

1 RISK ANALYSIS & DISASTER MANAGEMENT PLAN

1.1.1 INTRODUCTION

Hazard Identification is a critical step in Risk Analysis. A classical definition of hazard states that hazard is in fact the characteristic of system/plant/process that presents potential for an accident. Hence all the components of a system/plant/process need to be thoroughly examined in order to assess their potential for initiating or propagating an unplanned event/sequence of events, which can be termed as an accident.

In Risk Analysis terminology a hazard is something with the potential to cause harm. Hence the Hazard Identification step is an exercise that seeks to identify what can go wrong at the major hazard installation or process in such a way that people may be harmed. The output of this step is a list of events that need to be passed on to later steps for further analysis.

Risk analysis deals with identification and computation of consequence and risks. Risk analysis follows an extensive hazard analysis. This requires a thorough knowledge of probability of failure, credible accident scenario, vulnerability of population to exposure etc. Much of this information is difficult to get or generate. Consequently, the risk analysis is often confined to maximum credible accident scenarios. It provides basis for preparation of on-site and off-site emergency plan and also to incorporate safety measures.

Secured Land Filling (SLF) and allied activities as a part of the Common Hazardous Waste Treatment, Storage and Disposal facilities (TSDFs), are associated with several potential hazards to both the employees and the public. A worker in a TSDF site should be able to work under conditions, which are adequately safe and healthy. At the same time the environmental conditions should be such as not to impair his working efficiency. This is possible only when there is adequate safety in TSDF site.

The objective of the Risk Analysis study is to identify vulnerable zones, major risk contributing events, understand the nature of risk posed to nearby areas and form a basis for the Emergency Response Disaster Management Plan (ERDMP). In addition, the Risk Analysis is also necessary to ensure compliance to statutory rules and regulations. Risk assessment methodology is given in **Figure** below-

Steps of the risk analysis is as follows-

- Identification of Hazards and Selection of Scenarios
- Effects and Consequence Calculations
- Risk Summation (Risk calculation)
- Risk assessment (using an acceptability criteria)
- Risk Mitigation Measures

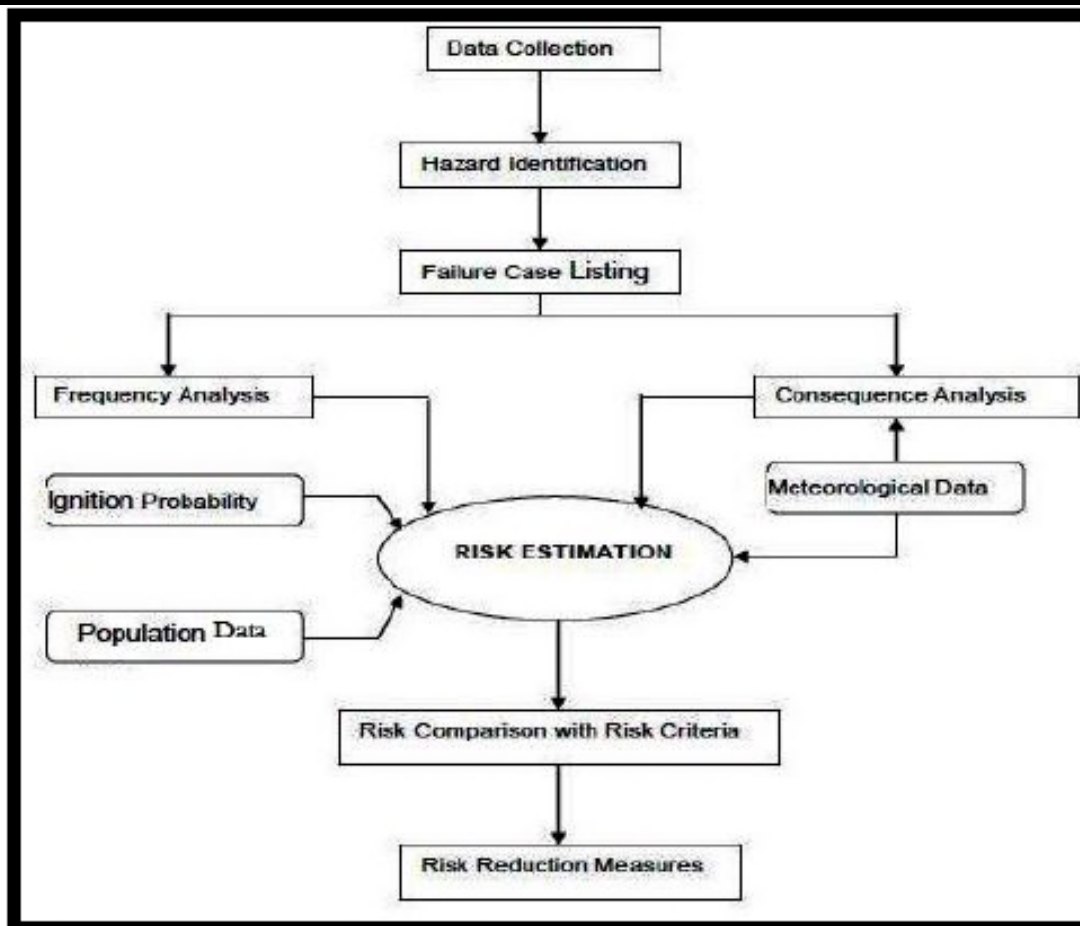


Figure 1-1: Risk Analysis Methodology

1.1.2 APPROACH TO THE STUDY

The risk assessment study covers the following:

- Identification of potential hazard area;
- Identification of representative failure cases;
- Visualization of the resulting scenarios in terms of fire and explosion;
- Assess the overall damage potential of the identified hazardous events and the impact zones form the accidental scenarios;
- Furnish the recommendations on the minimization of the worst accident possibilities
- Preparation of Disaster Management Plan;
- Emergency Plan, which includes Occupational and Health Safety Plan;

1.1.3 SAFETY AND CONSERVATION

The three basic principles required for safety are prevention, preparedness (both pro-active and reactive) and mitigation of effect through rescue, recovery, relief; a comprehensive risk assessment and disaster management has been drawn-up for the project incorporating the following:

7.1.3.1 Hazard Identification

Identification of hazards in the proposed project expansion of TSDF which is Secured Land Filling (SLF) and allied activities as a part of the Common Hazardous Waste Treatment, Storage and Disposal facilities (TSDFs) is of primary significance of the analysis, and quantification of risk hazard indicates the characteristics of hazardous wastes that pose potential for an emergency situation in the event of spillage and accidental release of hazardous wastes from the site.

All the components of a system/plant/process need to be thoroughly examined to assess their potential for initiating or propagating an unplanned event/sequence of events, which can be termed as an accident.

Explosive wastes in form of explosive solid and explosive liquid.

- Flammable wastes
- Corrosive Wastes
- Reactive wastes
- Toxic wastes

Flammable wastes containing solvent residue, can form explosive mixture with air, and heating may cause pressure rise with risk of bursting and explosion (however in case of TSDF explosion probability is very less as highly reactive materials and pressure vessels are not there) Some time vapour may be heavier than air and spreads along with the ground, narcotic in high concentrations, gives off toxic or irritant fumes in a fire.

Various type of organic hazardous wastes, paint wastes, waste oil, etc are flammable in nature and can catch fire if getting source of ignition. There will be release of toxic fume at the time of burning in the event of fire.

1.1.3.1 Other Hazard and Control

Human Health Risk from TSDF Site

Toxic medical wastes and e-wastes managed and disposed at the proposed TSDF can release constituents of concern (CoCs) as vapors or particles to the air. wind-blown erosion of disposed hazardous waste or as leachate to the ground water. Hazardous wastes managed in barrels or tanks can release COCs into the atmosphere via volatilization. During the operation of TSDF site, wastes may be entered into the environment through the following sources:

- Emission of particulate matters due to windblown erosion of disposed wastes;
- Volatization of organic liquid wastes;
- Infiltration of leachate into ground and subsequently contamination of ground water in an unlikely event of damage to liner system of TSDF site;
- Spillage of contaminated run off from the TSDF site during heavy rains;

1.2 Hazards associated with the TSDF Site

The list of hazard along with control measures is given in **Table** below-

Table 1-1: POSSIBLE HAZARD EFFECT & CONTROL MEASURES

S. No.	POSSIBLE HAZARD	SOURCES & REASONS	EFFECTS	PLACE OF EFFECT	CONTROL MEASURES
1	ELECTRICITY (1) Burning (2) Fire (3) Shock	Loose Contacts, Weak earthing, Short Circuit, Improper Insulation	Burning, Shock, Death	Surrounding the accident area	Proper Earthing, Periodical Checking of joints, proper insulations of Equipments, etc.
2	HOUSE KEEPING (1) Physical (2) Burning (3) Fire	Bad House keeping	Physical/Chemical Thermal Burn Injury (Major/Minor)	In all surrounding areas i.e. Storage, Plants	Proper Handling, regular cleaning, Proper placement of material (RIGHT THING AT THE RIGHT PLACE)
3	Structural Failure	Inside the factory (Corrosion)	Injury/Death to persons, damage to property	Within the factory	Structure stability inspection by competent person. Regular cleaning and painting
4	Natural Calamity	Nature	Injury/Death To persons, damage to property	Within & outside the unit	Siren, Evacuation Rescue & shelter/Welfare

Table 1-2: Characterization of Wastes

Categories of Waste	Type of Wastes	Regulatory Quantities
Waste Category No. 4	Mercury, Arsenic, Thallium and Cadmium bearing wastes.	5 kilograms per year the sum of the specified substance calculated as pure metal.
Waste Category No. 5	Non-halogenated hydrocarbons including solvent.	200 kilograms per year calculated as non-halogenated hydrocarbons.
Waste Category No. 6	Halogenated hydro-carbon including solvents	50 kilograms per year calculated as halogenated hydrocarbons.
Waste Category No. 7	Wastes from paints, pigments, glue, varnish and printing ink.	250 kilograms per year calculated as oil or oil emulsions.
Waste Category No.8	Wastes from Dyes and Dye intermediate containing inorganic chemical compounds.	200 kilograms per year calculated as inorganic chemicals.
Waste Category No. 9	Wastes from Dyes and Dye intermediate containing organic chemical compounds.	50 kilograms per year calculated as organic chemicals.
Waste Category No. 10	Waste oil and oil emulsions.	1000 kilograms per year calculated as oil and oil emulsions.
Waste Category No. 11	Tarry wastes from refining and tar residues from distillation or prolytic treatment.	200 kilograms per year calculated as tar

1.3 Operating Parameters

1.3.1 Inventory

Inventory Analysis is commonly used in understanding the relative hazards and short listing of release scenarios. Inventory plays an important role in regard to the potential hazard. Larger the inventory of a vessel or a system, larger the quantity of potential release. A practice commonly used to generate an incident list is to consider potential leaks and major releases from fractures of waste storage tanks and vessels containing sizable inventories. Each section is then characterized by the following parameters required for consequence modeling:

- Mass of flammable material in the process/storage section(waste storage like paint waste, organic wastes etc)
- Pressure, Temperature and composition of the material
- Hole size for release

1.3.2 Exposure Pathways

Exposure pathways of toxic constituents of concern are either direct such as inhalation through dispersion in ambient air, or indirect, such as the farm food chain pathways.

The exposure pathways considered in assessment were inhalation of ambient air, ingestion of soil, ingestion of root crops, ingestion of drinking water.

1.3.3 Hazards Due to Loss of Containment

TSDF site inventory can get discharged to Environment due to Loss of Containment. Various causes and modes for such an eventuality have been described. Certain features of materials to be handled at the plant need to be clearly understood to firstly list out all significant release cases and then to short list release scenarios for a detailed examination.

Hazardous waste (landfilable) handled, stored and disposed at the TSDF will be mostly toxic in nature. In the event of spillage, leakage or accidental release of these hazardous wastes. It will create localized effects within the short distances inside the site in the form of contaminant release.

Safety measures including fire fighting facilities will be provided at the TSDF to attend any emergency due to handling, storage and disposal of such hazardous wastes.

No toxic gas as hazardous wastes will be handled at the TSDF, therefore dispersion of toxic vapour cloud is not an issue at the TSDF.

1.3.4 Release of Flammable Wastes

Hazardous wastes containing fraction of organic waste and residue, paint wastes will be stored in drums and tanks of various sizes for incineration. At the time of leakage, spreading or fixed pool will be formed and in an unlikely event of fire, thermal radiation may cause damage to life and property within short distance.

1.3.5 Fire in Stored Hazardous Wastes at TSDF Sites

At TSDF site, hazardous waste will be stored in containers and drums. The hazardous wastes stored may be in solid and semi solid state. In normal condition, hazardous wastes at TSDF can not initiate fire. However, in the event of fire, hazardous wastes can burn and sustain fire resulting in generation of toxic fumes and smoke. Such toxic fume will be complex of suspended particulate matter, soot, carbon dioxide, oxides of nitrogen, and other toxic constituents, etc. In the event of fire, hazardous waste will act as a source of toxic gas emissions and disperse into the atmosphere and be responsible for deterioration of ambient air quality, subsequently, adverse impacts on the health due to inhalation of toxic gases.

1.4 Risk Mitigation Measures for Proposed Expansion of TSDF

Risk mitigation measures have been described for the proposed TSDF site as given below:

1.4.1 Collection and Transportation of Hazardous Wastes

- ❖ Transportation of waste by covered vehicles.
- ❖ Regular training to drivers to handle emergency situation during transportation of waste.
- ❖ Implementation of TREM card.

1.4.2 Storage area (Storage Shed)

- ❖ Flammable, ignitable, reactive and non-compatible wastes should be stored separately and never should be stored in the same storage shed.
- ❖ Storage area may consist of different sheds for storing different kinds of hazardous wastes and sheds should be provided with suitable openings.

- ❖ Storage area should be designed to withstand the load of waste stocked and any damage from the hazardous waste spillage.
- ❖ Loading and unloading of wastes in storage sheds should only be done under the supervision of the well trained and experienced staff.
- ❖ The storage and handling should have at least two openings/ routes to escape in the event of any fire in the area.
- ❖ Doors and approaches of the storage area should be of suitable sizes for entry of fork lift and fire fighting equipment;
- ❖ The exhaust of the vehicles used for the purpose of handling, lifting and transportation within the facility such as forklifts or trucks should be fitted with the approved type of spark arrester.
- ❖ In order to have appropriate measures to prevent percolation of spills, leaks etc. to the soil and ground water, the storage area should be provided with concrete floor or steel sheet depending on the characteristics of waste handled and the floor must be structurally sound and chemically compatible with wastes.
- ❖ All the storage yards should be provided with proper peripheral drainage system connected with the sump so as to collect any accidental spills in roads or within the storage yards as well as accidental flow due to fire fighting.

1.4.3 Storage Drums/Containers

- ❖ The container shall be made or lined with the suitable material, which will not react with, or in other words compatible with the hazardous wastes proposed to be stored.
- ❖ The stacking of drums in the storage area should be restricted to three high on pallets (wooden frames). Necessary precautionary measures should be taken so as to avoid stack collapse. However, for waste having flash point less than 65.5°C, the drums should not be stacked more than one height.
- ❖ No drums should be opened in the storage sheds for sampling etc. and such activity should be done in designated places outside the storage areas;
- ❖ Drums containing wastes stored in the storage area should be labeled properly indicating mainly type, quantity, characteristics, source and date of storing etc.

1.4.4 Spillage/Leakage Control Measures

- ❖ The storage areas should be inspected daily for detecting any signs of leaks or deterioration if any. Leaking or deteriorated containers should be removed and ensured that such contents are transferred to a sound container.
- ❖ In case of spills/leaks/dry adsorbents/cotton should be used for cleaning instead of water.
- ❖ Proper slope with collection pits be provided in the storage area so as to collect the spills/leakages.
- ❖ Storage areas should be provided with adequate number of spill kits at suitable locations. The spill kits should be provided with compatible sorbent material in adequate quantity.

1.4.5 Fire Protection System

The fire protection system shall comprise of:

- ❖ Fire detection and alarm system for waste storage area
- ❖ Fire Fighting system shall comprise of following major equipment and systems;
- ❖ Electric driven main fire pumps with emergency power from standby Diesel Genset for hydrant network serving of hydrants and hose reels;
- ❖ All necessary pump controls complete with all accessories for the above-mentioned pumps;

- ❖ All necessary sign-posting for the water-hydrant ring system including brackets, complete with accessories;
- ❖ All electrical rooms will be provided with clean agent automatic fire extinguisher systems
- ❖ Complete addressable analogue fire detection system with heat and smoke detectors for various plant area including storages with necessary cabling, interface panels, controllers, sounders, manual call points, sirens, response indicators, and all necessary hardware and accessories; and
- ❖ All necessary electrical equipment, such as LV switch-gear, LV motors, LV power and control cables, control panels with alarm, PBB and interlocks, necessary DC systems, push button stations, cable trays and accessories, cabling, glands lugs, earthing and lightning protection conforming to relevant electrical specifications.

1.4.6 Miscellaneous risk Mitigation Measures

- ❖ Smoking shall be prohibited in and around the storage areas;
- ❖ Good housekeeping needs to be maintained around the storage areas.
- ❖ Signboards showing precautionary measures to be taken, in case of normal and emergency situations should be displayed at appropriate locations.
- ❖ To the extent possible, manual operations within storage area are to be avoided. In case of manual operation, proper precautions need to be taken, particularly during loading/unloading of liquid hazardous waste in drums.
- ❖ A system for inspection of storage area to check the conditions of the containers, spillages, leakages etc. should be established and proper records should be maintained.
- ❖ The wastes containing volatile solvents or other low vapor pressure chemicals should be adequately protected from direct exposure to sunlight and adequate ventilation should be provided.
- ❖ Storage sites should have adequate & prompt emergency response equipment systems for the hazardous waste stored on-site. This should include firefighting arrangement based on the risk assessment, spill management, evacuation and first aid.
- ❖ Immediately on receipt of the hazardous waste, it should be analyzed and depending upon its characteristics and storage & disposal should be finalized.
- ❖ Only persons authorized to enter and trained in hazardous waste handling procedures should have access to the hazardous waste storage areas.
- ❖ Mock drill for onsite emergency should be conducted regularly and records maintained.

1.4.7 Hazard Analysis and Safety Audit

During operation of proposed expansion of incinerator, a preliminary hazard analysis should be conducted. Safety Audit should be conducted internally by the operator every year & externally once in two years by a reputed expert agency and same should be submitted to the regulatory agencies. Conditions stipulated by SPCBs while granting authorization under Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2008 to the TSDF operation should be complied.

1.4.8 Display of Necessary Information at TSDF Site

Necessary information containing the following elements shall be displayed at the site.

- ❖ Waste type (ignitable, toxic, reactive, etc)
- ❖ Approximately quantity of each type of wastes
- ❖ Generation location of waste storage area
- ❖ Evacuation point

1.5 General Recommendations and Suggestion Based on the Study

- ❖ All precautions will be taken to attend any emergency due to handling, storage and disposal of such hazardous wastes.
- ❖ Safety measures such as fire fighting system facility already working at TSDF site will be provided during the emergency.
- ❖ Proper handling of hazardous chemical, hazardous wastes, regular cleaning & proper placement of material will be maintained during operational phase.

1.6 DISASTER MANAGEMENT PLAN (DMP)

The objective of disaster management plan is to localize a disaster and to the maximum extent possible contain it to minimize the impact on life, the environment and property. The disaster management plan may be broadly divided into following steps as given in Figure below-

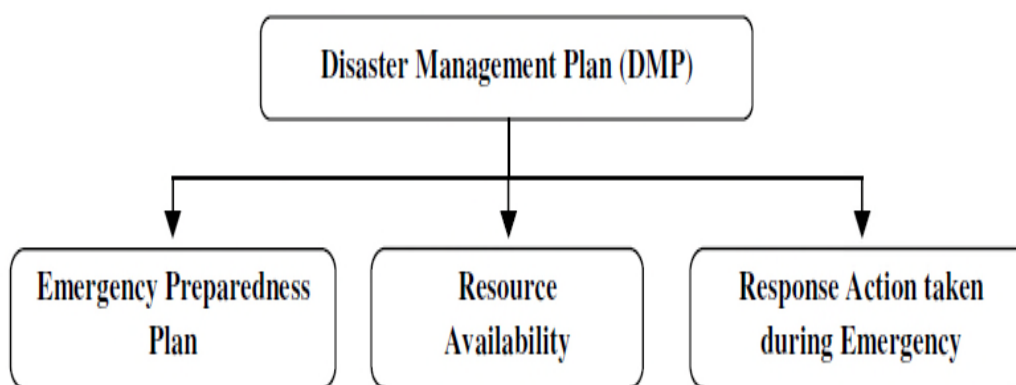


Figure 1-2: Steps for DMP

M/s. BEIL has developed emergency management system to tackle any emergency situation for proposed project activity. The Plan also provides for onsite resources and appropriate outside assistance in case of any incident at the facility. The Emergency Response Plan (ERP) will continue to be in place for expansion operation at site, and all personnel will continue to undergo a comprehensive training in emergency response.

1.6.1 OBJECTIVES OF DMP

- Minimization of the risks to lives and safety of proposed TSDF operators on-site and of the neighboring community.
- Coordination for appropriate and effective actions with outside regulatory agencies during and after their involvement in on-site emergencies.
- Containing and minimizing environmental damage, to surroundings, and to site property, and equipment, which could occur from emergency or accidental situations beyond the normal operations of the TSDF.
- Maintaining effective trained personnel capable of performing the established emergency response procedures when it is required.

- The risk involved during the hazardous waste transportation, storage and disposal site will involve hazardous consequences due to the toxicity of the waste, flammability of the waste or explosivity of the waste.

1.6.2 Priority in Emergency Handling

The general order of priority for involving measures during the course of emergency would be as follows:

- Safeguard life
- Safeguard environment
- Safeguard property

1.6.3 DEFINING THE NATURE OF EMERGENCY

An Emergency can be defined as an “Occurrence of such magnitude so as to create a situation in which normal pattern of life within a facility is suddenly disrupted, adversely affecting not only the personnel and property within the facility, but also its vicinity”. Such an occurrence may result in “On Site” implication like:

The following maximum credible accident scenarios may occur in a hazardous waste landfill (TSDF):

- Slope Failure of landfill
- Road accident during transportation of Hazardous waste
- Water accumulation at landfill due to heavy rain

Slope Failure

Adequate care has been taken to ensure safe overall slope of landfill. The capping activity will be also carried out immediately once the waste filling is completed in particular cell. After completion of capping of landfill site there should not be chances of increase moisture content of filled waste, so there should not be any chances of failure of top slope.

In the event of a landfill instability such as a slope failure the first concern is always safety, safety of site personnel, safety of site entrance, and safety of general public. The situation will need to be assessed concisely and necessary emergency procedures and precautions implemented as quickly as possible.

Road accident

Road signs should be provided at each and every turning point especially for the guidance of the operators at the night. To prevent road accident following precautions to be taken.

- ❖ Transportation of waste by only authorized vehicles
- ❖ Regular training to drivers
- ❖ Organize awareness program
- ❖ Implementation of MSDS and TREM card

Water accumulation at landfill

Following steps will be carried out;

- ❖ Implementation of onsite emergency plant.
- ❖ Incoming waste to be stopped
- ❖ Slope failure may increase exposure risk to personnel and public so necessary PPEs to be provided and covering of waste to be performed quickly and safely
- ❖ Perform mitigating activity to limit further contamination or damage
- ❖ Work to be done round the clock
- ❖ Primary report to be prepared and make ready for proper interval

The following maximum credible accident scenarios may occur in MEE plant:

- ❖ Spillage and leakage of liquid waste
- ❖ Fire

To prevent spillage, leakage and fire of liquid chemicals following actions to be carried out

- ❖ Preventive maintenance of liquid transferring equipment
- ❖ Dyke wall
- ❖ Inspection of equipments at regular intervals
- ❖ Handling of waste in closed system
- ❖ Separate storage of combustible materials
- ❖ Portable fire extinguishers
- ❖ Regular training to employees
- ❖ Display boards and written instruction to increase the awareness
- ❖ Fire fighting arrangement
- ❖ Flame proof electrical equipment
- ❖ Regular Safety inspection
- ❖ Spill and leakage control kit
- ❖ Use of flame arrestor at the silencer of vehicles
- ❖ Risk assessment and Hazards Identification on regular basis
- ❖ Restricted entry of unauthorized persons
- ❖ No Smoking

Incidents having Off Site magnitude can be:

- ❖ Natural calamity like earthquake, cyclone etc

1.6.4 CLASSIFICATION OF EMERGENCIES

Emergency is a general term implying hazardous situation both inside and outside the plant/installation premises. Thus, the emergencies termed “onsite” when it confines itself within the plant/installation even though it may require external help and “off-site” when emergency extends beyond its premises. It is to be understood here, that if an emergency occurs inside the proposed expansion of TSDF and could not be controlled properly and timely, it may lead to an “off-site” emergency.

1.6.4.1 OBJECTIVES

The main objectives of emergency management system are the following;

- ❖ Identification, control and containment of the hazardous situation.

- ❖ Minimizing the impact of event/accident prevention of damage to Men, Materials and Property

To achieve the above stated objectives of emergency planning, the critical elements are:

- ❖ An early detection of an emergency and careful planning
- ❖ Co-ordination and response organization structure along with efficient trained personnel
- ❖ Availability of resources for handling emergencies
- ❖ Appropriate emergency response actions
- ❖ Effective notification and communication facilities
- ❖ Regular review and updating of the ERP
- ❖ Proper training of the concerned personnel

The emergencies at the proposed TSDF can be broadly classified into three levels:

Level 1: The emergency, which is containable within the factory premises. Emergency may be due to spillage of liquid or solid hazardous wastes, small fire in flammable hazardous wastes, etc which can come under this category.

Level 2: The emergency, which is containable within the factory premises. Emergency may due to fire in flammable hazardous wastes, filling of water in disposal pit due to heavy rain, etc which can come under this category.

Level 3: An incident at the proposed expansion of TSDF may occur, causing a severe hazard or a large area which poses an extreme threat to life or property. Breakage in slope and liner system due to de-settlement/earth quake, subsequently contamination of soil and ground water.

1.7 LEGAL AUTHORITY AND RESPONSIBILITY

1.7.1 ON-SITE EMERGENCY PLANNING

The provisions of the Hazardous Chemicals Rules, Section 41 B(4) of the Factories Act, 1948 (as amended) requires that every occupier is to draw up an on-site emergency plan with detailed disaster control measures and to educate the workers employed.

The obligation of an occupier of hazardous chemicals installation to prepare an emergency plan is also stipulated in Rule 13 of the 'Manufacture, Storage and Import of Hazardous Chemicals Rule's, 1989 and subsequent amendments.

7.3.2 OFF-SITE EMERGENCY PLANNING

Under the 'Manufacture, Storage and Import of Hazardous Chemicals Rules' preparation of 'Off-site Emergency Plan' is covered in Rule No.14. The duty of preparing and keeping up to date the Off-site Emergency Plan' as per this Rule is placed on the District Emergency Authority. Also, occupiers are charged with the responsibility of providing the above authority with such information, relating to the industrial activity under their control, as they may require for preparing the off-site emergency plan.

Off-site emergency response needs actions by various Government agencies over which the operating company has no control. BEIL role and responsibility is to provide material, manpower, and knowledge support under the overall charge of the off-site control administration.

1.8 ORGANIZATION STRUCTURE OF EMERGENCY MANAGEMENT SYSTEM

The management structure includes the following personnel's;

- ❖ Chief Emergency Controller
- ❖ Site Main Controller
- ❖ Incident Controller
- ❖ Key Personnel's
- ❖ Essential Workers

The following are earmarked in the plant

- ❖ Assembly points
- ❖ Emergency control center
- ❖ Fire fighting arrangements
- ❖ Medical facilities
- ❖ Other arrangements

In case of an emergency, the On-site Emergency Plan of the proposed expansion of incinerator will come into action. Effective on-site emergency plan requires that in the event of an accident, nominated functionaries be given specific responsibilities, often separate from their day-to-day activities.

The emergency organization follows the usual pattern of the hierarchy. The senior-most functionary available during an emergency at the proposed expansion of incinerator takes charge as **Chief Emergency Coordinator (CEC)** and will locate himself at the designated Primary Command Post. The senior most functionaries for each emergency service will act as coordinator and shall report at the Primary Command Post unless otherwise instructed by the Chief Coordinator.

The senior most persons in the shift will be designated as the **Site Incident Controller (SIC)**. The SIC will take charge of the incident site and take the overall command. He shall be supported by other key persons representing various emergency services. Key persons are personnel available at the site on round the clock basis. It is to be appreciated that the key persons remain the front line fighters. The role of various coordinators is to assess the situation from time to time, take appropriate decisions in consultation with the CEC and to provide timely resources to the key persons to fight the emergency.

1.8.1 DUTIES AND RESPONSIBILITIES OF THE KEY PERSONNEL

The duties and responsibilities of the key personnel for unlikely event of emergency are given below:

Crises Co-ordinator

The Head of TSDF will work as Crisis Coordinator:

- ❖ He shall assess the situation and instructs the Chief Emergency Coordinator to sound the siren. This will inform the employee that an emergency situation has arisen and that the proposed expansion of incinerator should be shut down and evaluated.

- ❖ All the personnel/part of the proposed expansion of incinerator need to be evacuated and employees other than given responsibility assemble at the assembly points.
- ❖ He shall approve release of information to press, TV and Government agencies as required.

Chief Emergency Coordinator (CEC)

- ❖ The General Manager of TSDF shall work as Chief Emergency Coordinator.
- ❖ He shall report at the command post and will assume overall responsibility of the works and its personnel. His duties shall be:
 - ✓ To assess the magnitude of the situation and decide whether a major emergency exists or is likely to develop, requiring external assistance. To inform District Emergency Authority (DEA) (i.e. District Collector) in case on-site emergency escalates into off-site emergency.
 - ✓ To contact Crisis Cell of the Ministry and inform about the incident, magnitude of disaster, combating operations and number of casualties, if any
 - ✓ To exercise direct operational control over areas in the proposed expansion affected.
 - ✓ To assess the magnitude of the situation and decide if personnel need to be evacuated to identify safe places.
 - ✓ To continuously review in consultation with the other coordinators.
 - ✓ To arrange for a log of the emergency to be maintained in control room.
 - ✓ To liaise with senior officials of police, fire brigade and Factories Inspectorate and pass on information on possible effects to the Surrounding areas outside the factory premises.
 - ✓ To liaise with various coordinators to ensure casualties are receiving adequate attention and traffic movement within the proposed expansion of TSDF is well regulated.
 - ✓ To release authorized information to press through the media officer designated.

Site Main Controller

He shall have an overall responsibility for directing operations & calling outside help from Emergency Control Centers. He is required to take decisions after consultation with the Senior Manager available at site.

He shall have overall responsibility for directing and controlling following authorities and group.

Table 1-3: Authorities and Responsibility

1	Incident Controller	For the safe shut down of Plant. To review & assess the actions. Provide information to other Plants.
2	Fire & Safety	For the supply of P.P.E., F.F.E. etc.
3	Medical Officer	For the medical treatment & hospitalization
4	Security	For Visitors, manpower Movement, traffic control, fire fighting, rescue operations.
5	Pers. & Admn.	Evacuation of persons/causalities, outside shelter, information to the relatives of injured person, welfare of in plant affected persons, information to local authorities, statutory authorities, records of affected persons, press etc.
6	Environment	Environment monitoring /Controlling / safe disposal
7	Maintenance	For safe shut down of plant. Availability of Utilities, electrical isolation etc.
8	Stores	Availability of Engg. Spares, PPE etc.

The Shift Engineer of non-affected Plant will act as SMC till arrival of the designated SMC at Emergency Control Centre (ECC). Until the arrival of SMC, he may have to execute following responsibilities.

- ❖ As soon as he received the information or comes to know about the incident, he shall proceed to Emergency Control Room (Control Room) and shall take charge of the incident. If Control Room gets affected due to unfavorable wind direction, Fire Control Room shall be used as alternate Emergency Control Room.
- ❖ He shall ensure that all the Key Personnel are called.
- ❖ He shall assess the gravity of situation with the help of Incident Controller, Plant Manager and Key Personnel and after quickly assess the situation, shall find out of the emergency from Incident Controller and declare the emergency.

Level-1: Emergency -may be handled within the plant premises.

Level-2: Emergency -On Site Emergency plant shall be activated.

Level-3: Emergency -Action to be taken to operate Off-Site Emergency Plan.

- ❖ He shall direct all emergency operations within the affected area with the following priorities.
- ❖ Personnel safety, including of surrounding community.
- ❖ Minimum damage to Plant, Property and Environment.
- ❖ Appropriate actions to minimize loss.
- ❖ He shall direct for evacuation of plant and areas likely to be affected by the emergency.
- ❖ He shall continuously review and assess possible developments to determine most probable course of events and actions.
- ❖ He shall assess the situation and ensure that whatever resources needed is made available and utilized in a co-ordinate manner.
- ❖ He shall direct the safe shut down with incident controller and Key Personnel, if necessary.
- ❖ He shall check that all non-essential workers, visitors, contractors are evacuated to safe assembly points and head count is completed.
- ❖ He shall give instructions to the Incident controllers, Fire fighting and Rescue teams.
- ❖ He shall, if necessary arrange for evacuation of neighboring population.

- ❖ He shall ensure that search for casualties, within the affected area has been carried out and arrange for hospitalization of victims and additional medical help, if required.
- ❖ He shall ensure that liaison will be made with outside agencies such as Police Services, Fire Services, Expert on Health and Safety, Meteorological Office, District Emergency Authorities, Collector and Senior Inspector of Factories. Provide advice on possible effects to areas outside the factory.
- ❖ He shall arrange for up to date records of emergencies.
- ❖ He shall advice not to re-start the plants unless it is declared safe to start by competent authorities.

Incident Controller

- ❖ Incident Controller shall take overall control of handling the emergency at the plant. His first task shall be the isolation of the source of containment loss to the extent feasible. Simultaneously, in case of fire, he will organize appropriate fire response to get the situation under control and to prevent escalation.
- ❖ On arrival at the site, he shall assess the scale of emergency and judge if a major emergency exists or is likely to develop and shall inform the control room accordingly asking for assistance and indicating the kind of support needed. His duties and responsibilities shall include:
 - ✓ To coordinate the activities of other key persons reporting at the incident site, under his overall command.
 - ✓ To direct all operations within the affected areas giving due priorities for safety of personnel and to minimize damage to environment, proposed expansion of TSDF and property.
 - ✓ To provide advice and information to Fire & Safety personnel and other fire services as and when they arrive.
 - ✓ To ensure that all non-essential workers and staff within the affected area are evacuated to appropriate assembly points and those areas are searched for casualties.
 - ✓ To organize rescue teams for any casualties and to send them to safe areas/medical centre for first aid and medical relief.
 - ✓ To setup communication points and establish contact with control room
 - ✓ To seek additional support and resources as may be needed through the control room.
 - ✓ To preserve all evidence so as to facilitate any inquiry into the cause and circumstance, which caused or escalated the emergency (to arrange photographs, video, etc.)
 - ✓ To arrange for a head count after the emergency is over with respect to the personnel on duty in the affected areas

Key Personnel

Key Personnel are required to provide and to implement the decisions made by the SMC in the light of information received on the developing situation at the time of emergency. As necessary, they will decide the actions needed to shutdown plants, evacuate personnel, carryout emergency engineering work, arrange for supplies of equipment, utilities, carryout environment monitoring, provide catering facilities, liaise with police, fire brigade and other local authorities, relative of casualties, hospital, press & neighboring industries. Action at assembly points, outside shelters and mutual aid center under the direction of the SMC. All the key personnel and other called in to assist shall report to the ECC. They shall be available at any time on duty or on call or holiday.

Essential Workers

A task force of essential trained workers (expert's team) is available to get the work done by the Incident Controller and the Site Main Controller. Such work will include:

- ❖ Fire fighting and spill control till a Fire Brigade takes the charge.
- ❖ To help the Fire Brigade and mutual aid teams, if it is so required.
- ❖ Shutting down plant and making it safe.
- ❖ Emergency engineering work e.g. isolating equipment, material process, providing temporary by-pass lines, safe transfer of materials, urgent repairing or replacement, electrical work, etc.
- ❖ Provision of emergency power, water, lighting, instruments, equipment, materials, etc.
- ❖ Movement of equipment, special vehicle and transport to or from the scene of the accident.
- ❖ Search, evacuation, rescue and welfare.
- ❖ The injured is given First Aid.
- ❖ Moving tankers or other vehicles from area of risk.
- ❖ Carrying out atmospheric test and pollution control.
- ❖ Manning of assembly points to record the arrival of evacuated personnel. Manning for outside shelters and welfare of evacuated persons there.
- ❖ Assistance at casualties reception areas to record details of casualties.
- ❖ Assistance at communication centers to handle outgoing and incoming calls and to act as messengers if necessary.
- ❖ Manning of works entrances in liaison with the police to direct emergency vehicles entering the work, to control traffic leaving the works and to turn away or make alternative safe arrangements for visitors, contractors and other traffic arriving at the works.
- ❖ Informing surrounding factories and the public as well as directed by the Site Main Controller.
- ❖ Any special help required.

Assembly Point

In affected & vulnerable plants, all non essential workers (who are not assigned any emergency duty) are evacuating the area & report to a specified assembly Points. Each assembly point will be clearly marked by a Conspicuous notices & provided with an identification numbers e.g. assembly Point No. 1, 2 and so on.

Assembly Points are located at a safe place, well away from area of risk and least affected by the down wind direction. To ensure that workers do not have to approach the affected area to reach the assembly point proper location and numbers have been marked at assembly points. Each assembly point is manned by a nominated person to record the names and dept. Further telephone to communicate SMC has been provided at each assembly Points.

At each assembly point, duties of assembly point In-charge have been also displayed in brief. Before reaching an assembly point or subsequently, if it is required to pass through an affected area or due to presence of toxic substances, suitable PPE's including respirators, helmet etc., are issued & made available with workers.

Fire and Safety Function

- ❖ The Manager-Fire & Safety along with fire fighting team will work as fire and safety functionary.
- ❖ The main responsibilities of fire and safety functionary are:
 - ✓ To immediately take charge of all fire fighting operations upon sounding of the alarm.

- ✓ To instruct the telephone operator to immediately inform all essential personnel not residing within the audible range of the emergency siren.
- ✓ To guide fire fighting crew and provide logistics support for effectively combating the fire.
- ✓ To barricade the area at appropriate locations in order to prevent the movement of vehicular traffic.
- ✓ To assist in rescue and first aid operations.
- ✓ To operate the Mutual Aid Scheme and call for additional external help in fire fighting via the control room.
- ✓ To organize relieving groups for fire fighting.
- ✓ To inform the Crises Controller and give "All Clear" signal when the fire emergency is over.

Communication Function

- ❖ The Manger of Laboratory will work as communication functionary. He should perform the following duties:
- ❖ To ensure all available communication links remain functional.
- ❖ To quickly establish communication links between incident site and the control room
- ❖ To ensure that previously agreed inventory of various types of communication equipment is maintained in working condition and frequent checks carried out and records maintained.
- ❖ To maintain voice record of significant communications with timings received/passed from the primary control room.

Medical Function

The Manger – Occupational Health will look after medical function. He will perform the following:

- ❖ To arrange for the First Aid team to treat the affected personnel.
- ❖ To arrange for treatment in the hospital.
- ❖ To liaise with the local medical authorities and hospitals, if the casualties are more and the situation demands treatment at more/other medical centers.
- ❖ To liaise with the transport coordinator for transporting the victims to various hospitals.
- ❖ To arrange for ambulances
- ❖ The Medical Coordinator should ensure the upkeep of agreed medical supplies, antidotes and equipment that should always be kept in stock for treating victims of burns.

Transport Function

The Waste Transportation Manger will work as Transport Function. He shall perform the following duties:

- ❖ Arrange for transport of victims to hospital/dispensaries.
- ❖ Mobilize all available vehicles available at the proposed expansion of TSDF for emergency use, along-with the drivers.
- ❖ Arrange for the duty rotation of the drivers to meet with the emergency situation.
- ❖ To direct refueling of vehicles, if not topped up.
- ❖ To arrange for vehicles from other sources.
- ❖ To liaise with the CEC for evacuation of personnel and transportation of victims.

1.9 EMERGENCY RESPONSE PROCEDURES

1.9.1 Background

The following maximum credible accident scenarios may occur in a hazardous waste landfill (TSDF):

- ❖ Road accident during transportation of Hazardous waste
- ❖ Slop Failure of landfill
- ❖ Water accumulation at landfill due to heavy rain
- ❖ Breakage of Liner due to de-settlement of landfill pit
- ❖ Fire at flammable hazardous waste disposal site

The Command Post is to be promptly established at safest place at the proposed TSDF Site. It shall be the nearest office/place having communication facilities to be manned continuously.

The response planning topics covered in this chapter are as follows:

- ❖ Initial Notification of Release
- ❖ Establishment and Staffing of Command Post
- ❖ Formulation of Response Objectives and Strategy at the incident site
- ❖ Ensuring Health and Safety at Incident Scenes
- ❖ Evacuation
- ❖ Fire Response
- ❖ Health Care
- ❖ Personal Protection
- ❖ Public Relations
- ❖ Documentation and Investigative Follow-up
- ❖ Training

The accident scenarios for planning response procedures and carrying out mock drill should be considered based on the risk analysis study.

1.9.2 Initial Notification of Releases

In the event of emergency, alarm will be raised in control room. Otherwise, any person noticing a fire, explosion or the release of hazardous materials should shout “spillage” or “Fire and. He will also inform the control room on the nearest telephone and the panel officer will inform SIC.

ACTION BY INDIVIDUAL EMPLOYEE AT THE TIME OF EMERGENCY WHEN YOU NOTICE FIRE

- ❖ Do immediately inform the control room.
- ❖ Do act to control the incident as per the instructions.
- ❖ Do reach the assembly point.
- ❖ Do not get panicky or spread rumors.
- ❖ Do not approach control room without work
- ❖ Do not engage telephone or loudophone continuously

1.9.3 Establishment and Staffing of Command Post

- ✓ Quickly establish a command post near the scene of incident. The minimum that is necessary is a continuously manned communication system close to the incident site.
- ✓ It is the responsibility of the response personnel at the Command Post to restrict the entry or movement of people into the Hazard zone. The first step of a response action must be restriction of access to the leakage site and other hazardous areas.
- ✓ Security and access control at Command Post and Primary Command Post need to be provided.

1.9.4 Formulation of Response Objectives and Strategy at the Incident Site

- ✓ It is the responsibility of the CEC to decide on the appropriate response strategy specific to the situation prevailing. It is important to assess each particular incident before taking action.
- ✓ CEC in consultation with the Site Incident Controller will formulate realistic response objectives. The assessment should be based on resource requirement i.e. trained personnel and protective gear.

Upon completion of the incident assessment, command personnel will be in a better position to determine whether their response strategy should be defensive or offensive in nature. A defensive posture is best taken when intervention may not favorably affect the outcome of the incident, or is likely to place emergency response personnel in significant danger, and/or may possibly cause more harm than good. An offensive posture (i.e., one requiring response personnel to work well within the boundaries of hazard zones) is best taken when intervention is likely to result in a favorable outcome without exposing personnel to undue danger and without causing new and potentially more severe problems.

1.9.5 Ensuring Health and Safety at Incident Scenes

The results of hazard analysis will be used to identify the vulnerable zones. Based on incident-specific factors, the exact size and configuration of hazard control zones will be determined. The Hazard Control Zones have been defined below;

The CEC will formulate safe operating procedures for a site safety and health program that addresses the following.

- ❖ The use of appropriate protective gear and equipment
- ❖ Utilizing the most experienced personnel for the most hazardous tasks.
- ❖ Positioning a backup team to assist or rescue personnel.
- ❖ Providing medical surveillance for personnel.
- ❖ Monitoring (visually and through communications contact) the welfare of personnel operating within the emergency zones.
- ❖ Ensuring that all personnel understand their assignments.
- ❖ Ensuring that responders do not ingest contaminants through eating, drinking, or inhaling.
- ❖ Replacing fatigued personnel with —fresh personnel.
- ❖ Adjusting hazard control zones to reflect changing conditions.

1.9.6 Evacuation

- ❖ In case of an On-site emergency, the order to evacuate to a safe place will be given by the Chief Coordinator in consultation with other coordinators.
- ❖ In case of an Off-site emergency, the order to evacuate to a safe place will be given by the District Emergency Authority in consultation with Chief Coordinator in consultation with other coordinators.
- ❖ Accident scenarios covered in 'Risk Assessment study' can be a key source of information for evacuation planning where specific facilities are known to pose a threat.
- ❖ Evacuation and shelter-in-place decisions are incident specific and must be made at the time of an actual release. Guidance obtained from consequence analysis may be considered a starting point for the decision process.
- ❖ Only personnel in close vicinity and affected by heat radiation or pressure wave need be evacuated to safe distances. Non-essential personnel will usually be evacuated from the incident area and also from adjacent areas. Evacuation should be to a predetermined assembly point in a safe part of the plant. Assembly points marked on the plot plan should be appropriately displayed.
- ❖ For serious injury cases, evacuation to hospital will be carried out by the response personnel.
- ❖ Chief Coordinator should designate one individual to record all personnel arriving at the assembly point so that the information can be passed to the Primary Command Post.
- ❖ At the Primary Command Post, a nominated person should collect the lists of personnel arriving at the assembly points with those involved in the incident. These should then be checked against the roll of those believed to be on-site, updated with known changes for that day. Where it is possible that missing people might have been in the area of emergency, the site incident controller should be informed and arrangements made to organize a further search.

1.9.7 Fire Response

- ✓ All available firefighting resources will be mobilized in minimum time by head of firefighting services at the time of emergency. The firefighting arrangements including manpower and resources which will be organized to deal with worst scenarios like the largest tank in Pump station on fire.
- ✓ Fire department need to be well prepared and experienced in rescuing people from fire and explosion situations.

1.9.8 Health Care

- ❖ Requisite medical resources will be mobilized under the overall charge of the Health and Medical functionary.
- ❖ The operational response will be coordinated from the control room.

1.9.9 Personal Protection

- ❖ Specific skills need to be developed for the safe use of protective clothing through training and experience.
- ❖ The CEC will arrange for rapid availability of appropriate protective clothing in the event of an emergency.

1.9.10 Public Relations

- ❖ CEC will designate one specific individual as the Media Officer.
- ❖ The designated Media Officer only will speak to media personnel.
- ❖ The Media officer should ensure orderly and accurate dissemination of information.

1.9.11 Documentation and Investigative Follow Up

- ❖ CEC will assign responsibility to a functionary for real-time and post-incident documentation of the accident and resulting response actions.
- ❖ The responsible person will adopt appropriate reporting forms and procedures giving detailed records of what happened and what actions were taken in response.

Detailed records of what happened and what actions were taken in response can help in:

- ❖ Attempting to recover response costs and damages from the party responsible for the incident.
- ❖ Setting the record straight where there are charges of negligence or mismanagement resulting from the incident.
- ❖ Reviewing the efficiency and effectiveness of response actions.
- ❖ Preparing for future incident responses.
- ❖ Verifying facts, actions, injuries, equipment used, etc. for the purpose of legal proceedings, insurance claims, budget requests, and public inquiries.

1.9.12 Training

- ❖ Training sessions need to be provided in which personnel are briefed on their specific duties in an emergency.
- ❖ To provide training to all emergency responders. The concerned personnel are shown how to wear and properly use personal protective clothing and devices.
- ❖ Periodic drills to be conducted to test the overall efficiency and effectiveness of the emergency response plan and emergency response capabilities.
- ❖ The types of training required for emergency response personnel with responsibilities in any or all phases of the response is based upon the types of incidents most likely to occur and the related response and planning activities.

1.9.13 Responsibility, Frequency and Procedure for Evaluation

- ❖ The CEC is responsible for evaluating the effectiveness of the onsite emergency plan. Emergency mock drill should be conducted at an interval of six months. Experts should be invited to observe the mock drill in order to know their response and opinion. The recommendations following the discussions will help to identify the loopholes in the plan and response capability of the organization. Such periodic recommendations of the mock drill should be kept in order to update the plan.
- ❖ The CEC will be responsible to update their on-site emergency plan regularly. A regular review of the plan at least once in a year should be carried out to replace outdated information or to incorporate the results of mock drill.

1.10 COMMUNICATION SYSTEM & ACTION ON THE SITE

1.10.1 Communication System

- ❖ Any person noticing an emergency should be able to raise or cause to be raised the first floor level emergency alarm. All employees must be trained to operate such emergency alarms. There should be an adequate number of points from which the alarm can be raised either directly, by activating an audible warning of individual signal or message to a preliminary manned location. This has the advantage of permitting the earliest possible action to be taken to control the situation, which in turn may avoid the development of a major emergency. All such points must be distinctively marked and known to all employees.
- ❖ The alarm should be audible in every part of the plant. In areas of high noise level, it may be advantageous to provide an alternative to an audible alarm e.g. flashing lights. Alarm systems vary and will depend on the size of works. On small sites a simple alarm system should suffice which provide the means whereby the persons hearing the incident can warn others of the danger and summon assistance. On large sites a staged warning system may be more appropriate. The person discovering the incident should warn all those in the vicinity who should either evacuate or take other immediate action according to the predetermined plan. Automatic alarms may be appropriate on some sites. To communicate disaster hooter will be useful for proposed expansion of TSDF area and public in surrounding area.
- ❖ The alarm should alert the site controller who should assess the situation and implement appropriate emergency procedures.
- ❖ Separate alarms may be necessary to warn of different types of emergency such as fire and the beginning of the emergency as different procedure may be required. Care must be taken, however to avoid a multiplicity of alarms which would cause confusion. In case of total electricity failure and the alarms, telephones and intercom system not working, help of runners/messengers shall be taken. One (or more) big bell (independent power) and magnetic telephones with fire and emergency services may also be useful.
- ❖ Public address system or internal telephones throughout the proposed TSDF will be use full for quick communication. The alarm system should be checked periodically to test efficiency.

1.10.2 Declaring the Major Emergency

The declaration of major emergency puts many agencies on action and the running system may be disturbed which may be very costly at times or the consequences may be serious, therefore such declaration should not be decided on whims or immature judgment or without proper thought. Because of scale of activity which will be activated after the declaration of major emergency.

They should be selected on the basis that their knowledge and experience equips them to recognize the fact of a major emergency or the potential for it. Such nominated persons will advise the Crises Controller, declare the emergency and it will be declared accordingly through him.

The joint decision to declare major emergency may be taken but it should be as early as possible and without wasting the time.

1.10.3 TELEPHONE MESSAGE

After hearing the emergency alarm and emergency declaration or even while fast receiving the emergency message on phone, a telephone operator (or Communication Officer) has to play an important role. He should be precise sharp, attentive and quick in receiving and noting the message and then for immediate subsequent action of further communication.

1.10.4 COMMUNICATION OF EMERGENCY

There should be an effective system to communicate emergency

- (a) Inside the proposed expansion of TSDF i.e. to the workers including key personnel and essential workers, on duty and inside during normal working hours
- (b) To the key personnel and essential workers not on duty and outside during normal working hours.
- (c) To the outside emergency services and the government authorities and
- (d) To the neighboring firms and the general public in the vicinity. Key points are suggested below:

COMMUNICATION TO THE OUTSIDE EMERGENCY SERVICES AND AUTHORITIES

- ❖ Once the declaration is made, it is essential that the outside emergency services if they have not already been called in, be informed in the shortest possible time. Liaison at local level will help to determine the best means of achieving this, for example, direct line or automatic alarm to the fire brigade or by any emergency system. Predetermined code words to indicate the scale and type of the emergency may be useful.
- ❖ The emergency must be immediately communicated to the Government Authorities such as local Factory Inspectorate, Collectorate, Police and District Emergency Authority.
- ❖ The statutory information to above authorities must be supplied beforehand so that they can be well prepared to operate their offsite emergency control (contingent) plan. As per their advice to consultation, onsite plan should be modified and updated

1.10.5 STATUTORY COMMUNICATIONS

Under the statutory provisions, information is required to be given to the following:

- ❖ The workers
- ❖ The general public and neighboring firms
- ❖ District Emergency Authority.
- ❖ Factory Inspectorate

1.11 SERVICES AND CONTROL

1.11.1 Public Address System

Public Address System will be installed at selected points in the plant, which shall be used for announcement/ information to be given.

1.11.2 Telephones

Adequate facility for internal telephones already installed in the different offices in the proposed TSDF shall be used to communicate any emergency to personnel.

Emergency telephone numbers of responsible persons to be maintained with each department and emergency control centers.

A list of all external authorities, their address and telephone nos. will be maintained

1.11.3 In case of Failure of Telephone

In case of failure of telephone numbers, security guards shall work as runners/messengers. Vehicle being detained round the clock will be used for sending message, in case of emergency and to bring people to work for additional help to deal with emergency.

1.11.4 Fire Fighting Equipment

Fire extinguishers depending upon the type of fire shall be used. List of location & type of fire extinguisher will be maintained with each department. A quarterly check for extinguisher shall be done and recorded.

1.11.5 Mock Drill

For reviewing and assessing the level of emergency preparedness, mock drills will be conducted once in six months. Simulating the covered emergencies and will maintain records of the trails.

1.11.6 Review & Revision

All accidents/emergency situations shall be recorded in accident report. This shall be produced in the Safety Committee meeting in order to review & revise the emergency preparedness and response.