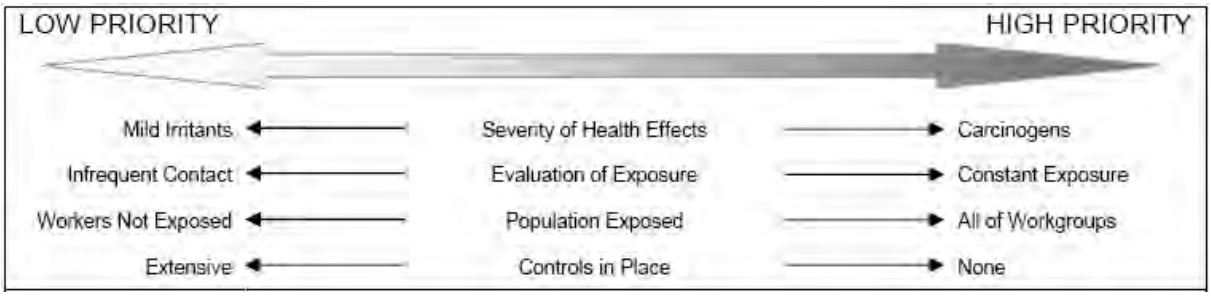
a. Name of department or process;
b. Nature of operation;
c. Raw materials and quantities used;

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 have 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.