# OFF SITE EMERGENCY PLAN

# FOR

# ARVALLI DISTRICT

**PREPARED BY**

**ARVALLI DISTRICT CRISIS GROUP**
**ARVALLI DISTRICT**

**UPDATED :–**

**December-2026**

# -: F O R E W O R D :-

**State of Gujarat has highest number of Major Accident Hazard (MAH) factories and tops the country with505Major Accident Hazard (MAH) units. Out of these1 such Industry is situated in Arvalli District .**

Government of Gujarat vide resolution dated 10$^{th}$October,1986, issued by Labour and Employment Department Constituted District Contingency Plan Committee under the Chairmanship of District Collector. Subsequently Government of India published Manufacture, Storage and Import of Hazardous Chemical (MSIHC) Rules,1989 and Chemical Accidents (Emergency Planning, Preparedness and Response) (EPPR) Rules,1996 under the Environment Protection Act,1986.

Arvalli District came to existence in year-2013 and First exclusive District Contingency Plan for Arvalli District has been prepared herewith as per the provision of MSIHC Rules,1989 and Chemical Accidents (EPPR) Rules,1996.

Ministry of Environment & Forests, Government of India, engaged M/s. Associated Consulting Engineers, New-Delhi to prepare Off-site Emergency Plan for Bharuch District vide their letter No. F. No. 15-11/2003 – HSMD dated 1$^{st}$May,2003. M/s. Associated Consulting Engineers, New-Delhi submitted a draft plan in the month of October,2003.

**The useful information given in the Off-site Emergency Plan prepared by the Office of Deputy Director, Industrial Safety and Health, Bharuch and the Off-site Emergency Plan submitted by M/s. Associated Consulting Engineers, New-Delhi has been compiled in preparation of this Off-site Emergency Plan.**

The present plan is in two parts i.e. Part-I and Part-II.

Part-I contains information about Area Profile, Potential for Off-site Emergencies, Emergency Management Organization, Emergency Planning and Preparedness, Details of Control Room etc. It also contains Annexures 1 to 5 giving details of Key Contacts, Emergency Organization, Resources Available and Remedial Measures alongwith Community Information and Evacuation aspects.

Part-II signifies Major Accident Response System (MARS) giving details about Action Plan for Off-site Emergency in the event of fire, explosion, chemical spillage, transportation hazards and post emergency activities. As response time is a critical factor for controlling and mitigating any type emergency, police, fire and medical services have been identified as first respondents.

I thank Shri H.S.Patel, Deputy Director, Industrial Safety and Health, Gandhinagarand his Officers' team for compiling & updation of this plan.

**Dated :**

**Arvalli District Collector and Chairman**
**District Off-site Emergency Plan**
**Arvalli**

# -: P R E F A C E :-

Government of India published Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules,1989 and thereafter Chemical Accidents (Emergency Planning, Preparedness and Response) (EPPR) Rules,1996 under Environment Protection Act,1986, with a view to minimize the loss of life and property in the event of industrial disaster.

Arvalli District came to existence in year-2013 and First exclusive District Contingency Plan for Arvalli District has been prepared herewith as per the provision of MSIHC Rules,1989 and Chemical Accidents (EPPR) Rules,1996.

Ministry of Environment and Forests, Government of India, engaged M/s. Associated Consulting Engineers, New-Delhi, to develop and Off-site Emergency Plan for Bharuch District, vide theirletter No. F. No. 15-11/2003 – HSMD dated 1st May,2003, dated 1st May,2003. M/s. Associated Consulting Engineers, New-Delhi submitted the draft plan to District Collector, Bharuch in the month of October,2003. A review meeting was kept at Ahmedabad on 13th April,2004 and M/s. Associated Consulting Engineers made presentation of the plan in the said meeting. Principal Secretary, Labour and Employment Department, Director, Industrial Safety and Health, Deputy Director, Industrial Safety and Health, Bharuch District and other Senior Officials of the Directorate also participated in the meeting. The plans prepared by Bharuch Office and by M/s. Associated Consulting Engineers were thoroughly reviewed and it was decided to formulate a revised Off-site Emergency Plan covering important information from both the plans.

Accordingly this Off-site Emergency Plan has been prepared comprising of useful chapter from each plan.

I am grateful to the Additional Chief Secretary, Labour and Employment, Government of Gujarat and Director, Industrial Safety and Health, Gujarat State and the District Collector, Arvalli for their useful guidance provided by them for preparation of this plan.

I am also thankful toOfficers of Gandhinagar Officefor the help they extended in completing the plan in the shortest possible time.

**(J.B.BODAT)**
**Dy. Director, Industrial Safety & Health**
**and Member Secretary**
**District Off-site Emergency Plan**
**Arvalli**

# OFF-SITE EMERGENCY MANAGEMENT PLAN FORARVALLIDISTRICT

# PART – I

# CONTENTS

# CHAPTER

# CHAPTER 1

# INTRODUCTION

## 1.1 PREAMBLE

An off site emergency arising out chemical is one, which has the potential to cause serious damage or loss of life beyond the plant boundary. In addition, accidents during transportation of hazardous chemicals by road, rail, pipeline, etc. can also cause offsite emergencies. Emergency services such as police, fire, medical etc. need to be prepared to handle such situations effectively. The snowballing of a small incident into a major chemical disaster and the subsequent effects on the life and property can be mitigated if there is a readily implement able emergency preparedness plan available with the concerned district authorities. In order to be in a state of preparedness to respond to the accidents and minimize their adverse impacts on the offsite population, Rule 14 of the MSIHC Rules, 1989 (Amended in 2000), under EPA, 1986, requires an Off-site Emergency Plan to be prepared by the District Collector for every District or Industrial Area, as applicable.

## 1.2 LEGAL BACKGROUND – RESOLUTION OF 1986

The tragedy in Bhopal has made people all over the world aware about the seriousness of chemical accidents. Immediately after the incident, all the State Governments started looking into the emergency preparedness to combat and control the chemical disasters.

Gujarat Government has passed the resolution to constitute the District Contingency Plan Committees for Six District where population of Major Accident Hazard (MAH) factories is more i.e. Ahmedabad, Vadodara, Bharuch, Surat, Panchmahal & Valsad. Legal origin of Off-site Emergency Plan begins with this movement

**This resolution is reproduced below:-**

**: RESOLUTION:**

1. The number and distribution of hazardous industrial units in the State (that is, industrial units which, in the event of an accident, are such as to constitute a source of hazards to the community in the continuous local area serves to emphasize the need for contingency plan to deal with the various types of emergency that may arise owing to an industrial accident. The agency to which the task of drawing up a contingency plan may be entrusted, and the

form of any such plan, are questions which have been examined by Government, after careful considerations, Government hereby :-

(a) Constitutes for the period up to the 31st Dec'1986, in relation to Districts Ahmedabad, Panchmahal, Vadodara, Bharuch, Surat and Valsad, a District Contingency Plan Committee for industrial hazards (DCPC) for the drawing up of a contingency plan in respect of each local area within the district with a significant number of hazardous industrial units.

(b) Directs that the District Contingency Plan Committee (DCPC) shall comprise the following members :-

| | | |
|---|---|---|
| 1. | Collector and District Magistrate | Chairman |
| 2. | Municipal Commissioner / Chief Executive Officers of the Local Authority / Authorities covered | Member |
| 3. | Commissioner of Police / District Superintendent of Police | Member |
| 4. | Chief Fire Officer of the Municipal Corporation / Municipality / Local Authority covered | Member |
| 5. | Civil Surgeon / District Health Officer | Member |
| 6. | Senior Officers In-charge of the GIDC Industrial Estates covered | Member |
| 7. | A Representative of the Local Industries Association / Chamber of Commerce Nominated by the Chairman | Member |
| 8. | Dy. Director / Asst. Director, Industrial Safety & Health | Member Secretary |

This clarifies that the Chairman shall be competent to co-opt as members of the committee, or to invite to its meetings, such persons as he may deem appropriate.

2. The primary objective of a contingency plan in respect of any identified local area is that of making explicit the inter related set of actions to be undertaken in the event of an industrial accident posing hazards to the community. The plan must, that is to say, be both factual and action oriented. The notes circulated under the letters dated 25.4.1986 and 28.4.1986 specified above serves to indicate the approach that may be adopted in the formulation of a contingency plan for a local area. Each such contingency plan will need to be drawn up in a format which corresponds broadly to that reproduced in the Annexure to this resolution (that is an introductory chapter, followed identified hazards and hazards arising from accidents in transportation, and chapter on fire, police, health service available and on the network of communication envisaged). The

plan will include reference also to the features of On-site Contingency Plans formulated by major hazardous units, to the availability of emergency services within industrial estates, to voluntary organizations that may be expected to assist in the provision of relief in an emergency, and to the mode of updating the plan from time to time. The draft of such a contingency plan in respect of each local area in the District with a significant number of hazardous units is to be drawn up by the 30th Nov'1986.

3. The head-quarters of the District Contingency Plan Committee shall be the head-quarters of the District in question.

4. For journeys performed in connection with work of the committee, non-official members / invitees will be entitled to draw allowances at the rates, and subject to the conditions, applicable under the orders for the time being in force in respect of members of a Dist. Level Committee. The Member Secretary of the Dist. Contingency Plan Committee will be competent to countersign bills relating to such claims.

5. The expenditure on this account shall be debited to the head, Demand No. 60-(B) Social and Community Services-287: Labour and Employment – (A) Labour – (C) Working conditions & safety – (5) lbr-96 Safety cell for the prevention of accidents (plan) and met from the grants sanctioned there under in the 1986-87 budget.

6. These issues with the concurrence of the Financial Advisor dated 17.9.1986 on this Department's file of even number.

By Order and in the Name of the Governor of Gujarat.

(J. M. Pandya)
(Under Secretary to Govt. Labour & Employment Dept.)

**MSIHC Rules'1989**

By the Government of India, Department of Environment and Forest notification dated 27.11.1989 the rules known as the manufacture storage and import of hazardous chemicals rules'1989 came into force from 27.11.1989. These rules provided definitions of hazardous chemicals, major accident, threshold quantity etc.

Rule 13 of these rules required On Site Emergency Plan and rule 14

required preparation of Off Site Emergency Plan by the authority.

As per schedule – 5 of these rules, District Collectors were declared as authority for preparation of Off Site Emergency Plan under rule 14.

Schedule – 11 of above rules prescribed details of On Site Emergency Plan and schedule – 12 prescribes the details of Off Site Emergency Plan. This schedule – 12 is reproduced below:-

**Schedule – 12**

**Details to be furnished in the Off Site Emergency Plan.**

1. The type of accidents and release to be taken into account.
2. Organizations involved including key personnel and responsibilities and liaison arrangements between them.
3. Information about the site including likely locations of dangerous substances, and plant.
4. Technical information such as chemical and physical characteristics and dangers of the substances and plant.
5. Identify the facilities and transport routes.
6. Contact for further advice e.g. meteorological information, transport, temporary food and accommodation, first aid and hospital services water and agricultural authorities.
7. Communication links including phones, radios & standby methods.
8. Special equipment including fire fighting materials, damage control and repair items.
9. Details of emergency response procedures.
10. Notify the public.
11. Evacuation arrangements.
12. Arrangements for dealing with the press and other media interests.
13. Long term cleanup.

**Chemical Accidents "Emergency Planning, Preparedness and Response" (EPPR) Rules'1996**

Lastly the Government of India published the rules known as the chemical accidents (Emergency Planning, Preparedness and Response) rules'1996. They came into force from 1$^{st}$Aug'1996. This rule defines of chemicals accidents, hazardous chemical, industrial pocket, isolated storage, major chemical accident (MAH) installation and Off-site Emergency Plan etc. Accordingly Off-site Emergency Plan means, the Off-site Emergency Plan prepared under rule 14 of the MSIHC rules.

**Constitution**

**As Per Chemical Accidents "Emergency Planning, Preparedness and Response" (EPPR) rules'1996, the following groups have formed:-**

- Central Crisis Group – Chairman – Secretary, Govt. of India, Ministry of Environment Forests.
- State Crisis Group – Chairman – Chief Secretary, Gujarat State.
- District Crisis Group – Chairman – District Collector of the District.
- Local Crisis Group – Chairman – SDM & Dy. Collector of the District.

## 1.3 OBJECTIVE & SCOPE

### OBJECTIVE

The objective of the present assignment is to prepare an area specific Off-site Emergency Plan for **Arvalli**District, which can be practically implemented / activated at a short notice, to ensure minimal impact on life and property due to emergencies arising out of chemical accidents at one or more of the Major Accident Hazard (MAH) units or during transportation of hazardous chemicals in the area. It must be remembered that a plan is just the beginning of the emergency preparedness activity and certainly not the be all and end all of emergency management procedure. The plan is more of a guideline than a ready recipe for handling a chemical emergency. The number of possible incidents leading to an emergency is numerous and the plan cannot possibly include all. However, all efforts have been made to cover all the worst-case scenarios arising out of Major Accident Hazard (MAH) installations and having potential off-site effects.

The plan should be regularly updated when there are changes occurring in the industrial setup, transportation aspects, key manpower, administrative changes, etc. A plan cannot possibly be static for all time to come. Regular drills, training of key persons, increasing safety awareness, etc. are extremely important areas that must be looked into for sound preparedness.

### SCOPE

The scope of the assignment is to prepare an Off-site Emergency Plan as per the guidelines provided by the Ministry of Environment & Forests (MoEF) and as provided in Schedule 12 of the MSIHC Rules,1989 (Amended in 2000).

## 1.4 DEFINITIONS [AS PER EP ACT, MSIHC & CHEMICAL ACCIDENTS (EPPR) RULES]

### Emergency

An emergency could be defined as an event that causes a temporary break in the normal life of an industry or community. Terms such as disaster, emergency, calamity, etc. are also used depending on particular context and the circumstances.

### Emergency (in factory)

An Emergency (in factory) may be defined as one or more emergencies, which can:-

- Affect one or several plants / departments.
- Cause serious injury to personnel.
- Result in extensive damage to property and / or loss of life.
- Cause disruption, both inside and outside the work.

### A Major Emergency

A major emergency in a works is one, which has the potential to cause serious injury or loss of life. It may cause extensive damage to property and serious disruption both inside and outside the works. It would normally require the assistance of outside emergency services to handle it effectively. Although the emergency may be caused by number of different factors, e.g. plant failure, human error, earthquake, vehicle crash or sabotage. It will normally manifest itself in 3 basic forms i.e. fire, explosion, or toxic release.

### Types of Emergency

1. Social
2. Natural calamities
    - Earthquake
    - Cyclone
    - Flood
3. Man made
    - Civil disturbance
    - War
    - Riots
    - Industrial

Man made emergency which are encounters in any industry are :-

- Fire
- Explosion
- Gas leak
- Poisoning
- Those arising out of abnormalities in operation,
- maintenance, start up / shutdown, failure of equipment and use of sub standard / wrong materials

**Classification of / Level of Emergencies and Management**

**(1) Level – 1 Emergency**

The emergency which can be managed / controlled on site with the sources of factory concerned in accordance with the on site emergency plan.

**(2) Level – 2 Emergency**

Emergency that can be managed / controlled by the concerned factory with the mutual aid arrangements and outside resources.

**(3) Level – 3 Emergency**

Emergency that spill over to off site (outside factory) and may require action from the off site emergency i.e. Local Crisis Group, District Crisis Group.

**(4) Level – 4 Emergency**

Emergency which may require assistance and help from the State Government and Central Government to tackle with

**Anatomy of an Emergency**

No emergency except perhaps a catastrophic natural disaster occurs suddenly. Every emergency has a pattern and its main elements could be distinguished as,

- The warning phase
- Emergency phase
- Rehabilitation phase
- Recovery phase

- Reconstruction phase

The warning signals can be noted in any industrial operations, if adequate and timely measures are not taken during the warning phase, then it suddenly precipitates into the emergency phase when the actual crisis occurs. The emergency phase is distinguished by a sort of fire fighting management exercise and relief is an essential part of this phase. The efficiency of management of a crisis should be judged by the response tuned to the warning signals that leads to the actual crisis and when the crisis does occur, the speed with which it is manages and contained. The earlier the management of crisis moves into the rehabilitation phase from the relief phase the better would be its progress. Efficient and timely management of the rehabilitation phase, the recovery phase and the reconstruction phase would ensure that a similar crisis may not occur and if it does reoccur it's rigors would be much less and can be contained and managed much more efficiently.

**Nature of Emergency**

If there is any emergency in part of the plant / work place / industry due to any reason, the area which may be affected due to the emergency can be divided in the following two nature :-

**Nature – I (On Site Emergency)**

Effects remain Ltd. to plants / industry boundary.

**Nature – II (Off Site Emergency)**

Effect spread to neighboring industry / population.

**On Site Emergency**

Events likely to endanger human lives, plant and equipment, and is beyond the control of shift personnel and facilities available in the plant.

Requires mobilization of additional resources of other plant department to handle the emergency.

Require help under mutual aid scheme for fire fighting and rescue operation from near by industries.

**Off Site Emergency**

Events likely to endanger the human lives, plant and equipment within the factory and also in the neighborhood and is not possible to control with the resources available within the factory.

Requires mobilization of out side resources from Local / District Authorities such as Hospital Facilities, Civil Defense, District Magistrate, Police, Army, Air Force, and other agencies (may be called into control and contain the emergency).

**Accident**

An Accident is an unplanned event, which has a probability of causing personal injury or property damage or both. It may result in physical harm (injury/ disease) to persons, damage to property, a near miss or any combination of these effects.

**Chemical Accident**

Means an accident involving a fortuitous, or sudden or unintended occurrence while handling any hazardous chemicals resulting in continuous, intermittent or repeated exposure to death, or injury to, any person or damage to any property but does not include an accident by reason only of war or radioactivity.

**Industrial Pocket**

Means any industrial zone earmarked by the Gujarat Industrial Development Corporation of the State Government or by the State Government or any industrial zone having more MAH units.

**Major Chemical Accident**

Means an occurrence including any particular major emission, fire or explosion involving one or more hazardous chemicals and resulting from uncontrolled developments in the course of industrial activity or transportation or due to natural events leading to serious effects both immediate or delayed, inside or outside the installation likely to cause substantial loss of life and property including adverse effects on the environment.

**Transport**

Means movement of hazardous chemicals by any means over land water or air.

**Major Accident**

Means an incident involving loss of life inside or outside the installation or ten or more injuries inside and / or one of more injuries outside or release of toxic chemicals or explosion or fire or spillage of hazardous chemicals resulting in on site or off site emergencies or damage to equipment leading to stoppage of process of adverse affects to the environment.

## Disaster

### Man Made Disaster

Disaster resulting from malafide intentions such as sabotage, riots, industrial unrest, air attack etc. resulting into industrial accidents, factory fires, explosions and escape of toxic gases or chemical substances, river pollution, other structural collapses, air, sea, rail and road transport accidents, aircraft crashes, collisions of vehicles carrying inflammable liquids, oil spills at sea etc. will require State / National level resources to combat it.

### Natural Calamities

Disasters resulting from natural phenomena like earthquakes, volcanic eruption, storm, surges, cyclones, tropical storms, floods, land slides, forest fires and massive insect infestation. Also in this group, severe drought which will cause a creeping disaster leading to famine, disease and death must be included. These type disasters are not under the purview of this plan.

## Chemical Hazard

Chemical hazards is a hazard due to chemical (including its storage, process, handling etc.) and it is realized by fire explosion, toxicity, corrosivity, radiation etc.

### Disaster or Contingent Plan

The disaster or contingent plan of the area will be developed by the District / Local Authorities based on the On-site and Off-site Emergencies Plans of individual units in that area.

### Hazard

Situation that has the potential for causing injury to life or damage to property and environment.

### Hazardous Substance

Hazardous substance is also defined by the same act and hazardous process is defined by section 2(cb) of the factories act.

**Off-site Emergency Plan**

The Off-site Emergency Plan deals with measures to prevent and control emergencies affecting public and the environment outside the premises. The manufacturer should provide the necessary information on the nature, extent and likely effects of such incidents.

**On-site Emergency Plan**

The On-site Emergency Plan deals with measures to prevent and control emergencies within the factory and not affecting outside public of environment.

**Risk**

The probability that injury to life or damage to property and the environment will occur.

# CHAPTER 2

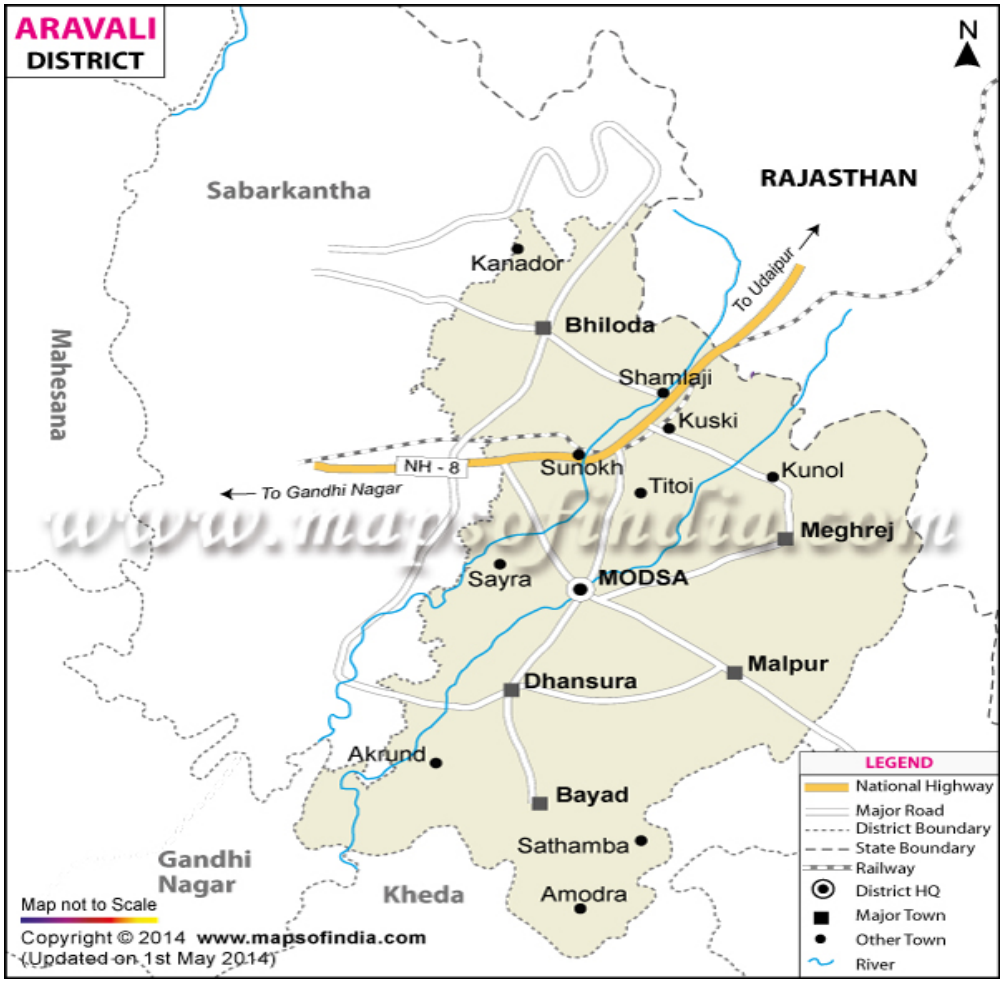
# AREA PROFILE

## 2.1 GENERAL

Off-site emergency planning not only involves detailed analyses of accident scenarios, roles & responsibilities of individuals & teams, management procedures, but also requires information on the topography, climatic conditions and demographic features of the areas surrounding the Major Accident Hazard (MAH) units. These data are necessary to develop scenarios, which are simulation of the actual conditions, thereby providing results, which are realistic and help in practical planning.

## 2.2 TOPOGRAPHY

The Map of the District with surrounding areas is given as below. (Annexure 1.1)



## 2.3 METEOROLOGICAL DATA

The climate of the District is generally characterized by a hot summer during major part of the year. Period from March onwards is hot season till the arrival of southwest monsoon in June, which lasts till the end of September, October and November are months of post monsoon.

January is the coldest month of the year. May is the hottest month of the year. The climate is generally hot.

## 2.4 INDUSTRIAL PROFILE (LIST OF MAH CATEGORY INDUSTRY)

Arvalli is a less industrialized District in Gujarat. The District is sub-divided into 06 Talukas viz. Bhiloda, Modasa, Meghraj, Bayad, Malpur & Dhansura. The unique feature of the District is that Major Accident Hazard (MAH) units are located in Bhiloda taluka only.Major Accident Hazard (MAH) units have been identified based on the information received from the Office of the Director, Industrial Safety & Health, Gujarat and latest information available with the Deputy Director, Industrial Safety & Health, Gandhinagar. As per the latest information available there are 01 functional Major Accident Hazard (MAH) units in Arvalli District. A list of these 01 functional Major Accident Hazard (MAH) units in the Arvalli District is given at Table – 2.1.

**Table – 2.1**

**Major Accident Hazard (MAH) Units in Arvalli District**

| Sr. No. | Name of the Unit | Location | Activity/ Product |
|---|---|---|---|
| 1 | NEON FUEL LTD. | At-KHODAMBA, Tal-BHILODA, Dist-ARAVALLI GUJARAT | LPG |

The directory of containing contact information of industry is given at Annexure No. 2.2

## 2.5 LOCATIONS AND SURROUNDINGS OF MAJOR ACCIDENT HAZARD (MAH) UNITS

Arvalli District having 1 Major Accident Hazard (MAH) unit. It has good infrastructure in terms of fire fighting (including facility available with the industries) and medical facilities.

## 2.6 DEMOGRAPHIC (POPULATION) PROFILE

Demographic profile of the area likely to be affected due to accident in the nearby Major Accident Hazard (MAH) units is given at Annexure 5.1

# CHAPTER 3

# POTENTIAL FOR OFF-SITE EMERGENCY

## 3.1 HAZARD IDENTIFICATION & ANALYSIS AT MAJOR ACCIDENT HAZARD (MAH) UNITS

### MAH Units in LCG

### a) Major Accident Hazard (MAH) units in Bhiloda pocket

There is 1 Major Accident Hazard (MAH) unit in the district. This 1 unit is located on National highway no- 8 and are surrounded by agricultural fields on all sides.

The accident scenarios having potential of Off-site emergency from storage at these Major Accident Hazard (MAH) units are given at Table 3.1.

Based on the information given in this table, it can be observed that the maximum hazard distance for all the accident scenarios of Major Accident Hazard (MAH) units is within 3 km from the accident site. Following points emerge from the analysis of data given in the table and observations made during the field visit.

- The nearest population centers are the respective villages near the Major Accident Hazard (MAH) units.
- Under all the above scenarios, almost all the employees of the concerned and probably some employees in the adjacent unit will be affected, as the case may be.
- As the LPG bullets / spheres are located adjacent to one another, cascading may also happen within the unit.
- LPG bottling plants as the quantities and therefore the damage potential is also very large. However, cascading effect amongst other units may not occur as only one such unit is there.
- Several LPG tank trucks are always parked near the gates of L.P.G. bottling plants and also at the parking bay. This increases the hazard potential of the area.

# Table 3.1

## Major Accident Scenarios for MAH Units at

| Name of the Unit | Chemical | Storage Qty. (MT) | | Damage Distance (m) | | | | | | | Toxic Disper-sion | | Popu-lation likely to be affec-ted | Areas likely to be affected |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Lar-gest | Total | Pool Fire | | BLEVE | | UVCE | | | D-3 | F-1.5 | | |
| | | | | FZR | IZR | FZR | IZR | FZR | IZR | D-LFL | | | | |
| NEON FUEL LTD.<br>AT. KHODAMBA<br>TA- BHILODA<br>DIST-ARVALLI | LPG | 30 | 30 | ---- | ---- | 204.0 | 403.2 | 61.8 | 197.8 | 400.8 | ---- | ---- | 100 | Khodamba |

## 3.2 TRANSPORT EMERGENCY

As can be observed from the foregoing sections, Arvalli Dist. Has only oneMajor Accident Hazard (MAH) unithandling LPG ashazardous chemical. Therefore, the transportation of hazardous chemical in the District is due to the following:

- Manufacturers dispatching hazchem to units within or outside the District.
- Manufacturers or other chemical industries receiving hazchem from manufacturers located within or outside the District.
- Bulk storage terminals receiving hazchem through pipelines and / or ships and dispatching to users within or outside the District.
- Transient traffic of hazchem carrier passing through the major corridors of the District.

### 3.2.1 Major Corridors for Hazchem Transportation

**National Highway No. 8** :- This stretch enters the District at Chandrala and exits towards Udaipur (Rajasthan). It also caters to the interstate transient traffic of hazchem and other goods. From this it can be observed that the movement of hazchem transportation and also the potential for accidents involving them in the district is very high.

In addition to the above, attention also needs to be given on the Bhiloda Modasa Road. While some of the roads are motorable, others are in bad shape and become worse during monsoon. Movement of heavy vehicles, even carrying hazchem, within this area is high. Poor road conditions may not only result in transportation accidents but also increases the travel time for first responders to reach the incident site.

It is a good feature that LPG bottling plant is located in isolated area away from the population centers, as far as safety is concerned. However, with regard to deployment of resources and condition of access roads, it is a negative aspect.

### 3.2.2 Major Hazchems Transported

Based on the results of an earlier study conducted by the Ministry of Environment & Forest (MoEF), following are the major hazchem transported through the District :-

| | |
|---|---|
| Acids & Alkalies | (Acetic, Hydrochloric, Nitric, Sulphuric) |
| Carbon Dysulphide | |
| Ammonia | Methanol |
| Benzene | Motor spirit |
| Chlorine | Naphtha |
| Diesel | Oleum |
| Kerosene | Solvents (Xylene, Toluene, Aromax) |
| LPG/Propane | Technical pesticides |

### 3.2.3 Transportation Hazard Potential

As mentioned above, various hazardous chemicals are being transported through out the District. With heavy transportation activity within the district, the potential for accidents also increases correspondingly. Accidents scenarios have been visualized for major hazardous chemicals passing through the district and the details are given below. This table provides likely scenario, chemical involved, its quantity and expected area of exposure. As transport emergency can happen anywhere in the District, the area and population likely to get affected will depend on the location and prevalent meteorological conditions in the area.

**Table - 3.6**
**Transport Accident Scenarios**

| Sr. No. | Transport Accident Scenario | Area Likely to be Affected |
|---|---|---|
| 1. | Failure of chlorine toner | 1 to 1. 4 Km down wind |
| 2. | Failure of acid / alkali tanker | Immediate surroundings and burns to persons coming in direct contact with the substance |
| 3. | Ammonia leak from cylinder | Varying, depending on the capacity of the cylinder but not more than 1 km |
| 4. | Ammonia leak from a tanker | Up to 3 km down wind |

| | | |
|---|---|---|
| 5. | Escape of explosive gases from cylinder followed by explosion | Explosion may cause over pressure up to 50 m for a short duration. However, pieces of damaged cylinder may travel up to 100 m from the accident site |
| 6. | LPG leak from tanker followed by fire / explosion | Thermal radiation and overpressure effects will be up to 200 m for short duration. BLEVE may result first degree burns up to 150 m and also cause secondary fires depending on the location of occurrence. |
| 7. | Spill / leak of flammable petroleum products followed by fire | Thermal radiation effects of unconfined pool fire will be felt up to 25 m from the pool edge for the duration of fire. |
| 8. | Spill leak of $CS_2$ followed by fire in a road tanker | Thermal radiation effects of unconfined pool fire will be felt up to 30 m from the pool edge for the duration of fire. Burning of CS2 results in formation of toxic sulphur dioxide, effects of which may be felt up to a distance of 2 km from the accident site |
| 9. | Spill / leak of solvents and other flammable chemicals such as toluene, methanol, benzene and xylene followed by fire | Thermal radiation effects of unconfined pool fire will be felt up to 15 m from the pool edge for the duration of fire. |

**Other items that will have bearing on the extent of damage are :-**

- Rate of chemical release - lower rates pose lesser risks. As per the guidelines of the Ministry of Environment & Forest (MoEF), we have considered catastrophic failure of container. However, it seldom happens in actual incidents and the material escapes from the container at a much lesser rate.
- Location : high population density – unfavorable.
- First response by the driver, if possible – favorable.
- Prompt action by response agencies – favorable.

## 3.3 HAZARD IDENTIFICATION FOR NATURAL & OTHER MAN MADE DISASTERS

**Such hazard could occur due to :-**

3.3.1 Floods & heavy rain
3.3.2 Earthquake
3.3.3 Cyclone
3.3.4 War

Leakage, spillage, escaping of toxic flammable, explosive, reactive, poisonous chemical vapor, dust, fumes from storage, manufacturing, handling, transportation, failure of equipment, civil commotion, armed conflicts, sabotage, war, riots and civil disturbances may result in toxic release, land poisoning, water poisoning, fire or explosion or combination of all.

This will affect human being, living creatures, land and water poisoning, damage to property and plant etc.

# CHAPTER 4

# EMERGENCY MANAGEMENT ORGANISATION

## 4.1 BACKGROUND

The first response team is the frontal organization that is responsible for all types of off-site emergency preparedness and response. The District Collector (DC) is the overall in-charge for planning, execution and coordination of off-site emergency management activities. District Collector (DC) has constituted District Crisis Group (DCG) for Arvalli District. Local Crisis Group (LCG) for Arvalli has not been constituted as there are only 1 MAH industries which are located on National Highway. The District Collector (DC) is also required to communicate with State, National and International emergency agencies for information and support on response strategies.

## 4.2 COMPOSITION & FUNCTION OF DISTRICT CRISIS GROUP (DCG)

District Crisis Group has been constituted for ArvalliDistrict, in line with the guidelines given in Chemical Accident (CA) Rules 1996. The composition of the District Crisis Group (DCG) is given at Figure - 4.1. It is proposed to include General Manager - Telecom in the District Crisis Group as he will have important role to play in the planning and response activities. The details of all the members of District Crisis Group are given at Annexure - 2.4.

The District Crisis Group is the apex body in the District to deal with major chemical accidents and to provide expert guidance for appropriately handling them. As per CA Rules, 1996, the District Crisis Group will :-

- Assist in the preparation of the District Off-site Emergency Plan.
- Review all the On-site Emergency Plans prepared by the occupiers of respective Major Accident Hazard (MAH) installations as inputs for the preparation of the District Off-site Emergency Plan.
- Assist the District administration in the management of chemical accidents at a site lying within the District.
- Continuously monitor every chemical accident.
- Ensure continuous information flow from the District to the Center and State Crisis Groups regarding accident situation and mitigation efforts.
- Conduct at-least one full scale mock-drill of a chemical accident at a site each year and forward a report of the strengths & weakness of the plan to the State Crisis Group.
- Meet every 45 days and send a report to the State Crisis Group.

## 4.3 COMPOSITION & FUNCTION OF LOCAL CRISIS GROUP (LCG)

No LCG is formed in the district as there is only 1 MAH Factory in the district which is located on National Highway and hence it can be taken care by DCG only. Hence no need is felt to from LCG in the district. The constitution of LCG as per EPPR rules-1996 is given in **FIGURE - 4.2**

## FIGURE - 4.1

### ORGANISATION OF THE DISTRICT CRISIS GROUP (DCG)

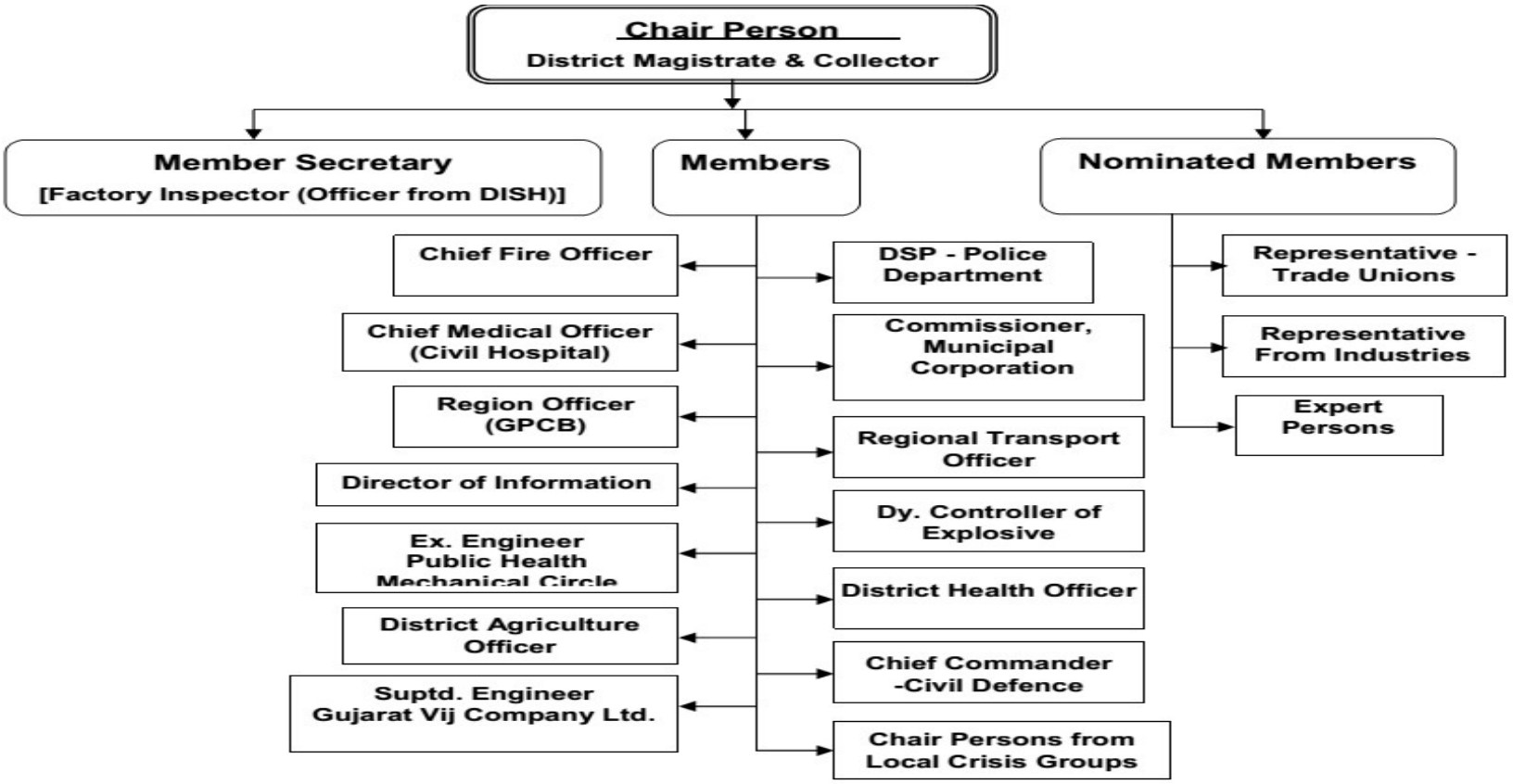
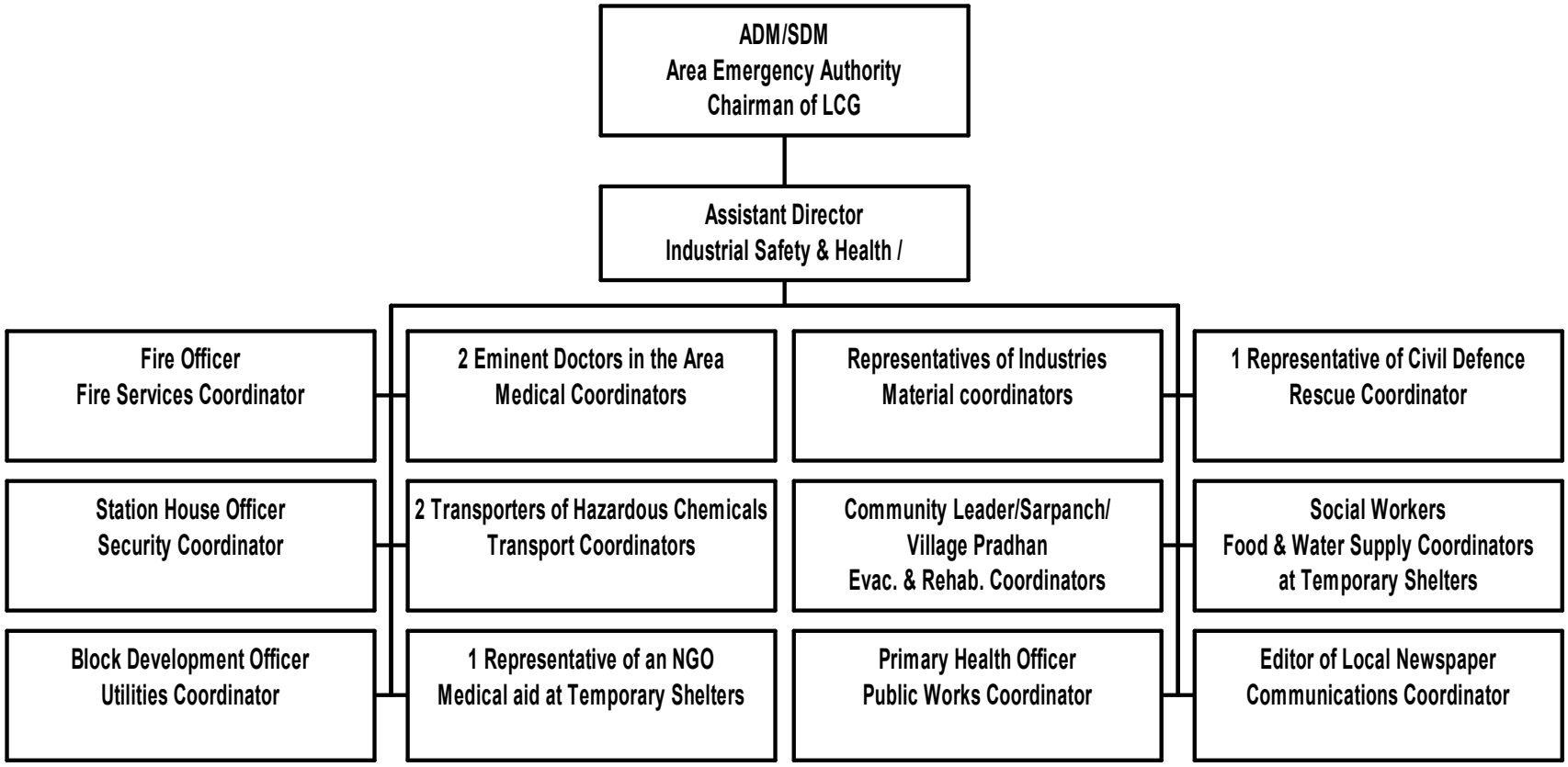


**FIGURE - 4.2**

**EMERGENCY ORGANISATION OF THE AREA LOCAL CRISIS GROUP (LCG)**



## 4.3 ORGANOGRAMS FOR TYPICAL EMERGENCIES

The prime requirement during a chemical emergency is well-coordinated efforts for effective management and control. This calls for identification of personnel and resources that will be involved in each function of emergency planning such as fire fighting, medical, rescue and combat, communication, etc. These personnel will function as a team for each distinct activity and may or may not be involved in all types of activities. The proposed organization charts for different teams for emergency management are presented at Annexure 1.2

With the knowledge of the area, identification of hazards due to storage and transportation of hazardous chemicals in the area and formulation of emergency organizations at different levels, we now need to assign appropriate roles and responsibilities to each of the identified key person for rendering effective response during emergency. The pre-emergency activities required to be performed by each of the team members are given in the next chapter.

# CHAPTER 5

# PREEMERGENCY PLANNING & PREPARDNES FUNCTIONS

## 5.1 INTRODUCTION

While implementation of accident prevention measures at an industrial installation is an internal function of the unit, there are various activities that go into planning and preparedness to effectively counter the impacts of chemical accidents at off-site level. For such accidents, which have off-site consequences, it becomes the responsibility of external authorities to apply countermeasure efforts and minimize the damage to men and material. For effectively handling such situations, the response agencies need to be in a good state of operational readiness and this requires meticulous planning on their part. While each member needs to identify and train first and second alternate officers, who can act on their behalf during their absence at the time of emergency, they also need to provide guidance to their counterparts in the local crisis group for effectively handling emergency situations. Following paragraphs discuss the pre emergency planning and preparedness functions for each member of the District Crisis Group (DCG) and their respective teams including counterparts in Local Crisis Group (LCG).

## 5.2 DISTRICT EMERGENCY AUTHORITY – DISTRICT COLLECTOR (DC)

- Provide guidance for preparing the Off-site Emergency Plan for the District and approve on finalization.
- Ensure that yearly mock drills of offsite plan are conducted effectively and outcome is used to improve the emergency planning and preparedness.
- In association with members of District Crisis Group (DCG), identify and assess the adequacy of resources available in the District to combat various possible emergency scenarios and prepare a plan to build the resource base to the required level. Logistics have been worked out for typical chemical emergency scenarios in Major Accident Response System (MARS) for each area. Help can be taken from the calculations provided to assess and build-up the resource base to the required level.

- Being Chairman of the DCG, the District Collector (DC) will formulate the response objectives and strategies for various possible off-site emergency scenarios, with assistance from all the members of DCG.
- Detailed response procedures for each accident scenario have been provided separately based on the type and level of emergency in MARS for each cluster.
- In association with Chairman of Local Crisis Group (LCG), plan and organize public awareness programs to educate the population likely to be affected in a chemical accident about the remedies, existing preparedness in the area, do's and don'ts during emergency, etc.

## 5.3 MEMBER SECRETARY – DEPUTY DIRECTOR OF INDUSTRIAL SAFETY & HEALTH, GANDHINAGAR.

- Assist members of the District Crisis Group (DCG) in identifying and understanding their roles and responsibilities for emergency management.
- In addition to having good knowledge of the industries and their operations, he also has fairly good knowledge of the area with respect to location of resources and facilities, communication and transport network and should therefore disseminate this information to other members of the District Crisis Group & Local Crisis Group (LCG).
- Identify, provide and maintain adequate facilities in District Crisis Control Room (DCCR) and at Local Command Post (LCP).
- Assist/Deputy District Collector (DC) in organizing meeting of DCG every 45 days (as per Chemical Accident rules).
- Conduct a full-scale mock trial at least once every year, monitor progress and provide technical inputs to improve preparedness level.
- Forward the report of such trials to State Crisis Group.
- Update the off-site emergency plan in consultation with the members of DCG, as and when required. The requirement and methodology for testing and plan updation is provided in the next chapter.

## 5.4 COMMUNICATION COORDINATOR – MANAGER – TELECOM, HIMMATNAGAR

Good communication system is critical to a successfully orchestrated response action, particularly if a number of different agencies or organizations at the Local, District, State, and even

Country level have important roles. The goal therefore is to quickly establish secure communication links between all major parties to a response action. The main responsibilities of communications coordinator for emergency planning and preparedness are to:

- Identify all available means of communication / warning and notification such as basic telephones, mobile phones, walkie-talkie, cable TV, radio, etc. that can be made use of during an emergency.
- Also identify ham radio operators in the area, assess how they can help during an emergency and formulate a procedure for seeking their help when required.
- Identify all the members of District Crisis Group (DCG) / Local Crisis Group (LCG) who have walkie-talkie and prepare a list of frequency and address code for contacting them during an emergency. Also prepare a list of members with their mobile numbers so that it can be used during an emergency.
- Prepare a pocket directory of key contact persons covering the members of DCG, LCG, their subordinates who might have to be instructed for carrying out specific tasks during an emergency, representatives of industries, experts and first & second alternates of all the members. The directory should include the name, designation, emergency designation, organization/department, office and residential address and telephone numbers, mobile phone numbers (if available) and contact information for access through walkie talkie. The directory of key contacts providing name, address and phone numbers of the control rooms, industries, LCGs, DCG, expert agencies, police stations, NGOs and press & media have been compiled in Annexure 2 which can be used for the purpose.
- All the members of the DCG/ LCG should always carry such a pocket diary, so that, irrespective of their location during an emergency at any time (say even at midnight), they can start coordinating response activities before reaching District Emergency Control Center (DECC). The same is true for first and second alternates of all the members.
- Provide additional telephone lines with unlisted numbers to response agencies wherever required. Providing telephones with only incoming facility may also be considered for first responders.
- Arrange to establish an all call system on telephone network for notification of emergency in the areas likely to be affected.
- Prepare and keep up-to-date the list and contact information of sensitive areas having concentration of population such as educational institutions, cinema halls, hospitals, prisons, etc. which

may require early notification. As transport accidents can happen almost anywhere in the District, this will also require identification of such areas along the major transport corridors of the District.

- As the damage distances in certain chemical accident scenarios exceed 3 Km (normal audible range of an industrial facility siren) warning and notification in far-flung areas becomes an important issue. Installation of fixed system has its own associated problems of techno-commercial feasibility, maintenance and up-keep. In view of this, warning and notification through vehicles mounted with siren and PA system may be considered. For this the communication coordinator shall, in association with transport coordinator, prepare and keep up-to-date the location-wise list of all the government and other vehicles having siren and PA system facility.
- Prepare standard message formats (in English and Gujarati) for use in radio / television broadcast or outdoor notification through megaphones to facilitate and reduce time necessary to alert the public of a problem and inform them of the protective actions to be taken. Sample instructions for toxic vapor release scenario could be.

  There is a chemical emergency at Name of the Unit / Location.
  Kindly follow these instructions :-

**In case of Shelter-in-place**

- Everyone is advised to stay indoors.
- Close all doors, windows and ventilation systems.
- Please keep your face covered by a wet towel.
- If possible stay under a shower.

**In case of evacuation: (based on information provided by Evacuation Coordinator)**

- Everyone is advised to come out of their houses immediately and proceed to Name of the Assembly Point via Name of the Route.
- You are advised to bring any prescription, medicines and special personal care items with you.
- Our other team members are taking adequate care of your children at the school (if applicable).
- All vehicle owners are requested to take as many people as possible with them and reach Name of the Rehabilitation Center, which has been declared as the rehabilitation center.
- Following Names of transportation means / transporters have been arranged for you at Name of the Assembly Point.

- Volunteers with Yellow Jackets are there to assist you. Please feel free in telling them your problems.

**Establish a warning system for different level of emergencies. It is important to note that wailing tones of siren for emergency purpose must be distinct from normal usage by the industries for begin / end of shifts. Suggested modes for emergency purpose are :-**

- For accident scenarios having off-site consequences - Long siren of 30 seconds duration followed by short siren of 10 seconds duration at least 10 times.

---

- For All-Clear signal: small sirens of 10 seconds each for two minutes.

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Information on communication and warning system available with various Major Accident Hazard (MAH) units is given at Annexure 3.9.

Same system should be followed by all industries and vehicles, which are wailing sirens for notification of an emergency. Announcements of standard messages may be carried out by vehicles, between wailing of sirens, for the benefit of those who are not aware of the warning signals.

Once a warning system has been discussed and finalized by the District Crisis Group (DCG), the same will be publicized for creating awareness among the local residents.

In consultation with the Railway authority prepare a plan for warning / stopping of trains at a safe distance during an emergency.

Assess the efficiency of the main and alternate communication system and warning system during mock drills and update the system where required.

## 5.5 TECHNICAL COORDINATORS - 4 EXPERTS IN INDUSTRIAL SAFETY & HEALTH

Technical Coordinators are the key people who have thorough understanding of the industrial processes, chemical hazards, safety and emergency management related issues. They are usually either entrepreneurs themselves or senior employees of major hazard units. Their responsibilities therefore include:-

- Formulation of response objectives and strategy in consultation with the District Collector (DC). This would involve providing technical inputs on toxicity, chemical emergency management procedures, resource requirement and deployment procedures, etc.
- As hazard identification for major chemical emergency scenarios have already been worked out, the results of computer simulation carried out for MCA scenarios at Major Accident Hazard (MAH) units as given in Chapter 3can be used for the purpose of estimating the damage distances. Providing regular training to first responders and support agencies.
- Deciding on which areas require evacuation and residents of which locations can be suggested to take shelter in place.
- Assisting the Evacuation Coordinator in identifying safe areas for assembly points and safe routes for their transfer to rehabilitation shelters based on possible wind directions.
- Assisting the members of the District Crisis Group (DCG) in plan testing and updating based on outcome of the mock-trials conducted in the District.

  Time is very critical in situations that require public evacuation or related protective actions and does not permit lengthy discussions or deliberations as to whether an evacuation is warranted or how large an area should be considered at risk. Predetermined criteria for decision making therefore greatly facilitate the process. Whereas, pucca houses with doors, windows and ventilators closed can provide adequate protection in scenarios where the contaminant residence time is not too long, population residing in shanty houses will definitely need to be evacuated to safer locations. The overview of shelter-in-place concept is given at Annexure - 5.2.

## 5.6 SAFETY COORDINATOR – REGIONAL OFFICER, GPCB

- Regularly obtain and keep a record of meteorological conditions in different areas of the District from IMD. Establish a link with IMD / other Met Stations in the area and also Major Accident Hazard (MAH) units who monitor wind speed and direction on continuous basis to get the real time met data at the time of emergency.

- As wind socks are available at most of the large MAH units and the simulation has been carried out for two atmospheric stability classes, following guidelines may be used for identifying the respective damage distances for different accident scenarios :-

1. Atmospheric stability Class F represents light, steady winds, night time skies and low level of turbulence. Therefore, damage distances corresponding to stability Class F may occur only during nighttime.
2. Atmospheric stability class D represents neutral conditions and applicable to heavy overcast conditions. Therefore, damage distances corresponding to stability class D may occur during daytime only.
3. Higher wind speeds (>3 m/s) would further assist in contaminant dispersion and therefore the damage distances would be lesser than those estimated during the simulation.

- As can be seen from Table 2.1the wind normally blows from South West (SW) in summer and from North East (NE) in winter months. The data collect through the above exercise can be analyzed to obtain the weather pattern of the area.
- Put a system in place and develop capability to monitor residual contaminant concentration in air, water, soil, food, fodder, etc. It would be required to monitor the residual concentration of toxic contaminant after emergency to declare the area, water, soil, etc. safe for reentry / use. To begin with, capability can be developed for various toxic chemicals used in the area and it can be extended to other toxic chemicals, which are transported through the area.

### 5.7 FIRE SERVICES COORDINATOR – FIRE OFFICER

- Formulate response strategy for each of the identified accident scenarios. This would involve assessment of the use of fire-fighting equipment and media for specific chemicals involved in fire.
- Based on the above, assess the requirements in terms of men and material that may be required during a major chemical emergency.
- Prepare an inventory of special fire-fighting equipment/media available with the department and the Major Accident Hazard (MAH) units and identify sources for procurement of additional material for use during an emergency. The details of fire fighting

resources available with MAH units are given at Annexure 3.1 The resources available with the fire stations in the district are given at Annexure 3.2

- In addition to the fire fighting, develop capability to handle various scenarios of toxic chemicals release.
- Train the manpower on handling chemical emergencies (major fire / explosion / toxic release) covering knowledge of possible chemicals accidents scenarios, use of Personal Protective Equipments (PPEs), controlling damage during transport accidents (such as capping leaking chlorine toner by using chlorine kit), etc.
- Conduct truncated mock trials regularly.

## 5.8 RESCUE COORDINATOR – COMMANDANT, HOME GUARDS

- Based on the possible emergency scenarios, assess the requirement of men and material that may be required during an emergency. List of special rescue equipment available with various agencies is provided at Annexure 3.11.
- Establish special rescue squads and train them for rescue of entrapped workers, members of response agencies and also local population.

## 5.9 MEDICAL COORDINATOR – DISTRICT MEDICAL & HEALTH OFICER

- Formulate mass casualty plan: - This item pertains to those emergency situations, which have the potential to kill or injure hundreds, or possibly thousands of individuals over a short period of time. Its intent is to ensure that medical care providers can cope with the problem as efficiently and effectively as possible. Fortunately, many hospitals and clinics across the country already have such plans for non-chemical related emergencies and therefore have the basic elements of a plan that can be expanded to cope up with hazardous material emergencies. For this, it is necessary in all chemical exposure situations, to have information readily available on:-
- Toxic effects of the substance(s) of concern by all likely routes of exposure of commonly used hazardous chemicals in the district are provided at Annexure - 4.2.
- Observable symptoms of human exposures;
- Special medical tests (if any) that may be advisable to assess the extent of injury;
- Need to observe victims for delayed effects; and
- Treatment methods or protocols recommended for various types and levels of exposure.

Public authorities should never assume that physicians or hospitals have this information on hand. Nor should they assume that the

basic first aid and health effect data given in typical material safety data sheets would be adequate for all eventualities. It, therefore, is the responsibility of the district medical coordinator to compile the first-aid and comprehensive treatment procedures for each toxic substance handled in the District, which has the capability of affecting a large section of population.

- Formulate a system for quick establishment of triage stations.
- Prepare an inventory of medical facilities available with the industries and the hospitals in the district. The medical facilities available with Major Accident Hazard (MAH) units are listed at Annexure 3.3Medical facilities in district are given at Annexure 3.4.Contact information of ambulance services, hospitals, private practitioners, blood banks,medical test laboratories & Pharmaceutical Distributorsare given at Annexure 3.5 to 3.7.
- Identify specific antidotes / medicines based on the common chemicals handled in the district. The most common antidotes for chemical poisoning and the associated treatment procedure are detailed at Annexure 4. 2.
- Prepare an inventory of specific antidotes / medicines available with different agencies such as hospitals, chemist shops, stockiest of drugs and prepare a plan for quick procurement of the same during an emergency

Refer Annexure 4 for remedial measures and common treatment procedures for exposure to chlorine and burn victims.

## 5.10 UTILITIES COORDINATOR – EXEC. ENGINEER (ELECT.) GEB

- Prepare a list and contact information of utility sub-stations or distribution points, which need to be informed to switch off the power supply in a particular area if required.
- Identify agencies, which give portable DG sets on hire, as alternate source of power may be required during an emergency to perform combat activities. Formulate a plan for procurement and quick deployment of such equipment during an emergency. The list of such vendors has been compiled and presented at Annexure 3.12.
- Identify and maintain a list of alternate sources of water for fire fighting.
- Identify and maintain a list of alternate sources of potable water for general population at residential areas and temporary shelters.
- In consultation with the transport coordinator, prepare a plan to provide water from the above sources through tankers, at incident site, residential areas and temporary shelters.

## 5.11 MATERIAL COORDINATOR – DISTRICT DEVELOPMENT OFFICER

- Procure a list of all the Personal Protective Equipments (PPEs) and other combat material, from the members of District Crisis Group (DCG), which may be required by them during an emergency. Compile the lists to prepare an estimate of different items that will be required by response agencies.
- Prepare an inventory of above material available with response agencies and industries. The details of PPEs available with Major Accident Hazard (MAH) units are given at Annexure 3.8 for ready reference. Identify the vendors / agencies / stockiest from where the additional requirement of such material can procure at short notice.
- Formulate a plan for distribution of PPEs and other material / equipment to response personnel, which they may require during an emergency.
- In addition to the specific PPEs and combat equipment, also identify sources of food, wheel chairs, general medicines, and recreation facilities that may be required at rehabilitation centers during an emergency. Prepare a plan for procurement of above material at short notice.

## 5.12 EVACUATION AND REHABILITATION COORDINATOR – CHIEF OFFICER OF MUNICIPAL CORPORATION/ NOTIFIED AREA.

- In association with the technical & transport coordinators, identify main and alternate assembly points based on different wind directions where people can assemble for getting evacuated.
- Also identify evacuation routes based on different wind directions through which the assembled population can be taken to temporary shelters.
- Based on possible accident scenarios, estimate the number of persons that may need to be evacuated. This can be done from the data provided in "Demographic Profile" given at Annexure 5.1,which lists the names of the villages along with the population data based on census records.
- Based on above information, identify temporary shelters in different wind directions for accommodating the evacuated population. The criteria for selection for rehabilitation shelters for evacuees are given at Annexure 5.3. List of proposed rehabilitation shelters is given at Annexure 3.13.

- In consultation with the medical coordinator, prepare a plan for evacuation of patients, for hospitals falling in the hazard zone.
- In consultation with the security coordinator, prepare a plan for shifting people in police custody, if a police station is likely to fall in the hazard zone.
- In consultation with the authorities of educational institutions, prepare a plan for evacuation of students, teachers and other staff members, for such institutions falling under the hazard zone.
- In consultation with the District Collector (DC) and the Prison Authorities, prepare a plan to evacuate prisoners, officers and staff members, if the prison is likely to fall in the hazard zone. This scenario may only happen during transport emergency occurring near prison.

  Note that the evacuation of people from individual residences who require special notification or assistance (such as senior citizens and physically handicapped) can be facilitated if public officials have compiled a list of those homes requiring personal attention. The local census data can be of great help in compilation of such information.

## 5.13 TRANSPORT COORDINATOR – ASSISTANT TRANSPORT OFFICER

- Various vehicles (available with the District Administration and Police Department) are fitted with sirens, Public Address (PA) system and walkie-talkies. Prepare a list of all such vehicles available in the District and shortlist those that can be made use of for warning general population.
- Establish agreements with public and private bus companies and ambulance services for provision of vehicles and drivers during emergency. For ambulance availability, refer Annexure 3.3 for Major Accident Hazard (MAH) units, Annexure 3.4 forMedical facilities in district and Annexure 3.2 for fire stations. The details of vehicles available at MAH units are provided at Annexure 3.10.
- Establish agreements with public and private agencies having water tankers for provision of water to residential areas, temporary shelters and for fire fighting under emergency situation.
- Establish procedure with material coordinator for obtaining appropriate protective clothing and equipment for its distribution to personnel who may have prolonged and excessive exposure to toxic contaminants while performing notification or evacuation operations.
- Training at least some of the drivers on emergency procedures and on use of Self Contained Breathing Apparatus (SCBA), if entry might be necessary or may unexpectedly occur (due to shift in wind direction or other factors) to zones with toxic air contaminants.
- In association with the evacuation and rehabilitation coordinator, identify main and alternate assembly points based on different wind directions where people can assemble for getting evacuated.
- Identify routes for response agencies and alternate routes for evacuation of general public for different wind directions.

## 5.14 SECURITY COORDINATOR – DISTRICT SUPERINTENDENT OF POLICE

- Assess the requirement of manpower and vehicles under different emergency scenarios.
- Assess the requirement of Personal Protective Equipments (PPEs) and other resources required for handling chemical emergencies.
- In association with the evacuation and rehabilitation coordinator, prepare a plan for evacuation of prisoners, from prisons or police stations, for such areas, which are likely to fall in the hazard zone.

- Provide training to police personnel on handling chemical emergency scenarios.

## 5.15 PUBLIC WORKS COORDINATOR – EXECUTIVE ENGINEER - PUBLIC HEALTH DEPARTMENT

- Compile a list of those companies or facilities that draw water from water bodies in the area of concern, together with a list of appropriate contacts and telephone numbers at these facilities for notifying them in case of an emergency.
- In association with technical coordinators, identify scenarios where wash water from emergency operations should not be allowed to enter rivers or surface water bodies and inform the Major Accident Hazard (MAH) units accordingly.
- Formulate a plan to contain wash water from emergency operation in dykes, tanks, etc., for further treatment before discharge to surface water bodies.
- Identify sewer shut-off points for the containment of hazardous materials that may leak or flow into sanitary and storm sewers.
- In association with the technical coordinators, formulate plan for containment of hazardous chemicals in case of transport emergency.
- Identify the material that may be required for above operation and compile a list of agencies from where it can be procured at short notice during emergency.
- In association with the veterinarian department, formulate a decontamination plan for domestic livestock and wildlife.
- Formulate a mass casualty plan for domestic livestock and wildlife.

## 5.16 LIAISON & PUBLIC RELATIONS COORDINATOR – ASSI. DIRECTOR OF INFORMATION

Prepare a list of contacts with telephone numbers of media persons who need to be informed of an emergency. A brief list is provided at Annexure 2.8 for ready reference.

## 5.17 COORDINATION WITHIN LOCAL CRISIS GROUP

Since several individuals and agencies are involved in decision making, the coordination amongst members is a vital requirement for the success of the plan. In order to ensure better coordination amongst the members, the following need to be pursued:-

- Clear and concise communication amongst the members.
- Efficient communication and warning system.
- Sequential decisions flow from the coordinator to the field personnel.
- Team spirit and task orientation.
- Appropriate training and retraining in emergency preparedness.
- Regular and frequent field visits, mock drills, and simulation exercises at Major Accident Hazard (MAH) units.
- Discussion of observations and feedback.
- Motivation of field personnel.

# CHAPTER 6

# CONTROL ROOMS

## 6.1 AIM & OBJECTIVES OF CONTROL ROOMS

It is a nodal center point of emergency authorities for fast flow of information upwards and downwards (to & fro) incase of any kind of emergency / disaster.

It also a some sort source of quick supply of emergency requirement for quick action to control to mitigate effects at some extent quickly, as well as great speedy extended rescue, relief and rehabilitation operations. To save human lives, living creatures, property and environment.

It has dual objective i.e. during emergency, which show above. Others objective is during normal times. They are as follows :-

1. Work as data bank, collection of data & keeping up to date information.
2. Give training to personnel.
3. Building public awareness.
4. Maintain emergency equipment in working condition.

## 6.2 LOCATION OF CONTROL ROOMS

| Sr. No | Main Control Room | | | | Alternate / Shadow Control Room No. 1 | | | |
|---|---|---|---|---|---|---|---|---|
| | Name | Place | Telephone No. | | Name | Place | Telephone No. | |
| | | | O | R | | | O | R |
| 1. | District Crisis Group C/R Arvalli | Collector Office, Control Room, Modasa | 02774-250200 | 9978405935 | District Crisis Group C/R Arvalli | Neo Fuel Ltd.,Khodamba, Bhiloda | 02774-266030 | 9426060920 9979033300 |
| 2. | Local Crisis Group C/R Arvalli | SDM & Dy. Collector Office ,Modasa | 02774-250225 | 7567005963 | Local Crisis Group C/R Arvalli | Mamlatdar office, Modasa | 02774-250221 | -- |
| | | Mamlatdar Office, Modasa | 02774-250221 | -- | | Mamlatdar Office, Bhiloda | 02774-234524 | --- |
| | | | | | | Mamlatdar Office, Bayad | 02779-220426 | --- |

## FACILITIES AVAILABLE AT EACH CONTROL ROOM

**At present facilities available in various Control Room functioning at different place is given below :-**

Apart from Control Rooms at Collector, SDM and Mamlatdar offices there is no independent Control Room. At present alternate Control Rooms are fixed at Bayer Crop Science, Himmatnagar.The facilities available with the industries in this area are utilized at the time of emergencies. For the pocket of Arvalli respective SDM & Mamlatdar office will be the control room / alternative control room.

- **Presently the following facilities are available at the Control Room, Bayer Crop Science, Himmatnagar**.

| | | | |
|---|---|---|---|
| 1. | Mobile Foam Tender | - | Nil |
| 2. | Fire Jeep | - | Nil |
| 3. | Ambulance | - | 1 No. |
| 4. | Manpower | - | 57+120 |
| 5. | Breathing Apparatus Sets | - | 1 No. |
| 6. | Chemical Canister Mask | - | 20 Nos. |
| 7. | B.A. Set Compressor | - | 2 Nos. |
| 8. | Water Monitors (Mobile) | - | 01 No. |
| 9. | Map of the Area | - | 01 No. |
| | | | |

- Local Crisis Group, Arvalli :- In case of emergency in MAH units Disaster Management Centre (Control Room) has been set up at SDM Office/Taluka Mamlatdar offices.

# CHAPTER 7

# PLAN TESTING AND UPDATING

## 7.1 INTRODUCTION

In areas having well-run industrial houses, Off-site Emergency Plans could get tested very infrequently. This may lead to rusting of the various response agencies in the area. It is therefore extremely important for the response personnel to be trained at regular intervals. There are two aspects of training, viz., technical and emergency management. Whereas the former can be through classroom sessions, interaction and industry visits, the latter requires thorough knowledge of the roles, responsibilities and linkages that have to be ensured during emergencies. This aspect can only be checked through a plan testing process in which an emergency situation is simulated.

An emergency response plan is developed to deal with largely unperfected events. Those involved in planning and preparing for emergencies must undertake periodic exercises to test the plan. Any plan remains a “paper plan” until it is put to test, as there are bound to be omissions and faults. Testing exercises vary in type and scope. The simplest type is a “desk-top” exercise; the most complicated is the full-scale mock drill.

## 7.2 DESK-TOP EXERCISE

Such an exercise basically involves development of a written accident scenario wherein all members of the response team take part in a paper exercise to ensure that each of them knows their as well as other members role in an emergency situation. The written scenario shall clearly identify the following:-

- Objective of the drill.
- Components of the plant to be tested.
- List of participants.
- Sequence of events.
- Level of simulated hazard, and
- Exercise evaluation checklist.

The written scenario shall be as realistic as possible and shall be taken from the sequence of events from an actual emergency.

Critique sessions during which the results of the evaluation are presented are crucial. The plan should be modified following such sessions, to rectify the shortcomings highlighted by the drill. A desk-top exercise is particularly useful for testing a new plan for the following reasons:-

- A new plan is likely to have many shortcomings, which can be readily discovered through such an exercise.
- The participants in the exercise will get an opportunity to work together, probably for the first time. When members of an emergency team meet frequently, work together, they are highly likely to cooperate effectively and efficiently during real emergency, and
- Desktop exercises are far less expensive than full-scale emergency drills.

The works main controller of the Major Accident Hazard (MAH) unit should take the initiative in organizing such exercises. Representatives of external agencies could also be involved in desktop plan testing process. Once a few such exercises have been conducted at the industry, Local and District levels, the modified plan is ready to be tested by field methods as given in subsequent sections.

## 7.3 TRUNCATED TRIALS

Truncated trials are an extension of the desktop exercises but lie halfway to the full-scale drills. In this exercise, it is required by the members of District Crisis Group (DCG) and their respective teams to be in readiness. It is primarily based on effectiveness of communication. At times it may also be scaled up to the industry level to actually estimate the response time for mobilization and deployment of resources at the incident site by the external agencies and departments.

This exercise gives almost a true picture of the level of preparedness of the personnel and familiarization of roles and responsibilities by individuals involved in emergency operation. Involvement of external agencies is a very important aspect as it is the only way for achieving effective coordination of the industry personnel with officers of support government agencies. Through these trials, officers of government agencies also get to work in close coordination with industry personnel and get the exposure of industrial safety aspects & requirements. It also gives an opportunity to identify gaps in the plan and areas of overlapping responsibilities amongst the industry personnel and government departments. Overlapping responsibilities are often the

cause of confusion and thus through such exercise the deployment pattern of man and material can be further improvised.

## 7.4 FULL SCALE TESTING

Nothing can replace a full-scale emergency drill as a means of identifying further areas requiring improvements in an Off-site Emergency Plan. Careful pre-planning of the drill, preparing a drill scenario and defining the evaluation process are all critical elements to a successful test. The emphasis of these drills might be on one or all of the interacting aspects of the plan. Some examples are given below:-

- Test the degree of cooperation achieved between the various agencies involved in plan implementation.
- Test the use and performance of emergency equipment such as fire extinguishers, self breathing apparatus, decontamination equipment, fire engines, ambulances, etc.
- Test the level of preparedness of various agencies and services involved in plan implementation.
- To estimate time taken for various activities such as notification, alarm, response, resource mobilization, deployment, etc.
- To test the knowledge gained by response personnel (of both industry and others) who have been imparted specialized training in emergency management.
- Test the feasibility of the formulated evacuation and rehabilitation plan, etc.

A full-scale mock drill could consider all the above aspects in one go and thus bring out practical bottlenecks in implementation of the plan.Such exercises are therefore essential in making the plan practical as far as possible.
As per the Chemical Accident (CA) EPPR Rules, 1996, a full-scale mock trial should be conducted by the District Crisis Group (DCG) once in a year. These groups are also required to prepare and send the report on the strengths and weaknesses of the mock trial to DCG and State Crisis Group respectively.

The present plan for ArvalliDistrict, on its approval by the District Collector and Ministry of Environment & Forest (MoEF), will be tested using aforementioned tools to check its practicability.

## 7.5 PLAN UPDATION

As plan testing, its updating is also a systematic process. The testing process should be closely monitored and steps documented. This will help in identifying the lacunae easily and will thus facilitate the plan updating. The Off-site Emergency Plan should be updated after one or more of the following activities:-

- Desk-top trial.
- Truncated trials.
- Full-scale mock drill.
- Establishment of a new Major Accident Hazard unit in the area.
- Close down of an existing MAH unit in the area.
- Modification in the type and / or quantity of hazardous chemicals handled at any of the existing MAH units.
- Establishment of a major population center such as a residential colony, supermarket, hospital, etc. in the vulnerable zone.
- Construction of any new road/rail line or by-pass in the area.

The prime responsibility for any modification or updating of the plan lies with the Chairman of the District Crisis Group (DCG), i.e., the District Collector. The DCG on assessing the information provided and the suggestions made by the LCG would update the plan. A proper record of the minutes of meetings of DCG should be maintained. All the reports and suggestions made by the members should also be preserved. The Member Secretary of DCG should also maintain a record of all modifications made in the plan.

# ANNEXURE - 1

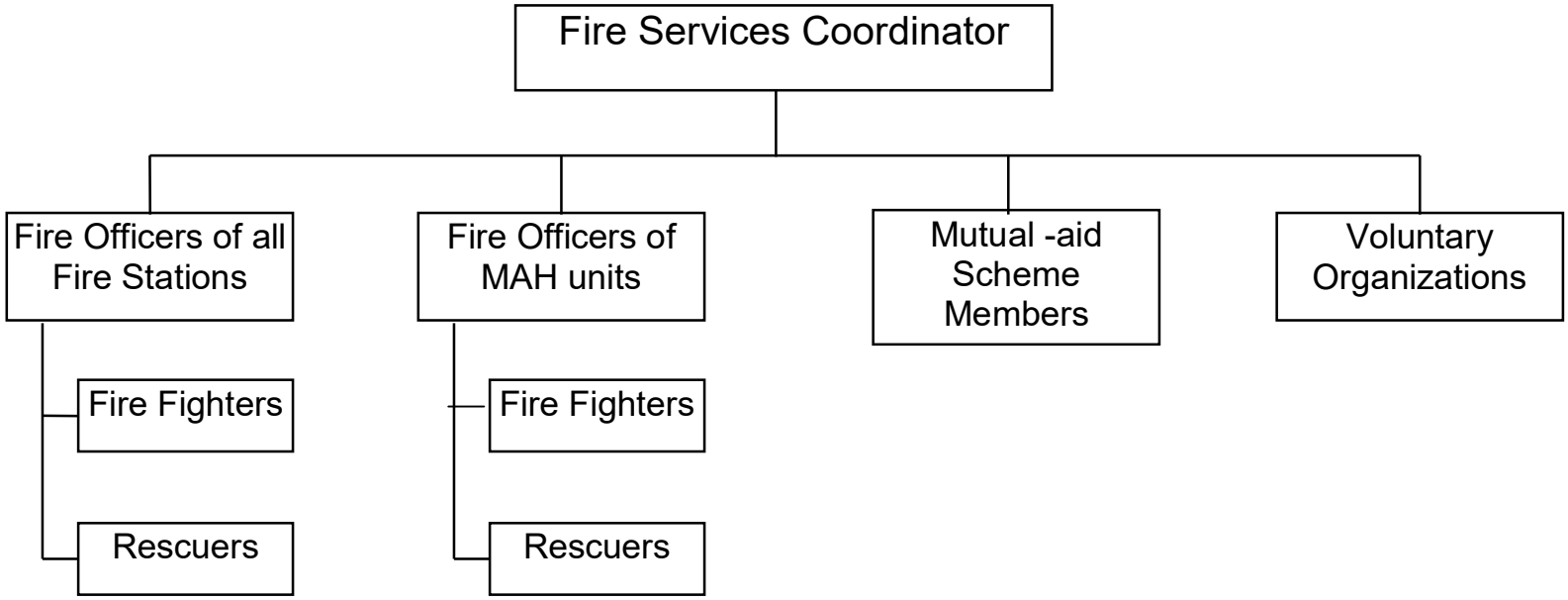
## 1. HAZARD SCENARIOS & EMERGENCY ORGANIZATION

### 1.1 AREA MAPS TO SCALE

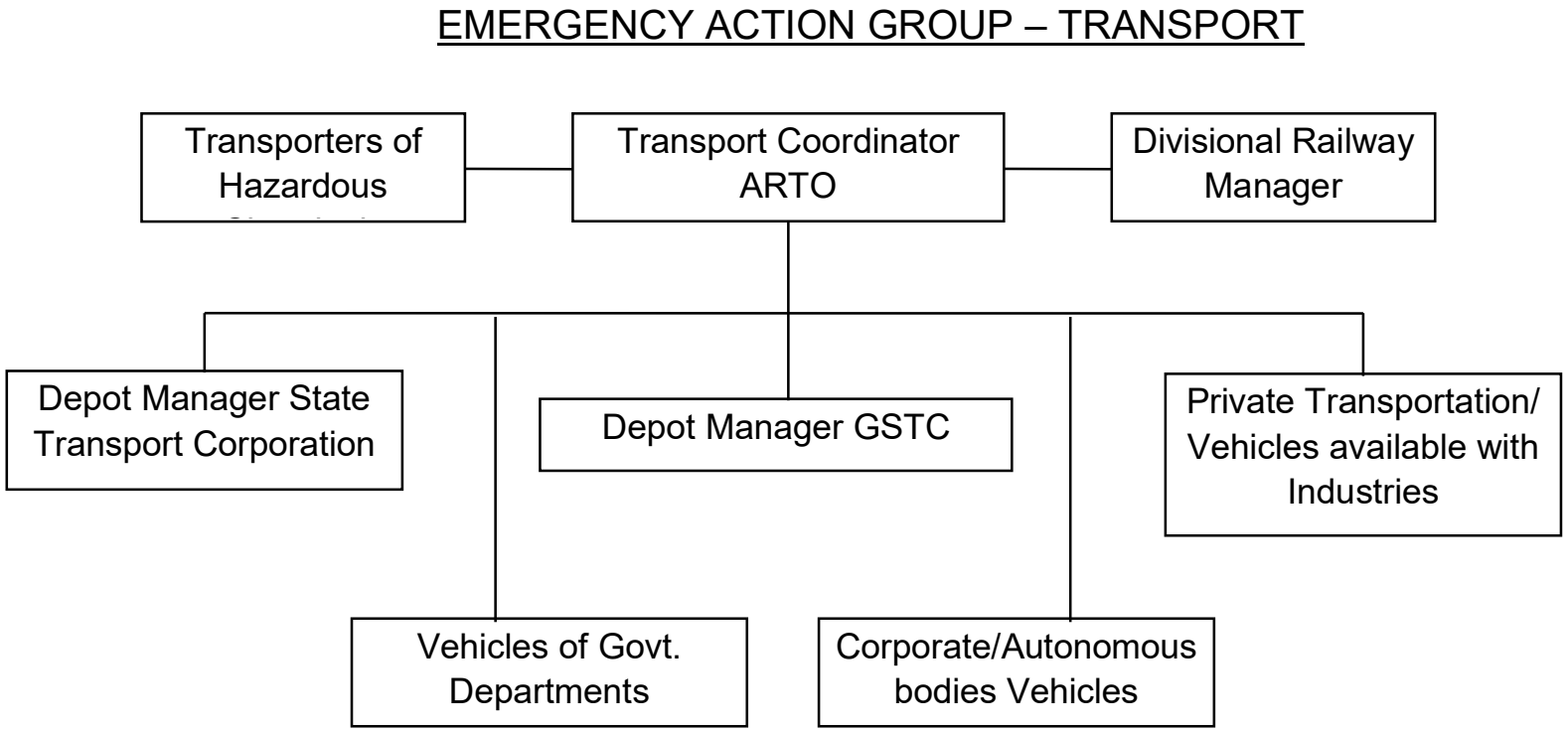
## 1.2 EMERGENCY ACTION GROUPS

**A) FIRE**

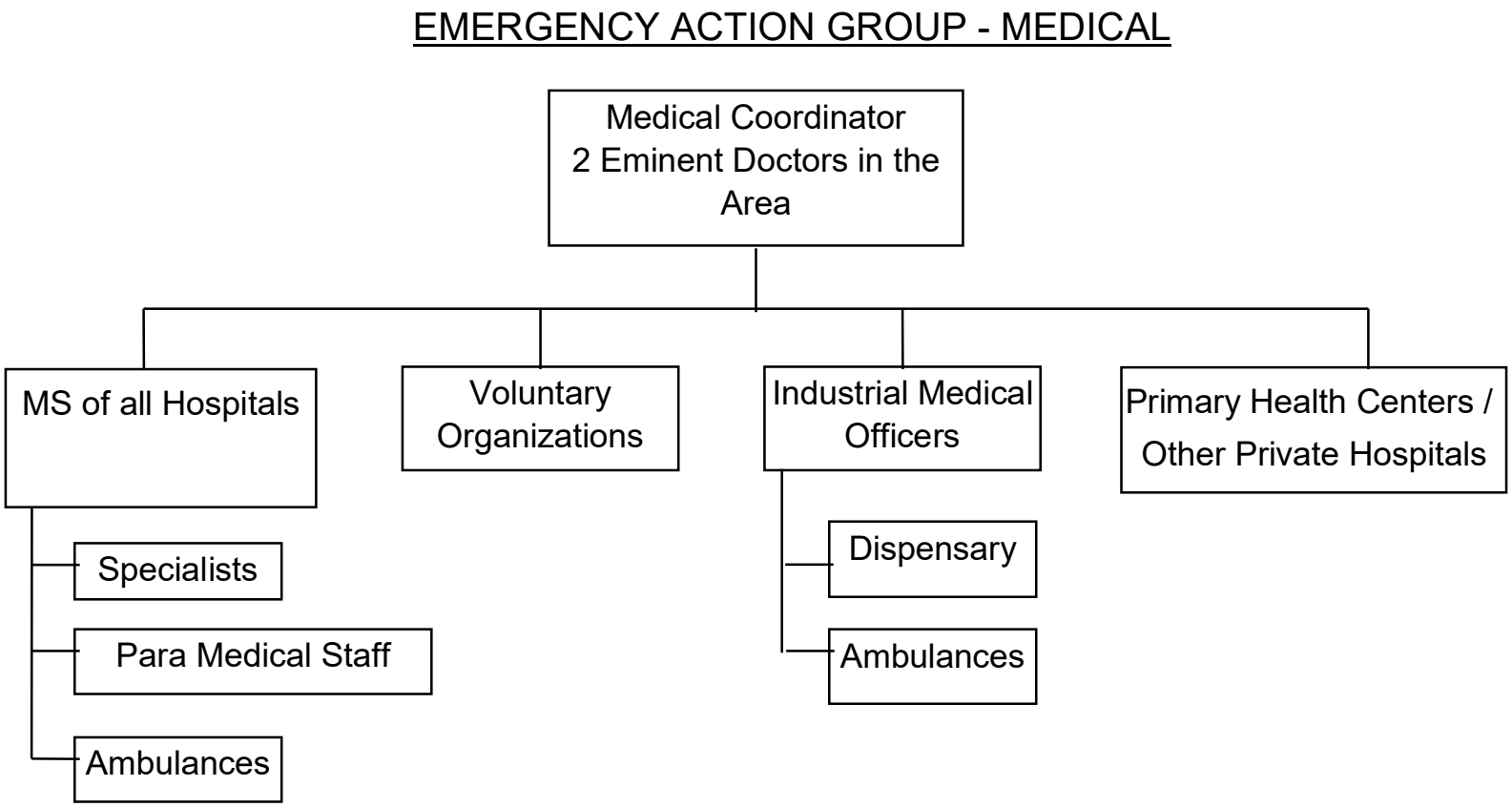
EMERGENCY ACTION GROUP - FIRE



## B) TRANSPORT

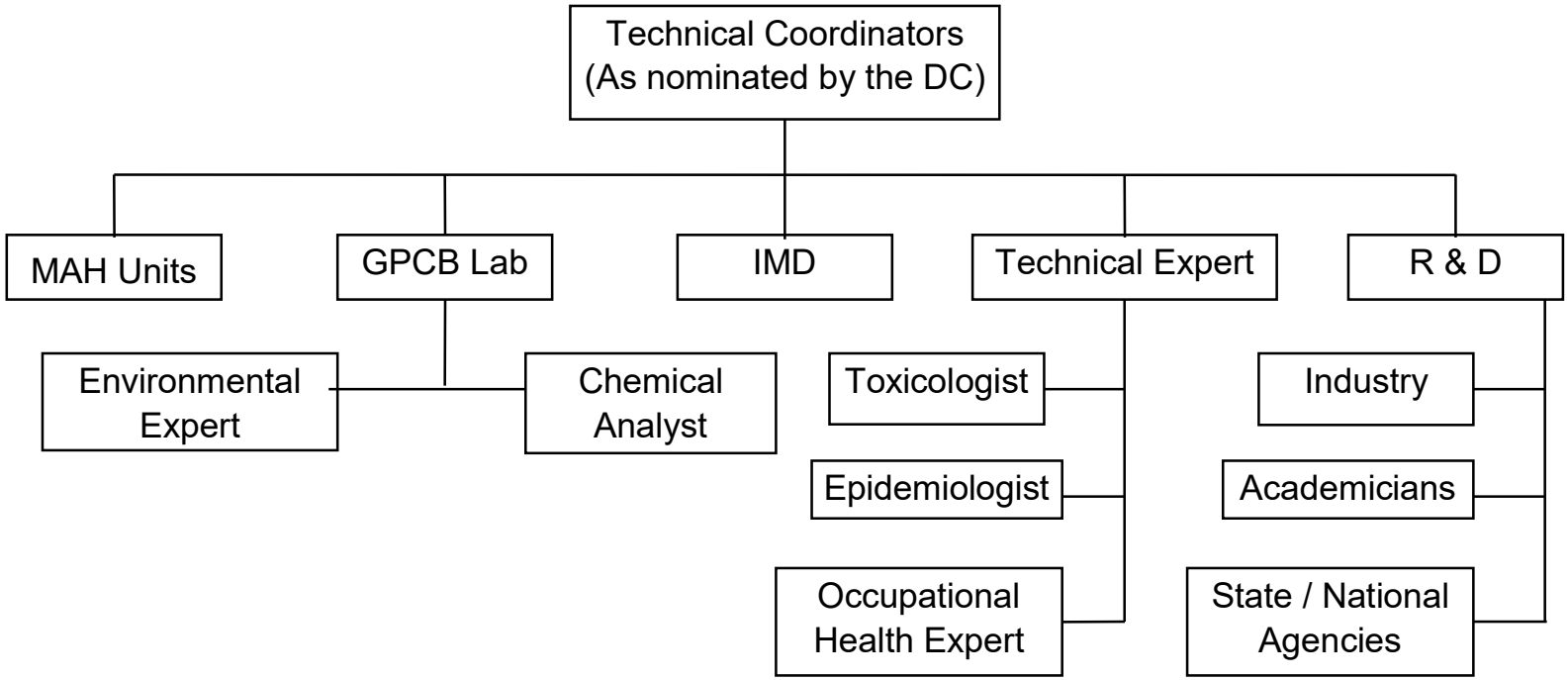

EMERGENCY ACTION GROUP – TRANSPORT
Transporters of Hazardous
Transport Coordinator ARTO
Divisional Railway Manager
Depot Manager State Transport Corporation
Depot Manager GSTC
Private Transportation/ Vehicles available with Industries
Vehicles of Govt. Departments
Corporate/Autonomous bodies Vehicles

**C) MEDICAL**


EMERGENCY ACTION GROUP - MEDICAL
Medical Coordinator
2 Eminent Doctors in the Area
MS of all Hospitals
Voluntary Organizations
Industrial Medical Officers
Primary Health Centers / Other Private Hospitals
Specialists
Para Medical Staff
Ambulances
Dispensary
Ambulances

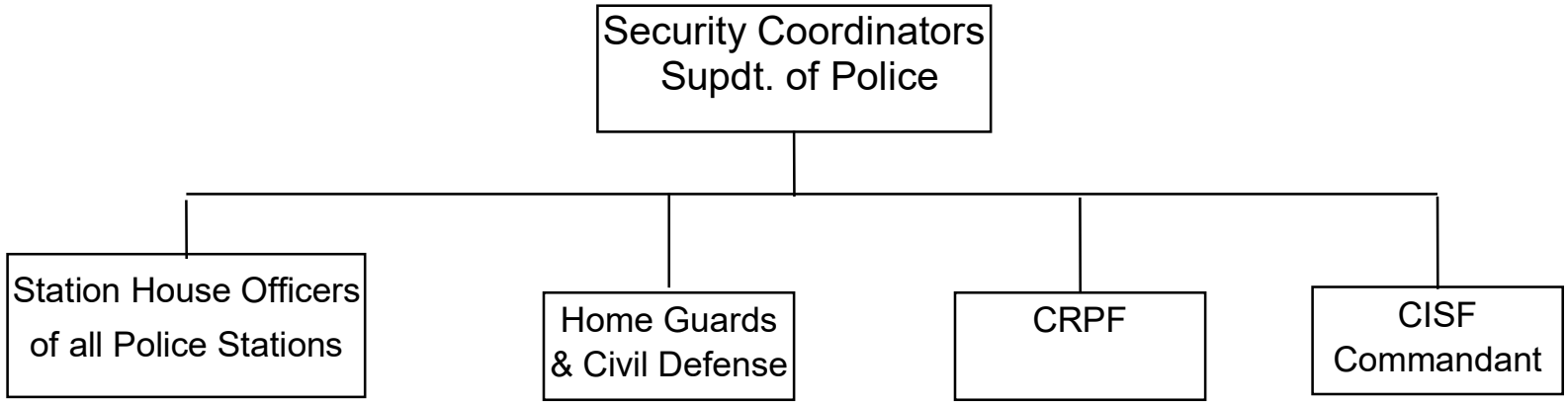
**D) TECHNICAL**

## EMERGENCY ACTION GROUP - TECHNICAL

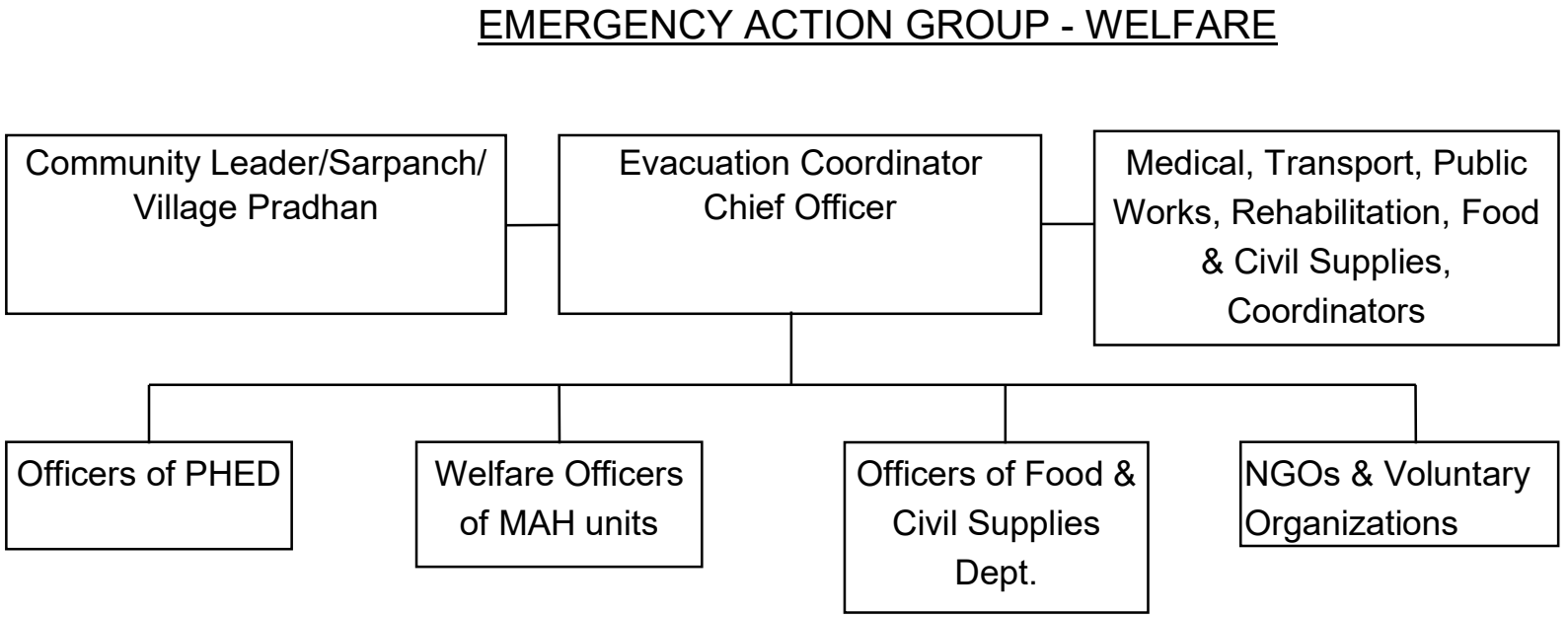


**E) SECURITY**

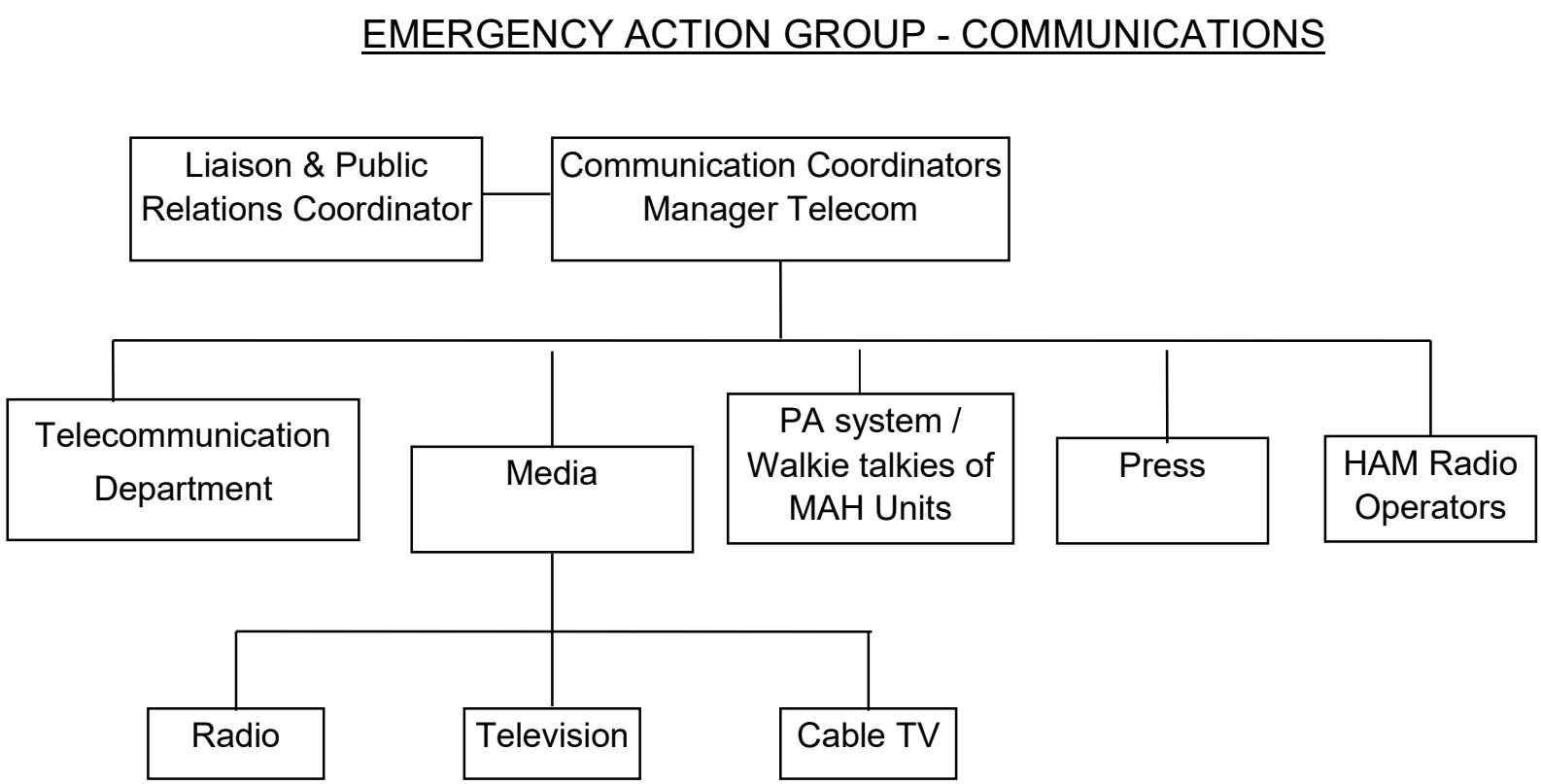
EMERGENCY ACTION GROUP - SECURITY



## F) WELFARE

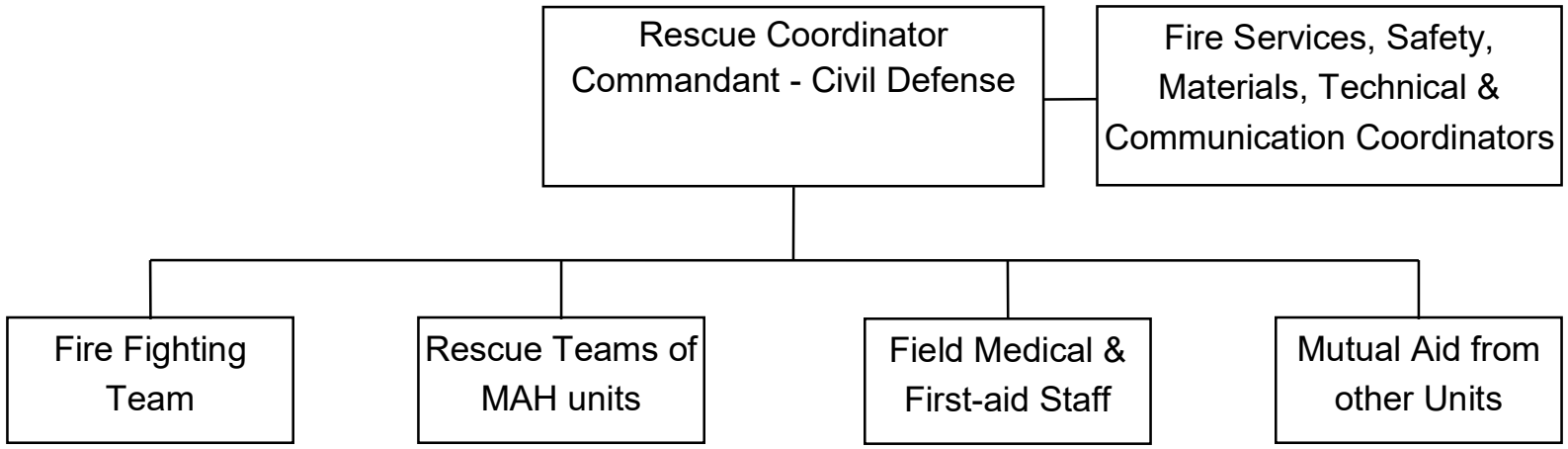

EMERGENCY ACTION GROUP - WELFARE
Community Leader/Sarpanch/ Village Pradhan
Evacuation Coordinator Chief Officer
Medical, Transport, Public Works, Rehabilitation, Food & Civil Supplies, Coordinators
Officers of PHED
Welfare Officers of MAH units
Officers of Food & Civil Supplies Dept.
NGOs & Voluntary Organizations

## G) COMMUNICATION



## H) RESCUE & COMBAT

EMERGENCY ACTION GROUP - RESCUE & COMBAT



# ANNEXURE - 2
# DIRECTORIES OF KEY CONTACTS

## 2.1 CONTROL ROOMS

| Sr. No. | Name | Contact Person | Jurisdiction | Location | Telephone No. | |
|---|---|---|---|---|---|---|
| | | | | | Office | Residence |
| 1 | District Crisis Control Room | District Collector | Arvalli District | District Collector Office, Modasa | 02774-250200 | 9978405935 |
| 2 | Local Crisis Control Room | SDM & Asst. Collector | Arvalli District | Asst. Collector Office, Modasa | 02774-250225 | 7567005963 |

**Remarks :-** Other details given on page no.48, 6.2 Location of Control Rooms.

## 2.2 MAH INDUSTRIES

| Sr. No. | Name | Address | Key Person 1 & Designation | Key Person 2 & Designation | Phone Numbers |
|---|---|---|---|---|---|
| 1 | NEON FUEL LTD.<br>AT. KHODAMBA | TAL. BHILODA<br>ARAVALLI<br>GUJARAT | Owner<br>9426060920 | Manager<br>9979033300 | 02774-266030 |

## 2.4 DISTRICT CRISIS GROUP-ARVALLI

| Sr No | Officer Name | desiganation | Position in DCG | Telephone Numbers | | |
|---|---|---|---|---|---|---|
| | | | | Office | Office | Fax / Mobile |
| 1 | MR. MILIND BAPNA | District Collector | Chairman | Collector office ,Modasa | 02774-250200 | 9978405935 |
| 2 | MR.D.V. MAKVANA | Resident Additional Collector | Additional chairman | Collector Office, Modasa | 02774-250205 | 9727756393 |
| 3 | MRS. MAHEK JAIN | District Development Officer | Materials Coordinator | Office of the DDO, District Panchayat Office, Modasa | 02774-240744 | 9978406496 |
| 4 | MR. J. B. BODAT | Deputy Director Industrial Safety & Health , Gandhinagar | Member Secretary | 5th floor,C-Block, Sahyog Sankul Building, Nr. Pathikashram, Gandhinagar | 079-23233231 | 079-23233231 |
| 5 | MR. MANOHARINDH JADEJA | SP | Security Co-ordinator | S.P. Office, Modasa | 02774-248888 (Control Room) 02774-248415 | 9978405978 |
| 6 | Mr. Anil J. Patel | Occupier | Technical Coordinator | Neon Fuel Ltd., Khodamba, Ta-Bhiloda, Dist-Arvalli | 02774-266030 | M-9426060920 |
| 7 | Mr. Dipak Patel | Occupier | Technical Coordinator | Navbharat LPG Bottling Co., Sabar Dairy-Talod Road, Himatnagar, Dist-Sabarkantha | 02770 233663/ 64/65 | M-9825165084 |
| 9 | Ms. Manali Bhatt | Regional Officer | Safety Coordinator | Gujarat Pollution Control Board, | 02772-229273-72 | 9824394243 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Himmatnagar | | |
| 10 | | Dy. Chief Controller of Explosives | Associate Safety Coordinator | 8th Floor, Yash Kamal Building Baroda (Gujarat) - 390001 | 0265-2225159 | - |
| 11 | Shree Bhadresh patel Shree Rudabhai | Chief Fire officer | Fire Service Coordinator | Fire Station, Modasa Nagrpalika Modasa | 101<br>02774-250221 | 24*7 disaster helpline- 1077<br>Control room- 02774-250225 |
| 12 | Ms. Nidhi Jayswal | Dy. Director of Information | Liaison & Public Relations Coordinator | Dy. Director of Information Office, Jilla seva sadan, Modasa | 02774-250234 | --- |
| 13 | Ms. R.K.Parmar | Dist. Mamalatdar, | Disaster Managment | Disaster management mamaltdar, Arvalli | 240616 | 9924327800 |
| 14 | Dr. Jayesh Parmar | Dist. H ealth Officer | Medical Coordinator | District Health Office,District Panchayat Office, Modasa | 02774-248911 | M-7575800951 M-7575800941 |
| 15 | | Civil Surgeon, Himmatnagar | Associate Medical Coordinator | Sarvajanik Hospital, Modasa | 02772-246618 | M-9687633101 |
| 16 | | Superintending Engg (Executive Engineer) | Utilities Coordinator | G.E.B. Circle Office. Old Power House, Hajipura, Himmatnagar | 02774-246648, | M-9099004763 |
| 17 | | Distt. Agricultural Officer | Associate Utilities Coordinator | Jilla Panchayat Office, (Agricultural Branch),Modasa | 02774-240760 | 7226952008 |
| 18 | | Chief Officer | Evacuation & Rehabilitation Coordinator | Modasa Nagar palika, | 02774-246209 | 9429109609 |
| 19 | Mr.Jayntibhai J. Shah | Industrialist | Associate Evacuation & Rehabilitation Coordinator | Durga Oil Mill Station Road, Himmatnagar | 240050<br>240051<br>228800 | 232250<br>M- 9825046800 |
| 20 | Mr.A.A. Harsoliya | (Trade Union Leader) | Associate Evacuation & Rehabilitation Coordinator | President Sabarkantha General Majdoor | -------- | 245060<br>M-9824164886 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Union, 1, Vali market, First floor, Opp. Khajuri masjid, Hajipur, Himmatnagar. | | |
| 21 | Mr.Hasmukhbha Patel | President | Associate Evacuation & Rehabilitation Coordinator | Sabarkantha Jilla Ceramic Asso. C/o, Asian Granito, Dalpur,Prantij, Himmatnagar | 240930-31-32-33 | |
| 22 | | RTO | Transport Coordinator | RTO Office, ,Modasa | 02774-249925 | 9426540579 |
| 23 | | GM Telecom, Himmatnagar | Communication Coordinator | District Telecom Office, Himmatnagar. | 02772-248600 | 248500 |
| 24 | | Supdt. Eng. | Public Work Coordinator | Office of Supdt. Engineer, Public Health Circle, Modasa | 02774-242904 | 9978406596 |

## 2.5 EXPERT AGENCIES

| Sr. No | Agency | Contact Information | |
|---|---|---|---|
| | | STD Code | Tel. No. |
| 1 | National Crisis Control Room | 011 | 24360734 |
| 2 | Dr. V Rajgopalan,<br>Joint Secretary, Ministry of Environment & Forests, Govt. of India. | 011 | 24361760<br>24101754 |
| 3 | Director,<br>Hazardous Substance Management Div. | 011 | 24360060 |
| 4 | DG-FASLI,<br>Mumbai. | 022 | 24074358<br>24092203 |
| 5 | National Safety Council,<br>Mumbai. | 022 | 24073694<br>24073285 |
| 6 | Disaster Management Institute, Bhopal. | 0755 | 566715<br>293592 |
| 7 | Mr. B N Jha,<br>Assistant Director (S), Inspectorate of Dock Safety, Near Bunder Gate, New Kandla. | 07249 | 270724 |
| 8 | Dy. Controller of Explosives,<br>Raopura, Vadodara. | 0265 | 2420512 |
| 9 | Dr. T V Subbaiah,<br>Director Manufacturing, Alembic Chemical Works Co. Ltd., Vadodara. | 0265 | 2338466<br>2330550<br>2340816 |
| 10 | Dr. H N Saiyed,<br>Director, National Institute of Occupational Health, Ahmedabad. | 079 | 22865142<br>22866237 |
| 11 | Dr. T Rangarajan,<br>Exec. Director (Technical),<br>KRIBHCO, Surat. | 0261 | 28420061<br>28420426<br>28420986 |
| 12 | Mr. J S Baxi,<br>GM,<br>ONGC, Chandkheda Complex,<br>Ahmedabad. | 079 | 22486176 |
| 13 | Mr. D V Chudasama,<br>Sr. Manager development, Excel India Ltd.,<br>Bhavnagar. | 0278 | 225322 to<br>225326 |
| 14 | Mr. D R Babalal, Mr.Anil Patel<br>Nisarg Environmental Protection Agency,<br>Gandhinagar. | - | 9327835215 |

## 2.6 POLICE STATIONS

| Sr. No. | Name | STD Code | Phone No. |
|---|---|---|---|
| 1 | D.S.P - Modasa | 02774 | 250100<br>9975405978 |
| 2 | P.A. to DSP - Modasa | 02774 | 250102 |
| 3 | Dy.SP.(H.Q) | 02774 | 250104 |
| 4 | Dy.S.P. - Modasa | 02774 | 250107 |
| 5 | Dy.S.P. –Bhiloda | 02771 | 233673 |
| 6 | Police Station - Bhiloda | 02771 | 234554 |
| 7 | Police Station - Shamlaji | 02771 | 240125 |

## 2.7 NON GOVERNMENTAL ORGANISATIONS

| Sr No | Name | Contact Person & Address | Phone No. | |
|---|---|---|---|---|
| | | | Office | Resi |
| 1 | Lions Club, Bayad. | Hasmukh C. Mehta.<br>Kotyark Society,<br>Opposite Sapan<br>Hospital, Bayad. | 222608 | M-94265 51103 |
| 2 | Lions Club, Modasa | Kamlesh N. Patel.<br>"Neel Kamal"<br>6, Keshav Dham, Malpur road,<br>Modasa. | (02774)<br>242259 | (02774)<br>240159 |
| 3 | Lions Club, Dhansura. | Bharat C. Shah.<br>c/o Jay Hind hardware<br>store, Main bazar, Dhansura. | (02774)<br>222018 | (02774)<br>247971<br>M-94263 61994 |

## 2.8 PRESS AND MEDIA

| 2.8 PRESS AND MEDIA | | | |
|---|---|---|---|
| Sr. No | Agency | Contact Person | Phone Number |
| 1 | ABP News Gujarati | Mr.Vipul Rana | 9426027597 |
| 2 | Sandesh | Mr.Pramod Pandya | 9974784085 |
| 3 | Divya Bhaskar | Mr.Navneet Mahesh | 9979416699 |
| 4 | GSTV | Mr.Rakesh Patel | 9427402176 |
| 5 | TV 9 | Mr.Atul Parmar | 9974740104 |
| 6 | Gujarat Samaachar | Mr.Ashok Parmar | 9998481079 |

# ANNEXURE - 3 RESOURCES

| Sr. No. | Name | STD Code | Phone 1 | Phone 2 | Fire Tenders | Water (m3) | Fire E Suits | Water Hoses |
|---|---|---|---|---|---|---|---|---|
| 1 | NEON FUEL LTD.<br>AT. KHODAMBA, TAL. BHILODA<br>ARAVALLI | 02774-266030 | 9426060920 | 9979033300 | - | 450000 litres | 01 | 08 |

## 3.2 RESOURCES AVAILABLE AT FIRE STATIONS

| Sr No | Name | STD Code | Phone | Man Power | Number of fire Tenders | Ambulances | Fire Suits | SCBA |
|---|---|---|---|---|---|---|---|---|
| 1 | Himmatnagar Fire Brigade | 02772 | 246720/ 309101 | 14 | 03 | 01 | 01 | 02 |
| 2 | Modasa Fire Brigade | 02774 | 246209/ 246212 | 02 | 02 | 01 | 01 | 02 |
| 3 | Mehsana Fire Brigade | 02762 | 254568/ 253375 | 14 | 03 | 01 | 02 | 02 |
| 4 | Mehsana ONGC – Fire Brigade | 02762 | 254606 | 10 | 01 | 01 | 02 | 02 |
| 5 | Vishnagar | 02765 | 230351 | 02 | 02 | 01 | 01 | 01 |
| 6 | Vijapur | 02763 | 222741 | 02 | 01 | 01 | 01 | 01 |
| 7 | Vijapur-Agriculture Manufacturing Association | 02763 | 222382/ 220190 | 02 | 01 | 01 | 01 | 01 |
| 8 | Gandhinagar | 079 | 23222742 | 25 | 01 | 01 | 02 | 02 |
| 9 | Ahmedabad-Danapith | 079 | 22148465 | 25 | 01 | 01 | 02 | 02 |
| 10 | Ahmedabad-Memnagar | 079 | 27910203 | 25 | 01 | 01 | 02 | 02 |
| 11 | Ahmedabad-Chandkheda | 079 | 29709738 | 25 | 01 | 01 | 02 | 02 |

## 3.3 MEDICAL FACILITIES AT MAH UNITS

| Sr No | Name | STD Code | Phone 1 | Phone 2 | Ambu-lance | OHC | First aid boxes | Stret-chers | Availability of | | Details of other facilities/equipment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Doctor | Nurse | |
| 1 | NEON FUEL LTD. AT. KHODAMBA TAL. BHILODA ARAVALLI | 02774-266030 | 9426060920 | 9979033300 | - | - | 02 | - | Nearest civil Hospital at Shamlaji (PHC) | - | -- |

## 3.4 MEDICAL FACILITIES IN DISTRICT

### CHCof Arvalli District

| Sr No | Center | In charge Person | Tel. Code | Center Phone |
|---|---|---|---|---|
| 1. | Amodara (Bayad) | Dr.A.P.Chaudhari | 9099064619 | |
| 2. | Bayad | Dr.J.J.Dave | 7383003243 | |
| 3. | Jitpur,Bayad | Dr.P.R.Solanki | 9099064606 | |
| 4. | Chorimala (Bhiloda) | Dr.S.S.Agrawal | 9408594728 | 02771-275316 |
| 5. | Shamlaji (Bhiloda) | Dr.K.N.Shah | 9427063292 | 02771-240283 |
| 6. | Dhansura | Dr.S.V.Pandya | 9426271250 | |
| 7. | Malpur | Dr.Pratiksha Damor | 7016841439/ 9558033181 | 02773-223136 |
| 8. | Isari (Meghraj) | Dr.Rameshbhai Kharadi | 9879373305 | 02773-243644 |
| 9. | Meghraj | Dr.S.V.Pandya | 9426271250 | 02773-244413 |
| 10. | Medhasan (Modasa) | Dr.Chirag Dhuvad | 9099064501 | 02774-262548 |

* Name of doctors subject to change as per their posting

## 3.4 MEDICAL FACILITIES IN DISTRICT

### PHCof Arvalli District

| Sr No | Center | location | Tel. Code | Center Phone |
|---|---|---|---|---|
| 1 | Bayad | Ambaliayara | 9687679223 | 02779-282338 |
| | | Choila | 9687679231 | |
| | | Demai | 7433979208 | 02779-266713 |
| | | Gabat | 9687679246 | 02779-287472 |
| | | Sathamba | 9687679252 | |
| | | Tenpur | 9687679231 | |
| | | UHC-Bayad | 7567888375 | 02779-222411 |
| 2 | Bhiloda | Kushki | 9428548254 | 02771-282123 |
| | | Jabchitariya | 9870082690<br>7573044829 | 02771-284152 |
| | | Janali | 7435065108 | |
| | | Kheradi | 7405400183 | 02771-220341 |
| | | Kishangarh | 9687679303<br>9265825530 | 02771-281778 |
| | | Lusadia | 9726288273 | 02771-286613 |
| | | Munai | 9687679257<br>9825433055 | 02771-278131 |
| | | Palla | 7435065188 | 02771-283521 |
| | | Torda | 7435065152 | 02771-225019 |
| | | Vankaner | 9687679264 | 02771-223259 |
| 3 | Dhansura | Akarund | 9687679140 | 02779-233447 |
| | | Bhensavada | 9687679116 | 02774-255526 |
| | | Shika | 9428197780 | 02774-268256 |
| | | Vadagam | 9687679130 | 02774-277210 |
| 4 | Malpur | Jitpur | 8140942722 | 02773-274501 |
| | | Rambhoda | 7359244342 | |
| | | Satarda | 9687679184 | 02773-274502 |
| 5 | Meghraj | Banthivada | 9726306668 | |
| | | Vaghpur | 9726306668 | |
| | | Kasana | 9979087249<br>9408823213 | 02773-284503 |
| | | Kunol | 7567444277 | |
| | | Pateldhundha | 9409049409 | 02773-282513 |
| | | Ramgadhi | 9429176842 | 02773-285528 |
| | | Rellavada | 9687407664<br>8849114469 | 02773-283277 |
| | | Sangal | 9429236635 | 02773-287611 |
| 6 | Modasa | Bolundra | 9601882629 | |
| | | Dadhaliya | 9662950929 | 02774-283331 |
| | | Limbhoi | 9687679147 | |
| | | Sardoi | 9428271271 | |
| | | Shinavad | 9687679159 | |
| | | Tintoi | 8128995095 | 02774-266117 |

* Name of doctors subject to change as per their posting

## 3.5 AMBULANCE SERVICES AND HOSPITALS

### Ambulances Services

Ambulance-Medical/Fire/Police - Phone :108

| Sr. No | Name | Phone Number |
|---|---|---|
| 1 | Aalok Orthocare & Arthroplasty Center. – Ahmedabad | 079 – 227558383<br>079 – 227558393 |
| 2 | Citizen Ambulance Service, Ahmedabad. | 079 – 225323268 |
| 3 | Citizen Relief Service Charitable Trust, Ahmedabad. | 079 – 225350104 |
| 4. | Karnavati Hospital Ltd., Ahmedabad. | 079 – 226575500 |
| 5 | Karuna Trust, Polio Hospital Ahmedabad. | 079 – 227552155 |
| 6 | Navdeep Medical Emergency Foundation, Ahmedabad. | 079 - 227543003 |
| 7 | Prerna Hospital Ltd., Ahmedabad. | 079 – 226400386 |
| 8 | Sadvichar Parivar, Ahmedabad. | 079 – 226585260 |
| 9 | Ashirvad Hospital, Dehgam. | 02716 – 232870 |
| 10 | Amin Kamlaben Rambhai Charitable Trust, Dehgam | 02716 – 232798 |
| 11 | Gopinath Amin, Dehgam | 02716 – 232087 |
| 12 | Akhil Bharatiya Manav Seva Sanstha, Dehgam. | 02716 – 232184 |
| 13 | Ravindra Maradiya, Dehgam | 02716 – 234019 |

## 3.5 AMBULANCE SERVICES AND HOSPITALS

### MAJOR HOSPITALS AND RESOURCES

| Sr No | Name | Location | Phone No. |
|---|---|---|---|
| 1. | Civil Hospital | Modasa | |
| 2. | Ayurved Hospital, | At: Kanpurkampa Taluka: Bayad | 02779-223038 |
| 3. | Sarvajanik Hospital, | Modasa | 02774-246236 |
| 4. | Navchetan Hospital | Bhiloda | 232172 |
| 5. | Krishna Health Care | Modasa | 02774-245050 |
| 6. | Arvalli Institute of Medical Science | Modasa | 848789192 |
| 7. | Sanjeevani Hospital | Modasa | 02774-244108 |
| 8. | Ayushman Surgical Hospital | Modasa | 02774-242900 |

## 3.5 AMBULANCE SERVICES AND HOSPITALS

OTHER HOSPITALS

| Sr No | Name | Location | Phone No. |
|---|---|---|---|
| 1 | Shri Harilal Maneklal Desai Govt. Ayurved hospital, | Kapadvanj, Dist: Kheda. | 02691-252289 |
| 2 | Civil Hospital | Gandhinagar. | 079-23222733 23221931/ 2 23221913 |
| 3 | Govt. Ayurvedic Hospital Sector 22 | Gandhinagar. | 23222509 |
| 4 | Sheth S.G.Shah Ayurved hospital, At: Lodara | Taluka: Mansa. | 02763- 285464 |
| 5 | Apollo Hospital | Bhat | 28501800 28501803 |
| 6 | T.B. Hospital, Sector 12 | Gandhinagar | 23221364 |
| 7 | Aids Cell, Sector 12 | Gandhinagar | 23220460 |
| 8 | Jashlok Hospital, Sec 22 | Gandhinagar | 23224906 |
| 9 | Sonal Hospital, Near Muni. Girls High School | Dehgam | 02716-232086 |
| 10 | Valay Hospital, Gandhi bag | Dehgam | M-98250 21877 |
| 11 | Sanjivani Hospital, Near Tarahi mata Temple | Dehgam | H-02716- 232127 R- 02716-232505 |
| 12 | Sahajanand Hospital, H 2, Shahanand Complex, | Dehgam | H- 02716-234069 M-98254 50079 |
| 13 | Mamta Hospital, Kharakuva khancho, | Dehgam | H-02716-232188 R-02716-232088 |
| 14 | Chandan Maternity Hospital & Sonography Center, | Dehgam | H-02716-232742 R-02716-232542 |
| 15 | Civil Hospital | Ahmedabad | 22683721 |
| 16 | Civil Hospital | Sola | 27474355 |
| 17 | Civil Hospital | Mehsana | 02762-221217 |
| 18 | ESIS General Hospital | Ahmedabad | 22743935 |
| 19 | V. S. General Hospital | Ahmedabad | 26577621 – 25 |
| 20 | B.M. Institute of Mental Hospital | Ahmedabad | 25622485 |
| 21 | Victoria Jubilee Hospital | Ahmedabad | 22141080 |
| 22 | Akhand Anand Ayurvedic Hospital | Ahmedabad | 25507796 |

| | | | |
|---|---|---|---|
| 23 | Maniben Amaratlal Hargovandas | Ahmedabad | 22686269 |
| 24 | SAL Hospital,Drive In | Ahmedabad | |
| 25 | Vivekanand Ayurvedic Hospital, Maninagar | Ahmedabad | 22774170 |
| 26 | Shardaben Mni. General Hospital | Ahmedabad | 22164261 |
| 27 | L.G. Hospital | Ahmedabad | 25461380 – 84 |
| 28 | Rajasthan (Chatrabhuj) Hospital | Ahmedabad | 22866311/12/13 |
| 29 | Karnavati Hospital | Ahmedabad | 26575500/1/3/5 |
| 30 | Stearling Hospital | Ahmedabad | 27481415 |
| 31 | Jagmohan Hospital, Navarangpura | Ahmedabad | 27540336<br>27540744 |
| 32 | Shree Krishna Cancer Hospital, Navarangpura, | Ahmedabad | 26461575/ 6<br>R- 27912309 - 27912267<br>M- 98250 16738 |
| 33 | Eye Care Hospital, Polytechnic road | Ahmedabad | 26446133<br>26430503<br>26561276 |
| 34 | Dr. Jivraj Mehta Hospital, | Ahmedabad | 26639840/1/2/ 3 |
| 35 | Gujarat cancer & research institute | Ahmedabad | 22681451 |
| 36 | Institute of Kidney Deases Research Center | Ahmedabad | 22685601,<br>22685454 |
| 37 | Dr. J.J.Vora Memorial General Hospital (Navdeep Hospital) | Ahmedabad | 27543333,<br>26583040 |
| 38 | Jagdish Orthopedic Hospital | Ahmedabad | 26578663<br>26747166 |

| | | | |
|---|---|---|---|
| 39 | Prerna Hospital | Ahmedabad | 26401332 |
| 40 | Starlin Hospital | Ahmedabad | 27481415<br>27485767 |
| 41 | Deep Euro Surgical and Kidney Hospital | Ahmedabad | 26565650 |
| 42 | M. P. Shah Cancer Hospital, | Ahmedabad | 22681454 |
| 43 | Nagari Eye Hospital, | Ahmedabad | 26466724 |

## 3.6 PRIVATE PRACTITIONERS – Modasa

| Sr. No. | Dispensary Name & Address | Doctor Name | Phone Numbers | |
|---|---|---|---|---|
| | | | Dispensary | Dispensary |
| 1. | Surgeons | Dr.Yogesh P.Upadhyay | 9824550192 | 243316 |
| 2. | Do | Deep Surgical | 9825348910 | 242060 |
| 3. | Do | Dr.B.T.Patel | 9879616196 | 243152 |
| 4. | Do | Dr.Suresh B.Shah | 9825321031 | 242664 |
| 5. | Physicians | Dr.V.M.Bhatt | 241488 | 233337 |
| 6. | Do | Dr.M.D.dave | 9824360206 | 246236 |
| 7. | Do | Dr.Haresh D.Shah | 9825050391 | 246246 |
| 8. | Radiologist/Sonologist | Dr.Jayesh Vora | 247334,241337 | 240335 |
| 9. | Do | Dr.Sudhakar G.Pandya | 9428832099 | 243441 |
| 10. | Orthopedic surgeons | Dr.Rakesh C.Shah | 9824250065 | 246784 |
| 11. | Do | Dr.Chetan N.Shah | 9879421526 | 245678 |
| 12. | Do | Dr.Hiren Shah | 9825400351 | 245545 |
| 13. | Anesthesist | Dr. Kirit Patel | 240320 | 9825076363 |
| 14. | Do | Dr. B.R. Patel | 233885 | 9825049475 |

## 3.7 BLOOD BANKS, MEDICAL TEST LABORATORIES AND PHARMACEUTICALS DISTRIBUTORS.

# Blood Banks.

| Sr No | Name & Address | Location | Phone No. |
|---|---|---|---|
| 1. | Prathma Blood Center.<br>Dr. C. V. Raman Marg, Behind Jivraj Mehta Hospital, Vasna.<br>(24 HOUR OPEN) | Ahmedabad | 079 – 26600101 |
| 2. | Sanket Healthcare Foundation.<br>Shefali Hse, Parimal X Road.<br>(24 HOUR OPEN) | Ahmedabad | 079 – 26462741 |
| 3. | Adarsh Path. Lab. & Voluntary Blood Bank. | Ahmedabad | 079 – 22746672 |
| 4. | Ami Pathology Lab & Blood Bank. | Ahmedabad | 079 – 27503545 |
| 5. | Ashish Pathology Lab. | Ahmedabad | 079 – 26303090 |
| 6. | ESI General Hospital. | Ahmedabad | 079 – 27743935 |
| 7. | Green Cross Blood Bank, Anil kunj,Paldi Cross Road | Ahmedabad | 079 – 26578824 |
| 8. | Gujarat Blood Bank | Ahmedabad | 079 – 26584893 |
| 9. | Help Voluntary Blood Bank. | Ahmedabad | 079 – 25463028 |
| 10. | Indian Red Cross Society | Ahmedabad | 079 – 26643833 |
| 11. | Karnavati Blood Bank. | Ahmedabad | 079 – 27415150<br>079 – 26401253 |
| 12. | Mahagujarat Blood Bank. | Ahmedabad | 079 – 25451331 |
| 13 | New Vihal Lab. | Ahmedabad | 079 – 22815227 |
| 14 | Aarogya Laboratory - Dr.Hayadwala | Himmatnagar | 249170 |
| 15 | Akar Pathology Laboratory | Himmatnagar | 240319 |
| 16 | Amit J. Manav Petho. Lab. | Himmatnagar | 253689 |
| 17 | Banshi Lab. | Himmatnagar | 230893 |
| 18 | Bhagdoyay General Hospital | Himmatnagar | 243031 |
| 19 | Bhavna Pethology Lab. | Himmatnagar | 243145 |
| 20 | Chintan Lab. | Himmatnagar | 233407 |
| 21 | Vinod Pathology - Darji Vinodchandra J. | Prantij | 230783 |
| 22 | Davada Salimbhai Nurbhai | Himmatnagar | 222167 |
| 23 | Gayatri Pathology Lab. | Himmatnagar | 231091 |
| 24 | Maitri Pethology | Bayad | 222646 |

| | | | |
|---|---|---|---|
| 25 | Mayur Pathology | Vijaynagar | 254279 |
| 26 | Navdeep Pathology N.R. Shah | Modasa | 246208 |
| 27 | Orient Laboratory | Modasa | 246750 |
| 28 | Orient Pathology | Modasa | 248034 |
| 29 | Soni Pathology | Idar | 254117 |

## Pharmaceutical Dealers.

| Sr No | Name & Address | Taluka | Phone No. |
|---|---|---|---|
| 1 | Bright Pharma | Himm. | 242491 |
| 2 | Brij Pharmaceutical | Mahavirnagar | 234011 |
| 3 | Chiranjive Pharmacutical | Modasa | 246830 |
| 4 | CPM Enterprise | Himm. | |
| 5 | Megh Pharmacutical | Modasa | 246563 |
| 6 | Montage Laboratories Pvt. Ltd. | Idar | 222684 |
| 7 | Montage Laboratories Pvt. Ltd. | Idar | 223684 |
| 8 | Salus Pharmaceutical | Himm. | 229737 |
| 9 | Sehat Pharma Pvt. Ltd. | Himm. | 222153 |
| 10 | Shelter Pharmacy | Himm. | 246995 |
| 11 | Unim Pharmacutical | Himm. | 223780 |
| 12 | Zenith Industires | Motipura | 228734 |

## Pharmaceutical Distributors.

| Sr No | Name & Address | Taluka | Phone No. |
|---|---|---|---|
| 1 | ShriNathji Medical Stores | Bayad | 220001 |
| 2 | Yamuna Chemist | Bayad | 222154 |
| 3 | Gayatri Medical Agency | Bayad | 220266 |
| 4 | Dipak Medical Stores | Bayad | 222279 |
| 5 | Umiya Medical Stores | Bayad | 222408 |
| 6 | Swaminarayan Medical Stores | Prantij | 230682 |
| 7 | Mahavir Medical Stores | Prantij | 230496 |
| 8 | Avon Medical Stores | Prantij | 230337 |
| 9 | Patel Medical Stores | Prantij | 230437 |
| 10 | Bhumi Medical Stores | Prantij | Not Available |
| 11 | J.D.Pharma | Idar | 251370 |
| 12 | Jalaram Medical Stores | Idar | 253413 |
| 13 | Keshav Drug agency, Javan pura | Idar | 250753 |
| 14 | Mahavir Chemist/Medical agency | Idar | 250370 |

| | | | |
|---|---|---|---|
| 15 | Mehta Medical Stores | Idar | 250519 |
| 16 | Paras Sales Corporation | Idar | 253843 |
| 17 | Mehta drug agency | Idar | 250619 |
| 18 | Mihir Medical Stores | Idar | 250471 |
| 19 | Royal Medical Stores | Idar | 250664 |
| 20 | Mahavir Sales Corporation | Idar | 250912 |
| 21 | R.K.Agencies | Himmatnagar | 242802 |
| 22 | R.K.Imam | Himmatnagar | 240802 |
| 23 | Ambika Medical Agency | Himmatnagar | 244802 |
| 24 | Kumar Corporation | Himmatnagar | 240372 |
| 25 | Krishna Medical and Surgical Agency | Himmatnagar | 241879 |

## 3.8 PERSONAL PROTECTIVE EQUIPMENT AVAILABLE AT MAH UNITS

| Sr No | Name | STD Code | Phone 1 | SBA | Canister Masks | Full Body PVC Suit | Air line BA | Chemical Splash suit | Emergency Kit | Water Gel |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | NEON FUEL LTD. AT. KHODAMBA TAL. BHILODA ARAVALLI | 02774-266030 | 9426060920 , 9979033300 | 01 | 10 | 01 | -- | -- | * Safety Gloves,Safety Shoes,Masks | -- |

## 3.9 COMMUNICATION & WARNING FACILITIES AVAILABLE AT MAH UNITS

| Sr No | Name | STD Code | Phone 1 | Mobile phones | P A System | Siren (Elect./ hand/steam) | Any other |
|---|---|---|---|---|---|---|---|
| 1 | NEON FUEL LTD. AT. KHODAMBA TAL. BHILODA ARAVALLI | 02774-266030 | 9426060920 9979033300 | --do-- | -- | Yes (Manual and Electrical both) | -- |

## 3.10 VEHICLES AVAILABLE AT MAH UNITS

| Sr No | Name | STD Code | Phone 1 | Bus/ | Truck | Car / Jeep |
|---|---|---|---|---|---|---|
| 1 | NEON FUEL LTD. AT. KHODAMBA TAL. BHILODA ARAVALLI | 02774-266030 | 9426060920, 9979033300 | - | *EICHER *Pick Up | 02774-266030 |

## 3.11 AVAILABILITY OF SPECIAL RESCUE EQUIPMENT

| Sr No | Name of the Unit | Equipment Details | Type | Quantity | Max. Boom Length (m) | Min Radius in m | Capacity in MT |
|---|---|---|---|---|---|---|---|
| 1 | Bayer crop science Ltd., Motipura, Himmatnagar. | Fork Lift | Godrej | 2 | - | - | 3 |
| 2 | Sabar Dairy, Himmatnagar. | Fork Lift | Godrej | 3 | - | - | 3 |
| 3 | Bloom Dekor Ltd. Oran | Fork Lift | - | 1 | - | - | 1 |
| 4 | Tudor India Ltd.Prantij | Fork Lift | Voltas / Godrej / Macneill | 4 | - | - | 2.5 / 3 / 2 |
| 5 | Asian Granito Ltd,Katwad | Lodder | - | 2 | - | - | - |
| 6 | National Highway Authority, Katpur M - 9925168446 | Crane | - | 1 | - | - | - |
| 7 | Sanjaybhai, Mehtapura, Himmatnagar M-9925204185 | JCB | - | 2 | - | - | - |
| 8 | Gopi Crane Service, A'bad | Crane | - | 2 | - | - | 30 |
| 9 | Thanaji S.Vanjara, Prantij M- 9925637155 | JCB | - | 1 | - | - | - |
| 10 | Jogaram Marvadi,Prantij | JCB | - | 1 | - | - | - |
| 11 | Shree Dutt Earth Moovers, Sujlam Suflam Canal, Katpur. Akubhai - M:9913612159 | JCB, Dumpers | - | 2,5 | - | - | - |

N.B: Other information is to be given by RTO office.

# ANNEXURE – 4

## REMEDIAL MEASURES

4.1 INDICATIVE LIST OF MEDICINES / EQUIPMENT
Medicines to be stocked at Treatment Center (per 1000 persons)

## General Medicines :-

| ITEM | QTY. | ITEM | QTY. |
|---|---|---|---|
| Methyl Cellulose Eye Drops, 5 ml. | 500 Bottles | Injection Tetanus Toxide multidose | 250 Vials |
| Surgical Spirit | 10 Bottles | 5% GNS IV Fluid, 540 ml. | 100 Bottles |
| Normal Saline Fluid, 540 ml. | 100 Bottles | Sterile Distilled Water, 500 ml. | 100 Bottles |
| Vinegar | 5 | Liquid Paraffin | 5 Bottles |
| Vaseline | 1 tin | Tincture Benzoine | 5 Bottles |
| Tincture Iodine | 5 Bottles | Tincture Cetrimide | 20 Bottles |
| Savlon Liquid | 25 Bottles | Ointment Soframycin | 100 Tubes |
| Ointment Atropine(Eye) | 50 Tubes | Atropine Eye Drops | 50 Bottles |
| Neosporin Dusting Powder | 100 Tubes | Pilocarpine Eye Drops | 25 Bottles |
| Acriflavin Gauze with Plastic Jar | 5 | Ointment Gentamycin (Eye) | 50 Tubes |
| Gentamycin Eye Drops | 50 Bottles | - | - |

## Injectables (Ampoules / Vials) :-

| | | | |
|---|---|---|---|
| Decadron | 100 | Deriphyline | 500 |
| Coramine | 100 | Calcium Gluconate | 100 |
| Adrenaline | 100 | Dopamine Hydrochloride | 25 |
| Mephentine | 50 | Sodium Bicarbonate | 500 |
| Atropine Sulphate | 1000 | Aminophyline | 100 |
| **ITEM** | **QTY.** | **ITEM** | **QTY.** |
| Lasix | 200 | Vitamin K | 20 |
| Lignocaine Hydrochloride | 70 | Salbutamol | 10 |
| Perinorm | 25 | Pethidine Hydrochloride | 50 |
| Ampicillin | 25 | Avil | 50 |
| Calmpose | 100 | Morphine Sulphate | 10 |

## Surgical Items :-

| | | | |
|---|---|---|---|
| Eye Plastic Undine | 50 | Absorbent Cotton Wool | 100 Rolls |
| Bandage 2”, 4”, 6” | 100 Rolls | Adhesive Plasters (Different sizes) | 100 Rolls |
| Oxygen Cylinders | 50 | Mackintosh (Rubber Sheet 3’ x 6’) | 20 Rolls |

| | | | |
|---|---|---|---|
| Polyethylene Masks (Surgical) | 1000 | Pathology Gloves (Misc. sizes) | 50 Pairs |
| Disposable Syringes (2, 5 & 10 ml.) | 150 | Catgut Chromic | 100 Boxes |
| Suture Needles Cur. Cutting (Different sizes) | 100 | Suture Needles Str. Cutting (4, 6, 8 mm) | 100 Each |
| Catgut Plain | 100 Boxes | BB Silk | 100 Reels |
| Operation Scissors, str. | 5 | Operation Scissors, Cur. | 5 |
| Tracheotomy Set | 10 | Forceps Artery, Str. | 50 |

| ITEM | QTY. | ITEM | QTY. |
|---|---|---|---|
| Forceps Artery, Cur | 50 | Forceps Mosquito | 50 |
| Plaster of Paris Bandage (10 & 15 cm) | 50 Rolls Each | Forceps Dissecting (Toothed & Non-toothed) | 5 |
| Forceps Cheatles | 4 | Thomas Splints (arm/hip) | 123 Each |

| | | | |
|---|---|---|---|
| Boyels Apparatus | 1 | Respirator Bear (Adult/child) | 2 Each |
| Laryngoscope (Adult/child) | 1Each | Endotracheal Tubes (diff. sizes) | 25 |
| IV Set, Disposable | 100 | Wooden Splints | 100 |
| Elastic Bandage | 100 | Electric Sterilizer | 5 |
| Hypodermic Needles (diff. Sizes) | 100 | SS Tray with Lid (rectangular) | 10 |
| EI Jar, (5") | 10 | EI Jar, (12") | 5 |
| Scissors shop | 2 | Basins (18" dia) | 5 |
| Kidney Tray | 10 | Loup (Eye Examination) | 4 |
| Others | | | |
| G N S IV Fluid | 100 Bottles | Water | 100 Bottles |
| Plasma | - | Oxygen Cylinders | 50 |

## Miscellaneous Items :-

| | | | |
|---|---|---|---|
| Overshoes | 100 Pairs | Torchlight (3 Cells) | 10 |
| Torch Cells | 60 | Stretchers | 50 |
| Mattress | 100 | Wheel Chairs | 10 |

N.B: Above information to be checked by CMO, DHO & conformed by them.

## 4.2 DETAILS OF CHEMICALS PROPERTIES, FIRE FIGHTING AGENTS, ANTIDOTES, FIRST AID & MEDICAL TREATMENT

| Sr No | Name of Chemical | Hazard Characteristic | Fire Fighting Agent | Antidote / First Aid / Medical Treatment |
|---|---|---|---|---|
| 1 | Acetic Acid | Corrosive | Carbon Dioxide, Dry Chemical Powder, Water Spray and Alcohol Resistant Foam | Remove the victim to fresh air. If there is a difficulty in breathing, give Oxygen. If heartbeats are absent, give external Cardiac compression. If substance has gone in eyes, wash with plenty of water for 15 minutes, holding eyes open and obtain medical treatment urgently. |
| 2 | Ammonia | Flammable, Toxic | Stop flow of gas, use water spray to cool fire exposed containers. Exposed fire fighter must wear positive pressure self-contained breathing-apparatus and full protective clothing. | Remove the victim to fresh air. If there is a difficulty in breathing, give Oxygen. Inhalation of steam or vinegar vapour is recommended. If substance has gone in eyes, wash with plenty of water for 15 minutes To relieve restlessness, ingestion morphine 15mg to relieve Dypspnoea, Oxygen inhalation. |
| 3 | Ammo-nium Carbonate | Corrosive | Non-flammable | Remove the victim to fresh air. If there is a difficulty in breathing, give Oxygen. If substance has gone in eyes, wash with plenty of water for 15 minutes, holding eyes open. |
| 4 | Ammonia Nitrate (Melt) | ------ | Use plenty of water to cool fire exposed containers. Exposed fire fighter must wear positive pressure self-contained breathing apparatus and full | In case of burns due to hot Ammonium Nitrate solution, part should be flushed with large quantity of water and treated according to usual burns. |

| | | | | |
|---|---|---|---|---|
| | | | protective clothing. Container may explode in fire. | |
| 5. | Carbon Dioxide | Asphyxiant | Non-flammable | It is simple asphyxiant and can cause oxygen deficiency in confined space / non ventilated areas. Respiratory protection is required. |
| 6. | Carbon Monoxide | Flammable, Toxic | Carbon monoxide, dry chemical powder, wears self contained breathing apparatus. Let fire burn, shut off gas while using the chemicals. | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. If hearts beats are absent, give external cardiac compression. Do not use mouth to mouth ventilation. Administer 100% oxygen till Carboxy hemoglobin level is measured. Cerebral edema and convulsions must be controlled. Methyline blue must not be injected. |
| 7. | Chlorine | Toxic | Non flammable | Remove the victim to fresh air. If there is a difficulty in breathing, give external cardiac compression. Incase of eye exposure, wash with copious amount of water for 15 minutes, keeping eyelids apart. |
| 8. | Coal | Flammable | Dry chemical powder, water supply | Incomplete combustion may produce CO1, suphur dioxide; hence respiratory protection may be required to fight the fire. |
| 9. | Formic Acid | Flammable, **Corrosive** | Carbon dioxide, dry chemical powder, water spray and alcohol resistant, foam all purpose foam. | Remove the victim to fresh air. If difficulty in breathing, give oxygen. If hearts beats are absent, give external cardiac compression. If substance has gone in eyes, wash with plenty of water for 15 minutes, holding eyes open and obtain medical treatment urgently. |
| 10. | Fuel Oil | Flammable | Carbon dioxide, dry chemical powder, foam | Remove the contaminated clothes. Wash the affected parts of skin with plenty of soap & water & seek medical advice immediately for inhalation of vapors / fumes. |

| | | | | |
|---|---|---|---|---|
| 11. | High Speed Diesel | Flammable | Dry chemical powder, foam | - do - |
| 12. | Hydro-chloric Acid | **Corrosive** | Non flammable | Remove the victim to fresh air. If there is a difficulty in breathing, give artificial respiration. Do not give alkaline substances or carbonate preparation. Skin should be treated with 5% Trietanol amine. If substance has gone in eyes, wash with plenty of water for 15 minutes, holding eyes open and obtain medical treatment urgently. |
| 13. | Hydrogen | Flammable, **Explosive** | Dry chemical powder, halon. Let fire burn under control. Stop gas flow | It is simple asphyxiant and can cause oxygen deficiency in confined space / non ventilated areas. Move victim to the fresh air and apply resuscitation methods. |
| 14. | Hydrogen Iodide | Toxic | Non flammable | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. If hearts beats are absent, give external cardiac compression Incase of eye exposure, wash with copious amount of water for 15 minutes, keeping eyelids apart. |
| 15 | Hydrogen Sulphide | Flammable, Toxic | Carbon dioxide, dry chemical powder. Wear self-contained breathing apparatus. Alcohol resistant foam is also advisable to be used to stop fire. | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. Patient with significant exposure, should be hospitalized for 72 hours of medical observation for delayed pulmonary edema. The respiratory centre may be stimulated by injection of LOBGIN and nike thamide. Vitamin C may be injected intravenously. Incase of eye exposure, it should be treated with boric acid solu. |

| | | | | |
|---|---|---|---|---|
| 16 | Iodine | Toxic | Use water spray or carbon dioxide. Do not use foam or dry chemical. Wear full protective clothing and self contained breathing apparatus for fire fighting. | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. If hearts beats absent, give external cardiac compression Patient with significant exposure, should be hospitalized for 72 hours of observation. consider administration of multiple metered doses of topical steroid hormone or 30 mg/kg of methyl prednisolone IV. |
| 17 | LPG | Flammable, **Explosive** | Carbon dioxide, dry chemical powder, water spray | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. If substance has gone in eyes, wash with plenty of water for 15 minutes holding eyes open. |
| 18. | Methane | Flammable, **Explosive** | Carbon dioxide, dry chemical powder. Shut off gas. | Remove the victim to fresh air. If there is breathing difficulty gives oxygen. If substance has gone in eyes wash with plenty of water. |
| 19. | Methanol | Flammable, Toxic | Carbon dioxide, dry chemical powder, water spray and alcohol resistant foam. | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. Never administer anything by mouth if a victim is losing consciousness. Do not induce vomiting. Do not use mouth to mouth respiration. Massive alkalization in life saving & eye saving measures. Give small quantity of Ethyl alcohol every 4 hourly. If substance has gone in eyes, wash with plenty of water for 15 minutes holding eyes open. |

| | | | | |
|---|---|---|---|---|
| 20. | Methyl Acetate | Flammable, Toxic | Carbon dioxide, dry chemical powder and alcohol resistant foam. Water may be ineffective. | Remove the victim to fresh air. Give oxygen if there is difficulty in breathing, If substance heart beats are absent, give external cardiac compression. If substance has gone in eyes, wash with plenty of water holding eyes open & obtain medical treatment urgently. |
| 21 | Methyl Formate | Flammable, Toxic | Carbon dioxide, dry chemical powder, water spray and alcohol resistant foam. | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. If substance heart beats are absent, give external cardiac compression. If substance has gone in eyes, wash with plenty of water for 15 minutes holding eyes open and obtain medical treatment urgently. |
| 22 | Methyl Iodide | Toxic | Non flammable | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. If substance heartbeats are absent, give external cardiac compression. Do not use mouth to mouth ventilation. Keep under medical surveillance for 48 hours. Consider administration of multiple metered doses of topical steroid by inhalation and or upto 30 mg / kg of methyl prednisolone. Incase of eye, contact immediately, refer to opthalmologist. |
| 23 | Mono Ethylene Glycol | Flammable, Toxic | Carbon dioxide, dry chemical powder and alcohol resistant foam. | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. If heartbeats are absent, give external cardiac compression. If substance has gone in eyes, wash with plenty of water. |

| | | | | |
|---|---|---|---|---|
| 24 | Naphtha | Flammable | Foam D.C.P., carbon dioxide. Apply water fog from as far dist. as possible. | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. The decision of whether to induce vomiting or not should be made by an attending physician. If heartbeats are absent, give external cardiac compression. If substance has gone in eyes, wash with plenty of water. |
| 25 | Natural Gas | Flammable | Stop flow of gas. D.C.P, carbon dioxide. | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. If substance has gone in eyes, wash with plenty of water for 15 minutes, holding eyes open. |
| 26 | Nitric Acid | Corrosive Toxic | Non flammable | Remove the victim to fresh air. If there is a difficulty in breathing, give Oxygen. Do not induce vomiting. If heartbeats are absent, give external Cardiac compression. If substance has gone in eyes, wash with plenty of water for 15 minutes, holding eyes open and obtain medical treatment urgently. |
| 27 | Nitric Oxide | **Corrosive** Toxic | Non flammable | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. Do not allow to walk. Fatal symptoms may be delayed up to 48 hours even though victim may seem normal after exposure. If hearts beats are absent, give external cardia compression. If substance has gone in eyes, wash with plenty of water for 15 minutes holding eyes open and obtain medical treatment urgently |
| 28 | Nitrogen | Asphyxiant | Non flammable | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. If hearts beats are absent, give external cardia compression. Treat for frostbite with lukewarm water. |

| | | | | |
|---|---|---|---|---|
| 29 | Oxygen | ------- | Non flammable | Inhalation of 100 % oxygen can cause nausea, dizziness, irritation of lungs, pulmonary edema, pneumonia and collapse. Liquid oxygen will cause frostbite. |
| 30 | Nitrogen Dioxide | **Corrosive** Toxic | Non flammable | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. Enforce complete rest for 24 to 48 hours. Incase of high exposure keep patient under medical observation for at-least 72 hours. Some individuals, who had symptoms of acute exposure with or without edema, develop in immune reaction 10 days or 6 weeks after exposure. Symptoms include severe cough, cyanosis (tuning blue) fever hypoxemia and X ray may show fire scattered nodes in the lungs are vulnerable to virus. |
| 31 | **Potassium Hydroxide** | **Corrosive** Toxic | Non flammable | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. If substance heart beats are absent, give external cardiac compression. Incase of eye contact immediately refer for opthomological opinion. Treat skin burns conventionally. |
| 32 | Potassium **Methoxide** | Flammable, Toxic | Only dry chemical powder is allowed to be used. In reacts with water and CO2. | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. Never administer anything by mouth if a victim is losing consciousness. Do not induce vomiting. Do not use mouth to mouth respiration. Backing soda in glass of water should be given. |

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| 33 | Propionic Acide | Flammable, Toxic, **Corrosive** | Foam, dry chemical powder, carbon dioxide. Apply waster fog from as far distance as possible. | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. If heart beats are absent, give external cardiac compression. Incase of eye contact flush with plenty of water for about 15 minutes. Remove wet clothese and wash affected area with water & soap. |
| 34 | Rhodium Triodide | -------- | Non flammable | Remove the victim to fresh air. Material cause irritation of nose, throat and respiratory tract. Repeated exposure to skin can cause allergic sensitilization. Incase of eye contact, flush with plenty of water for 15 minutes. |
| 35 | Sodium **Hydroxide** | **Corrosive** Toxic | Non flammable | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. Incase of eye contact flush with plenty of water for about 15 minutes. Remove wet clothes and wash affected area with water & soap. |
| 36 | Sulphur Dioxide | **Corrosive** Toxic | Non flammable | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. If hearts beats are absent, give external cardiac compression. Atropic rhnitis and pharngitis may be treated by inhalation of 5% solution of sodium chloride, followed by inhalation of 5% solution of sodium chloride, followed by inhalation of vitamin A. Incase of of eye contact, flush with 2% sodium bicarbonate solution, drops of 2 to 3 % phedrine should be instilled in the nose. |

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| 37 | Sulphuric Acid | **Corrosive** Toxic | Non flammable, react with water to form large amount of heat and corrosive fumes. Do not use water to existing fire in the nearby area. | Remove the victim to fresh air. If there is a difficulty in breathing, give Oxygen. Incase eye contact flush with plenty of water for 15 minutes. Remove wet clothes and wash affected area with plenty of water. |
| 38 | Trichloro Ethylene | Flammable, Toxic | Carbon dioxide, dry chemical powder, water spray and alcohol resistant foam. | Remove the victim to fresh air. If there is a difficulty in breathing, give Oxygen. Do not induce vomiting If heart beats are absent, give external Cardiac compression. If substance has gone in eyes, wash with plenty of water for 15 minutes, holding eyes open and obtain medical treatment urgently. |
| 39 | Ortho Dichloro Benzene | Flammable, Toxic | Foam dry chemical powder, carbon dioxide. Apply water fog from as far distance as possible. | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. Incase of eye contact flush with plenty of water for about 15 minutes. Remove wet clothes and wash affected area with plenty of water. |
| 40 | Trichloro Acetyl Chloride | **Corrosive** Toxic | Foam dry chemical powder, carbon dioxide. | It is very corrosive liquid. Exposure will produce tears in the eyes and severe chemical burns. Move the person to fresh air. If not breathing, perform artificial respiration. If required, give oxygen. Wash the affected skin thoroughly with soap and water. Flush and irrigate eyes with copious quantity of water for at-least 15 minutes. Do not induce vomiting. |

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| 41 | Acrylo-nitrile | Flammable, Toxic | Carbon dioxide, dry chemical powder | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. If the unconscious, crush an amylnitrite ampule in a cloth and hold it under the nose for 15 seconds in every minute. Do not interrupt artificial respiration during this process. |
| 42 | Copper Comp-ounds | ------- | Non flammable | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. If heart beats are absent, give external cardia compression. If substance has gone in eyes wash with plenty of water for about 15 minutes, holding eyes open and obtain medical treatment urgently. |
| 43 | Aniline | Flammable, Toxic | Foam, dry chemical powder, carbon dioxide | Remove the victim to fresh air. If there is a difficulty in breathing, give Oxygen. Aniline is very toxic, if splashed on skin. It passes through the skin, causing methanoglobinemia. Antidote is **methlyene blue**. Incase of eye contact flush with plenty of water for 15 minutes. Remove wet clothes and wash affected area with plenty of water. |
| 44 | Benzene | Flammable, Toxic | Foam, dry chemical powder, carbon dioxide | Remove the victim to fresh air. If there is a difficulty in breathing, give Oxygen. Benzene is very toxic or if splashed on skin. Chronic exposure may lead to leukemia. Incase of eye contact flush with plenty of water for 15 minutes. Remove wet clothes and wash affected area with plenty of water. |

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| 45 | Nitro-benzene | Flammable, Toxic | Foam, dry chemical powder,carbon dioxide | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. NB is very toxic if splashed on skin. It passes through the skin causing methanoglobinemia. Antidote is **methylene blue**. Incase of eye contact flush with plenty of water for about 15 minutes. Remove wet clothes and wash affected area with plenty of water. |
| 46 | Phosgene | Corrosive Toxic | Non flammable | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. Phosgene is very toxic incase of inhalation. It has very low TLV – 0.1 ppm. Keep the person under observation for 72 hours for possibility of delayed effect. Incase of eye contact, flush with plenty of water for about 15 minutes. Remove wet clothes and wash affected area with plenty of water. |
| 47 | Toluene | Flammable, Toxic | Foam, dry chemical powder,carbon dioxide | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. Toluene is very toxic if splashed on skin. Incase of eye contact flush with plenty of water for about 15 minutes. Remove wet clothes and wash affected area with plenty of water. |

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| 48 | Di Nitro Toluedene | Flammable, Explosive | Use plenty of water to cool fire exposed containers. Exposed fire fighter must wear positive self contained breathing apparatus. Foam and dry chemical powder and carbon dioxide can be used. | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. Di Nitro Toluene is very toxic if splashed on skin. Incase of `eye contact flush with plenty of water for about 15 minutes. Remove wet clothes and wash affected area with plenty of water. |
| 49. | Metaol-uene Di Amine | Flammable, Toxic | Foam dry chemical powder, carbon dioxide. Apply water fog from as far distance as possible. | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. Metaoluene Di Amine is toxic, if splashed on skin. Incase of eye contact flush with plenty of water for about 15 minutes. Remove wet clothes and wash affected area with plenty of water. |
| 50 | Toluene Di -Isocyanate | Corrosive Toxic | Dry chemical powder, carbon dioxide. Do not apply water as it reacts violently with water at elevated temperature. | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. Toluenen Di Isocynate is very toxic if inhaled.. In cause pulmonary edema. TLV of TDI vapour is ver low i.e. 0.0005 ppm. If splashed on skin, incauses sensitization of skin tissue. Incase of eye contact, flush with plenty of water for about 15 minutes. Remove wet clothes and wash affected area with plenty of water. |

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| 51 | Methyl Iodine | Toxic | Non Flammable | Remove the victim to fresh air. If there is a difficulty in breathing, give oxygen. If heart beats are absent, give external cardiac compression. Do not use mouth to mouth ventilation. Keep under medical surveillance for 48 hours. Consider administration of multiple metered doses of topical stercoid aerosol by inhalation and or up to 30 mg / kg of methyl prednisolone. Incase of eye, contact immediately, refer to opthalmologist. |
| 52 | Chloro Sulphonic Acid | A poison to irritant, corrosive | Use DCP, foam if exposes to fire. | Remove victim to fresh air. If there is difficulty breathing, give oxygen. Do not induce vomiting. Obtain medical treatment urgently. |
| 53 | Carbon Di Sulphide | Flammable, Explosive | Use DCP, CO2 | Remove victim to fresh air. If there is difficulty breathing, give oxygen. Do not induce vomiting. Obtain medical treatment urgently. |
| 54 | Etyhlene Oxide | Flammable, Carcinogen | Use DCP | Remove victim to fresh air. If there is difficulty breathing, give oxygen. Do not induce vomiting. Obtain medical treatment urgently. |
| 55 | Acephate Anilophose, Ethion Phorate, Quinal-phos | Non Flammable | Use DCP, foam if exposed to fire. | Atropine sulphate in dose 2 – 4 mg for adult, 2 pam 1000 – 2000 mg / im. |
| 56 | Alachor Carbenda-zim, Thiophanat e – M | Non flammable | Use DCP, foam is exposed to fire | Inject 1 gm of Eralidioxime chloride IV. Do not induce vomiting if the injected poison is principally a hydrocarbon solvent. |

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| 57 | Mancozeb Thiram | Non flammable | Use DCP, foam is exposed to fire | Low toxicity, no specific treatment. |
| 58 | Allethrin Cyperm-ethrin Fevalrate | Toxic | Use DCP, foam is exposed to fire | The treatment is symptomic. |
| 59 | Alumi-nium Phosphate | Non flammable | Use DCP, foam is exposed to fire | Injection copper sulphate 0.25 gm. |
| 60 | Isopro-turon | Non flammable | Use DCP, foam is exposed to fire | Supportive treatment. |
| 61 | Hexa-conazole Propi-conazole | Non flammable | Use DCP, foam is exposed to fire | There is no specific antidotes and treats the victim symptomatically. |
| 62 | Propane | Flammable, Explosive | DCP, Water | First aid. |
| 63 | Butadine | Flammable, Explosive | DCP, Water | First aid. |
| 64 | Propylene | Flammable, Explosive | DCP, Water | First aid. |
| 65 | Styrene Monomer | Flammable | DCP, Foam compound | ---------- |
| 66 | Phosphoric Acid | Corrosive | --------- | Skin Contact :- Wash with clean water. Apply dry sterile dressing.<br>Eye Contact : Wash with clean water, apply benoxinate (novesine) drop (0.4%)<br>Inhalation : Administer $O_2$, Give him fresh drink water.<br>Ingestion: Milk of magnesia, fresh egg, administe oxygen |

## 4.3 LEAK DETECTION, NEUTRALIZATION & DISPOSAL

| Leak Detection | Neutralization & Disposal |
|---|---|
| Chlorine<br>To detect the chlorine leak an ammonia spray or swab is used. Chlorine gives white dense fumes of ammonium chlorine is greenish yellow gas with pungent and irritating odour. | Emergency disposal of chlorine is done b y absorbing it in the solution of caustic soda, soda ash or hydrated lime slurry. Chlorine cannot be vented off as it is toxic gas. Cylinder of any part of cylinder should not be immersed in the tank holding caustic or other solutions. Don't use rubber hose or polyethylene pipe connecting for neutralizing chlorine gas. Do not pour water on the leak. |
| Ammonia<br>Ammonia leak can be detected easily due to its specific pungent odour. The exact location of leak can be finding out by hydrochloric acid swab in suspected region. This will give white vapours of ammonium chloride.<br><br>Another method used in the detection of ammonium leak is by the use of sulphur dioxide gas, which also forms white fog or cloud in contact with ammonium. | At it is toxic gas it cannot be vented to atmosphere.<br><br>Ammonia leakage can be absorbed in water in a suitably designed system, as its solubility in water is very high. Mild steel is used as material of construction. |

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| Sulphur Dioxide<br>Sulphur dioxide leak can be detected by odour as it has characteristic odour. But the exact location of the leak can be find out by ammonia vapours from a swab or squeeze bottle. Sulphur dioxide will produce dense white fumes with ammonia vapours. Leak may also be detected by applying soap solution. Soap solution incase of leakage will give bubbles. | Sulphur dioxide leak can be absorbed in caustic solution. For this purpose scrubber should be preferably fabricated of polypropylene backed by FRP. Do not use water on the leak. |
| Bromine<br>Bromine spillage can be find out as it has intensely irritating odour.<br><br>Bromine leak can be detected by using ammonia swab or spray. Bromine gives white dense fumes with ammonia solution. | As bromine is toxic and fuming liquid, it can't be vented to atmosphere. Water should not be directly poured over the spillage with mud or earth and mop up with plenty of water. |
| Carbon Monoxide<br>As the gas inflammable, flame should not be used to detect the leak.<br>Carbon monoxide leak can be detected with soap solution, which gives bubbles around leaking area. Palledour chloride paper gets darkened in contact with carbon monoxide. | Leaking gas can be vented slowly to air in a safe open area or should be burnt off in a suitable gas burner. |

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| Ethylene Oxide<br>Ethylene oxide leak can be detected by using soap solution. Leak will produce bubble with soap solution. | As the gas is extremely flammable, all the ignition sources should be shut off. Leaking gas can be slowly vented off in a safe and open area. Put water spray to cool down, if necessary. The gas can be burnt off in a suitably designed burner. |
| Butadiene<br>Butadiene leak can be detected by its mild aromatic odour.<br>Butadiene leak can also be detected by using soap solution, which will produce bubbles. | Leaking gas should be slowly vented off to air in a safe open area or can be burnt off in a suitable burnet. Put water spray for cooling, if necessary. |
| Benzene<br>As benzene is flammable gas, flame should not be used to detect the leak. Leak will produce bubbles with soap solution. | As the gas is highly inflammable, shut off all the sources or ignition. Apply non-flammable dispersing agent. Run the waste diluting greatly with running water. Due to non-availability of dispersant, this can be absorbed on sand. Site of spillage should be thoroughly washed with water and soap or detergent. |
| Vinyl Chloride<br>Vinyl chloride leak can be detected due to its characteristic odour.<br>Leak can also be detected with soap solution, which will produce bubbles. | Leaking gas can be vented slowly to air in a safe open area or gas should be burnt off in a suitable burner. |

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|---|---|
| Ethyl Alcohol<br>Ethyl alcohol leak can be detected by its characteristic smell. | Shut off all possible sources of ignition. Mop up with plenty of water and run to waste diluting greatly with running water. Ventilate area well to evaporate remaining liquid and disposal vapours. |
| Hydrochloric Acid<br>Detect the leak with its sharp pungent odour. Leak can also be detected by using wet litmus paper. Hydrochloric acid will change the colour of the paper from blue to red. | Hydrochloric acid should be scrubbed in lime or caustic or water scrubber made of MSRL. Do not put water directly on the leak. Content the leak by mixing it with earth / sand and lime sludge. Slowly nuetralize by pouring water and dilute alkali. |
| Nitric Acid<br>Detect the leak of nitric acid with wet litmus paper. Nitric acid will change the colour of the paper from blue to red. | Nitric acid should be scrubbed in lime or caustic or water scrubber made of MS or SS. Do not put water on the leak. Content the leakage by mixing it with earth / sand and lime sludge. Slowly neutralize by pouring water or dilute alkali. |
| Phosphoric Acid<br>Detect the leak of phosphoric acid with wet litmus paper, which will change the colour of litmus paper from blue to red. | Spread soda ash liberally over the spillage and mop up cautiously with plenty of water. Dilute the waste greatly with running water. |

## 4.4 GENERAL PROPERTIES OF HAZARDOUS CHEMICALS

| Sr No | Name of Chemical | Colour | Odour | Flash Pt. °C | Sp. Gravity | Exposure Limit | | TLV ppm ACGIH | LD 50 mg/kg | Solu-Buility in Water | Hazards | Haz Chem | Anti-dote | Haz. Comb-ustion Product |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | LEL % | UEL% | | | | | | | |
| 1 | Acetic aid | Colour-less | Pungent odour | 44.44 | 2.07 | 5.4 % | 16 % | 10 ppm | 3310 | Miscible | Flammable | 2 YE | --- | Emits irritating vapours when heated |
| 2 | Acrylo-nitrile | Colour-less yellow | Sweet pungent | 0.55 | 0.807 | 3.1 % | 17 % | 20 ppm | 93 | Slight | Flammable | 1 WE | Sodium throsul-phate | --- |
| 3 | Acetone | Colour-less | Frag-rant mint | - 20 | 0.791 | 2.6 % | 12.8% | 750 ppm | --- | Miscible | Flammable | 2YE | --- | --- |
| 4 | Ammonia | Colour-less | Pungent | --- | 0.771 | 16 % | 25 % | 25 ppm | 350 | Soluble | T. Com | 2 PE | Novesineth anol, ether milk, lemon for ingestion | --- |
| 5 | Aniline | Colour-less | Charac-teristics | 76 | 1.02 | 1.3% | - | 5 ppm | 450 | Poor | Combustible | 3 x | Glucose Solution Ascrobic Acid | - |

| Sr No | Name of Chemical | Colour | Odour | Flash Pt. °C | Sp. Gravity | Exposure Limit | | TLV ppm ACGIH | LD 50 mg/kg | Solu-bility in Water | Hazards | Haz Chem | Anti-dotes | Haz. Comb-ustion Product |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | LEL % | UEL% | | | | | | | |
| 6 | Benzene | Colour-less | Aromatic1 | -11.1 | 0.8 | 1.4% | 8% | 10 ppm | 3400 | Slightly | Flammable | 3 WE | --- | --- |
| 7 | Carbon Tetra Chloride | Colour-less to yellow | Rotten Engg. To sweet | --- | 1.26 | 1% | 50% | 10 ppm | 3188 | Insoluble | Flammable | 3 WE | --- | --- |
| 8 | Carbon Tetra Chloride | Colour-less | Swee-tish | --- | 1.585 | --- | --- | 10 ppm | --- | Insoluble | Non combus-tible | --- | --- | --- |
| 9 | Chlorine | Greenish yellow | Suffo-cating | --- | 1.559 | --- | --- | 0.1 ppm | --- | Slightly | Toxic | 2 XE | --- | --- |
| 10 | Chloro Sulphonc Acid | Light yellow | Fuming pungent odour | --- | 1.77 | --- | --- | 1 ppm | --- | Violent reaction | Highly toxic | 4 WE | For skin use baking soda solution | --- |
| 11 | Ethylene Oxide | Colour-less | Sweet | 17.8 | 0.87 | 3% | 100% | 50 ppm | 330 | Soluble | Fire explosion | 2 PE | --- | --- |
| 12 | Ethyl Alcohol | Colour-less | Alco-holic | 47.77 | 0.7893 | 3% | 19% | 1000 ppm | 7060 | Soluble | Flammable | 2SE | --- | --- |
| 13 | Ethylene Dichloride | Colour-less | Pleasant sweet | 16.5 | 1.26 | 6.2% | 15.9% | 10 ppm | 860 | Insoluble | Flammable | 2 YE | --- | Emit toxic fumes |
| 14 | Isopropyl Alcohol | Colour-less | Unplea-sant Alcohol | 17.5 | 0.785 | 2.5% | 12.0% | 400 ppm | 5045 | Mixible | Flammable | 2 SE | --- | --- |

| Sr No | Name of Chemical | Colour | Odour | Flash Pt. °C | Sp. Gravity | Exposure Limit | | TLV ppm ACGIH | LD 50 mg/kg | Solu-Buility in Water | Hazards | Haz Chem | Anti-dotes | Haz. Comb-ustion Product |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | LEL % | UEL% | | | | | | | |
| 15 | LPG | Colour-less | Merca-ptain added | - 60 Byten | 0.51 to 0.56 | 1.9% | 9.5% | 1000 ppm | --- | Floats | FE | 2 WE | --- | --- |
| 16 | Methanol | Colour-less | Alco-holic | 10 | 0.79 | 6% | 36.50 % | 200 ppm | 5628 | Slightly | Flammable | 2 PE | Baking in glass operate | --- |
| 17 | Nitric acid | Slightly yello-wish | Suffo-cating | --- | 1.5404 | --- | --- | 2 ppm | --- | Slightly | Corrosion | 2PE | --- | Reacts with water to produce toxic, corrosive, flammable vapour |
| 18. | Nitro Benzene | Light Brown | Bitter almond | 87.5 | --- | 1.8% | --- | 1 ppm | 4 8 9 | Insoluble | Combust-ible | 2 X | --- | --- |
| 19 | Oleum | Colour-less to cloudy | Sharp cho-cking | --- | 1.9 | --- | --- | --- | --- | --- | Toxic | 4 WE | --- | Reacts with water to produce heat toxic & corrosive fumes |
| 20 | Sulphuric Acid | Colour-less oily | Odour-less | - | 1.84 | ---- | --- | --- | 2140 | Miscible | Corrosive | 2 RE | --- | Emits toxic fumes of SO2 |

| Sr No | Name of Chemical | Colour | Odour | Flash Pt. °C | Sp. Gravity | Exposure Limit | | TLV ppm ACGIH | LD 50 mg/kg | Solu-Buility in Water | Hazards | Haz Chem | Anti-dotes | Haz. Comb-ustion Product |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | LEL % | UEL% | | | | | | | |
| 21 | Sulphur Dioxide | Colour-less | Sharp pungent | --- | 1.48 Liq-uid | --- | --- | 2 ppm | --- | Sinks & boils | Toxic | 2 RE | --- | Reacts with water to produce toxic & corrosion fumes |
| 22 | Thionyl Chloride | Colour-less to yellow | Suffo-catinbg | --- | 1.640 | --- | --- | 1 ppm | --- | Slightly soluble | Flamm-able | 3 YE | --- | Violent reaction with water, release hydrogen chloride & sulphur dioxide |
| 23 | Toluene | Colour-less | Plea-sant | 12.7 | 0.817 | 1.27% | 7.00% | 50 ppm | 5000 | Slightly soluble | Flammable | 3 YE | --- | Emits acric smoke & irritating fumes |
| 24 | Xylene | Colour-less | Sweet | 37.7 | --- | --- | --- | 100 ppm | 4300 | Insoluble | Flammable | 3 Y | --- | --- |

## 4.5 PERSONAL PROTECTIVE EQUIPMENT

INTRODUCTION

Personal Protection Equipment are required to ensure safety of the affected personnel, members of fire fighting and rescue teams at the time of emergencies involving toxic and flammable material. The equipment should be capable to provide complete protection and simultaneously be comfortable and convenient to wear.

The type of equipment needed depends on a number of factors such as degree of protection required, nature of the substance against which protection is required, the nature of work to be performed and the circumstances likely to be encountered in the event of an emergency, etc. Improvements are constantly being made in the design of devices for personal protection and the management of the works should ensure that the best available are being used.

TYPES OF PROTECTIVE EQUIPMENT

Respiratory Protection: Respiratory protection equipment are available in two main forms viz. Breathing Apparatus which enables the user to breath independently of the surrounding atmosphere. Respirator, that enables the user to breath from the surrounding atmosphere by inhaling through a filtering device. Respirators should not be worn if the oxygen level is below 20% for any reason. Several types are available and their qualities and limitations must be fully realized. The main problem is the leakage of toxic vapours past the face-piece.

Air Line Breathing Apparatus: There are two types of apparatus available: Where the user breathes fresh air using a face piece connected by a hose to fresh air without the assistance of the compressor

The greatest protection against inhalation of vapour is provided by face piece or helmet which is continuously supplied with air from a compressor or a blower at a rate sufficient to maintain a slight positive pressure within the face piece during the entire respiratory cycle, i.e., 100 liters per minute. Whenever the level of contamination is thought to be high, the use of this type of

respirator is especially desirable. Connection to a source of compressed air by air hose is necessary and thereby such equipment pose a limitation on mobility. Care must be taken to ensure that the air intake is properly located so that only clean, oil-free fresh air can be supplied. Precautions must be taken to prevent interference with the air supply and against the contamination of the supply by plant process, vehicles and other mobile equipment, etc. Care should be taken in selection of the material of construction of air hoses as they might, during use, be exposed to toxic substances or sludge. The air supplied suit, i.e., the garment covering the body requiring increased air supply to cool the user, is also included in this class of equipment.

Self Contained Breathing Apparatus (Open Circuit): The open circuit apparatus carries its own compressed air or oxygen in cylinders. These are connected directly to the face-piece through a pressure reducing valve and demand valve. This apparatus gives a fair degree of protection against high concentration of vapour and is recommended when interference with mobility is unacceptable.

Most of these equipments are fitted with a by-pass demand valve, which enables air from the cylinder to be fed continuously to the face piece, thus maintaining positive pressure. Exhaled air is passed to the atmosphere through a non-return valve. The life of the cylinder charge depends on the amount of work performed by the user.

Normal breathing rates are:

| | | |
|---|---|---|
| Hard Work | : | 40 Liters/min |
| Moderate work | : | 20 Liters/min |
| Light Work | : | 15 Liters/min |

Self Contained Apparatus (Closed Circuit): The closed circuit apparatus uses a supply of oxygen in cylinders, however unlike the open circuit apparatus; the exhaled air is recycled through a carbon dioxide absorber and a cooler into the breathing bag. Additional oxygen to make up the amount lost in breathing is admitted to the circuit at a rate controlled by a demand valve, which opens when the pressure is reduced during respiration. The breathing bags are usually made of rubber with a canvas protective cover, although some bags have neoprene bags with PVC covers. The closed circuit apparatus must not be used where there is a risk of bag being splashed or contaminated with substances, which may

permeate through the bag and produce an increasing concentration of toxic vapour inside the suit.

Canister Respirator: A canister respirator can provide adequate protection against specified gases in open-air situations, where there is no oxygen deficiency and the concentration of toxic vapour is low. Care should be taken to ensure that correct canister is fitted and it should be remembered that the absorbing capacity of canisters is Ltd.. The toxic vapours are absorbed on a suitable material, usually activated charcoal, contained in a canister, which may be fitted directly to the face-piece or carried elsewhere on the users' body and connected to the face-piece by a tube.

Choice of Equipment

The limitation imposed by a potential leakage between the face and rubber face-piece of certain types of equipment must always be borne in mind while selecting respiratory equipment.

Most types of breathing apparatus are equipped with face piece covering the user's face from chin to brow and held in place by straps passing over the user's head. Since these face pieces are normally manufactured in standard sizes, it is very difficult to get a close fit to the face of every individual who may have to wear one. When the user breathes, there is a reduction of pressure inside the face-piece any may result in leakage of the toxic vapours present outside to inside of the face-piece. Even with expertly fitted and maintained equipment, leakage of contaminated air into the face-piece is possible.

In one study using canister respirators, such leakage was found to account for 1% of the air inhaled by 15% of the persons studied. Larger amounts were detected in few cases, even when the users were at rest. Clearly, if face-pieces are hurriedly fitted and worn while performing moderately hard work, higher rate of leakages are possible. The airline breathing apparatus maintains a positive pressure of air inside the face-piece, thus preventing leakages.

In Self Contained Breathing Apparatus (SCBAs) equipped with demand valves, the effects of leakages are noticeable, if the contaminating gas can be smelt. In an emergency, opening the by-pass valve and supplying a greater pressure of air or oxygen to the face piece may reduce leakage. However, this practice reduces the life of the cylinder charge.

The effects of leakages through the face-piece are most noticeable in canister type respirators, where the user has to make a greater breathing effort in order to draw air through the resistance of the canister.

For these reasons, the use of pressurized equipment is strongly recommended in all cases where a very high concentration of vapour may occur. Great care should be taken to ensure best possible fit of any face-piece and the duration of exposure to the adverse conditions should be as short as possible. A special warning is necessary in connection with the use of any of the approved types of breathing apparatus in the presence of halogenated hydrocarbons. Both the liquid and vapours rapidly penetrate the rubber parts.

Air Line Hoses: Air line hoses for breathing apparatus and air supplied suits should be made of material resistant to abrasion and chemicals which are likely to be encountered during its normal operation. Hoses may become immersed in toxic substances or sludge during use and contamination of airflow in the hoses must be kept below the Threshold Limiting Value (TLV) of the substance. Regular testing and inspection of air hose for contamination is essential.

Eye Protection: The personnel should be encouraged to guard against falling splinters of solids or splashes from injurious liquid for eye protection. Goggles of an approved pattern should be made available to all those who require them for safe operation and emergency management. In some cases, special safety spectacles may provide adequate protection whereas for other conditions a gas-tight goggle may be needed.

Head and Face Protection: The wearing of an approved pattern of safety helmet should be encouraged as a regular habit to guard against normal industrial hazards. Hoods designed to drape the shoulders or tuck into working clothes should be available where protection for head and shoulders is required from the hazardous substance. In certain cases, caps and face visors may provide adequate protection.

Hand and Arm Protection: Hands and arms exposed to dangerous substances should always be protected by gloves, gauntlets and armlets wherever necessary. Care should be taken to ensure that wearing such equipment does not hamper the dexterity of the operator. The material

used and texture must be adequate to provide the desired protection against penetration of dangerous substances.

Protection of Normal Operations: A properly designed plant with adequate ventilation will do much to eliminate hazards during normal operation. Nevertheless, almost certainly there will be occasions when personal protection is needed for process operations and for some kind of maintenance work. It is the responsibility of the management to ensure that personal protection is assured on these occasions and on all other occasions whenever there is a possibility of injury.

All precautions should be taken to avoid wetting of Personal Protective Equipments (PPEs) or other clothing by HFL. In such cases where accidentally it does happen, the contaminated clothing should be removed immediately before there is any possibility of it getting a contact with the source of ignition. Where the likelihood of wetting cannot be avoided, suitable impervious fire resistant clothing of a type designed for rapid removal should be used.

Protection against Flame and Heat: Persons involved in rescue and combat operations may be required to work in the presence of intense heat and flames. For this they require special clothing and equipment. Most materials used in normal garments are combustible and easily catch fire especially when exposed to high intensity radiation or flames. Flame retardant treatment may prevent or probably delay ignition. Thickly knit clothes take a longer time to burn as compared to thin and loosely knit fabrics. The clothing therefore must not only be well designed, it should also be carefully maintained and intelligently used.

Entry into Vessels and Confined Spaces: Only those persons holding a valid “Permit-to-work” certificate should be allowed to enter a vessel or a confined space so that it has been ensured that appropriate considerations have been given to the operations before work starts. Persons entering a vessel or confined space must wear a safety harness. Wherever practicable, it should have a lifeline attached to it, which should be in charge of the observer positioned outside. The observer should be physically capable of pulling an unconscious person out of the vessel.

When entering the vessel from the top, the harness and lifeline should be so adjusted and worn that in an emergency the user can be drawn head up through a manhole or opening. In addition, another man equipped with

breathing and rescue equipment should be deployed as a stand-by. Person employed for such a work should be specially selected, trained and exercised.

Issue of PPEs to Users: Wherever practicable and found appropriate, protective clothing and equipment should be issued on a personal basis. This enables a better fit with a correspondingly higher standard of protection and comfort.

Care of Protective Equipment: All protective clothing and equipment should be taken off and left in a special room during meal times and at the end of each day's work. Under no circumstances should such PPEs be allowed to be taken home by the workers.

Management should make provision for the necessary cleaning and repair. Respirators and breathing apparatus should be examined regularly by a competent person and maintained in a hygienic and fit condition. These inspections are generally necessary after each use and should, in any case, take place at least once every month. The observations made during such inspections should be properly logged.

Responsibilities of Workers: Workers should use the protective clothing and equipment issued to them and complies with all operating instructions relating to this matter. They should be encouraged to take proper care of both personal and casual issue items, under their charge and keep them in a clean, hygienic and good working condition.

Breakage or damage to PPEs, which affect their normal functioning of efficiency, should be reported immediately so that exchanges can be arranged.

Items of protective clothing and equipment should not be used for purpose other than those for which it is designed and issued. Equipment deployed for use in an emergency should only used for that purpose and should not be removed for any other reason.

## 4.6 BRIEF OUTLINE OF HUMAN EXPLOSURE TO CHLORINE, IT'S SYMPTOSMS, FIRST AID & TREATMENT

Symptoms: Being an irritant causes conjunctivitis and damage to cornea. Asyphxia. Affection of respiratory tract, may lead to Bronchitis, Bronchospasm, Pulmonary Oedema.

First Aid: Prompt treatment is essential. Remove the patient to the area where fresh air is available. Do not give anything to an unconscious patient by mouth, it may choke him.

a) If chlorine gas inhalation is mild and the patient is only coughing, the following line of treatment may be given :-

- Loosen the clothes and remove the shoes. Give Ammonia by inhalation.
- Place the patient on his back with head and back elevated. Keep the patient warm with blanket to avoid chilling.
- Rest is a must.
- Milk, buttermilk, coffee can be given for relief from throat irritation.
- Cough syrups like Hitadrine, Coughrol, Linctus, Codeine, etc., and common throat lozenges such as Vox, Vicks tablets, Halls, etc., can also be given to soothen the throat irritation.
- If gas inhalation is severe but breathing has not ceased start oxygen immediately. Phlebotomy (500 - 700 ml), Caffeine and Sodium Benzoate 0.5 - 1.0 gm/min. may also be given.
- In case breathing has ceased start artificial respiration.

b) If Gaseous or Liquid Chlorine has come in contact with eyes :-

- Flush eyes immediately with running water or normal saline water for about 15 minutes.
- Hold eyelids apart to ensure complete neutralization with water.
- Do not try to neutralize with chemicals.
- Administer 2 - 3 drops of 0.5 % solution of Pontocaine or other effective topical anesthetic in the eyes.
- Do not use oils or oily ointments in the eyes.

c) If Gaseous or Liquid Chlorine has come into contact with the skin :-

- Remove contaminated clothes.
- Flush the affected portion with copious amount of running water.

- Wash skin with copious amount of soap and water.
- Do not apply greases.

d) If liquid chlorine is by chance swallowed

Swallowing of liquid chlorine is extremely unlikely. If swallowed and the patient is conscious:-

- Ask the patient to drink copious quantity of limewater, ammonia water (1 ml in 60 ml of water), milk of magnesia or fresh water.
- No attempt should be made to induce vomiting.
- Keep the patient under observation and call for immediate medical help.

Treatment

a) Pulmonary Oedema

- Administer 60 to 100 % oxygen at 6 Lit/min.
- Intermittent positive pressure breathing apparatus set to deliver positive pressures of 5 – 15 cm of water in the inspiratory cycle, is valuable in reducing the formation of edema
- Symptomatic treatment. Lasyx is suggestive.
- Administer Aminophylene intravenously.

b) Bronchospasm

- There is no known antidote for acute chlorine exposures. The exposure is associated with acute symptomatology requiring supportive therapy only.
- Early treatment is the most effective.
- Broncho dialators nebulized into the intermittent positive pressure gas stream are often beneficial.

## 4.7 BURNS AND THEIR TREATMENT

Cause of Burns

Under the category of burns, several environmental injuries are included. They are thermal burns, burns from electrical current, chemical burns, burns resulting from radiant energy and systemic reactions to heat.

Severity of Thermal Burns

The seriousness of the thermal burns depends upon the degree of the burn (depth of the skin injured) and the amount of body surface involved.

Degree of Burns:- Burns can be classified in degrees from one through six. A first-degree burn is Ltd. to the most superficial layer of the epidermis and results only in erythema (reddening) of the skin. A second-degree burn causes damage into but not through the dermis and characteristically results in the appearance of vesicles (blisters) in the skin. A third degree burn is one in which the full thickness of the skin is destroyed down to the subcutaneous fat. In this burn the skin may appear pale, dry and white; it may even be brown or charred. Clotted blood vessels may be seen through the skin as though one were looking at them through parchment. A fourth degree burn involves destruction of the skin and the subcutaneous fat. A fifth degree burn involves destruction of the skin, the fat and the underlying muscle. A sixth degree burn involves destruction through all the structures, including the supporting bone.

With burns more serious than second degree, there is destruction of the sensory nerve endings of the skin. The burned area is consequently insensitive. However, the area surrounding the burn will not have all ever endings destroyed and may frequently be extremely painful.

Body Surface Involved :- The amount of body surface that is burned is very important in determining the seriousness of the injury. A very rough but reasonably accurate estimate of the amount of body surface burned is determined by the rule of nine. This rule, which applies specifically in adults and older children, divides the body into sections, each of which constitutes approximately 9 % of the total area. The body sections and the respective percentage assigned to them are:

| | |
|---|---|
| Head, Face, i.e. area involving neck and above | 9 % |
| Each arm | 9 % |
| Front torso | 18 % |
| Each leg | 18 % |
| Back | 18 % |
| Genitals | 1 % |

By knowing the degree of burn, the approximate percentage of the body that has been burn, accompanying complications, and the age of the

patient, one can classify the severity of thermal burns as critical, moderate, or minor. Such classification is essential in a disaster where many injured patients are involved and where the triage separates the patients into emergency cases and cases for whom treatment may be delayed. A summary of the three classes follows.

Critical (Severe) Burns :- This category includes :-

- All burn of whatever degree and extent if they are complicated by respiratory tract injury and other major injuries or fractures
- Third degree burns involving critical areas such as face hands or feet
- Third degree burns which involve more than 10% of the body surface
- Second degree burns which involve more than 30% of the body surface

Moderate Burns :- This category includes :-

- Third degree burns of 2 to 10 percent of the body surface which do not involve the face, hands or feet
- Second degree burns which involve 15 to 30 percent of the body surface
- First degree burns involving 50 to 75 percent of the body surface

Minor Burns :- This category includes :-

- Third degree burns of less than 2 percent of the body surface if no critical areas are involved
- Second degree burns involving less than 15 percent of the body surface
- First degree burns of less than 20 percent of the body surface

In evaluating a patient who has sustained a burn, age and general condition must also be considered. A moderate burn in an aged patient who is chronically ill should be classified as critical in terms of the immediate treatment required because of the patient's general condition apart from the burns.

The Care of Thermal Burns

The care of thermal burns depends on the percentage of burned body surface involved. In no instance should grease (butter, lard, Vaseline, mineral oil or other ointments) be applied to a burn. For the first or second-degree burns, the emergency medical treatment should be to :-

- Remove any burning/smoldering clothing as necessary
- Immerse the burned part in ice water for five to ten minutes and periodically continue to add ice to keep the temperature low. If area cannot be immersed, cover with clean, porous cloth of nay kind and keep continuously wet with ice water (or the coldest water available)
- Use cool wet applications for relief of pain.
- Transport the patient to the emergency department, continuing cool applications en-route.

For extensive first or second degree burns and for all third degree burns the procedure set forth below should be followed :-

- Examine for and relieve any respiratory distress. Always anticipate respiratory difficulty when there are burns around the face and neck or when the patient has been exposed to hot gases or smoke.
- Clothing that adheres to the skin should be cut around and left in place.
- Cover the burned area with a sterile dressing or a clean sheet. Use cool wet applications for pain relief.
- Treat the patient for shock if it is apparent.
- Transport the patient to the emergency department, continuing cool applications en-route.

Severe pain, which may accompany first or second degree burns or may exist at the edges of third degree burns, is best relieved by injected analgesic medication. These drugs must be given by a qualified person or on doctor’s order.

Local treatment with cool compress remains the best emergency treatment for burn pain. Third degree burns, which destroy nerve endings, are often not painful enough to require such treatment before the patient reaches the hospital. In burns of this degree and increasing severity, initial efforts are best directed at general support and resuscitation of the patient.

# ANNEXURE - 5

## COMMUNITY INFORMATION AND EVACUATION ASPECTS

### 5.1 DEMOGRAPHIC PROFILE

Data for Urban Areas

| Sr No | Name | Residential Houses | Total Population |
|---|---|---|---|
| 1 | Modasa | 45,143 | 67,648 |
| 2 | Bhiloda | 8,544 | 16,074 |

Data for Rural Areas

| Sr No | Name of Taluka/Village | Area | Total Population |
|---|---|---|---|
| A | | | |
| | | | |
| 1 | Khodamba | up to 5 km | 924 |
| 2 | Kherancha | up to 5 km | 971 |
| 3 | Kushki | up to 5 km | 2,444 |
| 4 | Tintoi | Up to 10 km | 8,564 |
| 5 | Himatpur | Up to 10 km | 930 |

### 5.2 OVERVIEW OF SHELTER-IN-PLACE CONCEPTS

INTRODUCTION

There are essentially two ways to protect the public from the effects of toxic gas or vapour discharges into the atmosphere. One of these methods is evacuation and involves relocation of threatened populations to shelters in safer areas. The other involves giving instructions to people to remain inside their homes or places of business until the danger passes. In other words, it involves telling people to “shelter-in-place.”

Evacuation is clearly safer with respect to the specific hazards posed by a toxic gas or vapor release but has certain limitations and may pose new problems. For example, it is fairly well appreciated that a major evacuation takes time and may not be feasible once large amounts of toxic gases or vapours have actually entered the atmosphere. Indeed,

asking people in the path of a toxic cloud or plume to leave their homes may actually cause greater harm than good in some cases. Thus, large-scale evacuations in response to toxic gas or vapour hazards are best considered when:

There is a strong potential for a toxic discharge, the discharge has not yet taken place, and there appears to be time available to relocate people.

The discharge has taken place but people are sufficiently far downwind to permit time for evacuation.

People not yet in the direct path of a cloud or plume are threatened by a future shift in the wind direction.

The safety hazards of evacuation are outweighed by benefits of the action, and/or

Telling people to shelter-in-place might not fully protect them from serious consequences.

Much has been written and said over the years pertaining to the merits and demerits of evacuation, but little information has been made available on sheltering-in-place and indeed, far too manypeople and organizations have come to believe that sheltering-in-place will provide adequate protection to the public under a wide variety of circumstances without actually studying the issue involved. It is therefore the purpose of this Annexure to explain why staying indoors provide some degree of protection, to discuss the degree of protection that might be expected, and to discuss how best to instruct the public to shelter-in-place.

Outsider Air Entry into Buildings

If a building or other structure is airtight, i.e., like a sealed box, people inside will be completely immune from exposure to any toxic gases or vapors outside its walls. On the other hand, if walls of the upwind and downwind side of the building are missing, these people will be exposed to the same level of concentration “indoors” as they would be if they were in the open. It is easy to understand, therefore, that the exposure of people inside a structure to toxic gases or vapors in the external environment is a function of the “air tightness” of the building and the rate at which outdoor air passes in and out.

There are essentially three main ways in which air can enter (and exit) a structure, these being :-

- Natural ventilation
- Mechanical ventilation, and
- Infiltration

Natural ventilation refers to entry of outdoor air into a building through open windows or doors without assistance from fans. Obviously, the more openings in a building, the greater the rate at which outdoor air can pass through. Occupants can generally control this rate by opening and closing various doors and windows.

Mechanical ventilation refers to the use of fans and other equipment to bring air into a building, possibly heat, cool, filter, and/or re-circulate it several times, and then exhaust it from the structure. This type of system is most often seen in office buildings, other commercial establishments and factories. As above, occupants usually have considerable control over the rate of ventilation.

Infiltration is air leakage into a building through cracks and small openings around windows and doors and through floors and walls. The rate at which air enters a building by this mechanism depends on the type of building, workmanship and material applied during construction, and the condition of the building. Infiltration differs from natural and mechanical ventilation in the sense that the occupants are generally considered to have little effective control over its rate. The total rate at which the outdoor air enters a building, for the purpose of this discussion, can be considered as being the sum of the three types of the ventilation described above.

Rates of outdoor air ventilation are typically expressed in units of air changes per hour (ACPH), this being the number of building volumes of outdoor air that enter the building in the course of an hour. For example, if a building has an internal volume of 10,000 cubic feet, and 20,000 cubic feet of outdoor air enters the building each hour, its total fresh air ventilation rate is said to be 2.0 ACPH. If only 5,000 cubic feet of air enters the building in the same span of time, the rate becomes 0.5 ACPH.

The natural ventilation rate in structures with open windows and doors can vary widely and depends on the area of opening, the wind speed, the orientation of openings with respect to the wind direction, and the building volume. It could be as little as a fraction of 1.0 ACPH or as high as 80 - 90

ACPH, and possibly even more if residents do not mind a strong breeze blowing through the structure on a windy day.

Mechanical ventilation rate in office buildings and the like typically range from 4 to 12 ACPH with certain exceptions. During pleasant weather, 90 to 100 percent of this air might be from the outdoors. In very cold or very hot weathers, building operators often have the option to reduce heating or cooling costs by lowering the fresh air entry rate to 5 - 35 percent of the mechanical ventilation rate by recirculating large volumes of air.

There are great many factors that influence infiltration rates in homes and other buildings. When outdoor wind velocities are very low and indoor-outdoor temperature difference is minimal, infiltration rate may be as low as 0.1 ACPH. The average rate in American homes, however, is on the order of 0.8 - 0.9 ACPH, and “leaky” homes may experience 2.5 or so, especially under poor weather conditions with high winds and low temperatures. Available data on other type of building construction are Ltd. but suggest an average infiltration rate of about 1.0 ACPH for office type buildings.

Effect of Total Outdoor Air Ventilation Rate on Indoor Exposures

The overall subject of how outdoor air pollutants can affect exposures indoors is rather complex and is best discussed using two examples; one for the case when a distinct cloud of airborne contaminants passes a building, and another for the case when the building is engulfed by a plume of vapour or gas for a prolonged period of time. The cloud is assumed to pass in a total time period of 30 minutes, while the plume is assumed to last 10 hours. Both the cloud and the plume are assumed to have an average contaminant concentration of 100 ppm for the duration of their existence at any outdoor location.

Table - 1, developed from a mass balance model of indoor-outdoor pollutant relationships, presents average indoor contaminant

concentrations expected for the cloud scenario when outdoor ventilation rate ranges from 0.1 to 50 ACPH. Important observations are that:

Indoor concentrations increase steadily until the point in time that the discharge ceases and the last of the airborne contamination passes a building.

Tight buildings or average buildings in highly favorable weather, with air change rates of 0.1 ACPH are expected to experience a peak indoor contaminant concentration only 5% of the outdoor average after 30 minutes. Due to the lack of ventilation, however, indoors levels will drop slowly after the cloud has passed.

“Average” homes and buildings, with air change rates of 0.5 to 1.0 ACPH, may experience indoor concentrations on the order of 20 - 40% of outdoor levels after 30 minutes.

“Leaky” buildings or average buildings exposed to severe weather conditions, with air change rates of 1.5 - 2.5 ACPH, may experience 45 to 65 % of outdoor concentration in 30 minutes.

Buildings that have open windows or doors or mechanical ventilation system bringing in outdoor air at high rates will experience contaminant concentrations close to those experienced outdoors.

Peak indoor levels will be lower if the cloud passes in less than 30 minutes and higher if the cloud requires more than 30 minutes to pass.

# Table - 1

## Indoor Concentrations for Hypothetical Cloud Passage

| Time (Minutes) | Internal Concentrations (ppm) at various Air Change Rates (ACPH) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0.1 ACPH | 0.5 ACPH | 1.0 ACPH | 1.5 ACPH | 2.0 ACPH | 2.5 ACPH | 5.0 ACPH | 10.0 ACPH | 50.0 ACPH |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | 0.8 | 4.1 | 8.0 | 11.8 | 15.4 | 18.8 | 34.1 | 56.5 | 98.4 |
| 10 | 1.7 | 8.0 | 15.4 | 22.2 | 28.3 | 34.1 | 56.5 | 81.1 | 100 |
| 15 | 2.5 | 11.8 | 22.1 | 31.3 | 39.3 | 46.5 | 71.3 | 91.8 | 100 |
| 20 | 3.3 | 15.4 | 28.3 | 39.3 | 48.7 | 56.5 | 81.1 | 96.4 | 100 |
| 25 | 4.1 | 18.8 | 34.1 | 46.5 | 56.5 | 64.7 | 87.5 | 98.4 | 100 |
| 30 | 4.9 | 22.1 | 39.3 | 52.8 | 63.2 | 71.3 | 91.8 | 99.3 | 100 |
| 40 | 4.8 | 20.3 | 33.3 | 41.1 | 45.3 | 47.0 | 39.9 | 18.8 | 0 |
| 50 | 4.7 | 18.7 | 28.2 | 32.0 | 32.4 | 31.0 | 17.3 | 3.5 | 0 |
| 60 | 4.6 | 17.2 | 23.8 | 24.9 | 23.3 | 20.4 | 7.5 | 0.7 | 0 |
| 90 | 4.4 | 13.4 | 14.5 | 11.8 | 8.6 | 5.9 | 0.6 | 0 | 0 |

**Note :-** The cloud is assumed to have an average concentration of 100 ppm outdoors. Its leading edge reaches the building at time equal to zero. Its trailing edge passes the building at time equals 30 minutes, at which point internal contaminant concentrations begin to drop.

## 5.3 CRITERIA FOR SELECTION OF REHABILITATION CENTERS FOR EVACUEES

Following table provides details of the item and criteria for ranking of potential rehabilitation centers:-

| Sr. No | Item | Criteria |
|---|---|---|
| 1 | Location | Cross wind, Distance from potential emergency site |
| 2 | Capacity | 500,1000, 1500 persons, No. of rooms, size of each room |
| 3 | Food | Proximity to market or areas from where food and refreshments can be made available |
| 4 | Potable Water | Availability of potable water in $m^{3,}$ |
| 5 | Sanitation | Number of toilets and wash rooms for every 100 persons |
| 6 | Security | Boundary, fence, security guards, or possibility of deployment of police personnel |
| 7 | Facilities for physically handicapped | Beds, wheel chairs - proximity to areas from where it can be made available at short notice. |
| 8 | First aid/Medical help | Proximity to hospitals/ nursing homes, chemist shops and provision of doctor at the center. |
| 9 | Structural Stability | Special consideration should be given in case of explosion hazard potential in the nearby industry. |

Potential centers can be gauged based on the above criteria and ranked to get the best suited for particular emergency scenario.

# P A R T – II

# OFF SITE EMERGENCY ACTION PLAN

# FOR

# ARVALLI DISTRICT

# PART – II (Action Plan)

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| | 3.10 | Rescue Co-ordinator | |
| | 3.11 | Evacuation and Rehabilitation Co-ordinator | |
| | 3.12 | Transport Co-ordinator | |
| | 3.13 | Utilities Co-ordinator | |
| | 3.14 | Material Co-ordinator | |
| | 3.15 | Public Works Co-ordinator | |

# P A R T – II

# M A R S

# (Major Accident Response System) for Arvalli District

**Response Phase**

| Police | Phone (Office) | Phone (Residence) |
|---|---|---|
| District Superintendent of Police | (02774) 248666 248415 | 9978405978 |
| Police Inspector | (02774) 246660 | - |

| Fire | Phone (Office) | Phone (Residence) |
|---|---|---|
| Fire Superintendent | (02774-246572) 101 | - |

| Medical | Phone (Office) | Phone (Residence) |
|---|---|---|
| Chief District Health Officer | (02774) 248911 | 7575800951 7575800941 |
| Civil Surgeon | (02772) 240320 / 241892 | - |

# CHAPTER 1

# ACTION PLAN FOR OFF SITE EMERGENCY

## 1.1 BACKGROUND

The intensity of hazard can be gauged from the developments at the site. It is at the incident site where the hazard is first noticed and the countermeasures applied to contain the incident to within the plant boundary. If the hazard is uncontrollable within the works, it may pose threat to off site populations. However in case of explosion, both on-site and off-site consequences may occur simultaneously. Further any transport accident involving hazardous chemicals will immediately become offsite emergency. Although the primary functions of respective coordinators may be similar in each type of response, the first response, application of counter measures and the extent may vary for different incidents. In view of this, the “Major Accident Response System” (MARS) has been specifically tailored to meet the response needs of Arvalli District.

## 1.2 SCOPE AND COVERAGE

The scope of the present Major Accident Response System (MARS) for ArvalliDistrict is limited to Major Accident Hazard (MAH) units, chemicals exceeding the threshold quantities as specified under the MSIHC Rules and to transportation accidents involving hazardous chemicals. It does not cover accidents involving hazardous chemicals where the damage distances are small and may not pose significant off-site hazard. It also does not cover pipeline hazard as the present plan is a logical extension of the “Rapid Safety Audit and Hazard Analysis of MAH units” exercise, sponsored by Ministry of Environment of Forest (MoEF), and the pipelines were not in its scope of coverage.

## 1.3 LAYOUT OF THE PLAN

The plan has been divided into six chapters. Chapter 1 provides basic information on the need for the plan, its scope, coverage and Major Accident Hazard (MAH) units covered. Chapter 2 is action plan for managing off-site emergencies involving fire / explosion scenarios. Chapter 3 covers the action plan for management of chemical emergencies involving toxic dispersion due to large spills such that the maximum downwind damage distance is over 3 Km. Chapter 4 provides action plan for managing chemical accident scenarios where the maximum downwind hazard distance is up to3 Km. Chapter 5 deals with management of accident scenarios involving transportation of hazardous chemicals and Chapter 6 deals with the post emergency activities required to be performed by the respective team members to restore normalcy.

## 1.4 LEVEL OF RESPONSE

Communities that frequently experience hazardous material emergencies of a minor nature but are rarely faced with more significant events may wish to consider a staged response. For example, depending on the severity of the situation as described by the initial caller, various levels of response might be established, thus avoiding the immediate need to call out forces in strength for all incidents. Personnel arriving at the scene could, of course, request additional assistance and thereby raise the level or stage of response, much as additional alarms might be sounded during major fires or the threat thereof.

One strategy to be considered for establishing levels of response classifies responses into three levels, as follows:

- **Level 1**

  An incident that can be controlled by the first response agencies and does not require evacuation of other than the involved section of the plant or the immediate surrounding area. The incident is confined to a small area and does not pose an immediate threat to life or property.

- **Level 2**

  An incident involving a greater hazard or larger area which pose a potential threat to life or property and which may require a limited evacuation of the surrounding population and all plant personnel.

- **Level 3**

  An incident involving a severe hazard or a large area which poses an extreme threat to life and property and will probably require a large scale evacuation; or an incident requiring the expertise or resources of Local, District, State, Central or Private Agencies / Organizations.

  Based on assessment of the incident by District Crisis Group (DCG), the level of response required for the particular accident situation can thus be determined. Following chapters discuss the “Action Plan” for rendering response to chemical accidents at Major Accident Hazard (MAH) units in District Arvalli.

# CHAPTER 2

## ACTION PLAN FOR OFF SITE EMERGENCY – FIRE / EXPLOSION

This section deals with accident scenarios at Major Accident Hazard (MAH) units in ArvalliDistrict, involving hazardous chemicals leading to fire / explosion. Simulations of identified major accident scenarios were conducted and the results of only those scenarios where there is significant off-site damage potential are listed at Table 2.1for MAH units at Himmatnagar Taluka,Table 2.2for MAH units at Prantij taluka, Table 2.3for MAH units at Talod taluka. These tables also provide information on areas and population likely to be affected under each case. The qualifying criteria for inclusion in the off-site planning are given in the methodology at Chapter 1.

As can be observed from the information available in Table 2.1, the major hazardous substance leading to fire / explosion is Liquefied Petroleum Gas (LPG). Fires involving Ethylene Oxide and solvents will be localized and will not have any significant off-site effects.As can be observed that the maximum hazard distance will be due to Boiling Liquefied Expanding Vapor Explosion (BLEVE) involving 60 MT LPG at Regent Granito Limited at: Hajipur near Himmatnagar.

Although the probability of catastrophic failure is very remote, leakage from the storage containers finding a source of ignition could turn it into a disaster. The impact of these scenarios is such that almost entire population of both Regent Granito Limited and Navbharat L.P.G. Bottling Company will be affected. Communication system will be damaged and the response will be to focus on the prevention and spread of fire resulting in secondary explosions.

## Table 2.1

Off-site Areas and Population Likely to be affected by Accidents at HimmatnagarTaluka

| Name & address of the Unit | Chemical | Largest Storage Quantity (MT) | Damage Distance (m) | | | | | | | Areas Likely to be Affected |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Pool Fire | | BLEVE | | UVCE | | | |
| | | | FZR | IZR | FZR | IZR | FZR | IZR | D-LFL | |
| NEON FUEL LTD.<br>AT. KHODAMBA<br>TAL. BHILODA<br>ARAVALLI | LPG | 30 | ---- | ---- | 204.0 | 403.2 | 61.8 | 197.8 | 400.8 | Khodamba |

## 2.2 CHAIN OF EVENTS

Boiling Liquefied Expanding Vapour Explosion (BLEVE) / Unconfined Vapor Cloud Explosion (UVCE) at the above installations may lead to cascading effect and may also result in secondary explosions due to failure of adjoining storage containers of flammable substances. Intense heat generated during BLEVE and peak over pressures due to explosions has the potential to damage surrounding structures. Such heat and overpressure may also result in secondary fires due to the intense heat and short circuits as a result of explosions. The chain of events for effectively managing such an eventuality is presented below.

## 2.3 NOTIFICATION TO OFF-SITE AUTHORITIES

### 2.3.1 Action: Communication Coordinator of the Unit or adjoining units

In scenarios involving large fires / explosions, the communication system of the affected installation may get severely damaged and be rendered useless. If the system still exists, the communications coordinator of the affected installation will notify the off-site authorities. In all other cases, the chief of neighboring installations or any other responsible person may inform the off-site authorities.

The communication coordinator shall call (02772–240600, 241400, Telephone Numbers of District Crisis Control Room (DCCR) - Arvalli) for notifying the chemical accident emergency. In communicating the accident scenario he will:-

- Identify oneself by name and designation
- Give the location of the incident (Plant, Section, Equipment)
- Inform about the chemical involved
- State briefly the type of emergency i.e. whether fire, explosion, toxic release (specify the direction of gas cloud movement in case of toxic gas release)
- State the severity of the incident as given by the WMC
- Standby to render all possible assistance

There is a possibility that any other person may also see/hear the fire / explosion and calls the police station before they receive call from the affected unit or the District Emergency Control Center (DECC). It may not be possible for an ordinary citizen to provide entire information as perthe given format. In such a case it will be the responsibility of the information-receiving officer to call up the affected MAH unit or the nearby unit (if the communication system of the affected installation is severely damaged) and gather the desired information. It is suggested that a pad of blank formats are kept at Police Control Room (PCR) so that officer in-charge can promptly ask questions and record information.

### 2.3.2 Notification to Response Organizations

**Action : Departmental Officer Manning the District Collector Control Room (DCCR) / Police Control Room (PCR)**

The person receiving the information shall immediately inform the three first responders i.e. Police, Fire and Medical department by calling their chiefs / alternates (in case chief is not reachable). The contact information is given below for ready reference. Next he will inform District Collector, Chairman of District Crisis Group (DCG) and all other members of DCG. He will pass the complete information of the incident to all the members. If he receives, further information after making the first call, he will convey that also in the same order. Alternatively, if the information is more relevant to any particular department, he will first pass that information to its head. The directory of Key Contacts, i.e., members of DCG, LCG, industries in the district and expert agencies at District / State and National Level, is given at **Annexure 2.**

## 2.4 ESTABLISHING LOCAL COMMAND POST (LCP)

No LCG is formed in the district as there are only 1 MAH Factory in the district which is located at Village-Khodamba, Ta-Bhiloda pocket and hence it can be taken care by DCG only. Hence no need is felt to from LCG in the district.

## 2.5 IMMEDIATE RESPONSE BY FIRST RESPONDERS

On receipt of information about offsite emergency, first responders will immediately deploy first batch of response teams from a location nearest to the incident site i.e. they mobilize their counterparts in Local Crisis Group (LCG). They will further reinforce their teams by deploying additional resources from surrounding areas so that effective (based on their assessment of first information received) first response can be rendered at site. In the mean time they will keep additional resources in terms of manpower and equipment on high alert to move to incident site. On getting feedback from their response teams (who would have by then assessed the situation) they will take decision on movement of more teams. Once the assessed deployment is made, Chiefs shall also move to site for better

operational control. It may be possible in some of the cases that resources may have to be mobilized from neighboring districts or even other states. In such a case, chiefs will organize this through their respective Headquarters / District Collector.

**Major duties of the three first responders during emergency are discussed below:-**

### 2.5.1 Police Department

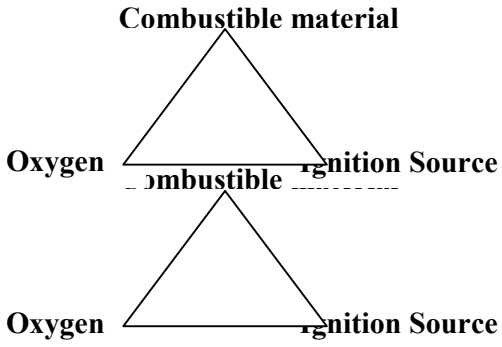
The teams will coordinate the following activities:-

- Control of traffic near the affected areas so that emergency vehicles reach the incident site at the earliest
- Ensuring law and order at the incident site during emergency

As explosion scenarios seldom give time for a structured response, areas that may get affected due to possibility of secondary explosions only need to be evacuated. In such a case, the police personnel will also provide security at the assembly points and evacuated areas.

### 2.5.2 Fire Department

For a fire to happen, three components are required as depicted below :-




Cutting off the supply of any one of the above three components can help in getting the fire under control. Therefore the major activities that the fire team will undertake will be directed towards cutting off the supply of one of more of these components.

**a) On-scene Assessment**

**The first fire vehicle to reach the site will immediately contact the site controller and collect the necessary information regarding the material involved, the actions taken and the current status. The driver will park the vehicle in a manner to prevent exposure to radiant heat.**

**b) Removing the Source of Ignition**

Water is by far the most reliable source for extinguishing fires. However, it may not be applicable on substances, which are lighter than water, insoluble in water or incompatible with water.

The Leading Fire Men (LFM) will assess the use of water for fire fighting. If it is found to be adequate for handling the incident fire, he will formulate the fire fighting strategy keeping in mind the manpower and resources available, access to the incident location, availability of hydrant points/monitors and wind direction. Each crewmember will wear necessary fire suits before entering the "Hot Zone". The crewmembers should work in pairs, taking care of each other.

Fire fighting should be attempted only when it is safe to do so. When water is not the right answer and alternate fire fighting material is not readily available at the incident site it may be wise to let the fire burn while preventing the adjoining vessels from overheating by cooling them. This is true primarily in cases where the possibility of explosions is minimal. In cases where the possibility of explosion is high, all efforts should be directed towards preventing the explosion from occurring and evacuating the area.

Primary function of fire team subsequent to explosions is to prevent secondary fires. During such incidents care should be taken so that the team members are not exposed to risks of secondary or delayed explosions.

During the entire operations, the Leading Fire Men (LFM) would keep the fire service coordinator informed of the development so as to enable him to plan and deploy additional resources at the incident location.

## c) Removing or limiting the amount of Combustibles

If the incident involves only major leaks / spills and there is no fire / explosion, the fire personnel will focus on plugging / stopping of the leak. Small leaks left unattended for extended periods of time can cause large losses of chemicals to the environment and have much more severe effects than would occur if the leak were somehow completely or partially plugged on a prompt basis. There are great benefits, therefore, in having access to one or more individuals with the basic tools and knowledge needed to limit losses from punctured or leaking tanks or pipelines.

The most widely available means for plugging holes or leaks in equipment involves use of conical, cylindrical, square or wedge shaped pieces of wood, rubber or metal sheets, inflatable pipe plugs, special patching compounds, clamps of various types, and a number of other items.

The plugs alone, if available in a variety of sizes, can be jammed into holes and greatly reduce the open area, from which the contents of the tank or pipeline can escape; assuming, of course, that it is safe for individuals to approach the leak area. Many incidents are brought to a rapid end simply by having the proper common tools available to close a valve or tighten some bolts. It is the responsibility of fire personnel to plug/stop leaks based on guidance obtained from technical coordinators.

## d) Suppression of Flammable Vapor

As fire is a surface phenomenon, it is advisable to restrict the spread of pool. Based on the guidance from technical coordinators, the response team shall take rapid measures to reduce the rate or amount of flammable/explosive vapors or gases entering the atmosphere using one or combination of the following measures :-

- Physical restriction of liquid pool surface areas.
- Transfer to an alternate or standby container if it is safe to do so.
- Dilution or coverage of liquid pools with water (or other compatible liquids).
- Cooling of spilled liquids or venting tanks.

**e) Removal of Oxygen**

This can be achieved by the following:-

- Use of fire-fighting or specialized hazardous material foams to cover the spill.
- Use of water sprays or fogs.

**f) Provide Rescue Services**

As fire department personnel are adequately trained to rescue trapped people from collapsed structures, two members of the fire response team will help the industry personnel in rescuing the people, till the time rescue team arrives.

### 2.5.3 Medical Services

On receipt of information from the District Emergency Control Center (DECC), the district medical coordinator shall dispatch his medical teams to the incident site. Following are the major activities of emergency medical teams reaching the emergency site.

**a) Establishment of Triage Stations**

Mass casualty situations will require establishment of field hospitals to take care for the injured and to identify, stabilize, and transport more serious cases to hospitals. Medical team will establish triage stations near the affected installation and will be required to evaluate and color code the victims. The following code is proposed

- **Red**for critical, such victims should to be sent to the hospital in the first available ambulance. Medical Officer manning the triage station will maintain a checklist for the number of victims sent to a particular hospital so as to know when the capacity is reached and further victims may be refused admission.
- **Yellow** for stable, such victims need to be sent to the hospital when there is room available in an ambulance after all the critical victims have been sent.
- **Green**for walking wounded, to be provided with first aid and treatment for shock and trauma.

Medical coordinator shall, from the list of the proposed rehabilitation centers, identify such areas to which the public can be directed in the aftermath of an accident where this action is warranted. Outside and local medical care personnel shall be informed by the district medical coordinator of their responsibilities in staffing and equipping such facilities quickly. Such field hospitals shall maintain a record of all the patients (as far as possible) so as to enable accounting of personnel and their destinations after triage. The on-scene medical command post shall be under the direction of the local medical coordinator. Local Medical coordinator shall also be responsible for formulating a mass casualty plan for the local hospitals as discussed in pre emergency activities.

**b) Medical Support for Response Personnel**

Where deemed necessary, properly equipped medical personnel and one or more ambulances shall be made available to check and (if necessary) treat injured response personnel as necessary. These personnel shall check the vital signs and general health of all personnel who will don specialized protective gear and enter "Hot" and "Warm" Zones, particularly where fully encapsulating protective suits are being used. The health of potentially exposed response workers shall be rechecked upon completion of their duties.

**c) Medical Support at Temporary Shelters**

Once the evacuees are at the shelter, it is the responsibility of local Medical coordinator to ensure their well-being. For this, the medical coordinator will assign team(s) to take care of people who become ill during evacuation or later. The doctors assigned this work should be aware of the signs and symptoms of exposure to flammable/explosive material and smoke so that they can easily identify victims and provide them with necessary treatment & care. Facilities should also be available for care of the handicapped and elderly.

## 2.6 RESPONSE BY OTHER RESPONSE AGENCIES

### 2.6.1 District Collector

On receipt of information of the accident the District Collector (DC) will rush to the District Emergency Control Centre (DECC), where he will be joined by Assistant Director, Industrial Safety & Health, Gandhinagar and two technical experts. Other technical experts (nearest to the incident location) will directly rush to the Local Command Post (LCP) and remain in touch with the DECC for regularly updating the information. Also they will provide technical support to combat teams at the incident site. The DC will address the following issues along with other members present at DECC:-

- Obtain update of the incident situation from Local Command Post (LCP) and establish a link for continuous communication (such as dedicated telephone line with speaker phones, set of warlike talkies, computer link, etc.) with the help of communication coordinator.
- Identify the hazardous and threatened areas based on map and templates available and information received from LCP.
- Supervise the overall management of each function through respective member of the District Crisis Group (DCG) and expediting response wherever required
- Take a decision on requirement and priorities of evacuation and organize the resources to execute the same. They will contact transport and evacuation coordinators (already on high alert) and issue instructions.
- Based on the inputs from the first responders and experts available at LCP, identify the additional resource requirement and initiate mobilization.
- After making the required arrangements, District Collector will take decision whether he is required to go to the incident site and who all shall accompany him. In such a situation, his deputy will take charge of the DECC.

**Duties and responsibilities of other members of DCG are discussed below:-**

### 2.6.2 Member Secretary of District Crisis Group (DCG) – Deputy Director Industrial Safety & Health, Gandhinagar.

- Assisting different members of the DCG in planning the performance of their duties
- Providing overall coordination within the DCG and with the Member Secretary of the Local Crisis Group (LCG).
- Arranging for complete documentation of proceedings at the incident site
- Maintaining detailed records of what happened and what actions were taken. This would help in:
- Recovering response costs and damages from the party responsible for the incident, if applicable.
- 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.

In addition to written documentation of an incident, it is good practice to draw diagrams or sketches of containers, vehicles, structures, streets, containment techniques employed locations of deployment, etc. Photographs and videotapes, if available, should be kept on file for reference purposes.

The Member Secretary of the DCG shall, through Personnel and Administration Manager of the affected unit, arrange to maintain a record of all the developments during an emergency. Wherever it is possible to do so, videotaping of the entire combat and rescue operations may also be arranged. Providing facility for recording all the communication had on the telephones can also be of help for future use. It is suggested that a telephone roster be maintained at the District Emergency Control Center (DECC) for future reference and analysis of emergency management operations.

### 2.6.3 Communication Coordinator

Depending on the severity of the incident, the communication coordinator may or may not be required to go to the incident site. However, under all circumstances, the major issues that he has to address are:

**a) Emergency Communication System**

With respect to overall use of telephones, special precautions must be taken where an explosion or fire at some critical location may destroy vital communication links or services. Therefore, the primary communication channel for an emergency at Himmatnagarshall comprise of communication through the walkie-talkie available with the District Administration, Police and Fire Services. Additionally, use will also be made of the mobile phones, landline telephones and alternate facilities available with the industries. The details of communication and warning system available with the respective MAH units are given at **Annexure 3.9.**

**b) Notification to General Population for Evacuation or Shelter - in-Place**

Time is critical during an emergency situation and it has been experienced that prompt notification has been a key factor in saving several lives. On getting instructions from the District Collector, communication coordinator will dispatch teams for notifying general public. As can be seen from **Table 2.1 to Table2.4** fire incidents may not require evacuation of general population from nearby areas. Further, explosions will not give enough time to notify and evacuate the general population. Therefore, notification of evacuation in such incidents is only applicable where the explosive chemical is leaking and the container may explode (major areas of concern under this scenario are explosion accidents at Himmatnagar, Prantij, Idar, Talod,)In all such cases, it will be the responsibility of the communication coordinator of the affected installation to notify all employees (except essential staff required for combat and emergency management) to immediately leave the plant. It is expected that the emergency shut-down procedure is followed at the plant level. The District communication coordinator will direct his local counterpart to organize notification to general population. For this, use can be made of industry/police or fire department vehicles with Public Address (PA) system, through which, standard message formats prepared in the planning phase can be announced. It is important to note

that all the warning and notification teams should be given the same set of instructions. Dissimilarity in warning signals/notification and instruction can lead to devastating confusion not only among the receptors but also the team members.

**c) Notification to Next of Kin of Death of Relative(s)**

It is important to note that next of kin are promptly notified of fatalities or severe injuries carefully and in a sensitive and supportive fashion. This activity should be discussed with the Red Cross and coordinated with members of voluntary organizations, NGOs. The notification must be first made to the relatives and then to press media to avoid administrative embarrassment.

### 2.6.4 Technical Coordinator

Four experts in industrial safety and health have been nominated as Technical coordinators. The major issues that they have to address are:

**a) Formulation of Response Objectives and Strategy**

The technical coordinator shall assess the incident before taking action and formulate realistic response objectives. The assessment shall be based on the following points for which they shall call their two colleagues, who are available at the incident site, to obtain first hand information:-

- Pre-incident plans and/or standard operating procedures
- Information that has been obtained regarding:
  - Material(s) involved
  - Container(s) involved
  - Vehicle(s) and/or structures involved
  - Atmospheric conditions affecting the incident
  - Environmental monitoring and sampling data, if available
  - Public protective actions that have or have not been initiated
  - Resource requirements (i.e., trained personnel, specialized protective gear, other equipment, etc.)
  - Hazards and risks posed to humans, animals, property, and the environment.

Upon completion of the incident assessment, they will be in a better position to determine whether their response strategy should be defensive

or offensive in nature. In all cases, of course, actions should be initiated to protect the public and environment outside the immediate spill or discharge area and/or to contain the hazard from a safe distance.

**b) Identification of Hazard Zone**

Technical coordinators, trained in these aspects shall be responsible for estimating the hazard zones and feeding the information to District Crisis Group (DCG) for further response. The estimation requires expertise in using the required computer simulation software. To estimate the hazard zone in a particular emergency scenario, the technical coordinator shall place the transparency provided with start point on the source of accident on the scaled map of the area given at **Annexure 1.1**. This will give them the extent of the area likely to be affected.

**c) Establishment of Hazard Control Zones at Incident Site**

An important component of the emergency response involves establishment of hazard control zones at the incident scene to limit the number of people in the most hazardous areas. The exact size and configuration of these hazard control zones must be determined and visually differentiated at each particular incident based on incident-specific factors and situations. These shall be determined by the technical coordinator based on the results of hazard analysis and may include the following:-

"Hot Zone" - Area of maximum hazard surrounding the damaged container(s) or fire area, which may be entered by only specially equipped and trained response personnel.

"Warm Zone" - Area of moderate hazard outside the Hot Zone in which properly equipped and trained backup crew will be standby.

"Cold Zone" - Area outside the Warm Zone that poses minimal or negligible hazards to emergency personnel. The command post, most of the deployed apparatus, and the resource staging area should be located in the Cold Zone.

### 2.6.5 Safety Coordinator

On receiving information about the ongoing emergency, Safety coordinator will rush to the District Emergency Control Center (DECC) and coordinate efforts for the following activities:

**a) Monitoring of Atmospheric Conditions**

The atmospheric stability conditions, wind velocities, and wind directions have a direct impact on the incident heat radiation in downwind areas. Real time data can be obtained from Indian Meteorological Department's station at Arvalli.Prompt availability of these inputs can help the response agencies in planning the deployment of manpower and resources at the incident location.

**b) Ensuring Safety of Response Team Members at Incident Scenes**

Safe operating procedures to be established and enforced by the Safety Coordinator include but are not limited to:-

- The use of appropriate protective gear and equipment.
- Limiting the number of personnel in the "Hot" and "Warm" hazard control zones.
- Utilizing the most experienced personnel for the most hazardous tasks.
- Positioning a backup team in the "Warm Zone" in case it is needed to assist or rescue personnel in the "Hot Zone".
- Monitoring (visually and through communications) the welfare of personnel operating within the "Hot" and "Warm" Zones.
- Ensuring that all personnel understand their assignments.
- Enforcing a "No Smoking" policy at incidents involving flammable or combustible materials.
- Replacing fatigued personnel with "fresh" personnel.
- Adjusting hazard control zones to reflect changing conditions.

### 2.6.6 Rescue Coordinator

There are a variety of scenarios under which workers at chemical facilities or members of the public near or downwind of a hazardous material released may be exposed to high levels of thermal radiation, or injured due to the effects of an explosion. Fire departments are usually well prepared and experienced in rescuing people from fire and explosion situations, and will in many cases not require any new or additional planning to meet these responsibilities.

- Rescue coordinator shall be responsible for deputing rescue teams to enter the hazardous areas and rescue injured or trapped individuals.
- Rescue teams operating in hazardous environments should work at-least in pairs. This is a common safety practice, as is the practice of having a backup team ready for action, should a problem develop.
- The rescue coordinator will contact the material coordinator for quickly obtaining the necessary protective gear so that the teams can commence search and rescue operations promptly.

### 2.6.7 Evacuation and Rehabilitation Coordinator

In case of fires, the damage distance for different scenarios is such that evacuation of off-site population may not be necessary. However, in case of explosions, evacuation of personnel of the plant and adjoining units may be required. Explosions occur suddenly and seldom give time for a phased response. Further, in contrast to toxic vapor release, heat is easily recognizable by all persons and on impulse; the person tends to move towards a cooler place thereby rendering the first response to him-self. In scenarios involving fires/explosions, the prime objective is to obtain inputs from the Technical Coordinators about the areas likely to be affected due to secondary fires and initiate evacuation. Under such circumstances, places having high population density such as neighboring industries, educational institutions, prisons, hospitals, cinemas, etc are the most vulnerable. All such areas may not require evacuation and the decision will largely depend upon the prevailing conditions.

Additionally, at residential areas where healthy persons can understand the warning and respond to the accident warning signal quickly, senior citizens, handicapped and children may need help and assistance form the rescue personnel. Census record of the area can be of great help in identifying the part of population that may require special care.

## a) Evacuation of General Population

- The local evacuation coordinator on receipt of instruction from District Collector shall immediately mobilize his team(s) for initiating evacuation of the areas expected to be exposed / threatened by heat radiation/explosion overpressure.
- He will also ensure that all his team members involved in alerting and support, are equipped with appropriate Personal Protective Equipments (PPEs) and are well aware of the procedures to be followed. The team members will carry a supply of chalk or colorful tags that can be used to mark doorsteps or place on the doorknob to indicate that the place has indeed been evacuated.
- He will direct his team to carry out rescue operation in association with the rescue coordinator.
- He will designate In-charge of rehabilitation center(s), and keep in touch with them for regular head-count, care of evacuees and availability of essential supplies at such centers.

## b) EvacuationRoutes and Assembly Points

In the overall planning process it is essential to define evacuation routes well in advance. The routes should be clearly spelt out in the warning signals, as also the location of shelters to where the people with automobiles should proceed and people without automobiles should gather for pick-up by buses / trucks or vans.

In designating evacuation routes, it has to be kept in mind that major roads are the most desirable. Visit to the area has revealed that Prantij - Dhansura, Vijapur – Himmatnagar, Shamlaji -Modasa, Shamlaji -Bhiloda, in all likelihood,will be available as it will not be affected by the accident as may be the case and/unless, they are dedicated to other important functions such as, for access by police, fire, public works, medical and other such emergency operation vehicles.

As soon as an evacuation has been declared, police and auxiliary personnel should be prepared to control traffic on evacuation routes, to keep non-evacuation related traffic off the roads and to remove any vehicle(s) that breaks down and causes a slowdown / obstruction of traffic. These activities will in turn require availability of tow-trucks and portable roadblock material (barricades, cones, signs, etc.).

**c) Shelter & Care of Evacuees**

This aspect is an important function of the overall evacuation exercise. It calls for providing safe and comfortable shelter for relocated population.

Once the evacuees reach the shelters, they would want to report “missing” persons or to determine if their family members, friends or neighbours are “lost” or are in other shelters. Response to these queries, as well as identification of persons genuinely missing will require registration of people upon entry and communication between shelters.

Care has also to be taken of any pets brought along by the evacuees. Human service personnel/volunteers may be required to render counseling, recreational and other needs of confined population. Quite obviously, shelters will require initial and periodic supplies of food, water and sanitary facilities for the inhabitants.

### 2.6.8 Transport Coordinator

Performing transport functions requires planning for the availability of buses/trucks/vans/ambulances and other vehicles to transport school children, residents of hospitals/nursing homes and general members of the public who do not own vehicles to safe shelters. For this the prime responsibility rests with the local transport coordinator who, on receipt of information about the emergency from District Emergency Control Center (DECC), will direct the fleet (drivers) and coordinate the following transport activities during an emergency:-

- During the emergency, he will work in close liaison with the communication and evacuation coordinators.
- On getting instructions from the District Crisis Group (DCG), he will effect the warning / instruction / notification operation,
- Arrange for the fleet of vehicles at a pre-designated location so that they can transport the affected population to safer areas (Rehabilitation Centers),
- Make coordinating efforts with vulnerable areas such as schools, hospitals, nursing homes, cinema halls, shopping halls, etc. for evacuation of people to safer places.
- He will also be responsible for ensuring that any needed response equipment, material and personnel are arranged promptly to the scene of an accident and for ensuring an adequate state of operational readiness thus consolidating the management of all transport related activities.

- Through mutual aid and other services, he shall be responsible for arranging ambulances at the incident site. Emergency transport and ambulance facilities available with the industries in Arvallidistrict are listed at **Annexure 3.3 & Annexure 3.10**respectively.
- He shall also be responsible for arranging the protective equipment, clothing, devices, and any decontamination and/or treatment supplies that may be required by ambulance personnel in an actual emergency.

### 2.6.9 Utilities Coordinator

#### a) Identification of Water Sources in Rural Areas

The main and largest source of water in Arvalli District is fromrivers (Hathmati, Sabarmati, Meshwo, Mazam & Vatrak). Water can be tapped form the intake point of Water Supply Corporation or from the industries themselves. Other source can be the bore-wells and tube-wells in the adjoining villages and agricultural fields. The water storage facilities at each industry are also given at **Annexure 3.1**.

Utilities coordinator is responsible for ensuring uninterrupted supply of water for fire-fighting to all the brigades in operation. He shall coordinate with the transport coordinator for replenishing the depleted stock of firewater at the incident site through water tankers.

#### b) Notification and Shutdown of Electric Utilities

Major explosions may result in breaking of power lines and an electrocution hazard to those who might make contact with any "downed" lines. In such a case, there may be circumstances in which it is desired to shutdown electric power systems rapidly in an area.

Based on information and instructions obtained from the accident site and the District Collector, the District Energy Officer shall, through his own communication channel, instruct the concerned officers of Sate Electricity Board to shut down the power supply to the identified area.

#### c) Provisioning Backup Power during Emergency

Once it is instructed to shut down the electric utilities in the area, power will still be required by the response teams, emergency control center and hospitals involved in treatment of victims during an emergency. For this

the utilities coordinator will be responsible for providing back-up or alternate source of uninterrupted power for smooth operations. For this he will arrange portable DG sets from the agencies involved in providing such equipment on hire. **(Annexure 3.12).**

### 2.6.10 Material Coordinator

#### a) Availability of Respiratory Protective Devices

Few Major Accident Hazard (MAH) units in the District have Self Contained Breathing Apparatus (SCBAs). The details regarding Personal Protective Equipment (PPEs) available with the industries and those at fire-stations are given at **Annexure 3.8** and **Annexure 3.2**respectively.

#### b) Availability of Special Protective Clothing

The normal turnout clothing of fire service personnel may be adequate to protect them in a wide variety of fire and / or spill situations. But there may also be cases where containers of toxic or corrosive chemicals have collapsed during explosions. Such situations may require more complete protection of the body by clothing that is resistant to the damaging effects of the spilled substance. The clothing itself may range from boots, gloves, or disposable suits made of chemical resistant materials to air-tight fully encapsulating "astronaut" suits made for protection of the body from spilled substances on the ground or in high concentrations in the air. Where fires may occur, appropriate thermal protection may be additionally necessary.

#### c) Requirement of Protective Wear for Medical Response Teams

There have been cases where medical personnel have had to treat victims and have needed protective clothing (at least gloves and masks) to protect themselves from smoke or products of chemical combustion. It is therefore the duty of the material coordinator to make available adequate number of appropriate protective clothing for the medical response team.

#### d) Support Services for Field Response Forces

Several situations can be envisioned in which response personnel in the field may be required or are needed at the incident site for more than a day. These personnel will require rest areas and food to be able to continue to function, particularly if they are in a remote area or a region that has otherwise been evacuated. Sources of assistance for planning in this

area include the Red Cross, St. John's Ambulance, Local NGOs, etc. The later organizations in particular may be able to provide tents, cots, lights, etc. Additionally, there will be representatives from the local, state and central agencies together with the media, industry and other personnel involved in the overall emergency response. The total number of people requiring food and rest areas may actually be substantial. It is therefore the duty of the material coordinator to arrange food, rest areas, and other equipment and supplies necessary to sustain field response forces. The items needed would include canteen services, accommodation, electrical power, portable toilets, washing facilities, etc.

**e) Maintenance of Apparatus and Equipments**

During long-duration incidents, apparatus and equipment (e.g., vehicles, generators, pumps, etc.) may require on-scene refueling and minor maintenance to enable uninterrupted operation. On-scene services of this nature are beneficial in that they eliminate the need to remove deployed apparatus and equipment from the incident scene. Providing of refueling and maintenance services may not be prudent in particularly hazardous locations. For example, fire department apparatus positioned near a fire should not be refueled where ignition of fuel vapors is possible. One step that may possibly eliminate the need to refuel apparatus and equipment is to fill fuel tanks to capacity prior to deployment. Furthermore, maintenance personnel must wear appropriate body and respiratory protective gear when operating in hazardous environments.

The unit's maintenance coordinator together with the material coordinator is responsible for carrying out the aforementioned operations.

### 2.6.11 Public Works Coordinator

On receiving notification of the emergency situation, the Public works coordinator will rush to the District Emergency Control Center (DECC) and instruct his team members to stand-by for rendering assistance in the following activities:-

- Besides the possible need for a temporary morgue, public works coordinator shall be responsible for planning and providing large-scale mortuary services when the need arises
- Initiating sewer shut-off to prevent contaminated water from entering water bodies,

- Evacuation and care of domestic livestock from the hazard zone when need arises.

  This aspect is likely to be most applicable in rural areas with large population of valuable animals and relatively few people.

### 2.6.12 Liaison & Public Relations Coordinator

The public needs to be informed accurately and rapidly as to what is happening during an emergency situation. Significant incidents may result in a large number of reporters arriving on scene and attempting to interview anybody and everybody. The Public Relations coordinator shall undertake the following tasks to help reduce confusion, facilitate information transfer, reduce problems that might be otherwise caused by a lack of organization, and reduce the incidence of unfounded rumors.

- Designate one specific individual and an alternate press officer to join the team of press officers that may be formed from representatives of all major parties to an emergency response operation (be they from local, state or central government agencies or the company responsible for the accident).
- Compile a list of telephone numbers of local radio and television station personnel who can initiate special “on air” announcements.
- Provide designated press officers with secretarial support, photocopy machines, and a means of communications with the overall command of the response operation.
- Select a site, preferably but not necessarily near the central emergency operations center, where the press can convene and be briefed by the press officer team. This site should ideally have telephones, electrical outlets, restrooms, and other facilities that media personnel may require.
- Establish a firm policy among all local officials and response personnel as to who should or should not speak to media personnel.
- Ensure that key emergency response personnel understand the need to relay up-to-date “status reports” to press officers on a regular basis.

**Things To DO**

- Accommodate the media as much as possible; make the news available to them.
- Schedule news conferences and avoid written releases.
- Be direct and specific.
- Always, always tell the truth.
- Send a press representative to the command post.
- Ensure that the team of press officers is in contact with the command post at all times.
- If safety permits, allow the media to take pictures of the accident site.

**Things NOT To Do**

- Do not permit arguments among public officials or press officers from different organizations in front of the press. Do, however, permit statements of dissenting opinions.
- Avoid giving gut opinions or conjecturing.
- Do not be evasive. If the answer to a question is not known, refer the question to someone who has the appropriate answer.
- Do not be critical in a personal manner; i.e., avoid personal remarks about other people at the accident scene.
- Do not be philosophical. These kinds of discussions are extremely susceptible to being quoted out of context.
- Do not make off-the-record comments. They may end up in print with later retractions buried in the back pages.
- Avoid friendly chats with media people. Casual comments may appear in print.
- Avoid bad or foul language.
- Do not hide from the media. They can sense this and form an unfavorable opinion of the press officer(s) as a credible source of news.
- Do not answer questions beyond personal knowledge or expertise.
- Do not permit media persons to attend emergency response team meetings. These are likely to be technical meetings with lively discussions that may last forever if people are performing rather than dealing with the problem at hand.

  Reasons for planning for and controlling statements made during a severe emergency go beyond a simple desire to ensure orderly and accurate dissemination of information. One of the groups showing up

more frequently at hazardous materials accidents is of lawyers representing a wide variety of interests. It should be remembered that good lawyers would remember everything they see and hear. A thoughtless comment or statement can surface months later in a courtroom. Placements of blame, criticisms of response actions, airing of dirty laundry in public and similar statements can result in lengthy and messy legal battles over comments or charges made in the heat of a very hectic moment.

# 3. ACTION PLAN FOR OFF SITE EMERGENCY – LARGE SPILLS

## 3.1 GENERAL

This section deals with the action plan for managing chemical accident scenarios involving spill/leak of toxic substances into the atmosphere such that the maximum downwind damage distance is over 3 km. The cut-off of 3 Km has been taken, as scenarios with lesser damage distances can primarily be managed by the members of Local Crisis Group (LCG) and would only require coordinating efforts by their counterparts at the district level. However, scenarios having off-site effects beyond 3 Km would require large-scale evacuation and counter measure efforts. These are the scenarios, which need careful planning and performance of respective duties by the response personnel as several lives are at risk to exposure. Accident scenarios having off site effects beyond3 Kmdue to toxic vapor dispersion inArvallidistrict are summarized inTable 3.1.

## 3.2 ANALYSIS OF MCA SCENARIOS

As can be observed from the information available in this table, the major hazardous substances leading to toxic vapor dispersion are LPG, Chlorine, etc. Low Immediately Dangerous to Life & Health (IDLH) value (30 ppm) of chlorine makes it one of the most hazardous widely used substances in the chemical industry.

## Table 3.1

## Toxic Vapor Accidents Scenarios Having Hazard Distance over 3 km

| Name of the Unit | **Location** | Chemical | Storage Quantity (MT) | | Atmospheric Conditions | Max. Downwind Hazard Distance |
|---|---|---|---|---|---|---|
| | | | **Largest** | **Total** | | |
| NEON FUEL LTD. | AT. KHODAMBATAL. BHILODA, ARAVALLI | LPG | 30 | 30 | D – 3 | 4.9 Km |
| | | | | | F – 2 | >10 Km |

**Note : The USEPA model (ALOHA of CAMEO SUIT) does not provide results beyond 10 Km as they are highly unpredictable due tochange in wind pattern and terrain.**

## 3.3 AREAS & POPULATION LIKELY TO BE AFFECETD

Based on the results of the above table, villages have been identified in each of the eight wind directions for each area. Corresponding total population of these villages have also been indicated along side the areas likely to be affected. Location wise-data is provided in Table 3.2

**Table: 3.2.1**

**Areas and Population Likely to be Affected due to Chemical Emergency at Khodamba ,Ta.Bhiloda**

| Location | Himmatnagar | | | |
|---|---|---|---|---|
| Maxi D/W-ind Hazard Distance | Up to 5 K.M. | | 5 - 10 K.M. | |
| Wind Direction | Area likely to be affected | Population likely to be affected | Area likely to be affected | Population likely to be affected |
| North | - | - | Sodpur | 440 |
| North-East | Kherancha | 971 | - | - |
| East | - | - | Himatpur | 930 |
| South-East | Kushki | 2444 | - | - |
| South | - | - | Tintoi | 8,564 |
| South-West | - | - | Brahmapuri | 980 |
| West | - | - | Khiloda | 2,158 |
| North-West | Asal | 531 | - | - |

# CHAPTER 4

## ACTION PLAN FOR OFF SITE EMERGENCY – SMALL SPILLS

### 4.1 GENERAL

This section deals with the action plan for managing chemical accident scenarios involving spill/leak of toxic substances into the atmosphere such that the maximum downwind damage distance is up to 3 km. The cut-off of 3 Km has been taken, as scenarios with lesser damage distances can primarily be managed by the members of Local Crisis Group (LCG) and would only require coordinating efforts by their counterparts at the district level. Accident scenarios having off site effects up to 3 Km due to toxic vapor dispersion in **Arvalli** district are summarized in Table 4.1.

### 4.2 ANALYSIS OF MCA SCENARIOS

As can be observed from the information available in this table, the major hazardous substances leading to toxic vapor dispersion is LPG, only. As these units have not surrendered their explosive license, are still continuing as MAH units)

Other scenarios although also have off-site damage potential, are less than 3 Km cut-off considered in this section of the action plan. The actual off-site damage will be governed by several factors such as population surrounding the source installation, prevalent atmospheric conditions, combating facilities available with the unit, etc. Green belt surrounding industry also provide certain degree of attenuation to the vapors, thereby reducing the damage distance

**Table 4.1**

**Major Accident Scenarios at MAH Units Involving Toxic Vapor Dispersion**

| Name of the Unit | Chemical | Largest Storage Quantity (MT) | Atmospheric Conditions | Max. Downwind Hazard Distance |
|---|---|---|---|---|
| NEON FUELS PVT. LTD. AT. KHODAMBA | LPG | 30 | D-3 | 823 m |
| TAL. BHILODA ARAVALLI | | | F-1.5 | 1.1 Km |

## 4.3 AREAS & POPULATION LIKELY TO BE AFFECTED

Based on the results of the above table, villages have been identified in each of the eight wind directions for each area. Corresponding total population of these villages have also been indicated along side the areas likely to be affected. Location wise-data is provided in Table 4.2 for Himmatnagar,

**Table: 4.2**
**Areas and Population Likely to be affected**

**due to Chemical Emergency at Khodamba,Ta.Bhiloda**

| **Location** | **Bhiloda** | |
|---|---|---|
| **Max. Hazard Distance** | | |
| **Wind Direction** | **Areas** | **Popul-ation** |
| North | Sodpur | 440 |
| North-east | Kherancha | 971 |
| East | Himatpur | 930 |
| South-east | Kushki | 2444 |
| South | Tintoi | 8,564 |
| South-west | Brahmapuri | 980 |
| West | Khiloda | 2,158 |
| North-west | Asal | 531 |

## 4.4 CHAIN OF EVENTS

As can be seen from the above tables, toxic vapor release at any of the above installations has the potential of affecting off-site population up to 3 Km and the chain of events for effectively managing such an eventuality is presented below.

## 4.5 NOTIFICATION TO OFF-SITE AUTHORITIES

### 4.5.1 Action: Communication Coordinator of the Unit or adjoining units

The communication coordinator shall call (02772 – 240600, 241400, Telephone Numbers of District Crisis Control Room (DCCR) - Arvalli) for notifying the chemical accident emergency. In communicating the accident scenario he will:

- Identify oneself by name and designation.
- Give the location of the incident (Plant, Section, Equipment).
- Inform about the chemical involved.
- State briefly the type of emergency i.e. whether fire, explosion, toxic release (specify the direction of gas cloud movement in case of toxic gas release).
- State the severity of the incident as given by the WMC to ascertain the level of emergency.
- Standby to render all possible assistance.

There is a possibility that any other person may also see / hear the fire / explosion and calls the police station before they receive call from the affected unit or the District Emergency Control Center (DECC). It may not be possible for an ordinary citizen to provide entire information as per the given format. In such a case it will be the responsibility of the information-receiving officer to call up the affected Major Accident Hazard (MAH) unit or the nearby unit (if the communication system of the affected installation is severely damaged) and gather the desired information. It is suggested that a pad of blank formats are kept at Police Control Room (PCR) so that Officer In-charge can promptly ask questions and record information.

### 4.5.2 Notification to Response Organizations

**Action : Departmental Officer Manning the District Collector Control Room (DCCR) / Police Control Room (PCR)**

The person receiving the information shall immediately inform the three first responders i.e. Police, Fire and Medical department by calling their chiefs / alternates (in case chief is not reachable) as per the list of District Crisis Group (DCG) members available with him. Next he will inform District Collector, Chairman of Local Crisis Group (LCG) and all other members of DCG. He will pass the complete information of the incident to all the members. If he receives, further information after making the first call, he will convey that also in the same order. Alternatively, if the information is more relevant to any particular department, he will first pass that information to its head. The directory of Key Contacts, i.e., members of DCG, LCG, industries in the district and expert agencies at District / State and National Level, is given at Annexure 2.

| First Responder & Designation | Phone No. | |
|---|---|---|
| | Office | Residence |
| **Police** | | |
| District Superintendent of Police | 02774-250100 | 9975405978 |
| Police Inspector | 02771 -234554 | 7575800951 |
| **Fire** | | |
| Fire Superintendent | 02774-246572 | 9427698947 |
| **Medical** | | |
| Chief District Health Officer | 02774-248911 | |
| Civil Surgeon | 02772-246618 | 9687633101 |

## 4.6 ESTABLISHING LOCAL COMMAND POST (LCP)

Chairman of the Local Crisis Group (LCG) will select a local command post based on the location and intensity of the incident. He will then, through local communication coordinator, inform all the members of LCG about the emergency and the location of Local Command Post (LCP) selected so that preliminary response can be quickly initiated. He will also inform about the location of LCP to DECC and members of District Crisis Group (DCG). The locations of LCG are suggested below:-

| Sr. No | Location | Suggested Location of LCP |
|---|---|---|
| 1 | Arvalli Modasa | District Collector (DC) office or Emergency Control Centre (ECC) / EOP of the non affected unit of Gurukrupa Krafts ,Kabola,Ta.Modasa |
| 2 | Bhiloda | Mamlatdar Office,Bhiloda |

**ECC : Emergency Control Center**

The above locations are suggested based on their proximity to the respective Major Accident Hazard (MAH) units and keeping in mind the availability of communication and control facilities for managing chemical emergency. However, prevailing wind direction also plays a major role in selection of the LCP. Alternate location may be selected based on on-scene assessment and availability of better location for operational control.

## 4.7 ACTION BY FIRST RESPONDERS

On receipt of information about offsite emergency, first responders will immediately deploy first batch of response teams from a location nearest to the incident site. They will further reinforce their teams by deploying additional resources from surrounding areas so that effective (based on their assessment of first information received) first response can be rendered at site. In the mean time they will keep additional resources in terms of manpower and equipment on high alert to move to incident site. On getting feedback from their response teams (who have by then assessed the situation) they will take decision on deployment of additional resources in terms of men and material.

**Major duties of the three first responders during emergency are discussed below:-**

### 4.7.1 Police Department

The teams will be equipped with necessary Personal Protective Equipments (PPEs) and will coordinate the following activities :-

- Control of traffic and curious onlookers near the affected areas.
- Ensuring law and order at the incident site during emergency.
- Ensure law and order at the assembly points and evacuation routes.
- Provide security in the evacuated areas.
- Hazardous areas when evacuated also become vulnerable to theft, burglary, etc. In such events, it becomes the responsibility of the police department to ensure that unauthorized individuals do not enter hazard

zones so that private and public property is safeguarded during evacuation.

- Ensuring law and order in the rehabilitation centers.
- Restoration of law and order in evacuated areas on termination of emergency.

### 4.7.2 Fire Department

The major activities that the fire team will undertake are:-

**a) On-scene Assessment**

The first fire vehicle to reach the site will immediately contact the site controller and collect the necessary information regarding the chemical spill / leak, the actions taken and the current status. The driver will park the vehicle in a manner to prevent exposure to air-borne chemical contaminants. Each crewmember will wear necessary Personal Protective Equipments (PPEs) before entering the "Hot Zone". The crewmembers should work in pairs, taking care of each other.

**b) Plugging/Stopping of Leaks**

Small leaks left unattended for extended periods of time can cause large losses of chemicals to the environment and have much more severe effects than would occur if the leak were somehow completely or partially plugged on a prompt basis. There are great benefits, therefore, in having access to one or more individuals with the basic tools and knowledge needed to limit losses from punctured or leaking tanks or pipelines.

The most widely available means for plugging holes or leaks in equipment involves use of conical, cylindrical, square or wedge shaped pieces of wood, rubber or metal sheets, inflatable pipe plugs, pneumatic leak sealing "bandages", special patching compounds, clamps of various types, and a number of other items. The plugs alone, if available in a variety of sizes, can be jammed into holes and greatly reduce the open area, from which the contents of the tank or pipeline can escape; assuming, of course, that it is safe for individuals to approach the leak area. Several vendors market special leak plugging and patching kits. Innovative response personnel may be able to fashion their own devices. Many incidents are brought to a rapid end simply by having the proper common tools available to close a valve or tighten some bolts. It is the responsibility of fire personnel to plug / stop leaks based on guidance obtained from technical coordinators.

### c) Suppression of Hazardous Gas or Vapor Releases

Based on the guidance from technical coordinators, the response team shall take rapid measures to reduce the rate or amount of hazardous vapors or gases entering the atmosphere using one or combination of the following measures :-

- Physical restriction of liquid pool surface areas.
- Transfer to an alternate or standby container if available.
- Use of fire-fighting or specialized hazardous material foams.
- Dilution or coverage of liquid pools with water (or other compatible liquids).
- Use of water sprays or fogs.
- Neutralization of spilled liquids.
- Cooling of spilled liquids or venting tanks.

## 4.7.3 Medical Coordinator

On receipt of information on the incident, the medical coordinator will dispatch medical teams to the incident location from the hospitals located nearest to the affected Major Accident Hazard (MAH) unit.

**Following are the major activities of emergency medical teams reaching the emergency site:-**

### a) Establishment of Triage Stations

Mass casualty situations will require establishment of field hospitals to take care for the injured and to identify, stabilize, and transport more serious cases to hospitals. Medical team will establish triage stations near the affected installation and will be required to evaluate and color code the victims. The following code is proposed:-

- Red for critical, such victims should to be sent to the hospital in the first available ambulance. Medical Officer manning the triage station will maintain a checklist for the number of victims sent to a particular hospital so as to know when the capacity is reached and further victims may be refused admission.
- Yellow for stable, such victims need to be sent to the hospital when there is room available in an ambulance after all the critical victims have been sent

- Green for walking wounded, to be provided with first aid and treatment for shock and trauma

Medical coordinator shall, from the list of the proposed rehabilitation centers, identify such areas to which the public can be directed in the aftermath of a spill emergency where this action is warranted. Outside and local medical care personnel shall be informed by the medical coordinator of their responsibilities in staffing and equipping such facilities quickly. Such field hospitals shall maintain a record of all the patients (as far as possible) so as to enable accounting of personnel and their destinations after triage. The on-scene medical command post shall be under the direction of the local medical coordinator. Medical Coordinator in consultation with the respective Medical Superintendents of the Major Hospitals shall also be responsible for formulating a mass casualty plan for such hospitals as discussed in section 5.9, Chapter 5 of the “Off-Site Plan – Volume I”.

**b) Medical support for Response Personnel**

Where deemed necessary, properly equipped medical personnel and one or more ambulances shall be made available to check and (if necessary) treat injured or contaminated response personnel. These personnel shall check the vital signs and general health of all personnel who will don specialized protective gear and enter "Hot" and "Warm" Zones, particularly where fully encapsulating protective suits are being used. The health of potentially exposed response workers shall be rechecked upon completion of their duties.

**c) Medical support at Temporary Shelters**

Once the evacuees are at the shelter, it is the responsibility of the medical coordinator to ensure their well-being. For this, he will assign team(s) to take care of people who become ill during evacuation or later. The doctors assigned this work should be aware of the signs and symptoms of exposure to toxic material(s) so that they can easily identify victims and provide them with necessary treatment & care. Contaminated individuals (those having contaminant residue on their person or clothing) should be segregated from unexposed people until adequately decontaminated. It is pertinent to note that significant contamination is unlikely to be of concern except where highly toxic aerosols, mists or dusts have entered the atmosphere or where individuals were in the immediate vicinity of the spill or discharge. Facilities should also be available for care of the handicapped and elderly.

## 4.8 RESPONSE BY DISTRICT COLLECTOR AND OTHER RESPONSE AGENCIES

On receipt of information of the accident, the District Collector (DC) will rush to the District Crisis Control Center Room (DCCR), where Assistant Director, Industrial Safety & Health, Arvalli and two technical experts will join him. Other two technical experts (nearest to the incident location) will directly rush to the Local Command Post (LCP) and remain in touch with the DCCR for regularly updating the information and provide technical support to combat teams at the incident site.

**The DC will address the following issues along with other members present at DECC:-**

- Obtain update of the incident situation from LCP and establish a link for continuous communication (such as dedicated telephone line with speaker phones, set of warlike talkies, computer link, etc.) with the help of communication coordinator.
- Identify the hazardous and threatened areas based on map and templates available and information received from LCP. They will also establish link with safety coordinator (PCB personnel) for latest met data so that likely shift of hazard zone can be assessed and communicated to LCP.
- Supervise the overall management of each function through respective member of the District Crisis Group (DCG) and expediting response wherever required
- Take a decision on requirement and priorities of evacuation and organize the resources to execute the same. They will contact transport and evacuation coordinators (already on high alert) and issue instructions.
- Based on the inputs from the first responders and experts available at LCP, identify the additional resource requirement and initiate mobilization. DC may have to get in touch with his counterparts in other districts and also with state authorities depending upon the requirements.
- After making the required arrangements, DC will take decision whether he is required to go to the incident site and who all shall accompany him. In such a situation, his deputy will take charge of the DECC.

With the above procedure, the off-site response will be initiated and will involve activities as listed in Chapter – 3 of this Action Plan. Although the activities will more or less remain the same, their extent or the scale of response will be lesser as compared to response for large spill scenarios. Further, as the damage distances are up to 3 Km, the impact may be limited to industrial areas fro unit located in Himmatnagar, Prantij, Idar, Talod and Vadali As majority of population in industrial areas will be

factory employees, response to warning through sirens is expected to be understood by them. This will help in reducing the number of affected people due to such accident scenario. For this, the management of all the industries located in this area will need to initiate training programs for response to emergency sirens and actions to be taken by workers (such as emergency plant shut down and gathering at designated assembly points).

# CHAPTER 5

## ACTION PLAN FOR OFF SITE EMERGENCY – HAZCHEM TRANSPORTATION

### 5.1 HAZCHEM TRANSPORTATION

The rapid growth in the use of hazardous chemicals in industry has brought about a very significant in the transportation of hazardous chemicals through rail, roads and pipelines, which has the potential to endanger the life of large number of people by an accident involving these chemicals. More often than not, national and state highways pass through large population centers through which such chemicals are transported. This has made the problem of hazardous material transportation, even more complicated. These have been an enormous number of road accidents in general and involving transportation of hazardous chemical in particular. Many of these accidents have lead to large scale loss of life, damage to environment and property.

As can be observed from the foregoing sections, Arvalli district has a large number of MAH Units handling a variety of hazardous chemicals. While some of the units are manufacturers of hazchem, employing more hazchems in the process, others are end users. Therefore, the transportation of hazardous chemical in the district is due to the following:-

a. Manufactures dispatching hazchem to units within or outside the District
b. Manufacturers or other chemical industries receiving hazchem from manufacturers located within or outside the District
c. Bulk storage terminals receiving hazchem through pipelines and / or ships and dispatching to users within or outside the District
d. Transient traffic of hazchem carrier passing through the major corridors of the District.

### 5.2 MAJOR CORRIDORS FOR HAZCHEM TRANSPORTATION

**National Highway No. 8**:- This 35 Km stretch enters the District at Limbadiya and exits near Chandrala. It also caters to the interstate transient traffic of hazchem and other goods. From this it can be observed that the movement of hazchem transportation and also the potential for accidents involving them in the district is very high.

**Ahmedabad – Shamalaji State Highway**: - Approach road although good. The road is just enough for two heavy vehicles to pass.

In addition to the above, attention also needs to be given on the roads within Himmatnagar and Prantij G.I.D.C. While some of the roads within these estates are motorable, others are in bad shape and become worse during monsoon. Movement of heavy vehicles, even carrying hazchem, within the estate is high. Poor road conditions may not only result in transportation accidents but also increases the travel time for first responders to reach the incident site.

It is a good feature that LPG bottling plants are located in isolated areas away from the population centers, as far as safety is concerned. However, with regard to deployment of resourcesand condition of access roads, it is a negative aspect.

## 5.3 MAJOR HAZCHEMS TRANSPORTED

Based on the results of an earlier study conducted by the Ministry of Environment of Forest (MoEF), following are the major hazchem transported through the District:-

- Acid (Acetic, Hydrochloric, Nitric, Sulphuric & Alkalies)
- Ammonia
- Benzene
- Chlorine
- Diesel
- Kerosene
- LPG / Propane
- Carbon disulphide
- Methanol
- Motor spirit
- Naphtha
- Oleum
- Solvents (Xylene, Toluene, Aromax)
- Technical Pesticides

## 5.4 TRANSPORTATION HAZARDS

As mentioned above, various hazardous chemicals are being transported through out the district. With heavy transportation activity within the district, the potential for accidents also increases correspondingly.

Accidents scenarios have been visualized for major hazardous chemicals passing through the district and the details are given below. This table provides likely scenario, chemical involved, its quantity and expected area of exposure. As transport emergency can happen anywhere in the district, the area and population likely to get affected will depend on the location and prevalent meteorological conditions in the area.

**Table: 5.1**
**Transport Accident Scenario**

| Sr. No | Transport Accident Scenario | Area Likely to be Affected |
|---|---|---|
| 1 | Failure of chlorine tonner | 1 to 1.4 km downwind |
| 2 | Failure of acid / alkali tanker | Immediate surrounding and burns to person coming in direct contact with the substance. |
| 3 | Ammonia leak from cylinder | Varying, depending on the capacity of the cylinder but not more than 1 km. |
| 4 | Ammonia leak from a tanker | Upto 3 km down wind. |
| 5 | Escape of explosive gases from cylinder followed by explosion | Explosion may cause over pressure upto 50 m for a short duration. However, pieces of damaged cylinder may travel upto 100 m from the accident site. |
| 6 | LPG leak from tanker followed by fire / explosion | Thermal radiation and over pressure effects will be upto 200 m for short duration. BLEVE may result first degree burns upto 150 m and also cause secondary fires depending on the location of occurrence. |
| 7 | Spill / leak of flammable petroleum products followed by fire | Thermal radiation effects of unconfined pool fire will be felt upto 25 m from the pool edge for the duration of fire. |
| 8 | Spill leak of $CS_2$ followed by fire in a road tanker | Thermal radiation effects of unconfined pool fire will be felt upto 30 m from the pool for the duration of fire. Burning of CS2 results in formation of toxic sulphur dioxide effects of which may be felt up to a distance of 2 km from the accident site |
| 9 | Spill / leak of solvents and other flammable chemicals such as toluene, methanol, benzene and xylene followed by fire | Thermal radiation effects of unconfined pool fire will be felt up to 15 m from the pool edge for the duration of fire |

**Other items that will have bearing on the extent of damage are :-**

- Rate of chemicals release – lower rates pose lesser risks. As per the guidelines of the Ministry of Environment of Forest (MoEF), we have considered catastrophic failure of container. However, it seldom happens in actual incidents and the material escapes from the container at a much lesser rate.
- Location high population density – unfavorable
- First response by the driver, if possible – favorable
- Prompt action by response agencies – favorable

## 5.5 ANALYSIS OF ACCIDENT SCENARIOS

From Table 5.1 is apparent that possibility of fire / explosion / toxic release during transportation exists anywhere in the district because large number of hazardous chemicals are transported through out the district.

If the vehicle carrying the hazardous chemical meets with a serious accident, there is likelihood of release of chemical to the atmosphere. Such chemicals may also get released during transportation due to damaged container; however, such possibility is rather remote. In both the events, consequences and extent of damage will vary considerably with location. Typical damage distance incase of catastrophic failure of container of hazardous chemical during transportation would vary with the type of chemical being transported. If it happens in highly populated area, it could seriously affect population in surrounding area. However, a quick emergency response can reduce the damage to a large extent.

Immediate emergency response would be required to contain the damage, rescue the trapped / injured people, provide medical help to the affected population, evacuate the affected / threatened areas, control of traffic and curious on lookers etc.

## 5.6 CHAIN OF EVENTS

Chain of events will be initially in case of a transport accident as discussed below:-

If the driver of the vehicle is safe and is trained to handle transport emergency (he is supposed to received basic training and carry TREMCARD – Transport Emergency Card., which gives do’s and don’ts during such situation specifically for the chemical being transported), he

can be instrumental in providing immediate initial response. He can help in :-

- Conveying the accurate information to the authorities.
- By keeping the onlookers away by shouting at them that this is a hazardous chemical and they should not come near the truck. Further, he can instruct to keep away all sources of ignition.
- By seeking help from other truck drivers in controlling the crowd and communicating with people in downwind direction so that they move away from gas cloud.

## 5.7 NOTIFICATION TO OFFSITE AUTHORITIES

Initial reporting of accident could be either by driver / cleaner / any passer by who observes the accident. Therefore, it is more important for the person on duty at control room to extract as much information as possible. As suggested in the case of accident at Major Accident Hazard (MAH) units, here also a format can be developed for transport accidents and kept at PCR so that Officer In-charge can promptly ask questions and record information. He would ask the caller to:-

- Identify himself.
- Give details of accident (fire / gas leak).
- Give location of the accident (as exactly as possible).

Incase the caller is driver or cleaner of the subject vehicle, he should also ask him to:-

- Give name and quantity of chemical transported.
- Give source, destination and name of the transporter.

It will be useful to ask the source (i.e. name of the unit and location from where the product is sent) and destination (i.e. name of the unit and location from where the products is being sent) as this will help in calling the unit's representatives (if located nearby) also, who are generally aware about the nature of the chemicals and are trained in controlling leaks, transferring the leaking chemical to other container, neutralizing the chemicals etc.

## 5.8 NOTIFICATION TO RESPONSE ORGANIZATIONS

**Action: Departmental Officer Manning the District Collector Control Room (DCCR)**

**On receipt of call, he will:**

- Make sure that information is received at the police and fire stations, which are nearest to the incident site.
- Inform the three first responders i.e. police, fire and medical department by calling their chiefs / alternatives (in case chief is not reachable) as per the list of District Crisis Group (DCG) members available with him.
- Inform DC and all other member of DCG.
- As soon as he receives, further information after making the first call, he will convey that also in the same order.

## 5.9 RESPONSE BY POLICE, FIRE AND MEDICAL DEPARTMENTS

On receipt of information about offsite emergency, first responders will immediately deploy first batch of response teams from a location nearest to the incident site. They will further reinforce, if required, their teams by deploying additional resources from surrounding areas so that effective (based on their assessment of first information received) first response can be rendered at site. In the meantime they will keep additional resources in terms of manpower and equipment on high alert to move to incident site. On getting feedback from their response teams (who would have by then assessed the situation) they will take decision on movement of more teams. Once the assessed deployment is made, chiefs may also move to site for better operational control.

The officer of the first agency (police or fire) to reach the accident site would take charge as incident controller He will :-

- Cordon off at-least 100 m of the area surrounding the leaking toner.
- Notify / warn people in the downwind direction to evacuate the area and move in the cross wind direction.
- Control traffic and curious onlookers at the incident site.
- Inform traffic control room to diver traffic coming on the highway and only allow vehicles belonging to emergency response agencies such as fire, medical, red-cross, technical experts etc.

If the personnel of the fire department are the first one to reach the site, they will simultaneously perform the following functions:-

- With appropriate Personal Protective Equipments (PPEs), the fire team personnel will roll the toner (in case of chlorine toner damage) so that the defective / leaking valve is on the upper side. This will prevent the outflow of aerosol from the toner and only gas will come out. In other cases, appropriate action depending upon the situation, will be taken by them. However, if they are not sure, they should wait for inputs from technical experts.

**(In case of flammable material):-**

- With the help of fire hose, from a water curtain in the downwind direction, so that chlorine / other toxic gases get dissolved and vapor hazard is minimized.
- Attempt to tighten the defective valve to prevent gas leak, if this does not work, try to stop the leak with the equipment available in the chlorine kit.

- With fire suits on, the fire team personnel will, if possible, try bunding the surrounding area. This will prevent the spread the material.
- Inform nearby people / shops to extinguish cigarettes, bhattis or any other source of ignition as the fire may flash back to the tanker if vapors come in contact with an ignition source.
- Attempt to straighten the vehicle, if possible, by typing and pulling by another vehicle such as recovery crane etc.
- Initiate fire fighting measures if the vehicle is on fire.

The off-site emergency response is initiated by the above procedure and will involve specific response functions as discussed earlier in Chapter 2 and 3. However the scale of response for communications, fire medical, evacuation, rescue and public works personnel may be smaller in this case. In addition to the responsibilities described in Chapter 2 & 3, certain activities specific to transport emergencies are given in subsequent paragraphs.

## 5.10 TECHNICAL COORDINATOR

### Formulation of Response Strategy

There are potential accident scenarios in which the risks associated with certain types of response activities may exceed any benefits to be realized, thus providing ample reason to only undertake protective and containment actions from a safe distance until the situation has stabilized or expert assistance has been obtained. General examples of situations in which the best course of action may be to hold back from a direct "attack" include:-

- When a major release takes place that poses unknown hazards or hazards for which response personnel are not equipped or prepared.
- When a flammable gas or liquid is on fire and extinguishing could lead to release of toxic of flammable vapors or gases and possibly, explosive re-ignition.
- When there are no endangered persons or structures nearby and the containers and / or hazardous materials present significant hazards to response personnel.
- When the addition of water to a fire may serve to spread highly toxic contaminants into the environment, thus causing a pollution problem that may cost much more to resolve than the value of the burning materials, vehicles or buildings.

## 5.11 SAFETY COORDINATIOR

### Containment of Spills of Liquids or Solids on Land

The first step in spill response when a liquid or solid has been discharged onto a land surface is to contain the spilled material and to prevent the further spread of contamination. Although specialized equipment has been developed to construct dikes of foamed concrete or plastic materials, the most widely available and generally adequate substances to use are earth, sand, clay and plastic or rubber sheeting. Local safety coordinator and his combat team in association with the specialized personnel and equipment from the municipal corporation shall be responsible for containing the unconfined spill or liquid or solids at the incident site.

Dikes or barriers of earth, sand or clay materials can be quickly constructed with bulldozers, similar equipment or properly equipped individuals with shovels. It is necessary to consider that motorized equipment should not be used indiscriminately in the vicinity of flammable

or explosive vapors or gases. Local materials coordinator shall supply the necessary protective clothing and breathing apparatus to response personnel who may need to approach a spill.

Plastic or rubber sheeting can be used to cover spilled solids. This can prevent the wind from causing toxic dusts to become airborne and also protect the bulk of the solid from becoming wet from aid or hose streams used in the area, thus reducing the extent or possibility of soil, groundwater or surface water contamination by the spilled substance. Such sheeting can also be useful for lining dikes, basins, and trenches for similar purposes where liquids are to be contained. Finally, sheeting materials, together with stones or bricks and soil, sand or clay, can be used to cover storm drain openings in a pinch.

When hazardous materials have already entered a storm drain system, there are benefits to attempting to limit or contain the flow of the materials by damming at strategic locations. Since storm drainage systems typically flow into bodies of surface water, containment might prevent significant water pollution and facilitate later cleanup. However, it is to be noted that volatile chemicals (such as CS2) should never be trapped in a closed conduit such as a storm drain, primarily due to the possibility that explosive vapor may accumulate and encounter a source or ignition. Thus, judgments on damming must be made on a case by case basis by the safety / technical coordinator with special attention being given to cases in which containment’s may enter a water treatment plant.

## 5.12 FIRE SERVICE COORDINATOR

### Spill Control

Where a tank vehicle is losing liquid cargo, it may be worth while to have the means available to turn the body of the vehicle or container over such that the point of leakage rises. This will lessen the total amount of cargo than can escape before the liquid level in the tank drops below the height of the hole. This is especially true in vessels having volatile liquids or liquefied gases such as chlorine. The rolling over of the vessel will facilitate reduction of the outflow of the contents. Be advised, however, that this may require special equipment, trained personnel and expert supervision for a safe outcome.

Various types of transportation containers have internal emergency shutoff valves that can reduce or stop outflow from external valves that have been damaged in an accident. Knowledge of the standard placement and use of these valves can be invaluable, most particularly for highway tank vehicles. Driver and cleaners of vehicle carrying hazardous substances will be instructed and trained in these aspects by the safety coordinator.

### Special Fire-fighting Equipment and Materials

Public fire departments primarily rely upon water for fire control, but are well aware that water can be ineffective on some types of fires and may actually be counterproductive or dangerous for use in other cases. This list of chemicals on which water **SHOULD NOT** be used is given below :-

| | | | |
|---|---|---|---|
| 1 | Acetyl Bromide | 2 | Acetyl Chloride |
| 3 | Aluminum Chloride | 4 | Calcium |
| 5 | Calcium Oxide | 6 | Diborane |
| 7 | Dimethyl Sulphate | 8 | Lithium |
| 9 | Phosphorus Oxychloride | 10 | Phosphorus Trichloride |
| 11 | Potassium | 12 | Hydrogen Peroxide |
| 13 | Potassium Hydroxide | 14 | Rubidium |
| 15 | Sodium | 16 | Sodium Amide |
| 17 | Sodium Hydride | 18 | Sodium Hydroxide (Flakes) |
| 19 | Sodium Peroxide | 20 | Sulphur Chloride |

Since water is usually adequate for most large fires encountered, fire departments rarely stock more than a limited number of portable dry chemical or carbon dioxide extinguishers and possibly a small amount of foam concentrate. These supplies of auxiliary agents available with the

services may not be adequate for major chemicals or petroleum product fires. Thus for assisting the fire department in identifying sources of additional supplies and equipment for use in emergencies, the fire fighting resources available with the industries in Arvalli District are listed at Annexure 3.1.

## 5.13 PUBLIC WORKS COORDINATOR

Cleanup of Spills of Liquids or Solids on Land.

Once a spilled substance has been contained, the next step is to remove it from the environment. The effort is often undertaken by the supplier of the chemical or a spill cleanup contractor it may hire, but Local, District and State Governments should have a capability to respond when the responsible party is unknown or is unprepared or unwilling to take action and circumstances do not permit waiting for govt. intervention. Such situations are generally encountered during transport emergencies.

The methods usually applied for “gross” cleanup of contaminated ground surfaces are rather straightforward. They involve :-

- Use of contaminated pumps, hoses and tanks, drums or vacuum trucks to collect pools of accumulated liquids.
- Use of soil, sand, clay, straw sawdust, fly ash, cement powder, perlite, vermiculite or commercially available mineral or plastic absorbent materials to absorb and mop up liquid residues, and
- Removal of contaminated surface layers (where cleaning in place is not practical) by shovels or mechanical means.

In all cases, suppliers and equipment used must be compatible with the hazardous material spilled, workers must be protected from toxic exposures and special care must be taken in the presence of potentially flammable or explosive atmospheres.

Other current cleanup techniques include steam cleaning or detergent washing of solid surface where hydrocarbons or similar materials have spilled, burning of flammable or combustible materials in place where it is safe to do so and permitted by regulatory authorities.

The responsibility of cleanup lies with the public works coordinator who shall undertake cleanup operations based on the instructions from the DCG. Local safety and material coordinator shall provide him with backup support of men and material. It is desirable to keep plastic sheets, absorbent material etc. at the local command posts.

## 5.14 TABLE OF INITIAL ISOLATION AND PROTECTIIVE ACTION DISTANCES

1. The table of initial isolation & protective action distances suggest distance useful to protect people from vapor resulting from spill involving dangerous chemical which are considered poisons / toxic by inhalation. Distances show areas likely to be affected during the first 30 minutes after material are spilled and could increase with time.

   **The initial isolation zone defines an area surrounding the incident in which persons may be exposed to dangerous (up wind) and life threatening (down wind) concentrating of material. The protective action zone defines an area down wind from the incident in which persons may become incapacitated and unable to take protective action and or incur serious or irreversible health effects. The table provides specific guidance for small and large spills occurring day or night. Table of initial isolation & protective action distance.**

| Sr. No | Chemical Name | Small Spills | | Large Spills | | | |
|---|---|---|---|---|---|---|---|
| | | First isolate in all direction (mtr) | Then protect persons in down wind during | First isolate in all direction (meter) | | Then protect persons down wind during | |
| | | Day | Night | Day (mtr) | Night (km) | Day (km) | Night (km) |
| 1. | Liquid ammonia, anhydrous ammonia | 30 | 0.2 | 95 | 0.3 | - | 0.8 |
| 2. | Ammonia solution with more than 50 % ammonia | 30 | 0.2 | 60 | 0.2 | 0.2 | 0.3 |
| 3. | Chlorine | 60 | 0.3 | 185 | 0.8 | 0.8 | 3.1 |
| 4. | Ethylene Oxide | 60 | 0.2 | 125 | 0.3 | 0.3 | 1.0 |
| 5. | Hydro Cyanic acid | 60 | 0.2 | 185 | 0.8 | 0.6 | 2.7 |
| 6. | Hydrogen Fluoride | 60 | 0.2 | 155 | 0.6 | 0.5 | 2.3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7. | Hydrogen Chloride | 60 | 0.2 | 155 | 0.5 | 0.5 | 1.8 |
| 8. | Fluorine | 60 | 0.2 | 185 | 0.3 | 0.5 | 0.1 |
| 9. | LPG | 90 | 0.2 | 120 | 0.3 | 0.5 | 1.0 |
| 10. | Naphtha / NGL | 30 | 0.1 | 60 | 0.2 | 0.2 | 0.3 |
| 11. | Free SO3/H2SO4 | 60 | 0.2 | 185 | 0.8 | 0.6 | 2.9 |
| 12. | Bromine | 60 | 0.3 | 215 | 1.0 | 0.8 | 3.5 |
| 13. | Ethyl Mercaptan | 60 | 0.2 | 125 | 0.5 | 0.3 | 1.3 |
| 14. | Benzene | 80 | 0.1 | 100 | 0.3 | 0.2 | 0.6 |
| 15. | CNG | 95 | 0.3 | 245 | 1.3 | 1.1 | 4.8 |
| 16. | HN3 | 60 | 0.2 | 155 | 0.5 | 0.5 | 0.8 |

## Transport Emergencies: - Isolation / Evacuation Distances

| Chemical | Transport Emergency Guide No. | Evacuation Distances (m) | | | |
|---|---|---|---|---|---|
| | | Small Spill | Large Spill | | |
| | | | Initial Isolation | Plume Width | Plume Length |
| Acetaldehyde | 6 | - | - | - | - |
| Acrylonitrile | 17 | 30 | 60 | 600 | 1000 |
| Ammonia | 1 | 30 | 60 | 600 | 1000 |
| Butadiene | 3 | - | - | - | - |
| Carbon Disulphide | 8 | 20 | 40 | 300 | 500 |
| Chlorine | 14 | 50 | 90 | 1100 | 1600 |
| Chloroformates | 11 | - | - | - | - |
| Chlorosulpu-onic acid | 9 | - | - | - | - |
| Dimethylamine | 4 | 30 | 60 | 600 | 1000 |
| Ethylene | 5 | - | - | - | - |
| Ethylene Oxide | 13 | 30 | 60 | 600 | 800 |
| Ethylamine | 12 | - | - | - | - |
| Hydrogen | 5 | - | - | - | - |
| Hydrogen Fluoride | 1 | 50 | 100 | 800 | 1100 |
| LPG | 5 | - | - | - | - |
| Mercaptans | 8 | - | - | - | - |
| Methylamine | 4 | 40 | 70 | 800 | 1300 |
| Nitrogen Dioxide | 14 | 40 | 70 | 800 | 1300 |

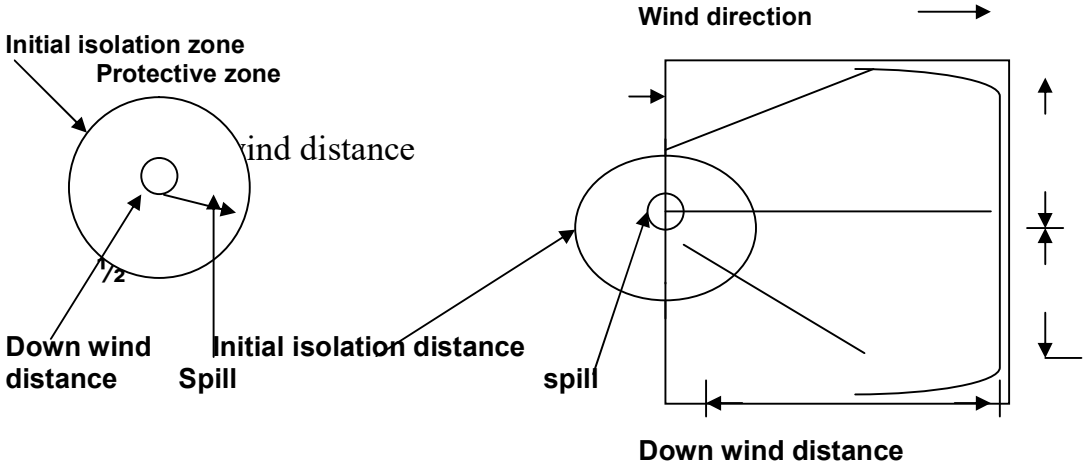
| | | | | | |
|---|---|---|---|---|---|
| Oleum / Sulphur Trioxide | 9 | 90 | 180 | 2400 | 3500 |
| Phosphorus Trichloride | 9 | 40 | 80 | 800 | 1300 |
| Propylene | 5 | - | - | - | - |
| Sodium | 16 | - | - | - | - |
| Sulphur Dioxide | 2 | 40 | 80 | 1000 | 1400 |
| Tert. Butyl Hydro Peroxide | 10 | - | - | - | - |
| Vinyl Acetate | 6 | - | - | - | - |

**How to use the table of initial isolation and protective action distance?**

(i) The responder
- Identified the name of the chemical.
- Read the guide for the chemical and taken the emergency action recommended.
- Noted the wind direction.

(ii) In determine if the incident involves a small or large spill and if day or night.

(iii) Lookup the initial isolation distance from the table direct all persons to move in cross wind direction away from the spill to the distance specified in the table.




Look up the initial protective action distance from the table. The table gives the down wind distance in km. The protection action zone is square, whose length & width are the same as down wind distance shown in the table.

# CHAPTER 6

## POST EMERGENCY ACTIVITIES

Once the situation at the site is under control, the spill / leak has been plugged, fire has been extinguished, the emission of vapors to the atmosphere has been effectively checked and a SAFE signal has been passed its time for the follow up exercise. Various activities remain unfinished, the details of which are given below in order of priority.

## 6.1 STRUCTURAL INSPECTIONS AFTER FIRES OR EXPLOSIONS

**Action: Technical Coordinator**

A major explosion could damage or destroy numerous buildings and any nearby bridges or tunnels. Similarly large fires can have major effects over a vast area. In either case, residents of partially damaged buildings will want to know if the structures are safe to occupy while they await repairs. Questions pertaining to the safety of highway or railway bridges must be resolved quickly to avoid traffic complications.

It is important to note that inspection personnel may require special precautions (i.e., chemical protective gear) in addition to normal safety equipment in those cases where the structure may still be contaminated by hazardous residues.

Fire and safety coordinators shall be responsible for inspecting the structural integrity of damaged buildings, bridges, or other structures in the aftermath of a fire or explosion.

## 6.2 POST-INCIDENT TESTING FOR CONTAMINATION

**Action : Safety Coordinator**

To some extent, this item overlaps with monitoring of concentrations. However, activity in “Action Plan” covers sampling and analysis during the initial phases of a response action while this one is concerned with the potential for persistent aftereffects.

Personnel of the Gujarat Pollution Control Board shall undertake to check crops, water (ground & surface), homes, stored foods, and animals that

may become part of the human food chain for possible chemical contamination. Help may be sought from the industries having capabilities for monitoring/ testing of contaminant in the target items.

## 6.3 WASTE DISPOSAL

**Action: Safety Coordinator**

Where the unit responsible for a spill do not take appropriate action, it may become necessary for public authorities to undertake disposal of hazardous wastes. This requires knowledge of Hazardous Waste (Management & Handling) Rules, 1989 (as amended in 2000) of the Ministry of Environment & Forests, Govt. of India. The location of approved and authorized disposal sites and the proper procedures for transporting and transferring wastes to these sites have also to be taken care of. Local authorities should seek assistance from the state department of environment. These departments will have considered such problems in their own state or regional emergency response plans. The items unfit for human consumption will also form part of the Hazardous waste, which needs to be disposed off in accordance with the above mentioned rules.

## 6.4 CLEANUP OF DEAD OR CONTAMINATED LIVESTOCK OR WILDLIFE

**Action : Public Works Coordinator / Medical Coordinator**

Contaminated animals must be sent to veterinary hospital for decontamination & treatment. A large number of animal carcasses be they hundreds of cows or chickens or thousands of fish can pose a variety of health hazards. Emergency response plans do not typically address this topic, possibly because it is somewhat distasteful, but the topic is worthy of consideration during the planning process where applicable. Where oil spills may contaminate waterfowl, consideration might be given to the formation of work crews to collect, clean, and care for the animals under the direction of experienced personnel. State and local public works agencies can provide assistance in planning for this activity. Local veterinarians and animal conservation groups may also be helpful, but in all cases, it is the responsibility of medical coordinator to ensure that personnel will not be placed at risk of adverse safety or health impacts by their actions.

## 6.5 PROVISION OF ALTERNATE WATER SUPPLIES

**Action : Utilities / Transport Coordinator**

There are a number of circumstances under which a potable water supply may become unfit for human consumption for a time and require replacement. This is most commonly accomplished by bringing in supplies of bottled water and/or tankers/trailers capable of carrying water. The later are available from local Municipal Corporation. Tankers carrying milk are another possibility for consideration once thoroughly cleaned. It is the responsibility of transport coordinator in association with the Social workers for arranging potable water for consumption of personnel engaged at the incident site. The potential sources of potable water are wells of water intake point of river, and ground water from neighboring villages / towns / agricultural areas where possibility of ground water pollution due to spillage of contaminants is minimal.

## 6.6 RE-ENTRY INTO EVACUATED AREAS

Action : Members of District Crisis Group (DCG)

Based on the assessment of the situation at the site, the DCG would take decision on the termination of emergency. Before this, however, several issues need to be resolved by the members of Local Crisis Group (LCG). Re-entry being again as complex as the evacuation operation, would require the respective coordinators to perform their functions such as transportation of evacuees back to their respective residential areas, restoration of electricity, gas, water supplies, post-accident monitoring of concentration, etc. The issues / activities thus required are listed at **Table - 6.1** in order of priority. However, as some of these are parallel activities, the decision should be taken based on actual site conditions.

The activities listed below are only those, which are essential for return of the normalcy. However, as the last item suggests, regular training to all sections of the society is also of equal importance.

## 6.7 SETTELMENT OF CLAIMS UNDER PUBLIC LIABILITIES INSURANCE ACT,1991

The Collector under whose jurisdiction the accident, resulting in loss of life or injury to a person or damage to property has occurred shall issue a notification to that effect and invite applications for claim of damages or compensation under sub section (1) of Section 6 of the Public Liabilities Insurance Act, 1991.

## 6.8 RESPONSIBILITIES OF OTHER STATUTORY AUTHORITIES

The designated authorities under various statutes like Indian Boiler Act, Factories Act, E.P. Act, Explosive Act, Static and Mobile Pressure Vessels Act etc. shall perform post emergency activities prescribed and also as directed by District Collector under Gujarat State Disaster Management Act, 2003.

**Table - 6.1**

**Post Emergency Activities**

| Activity | Responsibility |
|---|---|
| Check the industrial unit for possible secondary effect of delayed relapse. | Technical Experts |
| Provide notification at the shelters of termination of emergency | Communications Coordinator |
| Restoration of water, electricity & gas supplies | Utilities Coordinator |
| Arrange for transportation of evacuees back to residence | Transportation Coordinator |
| Restoration of law and order in the affected areas | Security Coordinator |
| Establish grievance cell | Liaison & PR Coordinator & Chairperson of Local Crisis Group |
| Hold press conference | Public Relations Coordinator |
| Hold public meetings for answering their queries | PR Coordinator in Association with Officials of the concerned (MAH) unit |
| Arrange for providing interim relief to the affected people | District Collector |
| Undertake accident investigation & documentation | Technical Coordinator |
| Arrange further relief to the affected people based on claim applications | District Collector |
| Plan updating, if so required | District Crisis Group (DCG) |