Risk Assessment Report of Capacity Expansion project for Manufacturing of Unsaturated Polyester Resin from 250 MT per Month to 1200 MT per Month in addition with Proposed Project for Manufacturing of Pigment Paste with the Capacity of 50 MT per month at G-1, 466/467, RIICO Industrial Area, Phase-1, Bhiwadi, Rajasthan For: M/s Revex Plasticisers Pvt. Ltd.

ENVIRONMENT CONSULTANT

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1. INTRODUCTION TO RISK ASSESSMENT

Chemical industry is associated with potential hazards that effect to the employee and environment. In the event of failure (Leak or Catastrophic rupture) will require the assistance of emergency services to handle it effectively. The operation shall be taken out under the well management and control by the qualified safety manager.

Disaster management plan shall be formulated with an aim of taking precautionary steps to avert disasters and also to take such action after the disaster which limits the damage to the minimum.

(A) Objectives of Risk Assessment

Industrial accident results in great personal & financial loss. Managing these accidental risks in today's environment is the concern of every industry including Chemical also, because either real or perceived incidents can quickly jeopardize the financial viability of a business. Many facilities involve various manufacturing processes that have the potential for accidents which may be catastrophic to the plant, work force, and environment or public.

The main objective of the risk assessment study is to propose a comprehensive but simple approach to carry out risk analysis and conducting feasibility studies for industries and planning & management of industrial prototype hazard analysis in Indian context.

(B) Hazard Identification & Risk Assessment (HIRA)

Hazard analysis involves the identification and quantification of the various hazards (unsafe condition) that exist in the plant. On the other hand, risk analysis deals with the identification and quantification of the risk, the plant equipment and Personnel are exposed to due to accidents resulting from the hazards present in the plant.

Risk analysis involves the identification and assessment of risks to the population who are exposed to as a result of hazards present. This requires an assessment of failure

probability credible accident scenario, vulnerability of population etc. Much of this information is difficult to get or generate consequently, the risk analysis in present case is confined to maximum credible accident studies and safety and risk aspect related to proposed production.

Activities requiring assessment of risk due to occurrence of most probable instances of hazard and accident are both onsite and off-site.

On-site

- Exposure to fugitive dust, noise, and other emissions
- Housekeeping practices requiring contact with solid and liquid wastes
- Emission/spillage etc. from storage and handling

Off-site

- Exposure to pollutants released from offsite/ storage/related activities
- Contamination due to accidental releases or normal release in combination with natural hazard
- Deposition of toxic pollutants in vegetation / other sinks and possible sudden releases due to accidental occurrences.

1.1 Raw Material Requirement (for production of Polyester Resin):

Raw material required for the manufacturing of unsaturated polyester resin and their source are given in below tables:

Table 1: Raw Material Requirement

S.No.	Raw Materials	Supply Source	Storage Area
For production of Unsaturated Polyester resin			
1	Pthallic Anhydride	Trimulai Chemicals	Warehouse
2	Maleic Anhydride	Optimistic (Trimulai Chemicals Indentor)	Warehouse
3	Di ethylene Glycol	Reliance/IOCL	Drums in Warehouse
4	Mono Ethylene Glycol	Reliance/IOCL	Drums in Warehouse

5	Propylene Glycol	Shell (Over Seas Polymer Importer)	Drums in Warehouse
6	Styrene Monomer	Shell (Bhansali Polymer Importer)	Drums in Warehouse
For production of Pigment Paste			
1	Black	Aditya Birla	Warehouse
2	White	Huntsman	Warehouse
3	Green	Subhashri Pigments Paste	Warehouse
4	Blue	Subhashri Pigments Paste	Warehouse
5	Red	Sudarshan Chemicals	Warehouse

Table 2: Capacity of Raw Materials

S.No.	Raw material	Existing Capacity MT/Month	Proposed Capacity MT/Month	Total
1	Pthalic Anhydride	40000	160000	200000
2	Maleic Anhydride	40000	160000	200000
3	Di ethylene Glycol	50000	200000	250000
4	Mono Ethylene Glycol	15000	60000	75000
5	Propylene Glycol	12500	50000	62500
6	Styrene Monomer	75000	300000	375000

1.2 Details of finished products:

Table 3: Details of Finished Products

S.No.	Product	Existing Qty.	Qty. after expansion	Physical state
1.	Unsaturated polyester resin	250 MT per Month	1200 Mt per Month	Liquid
2.	Pigment paste	-	50 Mt per Month	Viscous liquid

1.3 List of Hazardous Chemicals along with Their Toxicity Level as Per MSIHC Rules

Table 4: List of hazardous chemicals along with their toxicity levels as per MSIHC rules

S.No.	Chemicals	Hazard	IDLH	LD50	TLV as TWA	LEL	UEL	FP	BP	H F R as per NFPA
1	Phthalic Anhydride	Combustible	60 mg/m3	Not applicable	0.002 mg/m^3	1.7%	10.4%	152°C	284°C	2 1 0
2	Maleic Anhydride	Corrosive	10 mg/m3	Not applicable	Not applicable	1.4%	7.1%	102°C	202°C	3 1 1
3	Di ethylene Glycol	Combustible	Not applicable	Not applicable	Not applicable	1.6%	10.8%	124°C	245°C	1 1 0

S.No.	Chemicals	Hazard	IDLH	LD50	TLV as TWA	LEL	UEL	FP	BP	H F R as per NFPA
4	Mono Ethylene Glycol	Combustible	700 ppm	Not applicable	20 ppm	1.1%	12.7%	60°C	171°C	3 2 0
5	Propylene Glycol	Combustible	Not applicable	Not applicable	Not applicable	2.6%	12.6%	101°C	188.2°C	0 1 0
6	Styrene Monomer	Flammable	700 ppm	Not applicable	20 ppm	0.9%	6.8%	31°C	145°C	2 3 2

Source: Cameo Chemicals

The Toxicity level of hazardous chemicals as per Manufacture, storage and import of Hazardous Chemical (Amendment) Rules, 2000 (MSIHC) is shown as below:

Table 5: Toxicity Index as per MISHC rules 2000

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

2. HAZARD IDENTIFICATION AND PREVENTIVE MEASURES

2.1 Identification of Types of Hazards (HAZID)

Disaster at plant may occur due to following hazards:

- Fire in Electric Panels & fuel storage area
- Runaway reaction
- Explosion in Boiler house
- Electrocution
- Cleaning of barrels, which have held chemical substances
- Fall of material

The potential hazardous areas and the likely accidents with the concerned area have been enlisted below Table.

Table 6: Possible Hazardous Locations Onsite

S. No.	Hazardous Area	Likely Accident
1.	Boiler area	Explosion
2.	Storage area	Fire/Explosion & toxic exposure
3.	Electrocution	Lose fitting
4.	Electrical rooms	Fire and electrocution
5.	Transformer area	Fire and electrocution
6.	Cable tunnel	Fire and electrocution
8.	Fuel storage area (LPG)	Fire hazard
9.	Chimney	Air pollution

A) Fire

Fire can be observed in the boiler area, storage yard, Fuel spillage, Electrical rooms etc. due to accidental failure scenario.

B) Boiler Explosion/Explosion due to chemicals

Explosion may lead to release of heat energy & Pressure waves. Table 7 shows tentative list of Damages envisaged due to different heat loads.

Table 7: List of Damages Envisaged at Various Heat Loads

S. No.	Heat loads (kW/m^2)	Likely Accident	
		Damage to Equipment	Damage to People
1.	37.5	Damage to process equipment	100% lethality in 1 min. 1% lethality in 10 sec
2.	25.0	Minimum energy required to ignite wood	50% Lethality in 1 min. Significant injury in 10 sec
3.	19.0	Maximum thermal radiation intensity allowed on thermally unprotected equipment	--
4.	12.5	Minimum energy required to melt plastic tubing	1% lethality in 1 min
5.	4.0	--	First degree burns, causes pain for exposure longer than 10 sec
6.	1.6	--	Causes no discomfort on long exposures

***Source**: World Bank (1988). Technical Report No. 55: Techniques for Assessing Industrial Hazards. , Washington, D.C: The World Bank.*

Table 8: List of Damages Envisaged at Various Overpressure Level

Overpressure (bar)	Damage
0.001 0.002 0.003	• Annoying noise (137 dB if of low frequency 10-15 Hz) • Loud noise (143 dB, sonic boom glass failure) • Occasional breaking of large glass windows already under strain
0.007	• Breakage of small windows under strain
0.010 0.020	• Typical pressure for glass breakage • Projectile limit; some damage to house ceilings; 10% window glass broken
0.027	• Limited minor structural damage
0.034 0.034 to 0.068	• Large and small windows usually shattered; occasional damage to window frames
0.048 0.068 0.068 to 0.136	• Minor damage to house structures • Partial demolition of houses, made uninhabitable • Corrugated asbestos shattered; corrugated steel or aluminum • panels, fastenings fail, followed by buckling, wood panels (standard housing) fastenings fail, panels blown in
0.088 0.136 0.136 to 0.204	• Steel frame of clad building slightly distorted • Partial collapse of walls and roofs of houses • Concrete of cinder brick walls, not reinforced, shattered
0.157	• Lower limit of serious structural damage

0.170 0.204 0.204 to 0.272	• 50% destruction of brickwork of houses • Heavy machines (3,000 lb) in industrial building suffered little damage; steel frame building distorted and pulled away from foundations. • Frameless, self -framing steel panel building demolished; rupture of oil storage tanks
0.272 0.340	• Cladding of light industrial buildings ruptured • Wooden utility poles snapped; tall hydraulic press (40,000 lb) in building slightly damaged
0.340 to 0.476 0.476	• Nearly complete destruction of houses • Loaded train wagons overturned
0.476 to 0.544 0.612 0.680 20.414	• Brick panels, 8-12 inches thick, not reinforced; heavy machine tools (7,000 lb) moved and badly • Loaded trains boxcars completely demolished • Probable total destruction of buildings; heavy machines tools (7,000 lb) moved and badly damaged, very heavy machines tools (12,000 lb) survived. • Limit of crater lip

(CCPS Guidelines)

C) Electrocution

Fatal Accident due to carelessness in handling electrical appliances may lead to electrocution.

D) Consequences of Toxic Release

The effect of exposure to toxic substance depends upon the duration of exposure and

the concentration of the toxic substance.

Short-term exposures to high concentration give Acute Effects while long term exposures to low concentrations result in Chronic Effects.

Only acute effects are considered under hazard analysis, since they are likely credible scenarios. These effects are:

- Irritation (respiratory system skin, eyes)
- Narcosis (nervous system)
- Asphyxiation (oxygen deficiency)
- System damage (blood organs)

Following are some of the common terms used to express toxicity of materials.

- Threshold Limit Value (TLV): it is the permitted level of exposure for a given period on a weighted average basis (usually 8 h for 5 days in a week)
- Short Time Exposure Limit (STEL): It is the permitted short term exposure limit usually for a 15 minutes exposure.
- Immediately Dangerous to life and health (IDLH): It represents the maximum concentration of a chemical from which, in the event of respiratory failure, one could escape within 30 minutes without a respirator and without experiencing any escape/impairing (eg. Severe irritation) or irreversible health effects.
- Lethal Concentration Low (LCLo): It is the lowest concentration of a material in air, other than LC50, which has been reported to cause a death in human or animals.
- Toxic Concentration Low (TCLo): It is the lowest concentration of a material in air, to which humans or animals have been exposed for any given period of time that has produced a toxic effects in humans or produced carcinogenic, neoplastigenic or

teratogenic effect in humans or animals.

- Emergency Response Planning Guidelines 1 (ERPG1): The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour (without a respirator) without experiencing other than mild transient adverse health effects or without perceiving a clearly defined objectionable odor.
- Emergency Response Planning Guidelines 2 (ERPG2): The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.
- Emergency Response Planning Guidelines 3 (ERPG3): The maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.

F) Meteorology/Stability Class

Atmospheric stability plays an important role in the dispersion of the chemicals. "Stability means, its ability to suppress existing turbulence or to resist vertical motion".

Atmospheric stability plays an important role in the dispersion of chemicals. "Stability means, its ability to suppress existing turbulence or to resist vertical motion".

Dispersion of vapors largely depends upon the Stability Class. Various stability classes that are defined as Pasquill classes are:

- A Very Unstable
- B Unstable
- C Slightly Unstable
- D Neutral

- E Stable
- F Very Stable

The stability class for a particular location is generally dependent upon:

- Time of the Day (Day or Night)
- Cloud Cover
- Season
- Wind Speed

Six stability classes from A to F are defined while wind speed can take any one of numerous values. It may thus appear that a large number of outcome cases can be formulated by considering each one of very many resulting stability class-wind speed combinations. However in fact the number of stability class - wind speed combinations that needs to be considered for formulating outcome cases in any analysis is very limited. This is because, in nature, only certain combinations of stability class and wind speed occur. Thus, for instance combinations such as A-3 m/s or B-5 m/s or F-4 m/s do not occur in nature. As a result only one or two stability class - wind speed combinations need to be considered to ensure reasonable completeness of Quantitative Risk Analysis study. Furthermore, though wind speeds less than 1 m/s may occur in practice, none of the available dispersion models, including state-of-art ones, can handle wind speeds below 1 m/s. Fortunately, wind speed does not influence consequences as much as stability class and for a given stability class, the influence of wind speed is relatively less. On the other hand, consequences vary considerably with stability class for the same speed.

Except during the monsoon months little or no cloud cover along with the prevailing low wind velocities results in unstable conditions during the day (C or D) and highly stable conditions (E or F) at night. During the three months of monsoons, the wind

velocities are generally higher and cloud cover generally present. This results in stability class of D during the day and E or F during the night. The stability class distribution over the year roughly works out as below:

A – B - C	17%
D	50%
E or F	33%

The following wind velocity/ stability class combinations & frequencies are used for Quantified Risk Analysis.

D – 5 m/s

D – 3 m/s

F – 2 m/s

2.2 Risk Analysis Methodologies

The methodology includes,

- Hazard identification,
- Selection of potential loss scenarios,
- Simulation of release source model on DNV‟s PHAST software
- Plotting the damage contour on site map

These steps undertaken to carry out risk assessment for this project are described below in Chapter.

Hazard Identification is a critical step in Risk Analysis. Many aids are available, including experience, engineering codes, checklists, detailed process knowledge, equipment failure experience, hazard index techniques, What-if Analysis, Hazard and Operability (HAZOP) Studies, Failure Mode and Effects Analysis (FMEA), and Preliminary Hazard Analysis (PHA). In this phase all potential incidents are

identified and tabulated. Site visit and study of operations and documents like drawings, process write- up etc. are used for hazard identification. In the present case, the release of hazardous chemicals (as per MSIHC rules) can lead to undesirable consequences like toxic exposure/ fire/ explosion.

3. PROPOSED MITIGATION MEASURES

(A) Preventive Measures for Electricity Hazard

- All electrical equipment's is to be provided with proper earthing. Earthed electrode are periodically tested and maintained
- Emergency lighting is to be available at all critical locations including the operator's room to carry out safe shut down of the plant
- Easy accessibility of firefighting facilities such as fire water pumps and fire alarm stations to be considered
- All electrical equipment's are to be free from carbon dust, oil deposits, and grease
- Use of approved insulated tools, rubber mats, shockproof gloves and boots, tester, fuse tongs, discharge rod, safety belt, hand lamp, wooden or insulated ladder and not wearing metal ring and chain.
- Flame and shock detectors and central fire announcement system for fire safety are to be provided.
- Temperature sensitive alarm and protective relays to make alert and disconnect equipment before overheating is to be considered
- Danger from excess current due to overload or short circuit is to be prevented by providing fuses, circuit breakers, thermal protection

(B) Precautionary Measures for Falling material

- Safety helmets to be used to protect workers below against falling Material
- Barriers like a toe boards or mesh guards is to be provided to prevent items from slipping or being knocked off the edge of a structure.
- An exclusion zone is to be created beneath areas where work is taking place.
- Danger areas are to be clearly marked with suitable safety signs indicating that access is restricted to essential personnel wearing hard hats while the work is in progress.

3.1 Material handling hazards and controls:

Table 9: Raw material storage hazards and controls

S.No	Name of material stored	Quantity (max.)	Operating press/temp	Type of storage	Preventive measures	First aid measures	Persons affected
1	Phthalic Anhydride	500000	NTP	Separated from combustible substances, reducing agents, strong oxidants, strong bases, strong acids and food and feedstuffs. See Chemical Dangers. Ventilation along the floor.	**Inhalation-** Use local exhaust or breathing protection. **Skin-** Protective gloves. Protective clothing. **Eyes-** Wear safety goggles or eye protection in combination with breathing protection. **Ingestion-** Do not eat, drink, or smoke during work.	**Inhalation-** Fresh air, rest. Half-upright position. **Skin-** Remove contaminated clothes. Rinse and then wash skin with water and soap. **Eyes-** First rinse with plenty of water for several minutes (remove contact lenses if easily possible). **Ingestion-** Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink.	• Operators • Maintenance officer • Technicians

2	Maleic Anhydride	300000	NTP	Dry. Separated from strong oxidants, strong bases and food and feedstuffs.	**Inhalation-** Use local exhaust or breathing protection. **Eyes-** Wear safety goggles or eye protection in combination with breathing protection. **Ingestion-** Do not eat, drink, or smoke during work.	**Inhalation-** Fresh air, rest. Half-upright position. **Skin-** First rinse with plenty of water for at least 15 minutes, then remove contaminated clothes and rinse again. **Eyes-** First rinse with plenty of water for several minutes (remove contact lenses if easily possible). **Ingestion-** Rinse mouth. Give one or two glasses of water to drink. Do NOT induce vomiting.	• Operators • Maintenance officer • Technicians

3	Di ethylene Glycol	300000	NTP	Dry. Well closed. Separated from strong oxidants.	**Inhalation-** Use ventilation **Skin-** Protective gloves. **Eyes-** Wear safety spectacles. **Ingestion-** Do not eat, drink, or smoke during work.	**Inhalation-** Fresh air, rest. **Skin-** Rinse skin with plenty of water or shower. **Eyes-** Rinse with plenty of water for several minutes (remove contact lenses if easily possible) **Ingestion-** Give one or two glasses of water to drink. Rinse mouth.	• Operators • Maintenance officer • Technicians
4	Mono Ethylene Glycol	80000	NTP	Separated from strong oxidants and food and feedstuffs. Cool. Keep in the dark.	**Inhalation-** Use ventilation, local exhaust or breathing protection. **Skin-** Protective gloves. Protective clothing. **Eyes-** Wear safety goggles or eye protection in combination with breathing protection. **Ingestion-** Do not eat, drink, or smoke during work.	**Inhalation-** Fresh air, rest. **Skin-** Remove contaminated clothes. Rinse skin with plenty of water or shower. **Eyes-** First rinse with plenty of water for several minutes (remove contact lenses if easily possible) **Ingestion-** Rinse mouth. Give one or two glasses of water to drink.	• Operators • Maintenance officer • Technicians

5	Propylene Glycol	200000	NTP	Separated from strong oxidants and alkalis. Dry. Well closed. Ventilation along the floor.	**Inhalation-** Avoid inhalation of mist and vapour. Use ventilation. **Skin-** Protective gloves. **Eyes-** Wear safety spectacles. **Ingestion-** Do not eat, drink, or smoke during work.	**Inhalation-** Fresh air, rest. **Skin-** Remove contaminated clothes. Rinse skin with plenty of water or shower. **Eyes-** Rinse with plenty of water (remove contact lenses if easily possible). **Ingestion-** Rinse mouth. Seek medical attention if you feel unwell.	• Operators • Maintenance officer • Technicians

6	Styrene Monomer	600000	NTP	Fireproof. Separated from incompatible materials. See Chemical Dangers. Cool. Keep in the dark. Store only if stabilized. Store in an area without drain or sewer access.	**Inhalation-** Use ventilation, local exhaust or breathing protection. **Skin-** Protective clothing. Protective gloves **Eyes-** Wear safety goggles or eye protection in combination with breathing protection. **Ingestion-** Do not eat, drink, or smoke during work.	**Inhalation-** Fresh air, rest. **Skin-** Remove contaminated clothes. Rinse and then wash skin with water and soap. **Eyes-** First rinse with plenty of water for several minutes (remove contact lenses if easily possible). **Ingestion-** Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink.	• Operators • Maintenance officer • Technicians

Source: Cameo Chemicals

3.2 Safe Practice for Handling, Storage, Transportation and Unloading of Hazardous Chemicals:

For Storage/Handling:

1. Separate from strong oxidant. & Keep it in well ventilated room.
2. Dyke wall shall be provided to all above ground storage tank.
3. Fire hydrant system shall be installed.
4. Safety shower and eye washer shall be installed near storage area.
5. Flame proof light fitting shall be provided at flammable storage area.
6. Proper selection of MOC for chemicals storage tank.
7. Sprinkler system shall be installed at flammable material storage area
8. Earthing/bonding shall be provided for static charges.
9. Flame arrestor shall be provided on flammable material storage tank vent.
10. Level gauge and level measurement instrument shall be provided on material storage tank.
11. Lightening arrestor on all chimney and building shall be provided.
12. Hazardous material should be stored away from the plant and safe distance shall be maintained.
13. Safety permit system shall be followed for loading, unloading of hazardous chemical.
14. Fencing, caution note, hazardous identification board should be provided.
15. Only authorized person shall be permitted in storage tank area and register will be maintained.

For Transportation & Unloading:

1. Solvent shall be received by road tanker and stored in above ground storage tank in separated bulk storage area.

2. Loading and unloading procedure shall be prepared for material received through road tanker.

3. Earthing/bonding shall be provided for static charges.

4. Flexible steel hose shall be used for unloading from the road tanker.

5. Flame proof electric motor shall be used during loading/unloading.

6. Fixed pipeline with pumps shall be provided for transfer to vessel.

7. TERM CARD will be provided to all transporters and shall be trained for transportation of hazardous chemicals.

8. Personal Protective Equipment (safety goggles, hand gloves, apron, masks, gum boots etc.) shall be provided.

3.3 Occupational Health Surveillance Programme

Health surveillance is the monitoring of a person's health to identify changes in health status due to occupational exposure to a hazardous substance. It includes biological monitoring. Ideally, the avoidance of work-related diseases should be achieved by the prevention or controlling exposures to hazardous substances in the workplace. Where a process cannot be designed or maintained to eliminate the risk of exposure, it may be necessary for workers to undergo health surveillance.

3.3.1 Aims of health surveillance:

i) Identify those at increased risk

Health surveillance is used to identify workers who have an increased risk of developing an occupational disease. For example, people who have existing skin, kidney, liver and eye disorders, heart problem; additionally smokers and pregnant

women are at increased risk of being severely affected if exposed to hazardous chemical.

ii) Compliance with regulations

Health surveillance is sometimes required by laws and codes of practice (for example, a worker exposed to lead in battery manufacture or a spray-painted exposed to isocyanates in two-pack paints). Each state or territory has regulations containing a schedule of hazardous substances for which health surveillance is mandated.

iii) Early detection

The major purpose of health surveillance is to detect adverse health effects at an early stage so that the worker may be protected from further injury, either by control of the process or by removal from exposure.

iv) Evaluating effectiveness of control measures

Health surveillance is not a control measure in itself and should not be the sole means of determining whether control measures are effective. However, it can provide useful information on the effectiveness of safe working practices.

v) Epidemiology and disease

Health surveillance can be used to evaluate the health experiences of groups of workers exposed to specific hazardous agents or working within a particular industry.

Workers should be made aware that health surveillance is sometimes necessary to ensure their ongoing health. Health surveillance is often used in addition to workplace monitoring. Workplace monitoring will only indicate the potential for exposure of workers to a hazardous substance. It can never be an indication of the actual amount of

substance absorbed or the effect on the body of absorbing the hazardous substance.

When a toxic substance (such as an industrial chemical) is present in the environment, it contaminates air, water, food, or surfaces in contact with the skin: environmental monitoring evaluates the amount of toxic agent in these media.

As a result of absorption, distribution, metabolism, and excretion, a certain internal dose of the toxic agent (the net amount of a pollutant absorbed in or passed through the organism over a specific time interval) is effectively delivered to the body and becomes detectable in body fluids.

Subsequent interaction with a receptor in the critical organ (the organ which, under specific conditions of exposure, exhibits the first or the most important adverse effect) leads to biochemical and cellular events. Both the internal dose and the elicited biochemical and cellular effects may be measured through biological monitoring.

3.3.2 Occupational Health Programme

- The health & physical hazards caused due to toxic, irritant, corrosive, flammable materials. All chemicals should be within Threshold Limit Value as per ACGIH.
- Monitoring of occupational hazards like noise, ventilation, chemical exposure etc. will be carried out regularly and its record will be maintained.
- Good housekeeping, use of PPE, Engineering controls, Enclosure processes, scrubber system, display of safety boards, SOP of loading / unloading, local exhaust ventilation, safety shower etc. are important safety measures have taken to keep these chemicals within TLV.
- Appropriate personal protective equipment will be provided & ensure the usage of them.

- Workers will be trained on safe material handling of hazardous chemicals.
- Prepare & display the safe operating procedure for hazardous chemicals storage, handling & transporting or using.
- Periodical medical examination of the workers & Liver Function Testes will be done.
- Employee training and education will be carried out.
- Control the noise at source by substitution, isolation, segregation, barriers etc.
- Local Exhaust ventilation and scrubber should be installed where it is required to reduce fumes, vapors, temperature and heat stress.
- Insulate all hot equipment to reduce air temperature.
- Reduce the level of physical activity by sharing workload with other or by using mechanical mean.

3.3.3 Minimization of the Manual Handling of Hazardous Substance

- Whether moving materials manually or mechanically, your employees should know and understand the potential hazards associated with the task at hand and how to control. Their workplaces to minimize the danger.
- Employers and employees should examine their workplaces to detect any unsafe or unhealthful conditions, practices, or equipment and take corrective action.
- Provide flameproof electrical motor & transfer chemicals through the pipelines.
- Use specially designed pallets to hold, move raw materials, finished products through work areas.
- Minimize lifting of raw materials, heavy loads by using appropriate platforms, trolleys etc.

- Avoid the moving, manual handling of hazardous material.

3.3.4 DO'S AND DONTS'

3.3.4.1 Handling of Chemicals

Do's	Don'ts

• Know the antidotes for chemical, which is to be handled. • Do keep material safety data sheet in locations where chemicals are being handled and study it. • Use appropriate personal protective equipment like gloves, aprons, and respirator; face shield etc. depending upon nature of the work. • Label every chemical that you use and tightly close the container. • Use eye wash fountain / safety shower in case of splash of chemicals in the eye or body for at least 15 minutes. • Segregate toxic, flammable chemicals and keep them under control. • In addition to draining and closing valves, lines should be blanked before taking up maintenance work. • Provide proper ventilation at the chemical handling area to limit their concentration within prescribed level.	• Do not store the chemicals that are incompatible with other chemicals. • Do not spill the chemicals. • Do not dispose chemical without neutralizing. • Do not keep large inventory of chemicals • Do not allow empty containers of hazardous chemicals to be used by others. • Do not use compressed air for transferring chemicals. • Do not stand near chemical transfer pump while it is in operation with temporary hose connection. • Pouring of chemicals by hand or doing siphoning by mouth should never be adopted. • Chemicals drums should never be moved without protection. • Do not attempt to neutralize the acid / alkali on the skin. Use water only. • Do not use solvent for cleaning

	hands.

3.3.4.2 Material Handling

Do's	Don'ts
• Use proper lifting tool and tackle having adequate capacity. • Only authorized persons should operate material handling equipment's. • Each tool, tackle or equipment should have number and safe working load (SWL) marked on it. • Assess weight of the material, distance to be carried and hazards etc. before lifting the load. • Inspect and test all the lifting tools and tackles regularly as per Factory Rules. • Wear Personal Protective Equipments while handling of material.	• Do not use the equipment for the purpose other than its design intention. • Do not allow personnel to move underneath lifted load. • Do not load the equipment above its safe working load. • Do not use make shift arrangements for lifting equipment without inspection and test? • Do not use effective tool and tackles. • Keep the tools & tackles free from adverse effect of atmosphere by applying suitable protective coating.

3.3.4.3 House Keeping

Do's	Don'ts

• Assign places for everything and maintain things at assigned places. • Clean the area after completion of work. • Use aisle space free for personnel and material movement. • Ensure adequate illumination\ and ventilation for the job.	• Do not leave combustible materials in the work area. • Do not smoke in the area of work. • Do not allow dust bin to overflow. • Do not generate extra waste. • Do not disturb the safety equipment from assigned location. • Do not block emergency switches and on/off

3.3.4.4 Fire Prevention

Do's	Don't

• Follow 'NO SMOKING' sign. • Deposit oily rags and waste combustible material in the identified containers and dispose them suitably. • Fire Hose used for any other purpose should be permanently marked and taken out of fire hydrant system. • Keep minimum inventory of flammable and combustible substances. • Take permission before breaking or removal of fire barrier and ensure subsequent relocation of fire barrier. • Check periodically the operability of fixed fire fighting system. • Attend any abnormality/deficiency with fire protection system promptly. • Provide earthling or bonding to prevent accumulation of static charges to tanks where flammable chemicals are stored / handled. • Use instruments that are intrinsically safe in explosive atmosphere.	• Do not leave flammable material like acetone, kerosene etc. used as cleaning agent at the work area. • Do not over tighten fire hydrant valves with F-lever. • Do not allow wild grass growth around storage of the gas cylinders and switchyard. • Do not obstruct accessibility to the fire related equipment. • Do not destroy the inspection tag provided with the fire equipment. • Do not misuse fire-fighting equipment other than intended purpose. • Do not store the flammable material in the open container. • Do not use instruments that are not intrinsically safe in the explosive atmosphere.

4. RISK REDUCTION MEASUREMENT & RECOMMENDATION IN VIEW OF SAFETY CONSIDERATION

- In order to ensure the safety of the installation, the facility should be constructed as per relevant codes and standards.
- As per consequence analysis, the damage distance may go outside the plant boundary as it involves the involvement as hazardous chemical. So care to be taken to prevent the leakage of such chemical by proper designing, preventing corrosion, proper periodic inspection and maintenance of all instruments/ equipments.
- Wind indicator should be provided at the highest level of the plant to know the wind direction which will help to take necessary action for any type of emergency.
- Automatic sprinkler system for the flammable material tanks may be provided as knock on effect in case of fire is possible.
- Inspection of the storage tanks as per prefixed inspection schedule for thickness measurement, joint and weld efficiency etc.
- Provision of flameproof electrical fittings / equipment's.
- Proper maintenance of earth pits.
- Strict compliance of security procedures like issue of identity badges for outsiders, gate passes system for vehicles, checking of spark arrestors fitted to the tank lorries etc.
- Strict enforcement of no smoking.
- Periodic training and refresher courses to train the staff in safety fire fighting/handling of toxic release.

- Employee training and education will be carried out.
- Structural fireproofing in the process area could be considered as a safety measure in the light of probable spill and fires in the area.
- Emergency drills should be carried out periodically to ensure preparedness must continue.
- Many operations involve use of highly toxic/flammable materials and these needs to be documented as SOPs. These must be made and kept updated on priority.
- Extensive training on use of Self Contained Breathing Apparatus (SCBAs) must be ensured for emergency control.
- Loose drums of waste materials must be removed from the working areas and close watch kept.
- Proper Earthing system needs to be provided at appropriate locations
- All electrical equipment needs to placed as per HAC.
- Ventilation should be provided for any enclosed are where hydrocarbon or toxic vapors may accumulate. Several such areas were noticed- these may be surveyed and tackled accordingly.
- All personnel should be trained in handling emergency situations and should be apprised of their role in handling emergency situation and to ensure adequacy of the emergency procedures simulated exercise should be carried out.
- Flame arrestor should be provided.
- Adequate number of caution boards highlighting the hazards of chemicals should be provided at critical locations.
- The health & physical hazards caused due to toxic, irritant, corrosive, flammable materials. All chemicals are within Threshold Limit Value as per ACGIH.
- Monitoring of occupational hazards like noise, ventilation, chemical exposure etc.

will be carried out regularly and its record will be maintained.

- Good housekeeping, use of PPE, Engineering controls, Enclosure processes, scrubber system, display of safety boards, SOP of loading / unloading, local exhaust ventilation, safety shower etc. are important safety measures have taken to keep these chemicals within TLV.
- Appropriate personal protective equipment will be provided & ensure the usage of them.
- Workers will be trained on safe material handling of hazardous chemicals.
- Prepare & display the safe operating procedure for hazardous chemicals storage, handling & transporting or using.
- Local Exhaust ventilation and scrubber should be installed where it is required to reduce fumes, vapors, temperature and heat stress.
- Reduce the level of physical activity by sharing workload with other or by using mechanical means.
- Pre-employment medical checkup and periodically medical examination will be done.
- Proper inspection and maintenance of all instruments like PSVs, temperature indicator etc to avoid any accident.
- Use foam, water spray or fog in case of large fire.
- Use dry chemical powder for small fire.
- During Startup/shutdown/commissioning proper SOPs to be followed, ensure that all the instruments/safety devices to be worked properly. It is also to be ensured that all instruments/safety devices work accurately for giving correct readings.
- As chemicals handled are hazardous nearby population should be made aware about them or awareness program to be held for nearby population with respect

to do/don't during any offsite emergency.

- Emergency shut-down valves (automatic/operator executed from control room) to be provided in the plant to contain the consequences of release of hazardous chemicals.
- Hydrocarbon/Fire detectors to be checked regularly for their operation when needed.

Following Fire safety devices/Provision will be provided to protect from any incidents:

- Water storage of adequate capacity to meet the requirements of water for firefighting purposes.
- Fire hydrants and automatic sprinkler system. Diesel driven pumps and headers to supply water to fire hydrant network.
- Adequate Portable fire extinguishers, sand bucket, wheeled fire & safety equipment should be provided at the required places.
- Equipment required for personal safety like blankets, gloves, apron, gum boots, face mask helmets, safety belts, first aid boxes etc. are provided. Proximity suits and self- contained breathing apparatus to be provided.
- Designated fire fighting team should be present to handle the emergency.

4.1 Disaster Management Plan

4.1.1 Definition

A major emergency in an activity/project is one which has the potential to cause serious injury or loss of life. It may cause extensive damage to property and serious disruption both inside and outside the activity/project. It would normally require the assistance of emergency services to handle it effectively.

4.1.2 Scope

An important element of mitigation is emergency planning, i.e. identifying accident possibility, assessing the consequences of such accidents and deciding on the emergency procedures, both on site and off site that would need to be implemented in the event of an emergency.

4.1.3 Objective

The overall objectives of the emergency plan will be:

- To localize the emergency and, eliminate it; and
- To minimize the effects of the accident on people and property.

Elimination will require prompt action by operations and works emergency staff using, for example, fire-fighting equipment, water sprays etc.

Minimizing the effects may include rescue, first aid, evacuation, rehabilitation and giving information promptly to people living nearby.

4.1.4 Phases of Disaster

There are various phases of Disaster including pre and Post Management of Hazardous Event that may or has occurred.

Warning Phase

Emergencies /disasters are generally preceded by warnings during which preventive measures may be initiated. For example uncontrollable build-up of pressure in process equipment, weather forecast give warning about formation of vapor cloud, equipment failure etc.

Period of Impact Phase

This is the phase when emergency /disaster actually strike and preventive measures may hardly be taken. However, control measures to minimize the effects may be taken through a well-planned and ready-to-act disaster management plan already prepared

by organization. The duration may be from seconds to days.

Rescue Phase

This is the phase when impact is almost over and efforts are concentrated on rescue and relief measures.

Relief Phase

In this phase, apart from organization and relief measures internally, depending on severity of the disaster, external help are also to be summoned to provide relief measures (like evacuations to a safe place and providing medical help, food clothing etc.). This phase will continue till normalcy is restored.

Rehabilitation Phase

This is the final and longest phase. During which measures required to put the situation back to normal as far as possible are taken. Checking the systems, estimating the damages, repair of equipment and putting them again into service are taken up. Help from revenue/insurance authorities need to be obtained to assess the damage, quantum of compensation to be paid etc.

4.1.5 Onsite Emergency Plan

The onsite emergency is an unpleasant situation that causes extensive damage to plant personnel and surrounding area and its environment due to in operation, maintenance, design and human error. Onsite plan will be applied in case of proposed expansion. Following point are to be taken into consideration:

- To identify, assess, foresee and work out various kinds of possible hazards, their places, potential and damaging capacity and area in case of above happenings.
- Review, revise, redesign, replace or reconstruct the process, plant, vessels and control measures if so assessed.
- Measures to protect persons and property of processing equipments in case of all kinds of accidents, emergencies and disasters

- To inform people and surroundings about emergency if it is likely to adversely affect them

4.1.5.1 Disaster Control Management System

Disaster Management group plays an important role in combating emergency in a systematic manner. Schematic representation Emergency Control Management system for M/s Revex Plasticizers Pvt. Ltd. is shown in **Figure 1.**

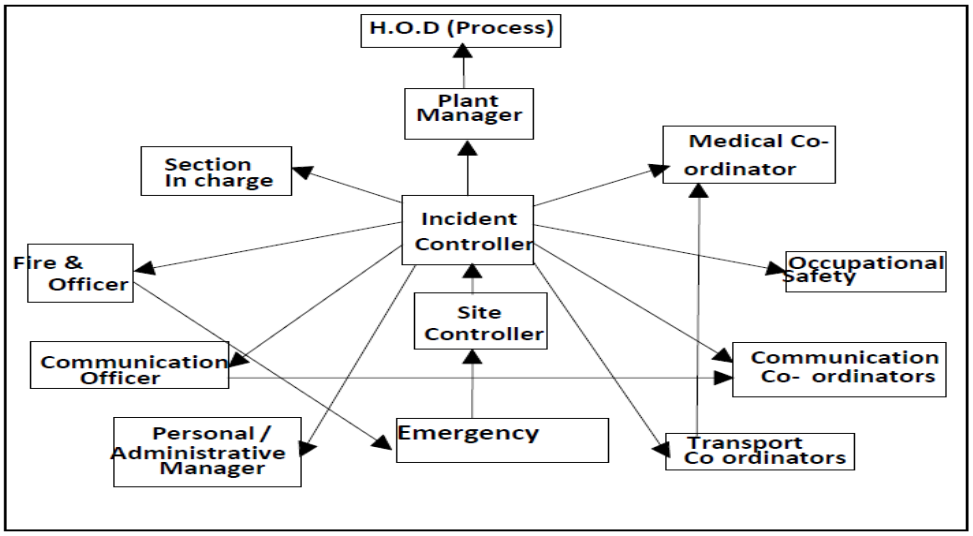

Figure 1: Onsite DMP - Disaster Control / Management System

4.1.5.2 Alarm System

A siren shall be provided under the control of Security office in the plant premises to give warning. In case of emergencies this will be used on the instructions to shift in charge that is positioned round the clock. The warning signal for emergency shall be as follows:

- Emergency Siren: Waxing and waning sound for 3 minutes.
- All clear signal: Continuous siren for one minute.

4.1.5.3 Communication

Walkies & Talkies will be located at strategic locations; internal telephone system EPBX with external P&T telephones would be provided.

4.1.5.4 Fire Fighting System

The fire protection system for the unit is to provide for early detection, alarm, containment and suppression of fires. The fire detection and protection system has been planned to meet the above objective an all–statutory and insurance requirement of Tariff Advisory Committee (TAC) of India. The complete fire protection system will comprise of the following.

A designated fire fighting team would be available in the facility to handle the fire emergency.

System Description of Fire Fighting System

The entire fire safety installation shall be compliant with the most stringent codes / standard for the entire complex to ensure the highest safety standard and uniformity of system. Further, before property is operational, the fire protection shall be fully operated and tested under simulated conditions to demonstrate compliance with the most stringent standards, codes and guidelines.

A) Fire pumping system

The fire pumping system shall comprise of independent electrical pumps for hydrant and sprinkler system, diesel engine driven pump & jockey pump for hydrant & sprinkler system.

Electrical pump shall provide adequate flow for catering requirement of hydrant system. Diesel engine driven fire pumps shall be provided for ensuring operation & performance of the system in case of total electrical power failure. Jockey pumps shall compensate for pressure drop and line leakage in the hydrant and sprinkler installation. Provision of PRS/ orifice plate shall be made in sprinkler riser to restrict pressure on sprinkler system.

Individual suction lines shall be drawn from the fire reserve tanks at the basement level and connected to independent fire suction header. The electric fire pumps, diesel engine

driven fire pumps and the jockey pumps shall all draw from this suction header.

Delivery lines from various pumps shall also be connected to a common header in order to ensure that maximum standby capacity is available. The sprinkler pump shall be isolated from the main discharge header by a non return valve so that the hydrant pump can also act as standby for the sprinkler system. The ring main shall remain pressurized at all times and Jockey pumps shall make up minor line losses. Automation required to make the system fully functional shall be provided.

B) Fire hydrant system

Internal and external standpipe fire hydrant system shall be provided with landing valve, hose reel, first aid hose reels, complete with instantaneous pattern short gunmetal pipe in the Complex.

The internal diameter of inlet connection shall be at least 80 mm. The outlet shall be of instant spring lock type gunmetal ferrule coupling of 63 mm dia. for connecting to hose pipe. Provision of flow switch on riser shall be made for effective zone monitoring. The flow switch shall be wired to FAP and shall indicate water flow on hydrant of the identified zone.

Recessed cupboard/ fire hydrant cabinet shall be strategically located for firefighting requirement. Location of cabinets shall be accessed as per compartmentation plan in consultation with the Architect. Provision of fire man's axe shall be made for internal hydrant.

External hydrant shall be located within 2 m to 15 m from the building to be protected such that they are accessible and may not be damaged by vehicle movement. A spacing of about 45-50 m between hydrants for the building shall be adopted. Details of fire hydrant system are as follows:

Piping: Mild Steel pipes (heavy class) as per IS: 1239 shall be provided throughout the

complex. Pipes buried below ground shall be suitably lagged with 2 layers of 400 micron polythene sheet over 2 coats of bitumen.

External Hydrants: External hydrants shall be provided all around the Complex. The hydrants shall be controlled by a cast iron sluice valve or butterfly valve. Hydrants shall have instantaneous type 63mm dia outlets.

For each external fire hydrant two numbers of 63mm dia. 15 m long controlled percolation hose pipe with gunmetal male and female instantaneous type couplings machine wound with GI wire, gunmetal branch pipe with nozzle shall be provided.

- Each external hydrant hose cabinet shall be provided with a drain in the bottom plate.
- Each hose cabinet shall be conspicuously painted with the letters "FIRE HOSE".

Hose Reel: Hose reel shall be heavy duty, 20 mm dia, length shall be 36.5 metre long fitted with gun metal chromium plated nozzle, mild steel pressed reel drum which can swing upto 170 degree with wall brackets of cast iron finished with red and black enamel complete.

C) Sprinkler system

Elaborate automatic sprinkler system shall be provided. The system shall be suitably zoned for its optimum functional performance.

The sprinkler system shall be provided with control valves, flow and tamper switches at suitable location and shall be connected to control module of the fire alarm system for its monitoring and annunciation in case of activation.

Sprinkler type along with its Quartzite bulbs rating shall be selected based on the requirement of the space and shall be specified accordingly. Inspector's test valve assembly with sight glass shall be provided at remote end with discharge piped to drain outlet / pipe.

D) Fire Extinguishers

Portable fire extinguishers of water (gas pressure), Carbon-di-oxide, foam type, Dry Chemical Powder and FM-200 or Clean agent type shall be provided as first aid fire extinguishing appliances. These extinguishers shall be suitably installed in the entire areas as per IS: 2190.

The appliances shall be so installed over the entire sections, that a person is not required to travel more than 15 m to reach the nearest extinguisher. These shall be placed or hanged on wall in a group on several suitable places.

E) Fire Pump

The fire pump shall be horizontally mounted, variable speed type. It shall have a capacity to deliver and developing adequate head so as to ensure a minimum pressure at the highest and the farthest outlet. The pump shall be capable of giving a discharge of not less than 150 per cent of the rated discharge, at a head of not less than 65 per cent of the rated head. The shut off head shall be within 120 per cent of the rated head.

The pump casing shall be of cast iron and parts like impeller, shaft sleeve, wearing ring etc. shall be of non-corrosive metal like bronze/brass/gun metal. The shaft shall be of stainless steel. Provision of mechanical seal shall also be made.

Bearings of the pump shall be effectively sealed to prevent loss of lubricant or entry of dust or water. The pump shall be provided with a plate indicating the suction lift, delivery head, discharge, speed and number of stages. The pump casing shall be designed to withstand 1.5 times the working pressure.

F) Foam System for Fire Fighting

Aqueous Film-Forming Foams (AFFF) based on combinations of fluoro-chemical surfactants, hydrocarbon surfactants, and solvents will be used as foam agent. These agents require a very low energy input to produce high quality fire-fighting foam.

Foam concentrate will be stored in a bladder tank system. In AFFF systems a bladder tank containing a nylon reinforced elastomeric bladder is used to store the foam

concentrate. System water pressure is used to squeeze the bladder providing firefighting foam concentrate, at the same pressure, to the proportional.

An aqueous film will be formed on the surface of the alcohol by the foam solution as it drains from the foam blanket.

This film is very fluid and floats on the surface of most alcohol. This gives the AFFF unequaled speed in fire control and control the spill fire.

First Aid

A first aid centre with adequate facilities shall be provided. It shall be maintained round the clock by a compounder cum dresser and a doctor. An Ambulance shall also be provided at site to carry affected people to hospital.

4.1.5.5 Security

The security requirements of the company premises shall be taken care of by CSO assisted by a Fire In charge. The team, apart from the normal security functions will manage the role required during a disaster management operation as a part of the crisis control team.

4.1.5.6 Safety

The safety wing led by a Safety Head will meet the requirement of emergencies round the clock. The required safety appliances shall be distributed at different locations of the plant to meet any eventualities. Poster/placards reflecting safety awareness will be placed at different locations in the plant area.

4.1.5.7 Evacuation Procedure

As the major hazard is only due to fire, which has more or less localized impact no mass evacuation, procedures are required. Evacuation would involve only the people

working very close to the fire area.

4.1.5.8 Personal Protective Equipment's (PPE)

This equipment is used mainly for three reasons; to protect personnel from a hazard while performing rescue/accident control operations, to do maintenance and repair work under hazardous conditions, and for escape purposes. The list of Personal Protective Equipment provided at the facility and their locations shall be available in ECC.

Effective command and control accomplish these functions necessitates personal trained in this On–site Disaster Management Plan with adequate facilities and equipments and equipment to carry out their duties and functions. These organizations and the facilities required to support their response are summarized in the following subsections.

Personal protective equipment's play a vital role in overcoming major disastrous situation saving life during onsite emergency. List of recommended Personal Protective equipment (PPE) is given below in **Table 10**.

Table 10: Summary of Recommended Personal Protective Equipment According to hazard onsite

Objective	Workplace Hazards	Suggested PPE
Eye and face protection	Flying particles, molten metal, liquid chemicals, gases or vapors, light radiation	Safety glasses with side-shields, protective shades, etc.
Head protection	Falling objects, inadequate height clearance, and overhead power cords	Plastic helmets with top and side impact protection
Hearing protection	Noise, ultra-sound	Hearing protectors (ear plugs or ear muffs)

Foot protection	Failing or rolling objects, points objects. Corrosive or hot liquids	Safety shoes and boots for protection against moving and failing objects, liquids and chemicals
Hand protection	Hazardous materials, cuts or lacerations, vibrations, extreme temperatures	Gloves made of rubber or synthetic material (Neoprene), leather, steel, insulation materials, etc.
Respiratory protection	Dust, fogs, fumes, mists, gases, smokes, vapors	Facemasks with appropriate filters for dust removal and air purification (chemical, mists, vapors and gases). Single or multi-gas personal monitors, if available
	Oxygen deficiency	Portable or supplied air (fixed lines). Onsite rescue equipment
Body / leg protection	Extreme temperatures, hazardous materials, biological agents, cutting and laceration	Insulating clothing, body suits, aprons etc. of appropriate materials

4.1.5.9 Mock Drill

As per the Industrial Major Accident Hazard Rules,

- Mock drills of the on-site emergency plan are conducted every six month.
- A detail report of the mock drill conducted is to be made immediately available to all the concerned authority

- Also, Major Fire and Minor Fire mock drills are conducted once in six months

4.1.5.10 Training

On job training to the engineers on various stages of risk analysis and preparedness during emergency to reflect in the operation of terminal, especially from the safety stand point. The fire team belonging to the firefighting department is to be intensively trained for the use of all equipment and in various fire fighting methods for handling different types of fires.

Details of Training facilities for	
• Safety	Monthly
• Fire Fighting	Monthly
• Occupational Health & safety	Monthly

4.1.5.11 Procedure for Testing & Updating the Plan

Simulated emergency preparedness exercises and mock fire fighting exercises including mutual aid scheme resources and in conservation with district emergency authority to be carried out time to time. Designated assembly point to be present in the facility with head count facility.

4.1.5.12 Disclosure of Information to Worker & Public Awareness System in Existence & Anticipated

- Safety awareness among workers by conserving various training programs and Seminars, competition, slogans etc.
- Practical exercise.
- Distribution and practices of safety Instructions.
- Safety Quiz contests.
- Display of Safety Posters & Safety Slogans.

- Developing Safety Instructions for every Job and ensuring these instructions/booklets or manuals by the workers.

4.1.6 Off-Site Emergency Planning

The off-site emergency plan is an integral part of any hazard control system. It is based on those accidents identified by the works management, which could affect people and the environment outside the works. Thus, the off-site plan follows logically from the analysis that took place to provide the basis for the on-site plan and the two plans therefore complement each other. The roles of the various parties that may be involved in the implementation of an off-site plan are described below. The responsibility for the off-site plan will be likely to rest either with the works management or with the local authority. Schematic representation of various organizations involved during emergency is shown below in **Figure 2**.

Either way, the plan must identify an emergency coordinating officer who would take overall command of the off-site activities. 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.
- If fire is escalating very fast it is necessary to evacuate people nearby as soon as possible.
- In acute emergency people are advised to stay indoors and shield themselves from the fire.

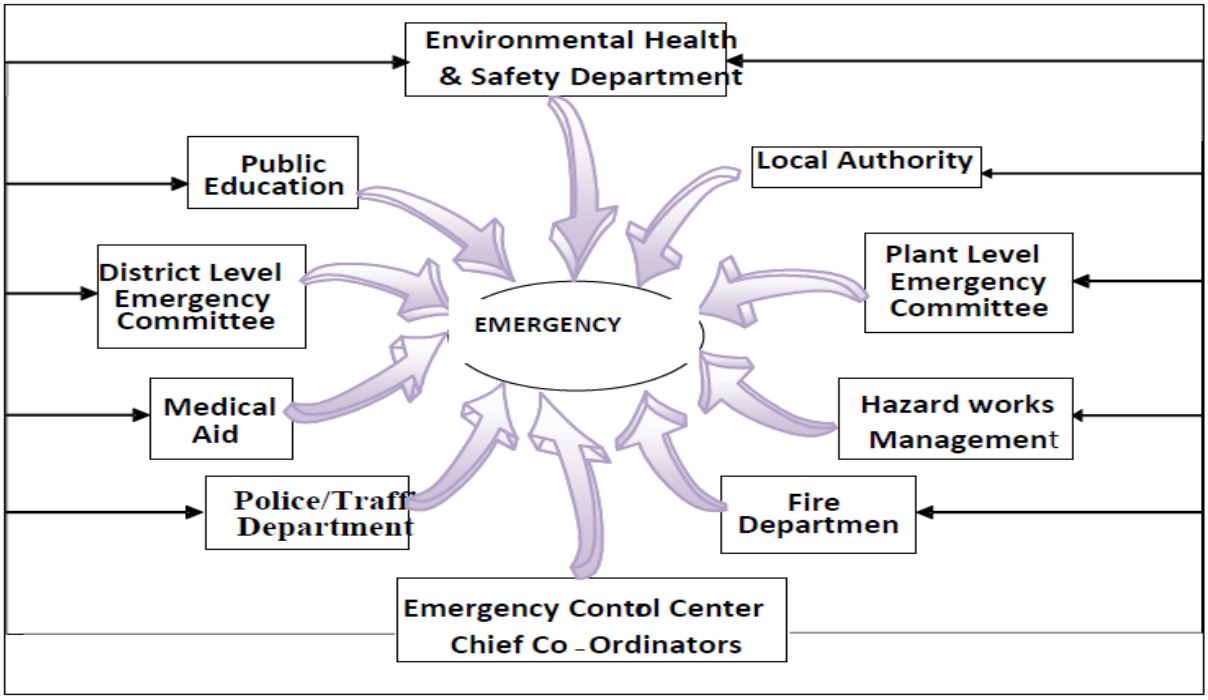

Figure 2: Various Organizations Involved During Emergency

4.1.6.1 Organization

Organizational details of command structure, warning systems, implementation procedures, emergency control centres include name and appointments of incident controller, site main controller, their deputies and other key personnel involved during emergency.

4.1.6.2 Communications

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

4.1.6.3 Special Emergency Equipment

Details of availability and location of heavy lifting gear, specified fire-fighting equipment, fireboats etc.

4.1.6.4 Voluntary Organizations

Details of Voluntary organizations, telephone numbers nearby of hospitals, Emergency helpline, resources etc are to be available with chief authorities.

4.1.6.5 Non-governmental Organizations (NGO)

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.

- Evacuation of personnel from the affected area
- Arrangements at rallying posts and parking yards
- Rehabilitation of evacuated persons

4.1.6.6 Chemical information

Details of the hazardous substances (MSDS information) and a summary of the risks associated with them are to be made available at respective site.

4.1.6.7 Meteorological information

There is to be arrangements for obtaining details of weather conditions prevailing at or before the time of accident and weather forecasts updates.

4.1.6.8 Humanitarian Arrangements

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

4.1.6.9 Public Information

- Dealing with the media-press office
- Informing relatives, etc.

4.1.6.10 Assessment

- Collecting information on the causes of the emergency
- Reviewing the efficiency and effectiveness of all aspects of the emergency plan.

4.1.6.11 Role of local authority

Local Authorities like Panchayat, Sabha, Samity, municipalities can help in combating

emergency situation after assessing the impact scenario in rescue phase.

4.1.6.12 Role of police

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

- Co-ordination with the transport authorities, civil defense and home guards.
- Co-ordination with army, navy, air force and state fire services.
- Arrange for post mortem of dead bodies
- Establish communication center with easy contact with ECC.

4.1.6.13 Role of Fire Brigade

The fire brigade is to be organized to put out fires and provide assistance as required during emergency.

4.1.6.14 Media

The media is to 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 avoid commotion and confusion.

- Efforts are made to check the clarity and reliability of information as it becomes available, and before it is communicated to public
- Public health authorities are consulted when issuing statements to the media concerning health aspects of chemical accidents
- Members of the media are to facilitate response efforts by providing means for informing the public with credible information about accidents involving hazardous substances

4.1.6.15 Role of health care authorities

Hospitals and doctors must be ready to treat all type of injuries to causalities during emergency.

- Co-ordinate the activities of Primary Health Centers and Municipal Dispensaries to ensure required quantities of drugs and equipment.
- Securing assistance of medical and paramedical personnel from nearby hospitals/institutions.
- Temporary mortuary and identification of dead bodies.

5. CONCLUSION

As discussed in above sections, adequate risk Control measures for process needs to be considered for the new proposed Project Activity is not likely to cause major significant risk to onsite, offsite & environment. Suitable Mitigation Measures will be taken by M/s Revex Plasticisers (RIICO Industrial Area, Phase-1, Bhiwadi, Rajasthan) to ensure complete workplace safety. In the event of disaster onsite, offsite and all the emergency planning procedures will be followed so as to minimize the impact on working personnel, plant surrounding and environment.