RISK ASSESSMENT AND CONSEQUENCE ANALYSIS

Risk Assessment (RA) is a method that has proven its value as an all-round tool for improving the safety standards prevalent in every hazardous industry. With advancements in in-built and inherent safety systems, accidents rates have come down, but still persist at unacceptable levels for newer technology and new plants. RA is a structured safety assessment tools designed for high hazard activities such as handling of chemical, petrochemical, storage and transportation of cargos etc., supplementing other safety systems tools such as HAZOP, HAZID, regular incident analysis and to identify the potential for incidents (near-misses, unsafe conditions) and to evaluate the necessary control measures.

- Assessing risk levels due to the operations of the facility handling hazardous chemicals.
- Identification of the risk mitigation measures to bring the potential risk within acceptable range.
- To suggest general safety improvement measures.
- To help generate accident free hours
- To identify emergency scenarios and suggest mitigation measures to avoid such emergencies

Risk Management: Overall description of the steps taken to manage risk, by identifying hazards and implementing controls in the workplace. There are four T's of risk management.

Tolerate –Low level of risk which can be live with.

Treat – Take measure to reduce the risk to make it tolerable e.g. use of PPE.

Transfer – Change the location or transfer the process to some other who can take a risk and carry out the activity**.** E.g. many advanced countries are getting the operations executed which are banned in their country by law**.**

Terminate- Drop the operation or do not carry the activity where very high risk is involved. E. g. Online repairs on high voltage line

Risk Rating: The category, level, or risk assigned following risk assessment (e.g. High, Medium, or Low).

Threshold Limit Value (TLV): it is the permitted level of exposure for a given period on a weighted average basis (usually 8 hrs 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.

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 effect in humans or produced carcinogenic, neoplastigenic or tetratogenic effect in humans or animals.

Methodology for Risk Assessment:

The scope of work includes site inspection, hazard identification, selection of potential loss scenarios, and to take strategic decision to mitigate/minimize the level of risk to the facility and to the community. The steps undertaken to carry out Risk Assessment for the proposed increased capacity are described in subsequent sections.

As a first step towards risk assessment it is required to identify the selected scenarios based on available information about Scenario development for potential Maximum Credible Loss Scenarios (MCLS). MCLS' selected are based on the findings of the HAZOP and HAZID study.

Toxic Gas Scenarios these include: Bursting of a toxic gas container under pressure causing a puff of toxic gas. Leak from major pipeline of gas leading to a plume scenario of toxic gas.

Toxic Liquid Scenarios These include: Flash vaporization scenarios for toxic liquids stored above their atmospheric boiling point, causing a puff dispersion scenario. Formation and spill pool evaporation scenarios due to substrate heat conduction including first minute rapid evaporation, followed by steady state pool evaporation.

Flammable Gas Scenarios these include: Bursting of a flammable gas container under pressure causing a gas puff. Leak from a Major pipeline of gas leading to a plume scenario of flammable gas.

Flammable Liquid Scenarios These include: Flash vaporization scenarios for flammable liquids stored above their atmospheric boiling point (BP) causing a puff scenario.

Pool formation and spill pool evaporation scenarios due to substrate heat conduction including first minute rapid evaporation, followed by steady state pool evaporation.

Secondary Scenarios for Flammable Liquids & Gases These may include (after containment loss of the liquid / gas): No ignition of puff, leading to puff dispersion. No ignition, causing dispersion of pool evaporation. Immediate ignition of puff, causing fire ball scenario Ignition of spill pool, causing pool fire. Delayed ignition of the puff, causing a VCE (Vapor Cloud Explosion) flash back fire (flash fire) and pool fire.

B-LEVE Scenarios These include:

Boiling Liquid Evaporating Vapor Explosion (BLEVE) scenarios for flammable liquid storages getting engulfed by fire, getting over pressurized, vessel bursting and flash vaporization and explosion. The scope of work includes hazard identification, risk assessment and ranking, resulting in treatment controls and action plans.

Level 1: Hazard Identification - Hazard identification includes:

Study of Safety Issues Pertaining to the Project

-Study of process and engineering, operational information including safety concepts used in design of equipment and storages.

-Listing of hazardous inventory and identification of key hazardous substances to be used.

-Preliminary identification of hazardous sections of the plant and that of storage with recourse to fire and explosion index for these units.

-Analysis of major inventories in process and storage for identification of major hazardous locations of the plant with recourse to "Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989".

-Consultation with the personnel, who carry out or are likely to carry out the jobs.

-Delineation of the vulnerable operations.

-Maximum Credible Accident (MCA) Analysis for construction and operation and maintenance hazards.

-Past history of accidents and near misses, at an industry level.

-The expected outcome of this study will be identification of hazard prone operations and estimation of maximum damages, distances based on probable accident/releases cenarios.

Level 2 Risk Assessment and Evaluation

Risk Assessment

As defined in foregoing paragraph, the risk is a function of likelihood and consequence. Likelihood is the chance that the hazard might occur. Since the risk of any hazard is dependent upon the chance that it will occur (likelihood), and the impact of an occurrence (consequence).

Risk Score = Likelihood x Consequence

In some cases, personnel are only exposed to the hazard for part of the time. Hence, a more detailed analysis of the risk ranking can be carried out, by taking exposure (% time personnel are present) and probability (chance that they will be harmed) into consideration. Thus:

Risk Score = (Probability x Exposure) x Consequence

The values used for likelihood, consequence, exposure or probability need to be agreed to by the risk assessment team, and there is an element of professional judgment in exercising these choices.

Level 3: Treatment Controls and Action Plans Treatment controls

After examining the high priority risks, a prime consideration is given to the potential to reduce or eliminate the risk by using the hierarchy of controls. This assists in establishing methods to reduce risk. From experience, the effectiveness of each method is given as a percentage after each of the control descriptions. The desirability of control plans (with reducing effectiveness) is as follows:

- **Elimination:** Remove step to eliminate the hazard completely.
- **Substitution**: Replace with less hazardous material, substance or process.
- **Separation**: Isolate hazard from person by guarding, space or time separation.
- **Administration**: Adjusting the time or conditions of risk exposures and/or give written operating instructions to carry out the activity in a safe way e.g. work permit procedure
- **Training:** Increasing awareness, improving skills and making tasks less hazardous to persons involved.
- **Personal protective equipment**: Used as the last resort, appropriately designed and Properly fitted personal protective equipment, where other controls are not practicable.

Control measures can reduce either the likelihood or consequence of the event or both. Depending on the level of reduction of the hazard, there could still be a residual risk that needs to be monitored so that a secondary prevention process can be initiated when trigger points are reached.

Action Plans

The team should develop an action plan recommending actions, responsibilities and when it should be completed. The proposed action plan is required to be put forward to the decision-making authority and reviewed, if necessary, before taking a final decision to proceed.

Level 4: Development of Disaster Management Plan

The suggested DMP is organized in a Plan, Do, Check, Review (PDCR) cycle to enable its effective implementation.

HAZARD IDENTIFICATION & DETAILS OF PROPOSED SAFETY SYSTEMS

The following hazards have been identified, along with their qualitative analysis of risk and the mitigation measures to be taken. With the proper mitigation measures in place the hazard level is reduced to a low and tolerable level.

DUST AND CHEMICAL VAPOURS HAZARD- exposure to chemical dust and vapours present in the working atmosphere –The dust generation will be due to mainly handling of chemicals and vapours will be emitted from liquid chemicals.

Safety and Mitigation of hazard:

- The Reaction will be carried out in closed reactor and in controlled condition.
- The vent gases from the reactor will be scrubbed before letting them out to the atmosphere.
- Workplace monitoring will be done and concentration of various chemical vapours will be maintained well below the threshold limit i.e. PEL (permissible exposure limit) values
- To reduce dust pollution due to movement of vehicles inside, roads will be tarred and water will be sprinkled on roads during construction phase.
- Use proper PPE's like facemask, dust mask, chemical breathing apparatus and air breathing apparatus.
- Use of spark arrestor must be done for the vehicles in the premises.
- MSDS of all chemicals must be kept handy in case of need.
- All the liquid chemicals should be placed in tight container to avoid evaporation of chemicals which may lead to fugitive emissions in the atmosphere.
- Workers will be trained in handling the chemicals to avoid leakage or spillage of chemicals

- If there is any spillage of chemical it will be immediately wiped out with the help of spill kit to avoid its vapour spread in the atmosphere.
- Periodical medical checkup will be done to find out if there is any adverse effect on worker's health due to exposure to chemical vapours.

FIRE AND HEAT: Since there is storage of flammable & combustible materials with low flash points; hence the risk of fire is high.

Safety & Mitigation measures fire hazard:

- The raw materials will be stored either in a closed tank or closed containers and transferred by pump to avoid any leakage to reduce the chances of fire in the factory premises.
- The tanks and other equipment's will be properly grounded and bonded to eliminate static electricity generation and static spark hazard. Even the MS storage drums will be grounded.
- Proper and sufficient firefighting equipment's will be provided to fight the fire in case of eventuality.
- The storage and processing (manufacturing) area where flammable chemicals are being handled will be declared as electrical hazardous zone and only flameproof electrical equipment's fittings will be installed in the area.
- The electrical and other equipment's used will be flameproof. No spark producing equipment or vehicle will be allowed inside these areas.
- The complete plant will be declared as no smoking zone. Matches and lighters will not be allowed inside the factory premises.
- Flameproof equipment's and instruments will be deployed.
- A fire water network will be provided inside the factory premises. A jockey pump will always be kept running to maintain the fire water line pressure all the time. A spare diesel operated fire water pump will be provided
- All the workers including security staff will be trained in firefighting operations.
- Fire extinguishers will be provided in the sensitive areas and people will be trained in firefighting operations.
- Direct contact of the flammable material with oxidizing agents like nitrates and acids will be avoided.
- The compatibility matrix of the materials will be considered while storage of chemicals. Incompatible materials will be stored separately.

- Training and fire mock drills will be arranged regularly.
- Adequate provision of foam and water will be made to fight the fire.
- Emergency management plan will be made and it will be tested periodically for its effectiveness.
- Fire water network with emergency fire water pump will be installed in the facility.

OCCUPATIONAL HEALTH HAZARDS AND ITS IMPACT: Since the facility is handlingvarious hazardous and toxic chemicals, it is likely to cause many workplace health hazards.

Safety & Mitigation measures:

- The occupational hazard is likely due to handling of the hazardous chemicals like Acetic acid, Acetone, Sodium hydroxide, potassium hydroxide etc.
- A proactive approach will be adopted to minimize the health impact of chemical exposure in the workplace.
- MSDS of each chemical will be available at the point of use for ready reference.
- Adequate PPEs will be provided to operating staff especially dust mask, face mask and breathing apparatus.
- Safety Showers and eye wash showers will be provided at convenient location for emergency in case of eye contact, skin contact of hazardous materials.
- Training will be given to the staff in handling of hazardous chemicals. Special training will be given to those handling highly hazardous chemicals like Caustic Soda, Isopropyl alcohol etc.
- Some of the workers will be given training in first aid.
- First aid box will be available at the point of use.
- Provision of special antidotes for various chemicals will be available.
- Occupational health specialist (Doctor) will be appointed by the company and he will be available on call.
- The storage and processing area will be well ventilated to keep concentration of chemical vapours and gases well within the permissible limit.
- Periodic ambient air monitoring will be done to monitor and control the concentration of pollutants. The concentration of chemical pollutants will be maintained well below their TLV limits.

- Periodic checking of health of the workers will be done as per the factories act.
- Work permit procedures will be followed for maintenance of equipment's.
- Electrical permit system will be followed while working on electrically driven or electrical equipment.
- Periodic safety audits will be done to detect/locate the safety and health hazards.
- In addition to above periodic safety and good housekeeping rounds will be taken by Sr. Officers periodically.
- Periodic safety committee meetings will be held for inviting safety suggestions from the workers. Workers participation will be ensured in safety committee meeting.
- Health and safety policy will be made and it will be strictly implemented.

NOISE HAZARD: The noise generation is mainly from DG set which runs when there is a power outage. The DG set is likely to run for few hours in a week. The other source of noise is from operation of pumps, agitators, Boiler, Cooling tower, Material handling, and vehicular traffic.

Safety & Mitigation measures:

- DG set will be provided with acoustic enclosure to reduce the noise level by 25 dB as per the noise pollution control Regulations.
- Earplugs and earmuffs will be provided to workers and management will ensure that the workers will wear them where there is high noise level. The workers will be trained on the health effects of noise pollution.
- A signboard will be displayed where the noise level is above 75 dB to warn the operating staff.
- Workers will be advised to stay minimum period of time in a high noise level area.
- Regular noise monitoring will be done as per the PPCB norms and report will be sent to PPCB. (Day and night noise monitoring once in three months or as per the consent condition)
- All precautions will be taken to control noise level below 85 db.
- Proper preventive maintenance of the DG set, boiler, agitators and pumps will be done whenever the noise and vibration level goes high.
- Periodic health check-up of the staff will be done as per factories act and health check

- will include checking of hearing capacity (Audiometric test) of persons.

ELECTRICAL HAZARD: Injury due to electrical shock, and since the facility is handling flammable chemicals, we need to take care of electrical hazards including static electricity hazards.

Safety & Mitigation measures:

- A licensed electrician should be deployed to complete all temporary wiring and electrical installations required for plant activities.
- Fuses and circuit breakers (ELCB's) should be used to protect motherboards, conductors and equipment to avoid short circuiting and electric shock.
- Extension boards for equipment or as part of a temporary wiring system should not be damaged or compromised in any way and insulation must be of the highest grade.
- The joints of electrical wires should be avoided or an extension boards can be used if needed.
- Anytime electrical equipment is deactivated for repair, or circuits are shut off, the equipment will be locked out and tagged at the point where it can be energized. (Lockout tagout procedure)
- Proper earthing is to be ensured for all stationary equipment and electrical panels.
- Earthing will be ensured for transferring any organic chemical or solvent from tanker or even from MS drum.
- The earthing will be regularly checked once in six months and records will be maintained as per the electrical safety rules 1956.
- If earth pit resistance is found to be more than 2 ohms then the earth pit will be charged with water and salt and resistance will be rechecked to see that it has come down to less than 1 ohms.
- Temporary lights should not be suspended by their cords.
- Hazardous area classification will be done and flameproof electrical fittings have to be fitted in the flammable area.
- Electrical safety audit will be carried out periodically by competent agency and its recommendations will be implemented.

PROVISION OF PPE: Required PPE should be provided by the company to cover occupational foot, head, hearing, and eye protection from hazardous chemicals.

FOOT PROTECTION: If machines or operations present the potential for foot injury, the company should provide foot protection, which is of safe design and construction for the work to be performed. To avoid the slippage on the floor due to spillage of oils provision of special safety shoes to be made.

HEAD PROTECTION: If head hazards remain after all steps have been taken to control them, the Company should provide employees with appropriate head protection. Safety helmet is recommended.

EYE PROTECTION: When operations present potential eye injury from chemical elements, the company should select, provide, maintain and required affected employees to use appropriate eye protection. Any work which involves looking upside also requires the protection e.g. electrical cabling on walls and ceiling. The various eye protecting devices like safety glasses and goggles should be adequate and reasonably comfortable.

ONSITE AND OFFSITE DISASTER AND EMERGENCY MANAGEMENT PLAN

Introduction

The emergency plan delineates the Organizational procedures for dealing with accidents or unexpected events and natural calamities arising from operation of the facility.

An experience of any accidents that have occurred in other manufacturing/mining projects is considered to prepare this plan. This Emergency plan should be periodically reviewed and modified. It should also be changed based on the observations of emergency mock drills and experience of handling actual emergencies.

Objective

The main objective of emergency plan has been to get prepared for any foreseeable emergency situations and to reduce the damage to the property, environment and human life in these situations. The other objective of emergency management plan is to prevent such emergencies especially the manmade emergencies. The emergency plan is useful to tackle emergencies such as fire, explosion, major accidents at the site and also natural calamities.

This Emergency response plan has been designed to fix responsibilities and action to be executed by various groups to contain the emergency within short time period with minimum damage of human lives, environment, materials, machines and properties. It is responsibility of all persons in their respective areas to ensure success of this emergency plan. Major objectives of this onsite – offsite emergency plan are:

To take necessary proactive and preventive actions to avoid the emergency. The main aim of any emergency plan should be to prevent emergency situations

To train the manpower to handle the emergencies of the following nature:

i. On-site (Within boundary of industry)
ii. Off-site (Outside agencies)

On-site and off-site emergency Plan.

Type of emergencies: There have been some identified as emergency situation inside of site such as:

A. Emergency on account of

- Fire
- Explosion
- Electrocution
- Major accidents involving exposure to hazardous and toxic chemicals.

B. Disaster due to natural calamities like

- Flood/ heavy rains which can involve natural landslides.
- Earth quake
- Cyclone
- Lightening

C. Emergencies due to external factors

- Sabotage
- Civil riots.
- Terrorism, air raid etc

Preventive actions / measures to avoid emergencies

Fire: As we all know, fire sets in with combination of air, fuel and heat. That is why it's necessary to eliminate all sources of heat generation. Proactive measures and prevention is the best remedy to avoid fire incidence.

-Install fire alarms and flammable gas detectors with proper guidelines by safety auditor this should be done if LPG or natural gas is used as fuel.

-Installation of flame proof electric fittings as per area classification.

-Ensure earthing of all equipment's such as, electrical motors, air compressors, reactors and storage vessels to avoid static electricity generation and static spark.

-Storing of fuels like diesel and agricultural waste briquettes in separate areas at a safe distance away from the main operations.

-Prohibition to smoking in the entire facility.

-Training of employees and operators in firefighting operations and use of fire extinguishers. This will ensure that a minor fire will be notice which may turn into a major emergency.

Explosion: When a mixture of flammable gas and air gets a source of ignition as spontaneous reaction takes place causing a pressure and sound wave of high intensity, this is termed as explosion. The explosion of the air receivers is common in compressed air system if proper checking and maintenance is not done. To avoid explosions, following precautions should be taken.

-The diesel and flammable chemical drums should also be kept in shed to avoid direct sunlight.

-Always check leaky fuel and solvent drums

Electrocution: To Prevent electric shock and electrical short circuit following pre-ventive actions should be taken:

- Install Ground Fault Circuit Interrupter (GFCI) outlets and adapters.
- Ensure all the electrical equipment's are properly grounded.
- Wear protective gears e.g. insulated hand gloves while working on electric switches, motors orgenerators.
- Lock out/tag out permit to be enforced for working on electrically operated equipment's.

General Guidelines:

- Fire and first aid trained Operator/Fireman must be immediately available at all the times duringoperations.
- The plant should be immediately stopped (emergency shutdown) in case of any emergency. A siren can be sounded if available.
- An emergency assembly point should be created and all Employees should guide visitors or contractors to approach the assembly point.
- The security office on the gate can serve as emergency control room (Centre) in case of emergency.
- Emergency vehicle should be available near security main gate and rush to the emergency control centre at the blowing of emergency siren. The driver of emergency vehicle will followthe instructions of Incident Controller / Site Main Controller.
- The shift engineer/electrician should get ready to manage generator set and MCC as per the instructions of Incident Controller.
- People should be trained for the precautions to be taken during natural disasters line heavy rain, floods, earthquake and cyclone.

Emergency Prevention:

- Prepare maintenance Schedule for all the equipment's as per recommendations of manufacturer's user manuals.
- To collect and analyze information of minor incidents and accidents at site and recording near emergencies that were averted which gives indication of likely or unlikely site facing emergencies.

Emergency Structure and Responsibility:

The emergency preparedness organizational structure should consist of the following persons

- Site main controller- The Factory manager can be named as site main controller
- Incident Controller– The shift supervisor or production supervisor can act as incident controllerin case of emergency.
- Safety officer or fire & safety coordinator (if available)
- Rescue team consisting of operators and employees specially trained in safety and/or first aid.

Role of Site Main Controller:

- Site Main controller relieves the incident Controller of the responsibilities of overall emergency control as soon as he arrives at the site and takes stock of the situation and thereafter will position himself in the Emergency Control Centre and give directions from here.
- Ensures the medical aid is promptly provided to the causalities and their relatives are to be informed.
- Organize evacuation and transportation of personnel from the assembly points to a safe location outside.
- If external help is needed, co-ordinate with outside emergency services like fire brigade of the nearest town, ambulance etc.
- Ensures that affected personnel are transported to external medical centres, and keep constant liaison with these medical centres during the course of the emergency through the medical officer.
- Keeps concerned Government Agencies informed of the emergency and if necessary, arranges information to the outside habitants through police.

- Decides to call off the emergency when everything is OK.

Role of Incident Controller:

- Incident Controller on reaching the site of the incident relieves the in-charge of the responsibilities of directing the emergency operations and assumes total control of emergency operations in the affected area.
- Determines the adequacy of the emergency services.
- Direct emergency operation from the incident site to localize emergency, keeping in mind the priorities for safety of personnel, least damage to the property and environment & minimum loss of materials.
- Provide advice and information to the Fire and Security Personnel and Local Fire Services as and when they are called.
- Continuously reviews the situation with the site Main Controller.
- Proceeds to the emergency control center, establishes contact with firemen and incident controller and supplements efforts in firefighting in case of fire and other such emergencies involving people.
- Assist nurse in providing first aid to those who are injured.
- Mobilize personal protective equipment and safety appliance and assists personnel handling emergency in using them.
- Collect and preserve evidence to facilitate future inquiry.

Role of Security In-charge:

- Assumes charge of all external communication in consultation with Site Main Controller.
- Takes charge of EPABX (Electronic Private Automatic Branch Exchange, if available) Board and deputes a trained person (e.g. security guard) to man the board when regular telephone operator is off duty and restrict the unnecessary calls.
- Assumes total control of the storage facility under the direction of the Site Main Controller.
- Controlling traffic movement, removing truck and tanker drivers outside the site and prevents entry of all non-essential personnel.
- Cordons off the incident site and keeps the site clear off observers.

Firefighting staff:

The firefighting staff consists of the persons trained in firefighting and rescue operations. These people should be fully trained in operations of the firefighting equipment's readily available at site e.g. fire extinguishers, CO2 extinguishers, water hoses etc

- Firefighting team must be alert in any case of emergency.
- The firefighting team should use the equipment's and means available at site, until external helpcomes in.
- Direct the external agencies in fighting fire and help them as needed.
- First aider or the team shall rush to emergency control point and get the feedback from the site controller about the emergency.
- As per the instruction, they must rush to the area of emergency and assess the situation.
- Approach emergency site quickly with BA set and First Aid Box Kit.
- Diagnoses the situation and decides whether the affected persons shall be moved to the safearea.
- The injured personnel are moved to the safe place and given first aid as required by the situation.
- Follow instructions of incident Controller.
- Move/Transport the causalities to the ambulance/ near medical centre for necessary medical assistance.

Emergency Control Centre.

An Emergency Control Centre (ECC) is the primary area or aroom from where emergencies are handled. An ECC should contain various items as listed. The site office or security control room can serve as emergency control centre if a special ECC is not created. The emergency control centre should have the following facilities to help tackle the emergencies.

For communication:

- Siren
- Telephone directory (with all mobile phone numbers), and emergency numbers like police, Ambulance, nearby Hospitals, medical doctor, and any other number useful in emergency.
- Site Directory (if applicable)
- List of important & Emergency phone numbers

Documents for ready reference:

- Site plan or current operation plan.
- Layout plan with hazard zones, assembly points marked and location of siren, safety/fire systemshown (Display).The layout plan should show the storage area of hazardous and flammable chemicals.
- Stock list of Fire extinguishers
- Stock list of safety appliances
- Fire-water system and additional sources of water (if applicable)
- The existing water storage and water pumping system can be easily converted into fire watersystem.
- Emergency Response Plan and Layout Plan, Flip chart.Copy of First Aid procedures
- Copy of MSDS of the chemicals stored, handled at site. E.g. Diesel, solvents, toxic chemical etc.Mutual Aid Members list
- List of employees and their addresses and phones numbers.Site plan
- Layout plan
- Emergency Organization.
- Firefighting system layout and additional source of water.Site entrance, roadway and emergency exist.
- Storage area of hazardous materials. (explosives& diesel, LPG cylinders)Assembly points.
- Storage of safety equipment Stationary.
- Recording System
- Utility Items (Torches and umbrellas.)First aid box &common antidotes

Emergency Control:

- Shut down of operations: Raising the alarm or siren followed by immediate safe shut down ofthe power supply, and isolation of affected areas.

- Treatment of injured: First aid and hospitalization of injured persons
- Protection of environment and property: During mitigation, efforts should be made to preventimpacts on environment and property to the extent possible.
- Preserving all evidences and records: This should be done to enable a thorough investigation ofthe true causes of the emergency.
- Ensuring safety of personnel prior to restarting of operations: Efforts required to be made toensure that work environment is safe prior to restarting the work

Offsite Emergency Plan:

Off-site Emergency Response Plan

- If the accident is such that its effects inside the factory are uncontrollable and it may spread outside the factory premises, it is called as **Off-site Emergency**.
- An emergency may affect areas offsite (outside) of the works as for example, an explosion can scatter debris over wide areas and the effects of blast can cover considerable distances, wind can spread the fire to new areas. The toxic gas release can affect the nearby areas.
- It will be necessary to prepare in advance simple charts or tables relating the likely spread of the vapours cloud taking into account its expected buoyancy, the local topography and all possible weather conditions during the time of release.

Linking of On-site, Off-site with the District Authority

- A District crisis and State crisis group shall be formed as per the chemical accident's rules 1996. Since the facility is a Major accident hazard unit, the onsite emergency plan is linked with district crisis management group. All the possible hazards and MSDS of the chemicals will be informed to district crisis group. The District Crisis Group shall meet every forty-five days and send a report to the State Crisis Group. The Local Crisis Group shall meet every month and forward a copy of the proceedings to the District Crisis Group.
- In case of fire and other off-site emergencies, the District authorities and Site Main controller can be informed and necessary help could be taken following the emergency such as:
- Information regarding the incident and getting help from the surrounding industries.
- Calling the help nearby firefighting authorities to control the situation from Rajpura Municipal Council Fire department.
- Necessary first aid measures if required from the nearby hospitals and first aid centers.

- Providing MSDS of all chemicals and other information to district authority.

Functions of the District Crisis Group:

The District Crisis Group shall –

- Assist the preparation of the district off-site emergency plan;
- Review all the on-site emergency plans prepared by the occupier of Major Accident Hazardsinstallation for the preparation of the district off-site emergency plan;
- Assist the district administration in the management of chemical accidents at a site lying withinthe district;
- Continuously monitor every chemical accident;
- Ensure continuous information flow from the district to the Centre and State Crisis Group regarding accident situation and mitigation efforts;
- Forward a report of the chemical accident within fifteen days to the State Crisis Group;
- Conduct at least one full scale mock-drill of a chemical accident at a site each year and forwarda report of the strength and the weakness of the plan to the State Crisis Group.

Functions of the Local Crisis Group

Prepare local emergency plan for the industrial pocket;

- Ensure dovetailing of the local emergency plan with the district off-site emergency plan;
- Train personnel involved in chemical accident management;
- Educate the population which likely to be affected in a chemical accident and tell them about the remedies and existing preparedness in the area;
- Conduct at least one full scale mock-drill of a chemical accident at a site every six months and forward a report to the District Crisis Group; and
- Respond to all public inquiries on the subject

The District Off-site Emergency Plan for the district shall be prepared by the District Magistrate in consultation with the factory management and Govt. agencies. The plan contains up-to-date details of outside emergency services and resources such as Fire Services, Hospitals, and Police etc. with telephone number. The following district authorities are to be included in the emergency plan.

- Police Department.
- Revenue Department.

- Fire Brigade.
- Medical Department.
- Municipality.
- Gram Panchayat
- Railway Department.
- Telephone Department.
- Factory Department.
- Electricity Department.
- Pollution Control Department.
- Explosive Department.
- Press and Media.

Mock exercises on Off-site plan should be carried out at least once in a year in order to train the employees, to update the plan, & to observe and rectify deficiencies so that in case of emergency immediate action can be taken to avoid any kind of disaster