



EMERGENCY PLAN

[Schedule - 8A, Under Rule - 68-J(12)(1) of Gujarat Factories Rules 1963(2004) and Schedule - 11 under Rule 13(1) of MSIHC Rules - 1989 (2000)] J

ON-SITE

Prepared By	Reviewed By	Approved By	Revision No./Year
Mr. Piyush Parmar	Apex Safety Committee	Mr. Rajendra Tak	Rev-07 01.06.2022



FOREWORD

Occupational Safety and Health is an area concerned with safeguarding the health and welfare of workers working under risk conditions of the industry. The development of an appropriate response to the emergency issues should rely on and make use of the collective body of knowledge, experience and good practice in this area.

Keeping in view the basic objectives of an “On-Site Emergency Plan” and in conformity provisions under schedule 8-A of Rule 68-J of The Gujarat Factories Rules 1963(2004), along with guide Lines issued by Director, Industrial Safety & Health (CIF), Gujarat State.



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Abbreviations

Name

A/B	Above Ground
Amb	Ambient Temperature
Asst	Assistant
Atm	Atmospheric Pressure
CA (EPPR)	Chemical Accident (Emergency Planning
D.G.	Diesel Generating Set
DISH	Director of Industrial Safety & Health
Dy	Deputy
EHS	Environment, Health & Safety
ETP	Effluent Treatment Plant
F/A	First Aid
F/E	Fire Extinguishers
GPCB	Gujarat Pollution Control Board
HAZCHEM	Hazardous Chemicals
I.S.	Indian Standard
KL	Kilo Liters
LEL	Lower Explosive Limit
m/s	Meter/second
MAH	Major Accident Hazard
MSDS	Material Safety Data Sheet
MSIHC	Manufacturing, Storage and Import of Hazardous
MT	Metric Tons
OHC	Occupational Health Centre
OP	Operation
PESO	Petroleum & Explosive Safety Organization
PHC	Primary Health Centre
PPE	Personal Protective Equipment
Pre	Pressure
Prod	Production
Sr.	Senior
SBA	Self-contained Breathing Apparatus
SOP	Sulphate of Potash
Temp	Temperature
TLV	Threshold Limit Value
UEL	Upper Explosive Limit



AMENDMENT SHEET

Sr. No	Amendment No.	Chapter no.	Para no.	Page No.	Date	Summary	Approved By



REPORT SECTION



ARCHEAN CHEMICAL INDUSTRIES LIMITED



CHAPTER-1 SCHEDULE-8A

Schedule - 8A, Under Rule - 68-J(12)(1) of Gujarat Factories Rules 1963(2004)
Schedule - 11, Under Rule - 13(1) of MSIHC Rules 1989 (2000)

1. Name and Address of the person furnishing the information

1.1. Factory Address:

Archean Chemical Industries Ltd

Greater Rann of Kutch, Village: Hajipir,
Taluka: Bhuj, Dist.: Kutch. Pin. 370605
M-94298 96989

1.2. Office Address:

'Anandam'

D/4,nu-0-, Shakti Nagar, Opp. Lions Club,
Gandhidham-370201.
Ph.-02836-234259/234158/233841

1.3. Occupier : Residence Address :

Mr. S. Meenakshi Sundaram, Director,

Archean Group 20/43, K B Dasan Road
Teynampet, Chennai – 600 018

1.4. Factory Manager : Residence Address :

Mr. Bhupathi K. Unit HEAD.

Greater Rann of Kutch, Village: Hajipir, Ta.: Bhuj,
Dist.: Kutch-370605. Gujarat, India.



2.0 Key personnel of the organization and responsibilities assigned to them in case of an emergency

Sr. No.	Post	Name	Designation	Mobile Number
01	Site Main Controller	Mr. Bhupathi K.	Unit Head	8086996117
02	Alternate Site Main Controller	Mr. Anil Kumar	GM	9099052731
03	Incident Controller	Mr. Vijayaraghvan	GM	9409305495
04	Dy. Incident Controller	Mr. Subash Kasinathan	Project Head	9408703477
Key Person				
01	Emergency Control center	Mr. Piyush Parmar	Dy Manager	9429892747
01	Safe Assembly Point	Mr. M Krishnan	Dy Manager	9429109651
02	Technical Team	Mr. Hemmana G.T.	AGM	9409305481
03	Maintenance Team	Mr. Govind Malastar	Sr. Manager	946730355
04	Electrical Team	Mr. Hitesh Agravat	Sr. Manager	9428896055
05	Rescue Team	Mr. Harshad Giri	Executive	9601324999
06	Evacuation Team	Mr. P. Nambiar	AGM	9427205847
07	Safety Expert	Mr. Rajendra Tak	AGM	9409104656
08	Medical & First aid Team	Dr.B.G.Sodha	FMO	9408703404
09	Security & Traffic	Mr. Arvind Varotra	Sr. Executive	9408703467
Essential Workers				
01	Fire Fighting	Mr. Hasmukh Dadhaniya	Sr. Executive	9428895867
02		Mr. Surendra singh	Executive	8875363167
03	Rescue Team	Mr. Harshad Giri	Executive	9601324999
04		Mr. Dayalal Patel	Manager	9428895991
05	First Aid	Mr. Bhavik Patel	Executive	9924453572
06		Mr. Mithilesh	Executive	9428896040
07	Electrical Team	Mr. Rakesh Patel	Dy Manager	9426896935
08	Workshop Team	Mr. Dilip	Executive	9426896587
09	Water Supply	Mr. Mayur Joshi	Executive	94093 05483
10	Security & Traffic	Mr. Vijay	Executive	9408703477



3. Outside organizations if involved in mutual aid during On-Site Emergency

- (a) Type of accidents
- (b) Responsibility assigned

There is no other any unit surrounding the Factory. However, following type of accident/incident may create the On-Site Emergency:

(a) Type of Accidents/Incident,

- TOXIC GAS DISPERSION
- FIRE - EXPLOSION

4. Details of liaison arrangement between the organizations

5 (a) Information on the preliminary hazard analysis Type of accidents/Incidents

- Toxic Gas Dispersion
- Fire
- Explosion

5 (b) System elements or events that can lead to a major accident.

- Inadequate design against internal pressure, external forces, corrosion and temperature.
- Mechanical failure of Pipes, Vessels, Elbows due to corrosion, erosion, impact, liquid expansion etc.
- Failure of manual and automatic control system and safe devices or instrumentation.
- Failure of safety systems.
- Weld failure, Gasket failure.
- Unsafe operation / maintenance.
- Heating of electrical element may result into fire.
- Natural Calamities

5 (c) HAZARDS

- **TOXIC GAS DISPERSION**
 - (a) Chlorine
 - (b) Bromine
- **TOXIC LIQUID SPILL/SPREAD**
 - (a) Sulphuric Acid
 - (b) Hydrochloric Acid



- **EXPLOSION**

- (A) Boiler
- (B) D.G. Set
- (C) Process- Reactors
- (D) Pressure Vessels
- (E) Co-Gen Plant
- (F) FES Plant (Sulphur)

- **FIRE**

- (a) D.G.Set
- (b) Boiler
- (c) Coal-Yard
- (d) Tank-HSD, Petrol
- (e) Co-Gen Plant, etc.

- **ELECTRICAL FIRE**

- (a) Co-Gen Plant, General electric lighting area, Electrical Cable Trays, etc.

5. (d) Safety relevant components

- Necessary License from Explosive Department obtained.
- Provision of Storage of Chlorine tonners separate Storage area.
- Gas Detectors, Chlorine Kit, Caustic Pit, SCBA set, etc.
- Provision of FRP Hood with suction pump arrangement.
- Provision of Blower with HCL Scrubber.
- Auto Control System.
- Provision of PPE, Water Shower with eye Washer.
- Fire Protection System.
- Qualified Operatives/ Supervisors.
- Test, Examination & Certification of Pressure Vessels, Lifting Tackles, etc.
- Calibration and Maintenance Schedule.
- Displaying Instruction, Cautionary Notice, Permit to work system, etc.
- Provisions of training to workers, operatives, Supervisors, etc.

6.(a) Details about the site

Location of dangerous substances

- **POTENTIAL AREA FOR TOXIC GAS DISPERSION**

- a) Chlorine : Tonner
- b) Chlorine : Pipe line, Handling
- c) Chlorine : Process Area
- d) Scrubber : Scrubber Vent
- e) Bromine : Storage area: Bottle -Crate, ISO-Tank



ARCHEAN CHEMICAL INDUSTRIES LIMITED



- f) Bromine : Pipe line
- g) During Process-Reactor Failure, etc.

- **POTENTIAL AREA FOR TOXIC LIQUID SPILL/SPREAD**

- (a) Tank-Farm: Sulphuric Acid.
- (b) Tank-Farm: Caustic Soda Lye.

- **POTENTIAL AREA FOR EXPLOSION**

- (A) Boiler
- (B) D.G.Set
- (C) Process- Reactors
- (D) Pressure Vessels
- (E) Power Gen. Plant

- **POTENTIAL AREA FOR FIRE**

- (a) D.G.Set
- (b) Boiler
- (c) Coal-Yard
- (d) Tank-HSD, Petrol
- (e) Power Gen. Plant

- **ELECTRICAL FIRE**

Co-Gen Plant ,General electric lighting area, Electrical Cable Trays, etc.

6.(b) Seat of key personnel

- Administration Building
- Plant Office

6.(c) Emergency Control Centre

- Experienced & Senior Person will be deputed as Officer on duty in Emergency Control Centre.
- Emergency Control Centre is located in ECR-1
- Facilities like, P.P.E., Safety Equipment, are provided in Emergency Control Centre.
- On-site Emergency Plan, M.S.D.S., Location Plan, Inventory of stores, etc. are available.
- Emergency Contact numbers, instructions, duty list, etc. are kept ready



7 (a)

Description of hazardous chemicals at plant site				
Chemicals (quantities and toxicological data).				
Sl. No.	Name of Hazardous Substance	Type of Storage	Max Storage Quantity	TLV (PPM)
1	Chlorine	900kg in Tonner	270MT	1 ppm,
2	Caustic Soda Lye	Tanks-1	22MT	2 (ceiling) mg/m3
3	Sulphuric Acid 98%	Tanks-4	160MT	0.2 mg/m3 TWA
4	Lime	Bags	200MT	
5	Sea Britten	Ponds-7	Brine Field	
6	Sulphur	Bags	600T	
MAJOR PRODUCTS				
1	Bromine	ISO glass Lined Tank & Glass Bottles-5 Kg	100MT+5 MT	0.1 ppm
2	Sulphate of Potash	Bags	100000/ MT/YEAR	
FUEL				
1	Coal	Yard	500MT	Combustible
2	Diesel	Tank-2	40KL	800 ppm

7 (b) Transformation if any which could occur

- During the process , if reaction becomes uncontrollable, then; possibility of Toxic Gas dispersion or Explosion

7 (c) Purity of chemicals

- Generally All chemicals are pure

8. Likely dangers to the plant

- Use of Toxic compressed Gas: Chlorine -- Storage, handling and process.
- Use of Bromine ;Toxic liquefied gas/Liquid: storage; process.
- Installation of Pressure Vessels, Process Vessel, D.G. Set, Boiler, Elec. Power Gen. Plant, etc.
- Bulk storage of Toxic liquid - Sulphuric Acid, Caustic soda, etc.
- Fire -prone area: Boiler House, Coal-Yard, D.G.Set, Fuel Storage Tank, Elec. Power Gen. Plant, & Sulphur Storage

9. (i) Enumerate effects of Stress and Strain caused during normal operations

Stress & Strain occur in manual and in mental work, yet its sensation is appreciated in the mind only. The result of Stress and Strain on worker generally inefficient and accident prone is a fairly recent one and not always appreciated. The muscular stress and Fatigue, mental and nervous fatigue, Boredom and Chronic fatigue, improper environment, climate, lighting, noise, vibration, ventilation, some effect of Insomnia (frequent sleep problem) etc. are the stress & strain effects. There are nearly always potential accident hazards.



9. (ii) Fire and explosion inside the plant and effect if any of fire and explosion outside

- Most of the major chemicals are toxic (noncombustible) in nature, so possibility of FIRE is rare.
- Even in case of fire, there will be no effect outside. In case of explosion, in Boiler, D. G. Set, Pressure Vessel, Elect. Power Gen. Plant, etc. Considering wide area of plant, there will be inside effect and no effect outside

10.(i) Details regarding Warning, alarm and safety and security systems

- Siren :Company has provided manual bell, and Electrical Siren
- Safety System :
 - o Storage of Chlorine tonners is separate and isolated area.
 - o Provision of Mechanical handling (Hoist + Mono rail) System for Chlorine Tonners.
 - o Provision of Chlorine Detector with alarm system.
 - o Provision of Chlorine Kit, Caustic Pit, SCBA set, etc.
 - o Provision of FRP Hood with suction pump arrangement.
 - o Provision of PPE and safety equipment.
 - o Employment of Qualified, experienced &Trained Operatives/supervisors.
 - o Provision of Safety shower with eye washer.

10 (ii) Alarm and hazard control plans in line with disaster control and hazard control planning, ensuring necessary technical and organizational precautions

Declaration of SHE Policy.

- Organization Structure and assignment of responsibility.
- Examination & checking system of each Chlorine Tonner, while receiving.
- Provision of Chlorine Detector with alarm system.
- Provision of Chlorine-pit with adequate quantity of Neutralizing Agent.
- FRP Hood with suction pump arrangement.
- Only Qualified & experienced operatives/supervisors are employed.
- Periodical Maintenance Schedule.
- Examination of Health of workers, & maintenance of Health records
- Periodical Test & Examination of Pressure vessels, Lifting Tackles, Centrifuge machines by competent person.
- Accident Reporting, investigation and recording System.
- Safety Committee constituted.
- Training on safety awareness, 5-S System on Good House Keeping, Marking & Labeling, Process & safety, use of P.P.E., Safe Operation System, etc.
- Establishing Emergency Control center, safe assembly point, escape route, codification of siren, wind sock, assignment of responsibility to persons, displaying signs, posters, instructions, boards, etc.
- Periodical Mock-Drill on on-site emergency-plan.
- Daily presentation on work performance to higher authorities.
- Computerization System.
- Toxicological Details on all chemicals used in the plant
- Preparedness on medical emergency, FMO, sp. medical treatment and provision of antidotes, Medical Exam. of workers & Maintaining Health Records.



10 (iii) Reliable measuring instruments, control units and servicing of such equipment's

- Purchasing Policy to get standard & reliable quality with modern technology.
- Provision of Chlorine detectors with alarm system in the Chlorine shed area
- All such equipment's/instruments will be Calibrated and tested periodically

10 (iv) Precautions in designing of the foundation and load bearing parts of the building

- All the foundation and load bearing parts of the building are designed as per Prevailing Indian standards keeping necessary precaution

10 (v) Continuous surveillance of operations

- Necessary preventive and periodical Inspection & Maintenance are carried out by Company. Lifting Tackles, Pressure vessel etc. are tested and certified by Competent person periodically as mentioned in The Gujarat Factories Rules

10 (vi) Maintenance and repair work according to the generally recognized rules of goods engineering practices

- Company is following maintenance and repair work according to the generally recognized rules of good engineering practices

11. Details of communication facilities available during emergency and those required for an Off-Site Emergency

- Bell, siren, Public Address System.
- Mobile Phones
- Fax
- Messengers
- Internet
- Wind Sock
- Vehicles

12. Details of firefighting and other facilities available and those required for an off-site emergency

Majority of chemicals stored and used are toxic in nature, however following facility will be provided, as fire protection system

- Outside Water Supply, keeping Reservoir with capacity of 12550 M3 Water
- A/G Water Tank, 630 M3 X 2.
- Pump Sets: Electric, Jockey, Diesel.
- Fire water pipeline network, hydrant, monitors, hose pipes, fire buckets, etc.
- CO2 Type Fire Extinguishers 4.5 Kg:- 53 Nos.
- Water Type Fire Extinguishers 9 Kg:- 03 Nos.
- DCP type Fire Extinguishers 50 Kg:- 6 Nos.
- DCP type Fire Extinguishers 06 Kg:- 80 Nos
- Foam Type Fire Extinguisher 9 Liters : 01 Nos.



Other Facility for Toxic Chemicals like Chlorine;

- Chlorine Kit, Caustic Pit, multiple gas detector, Radiation Monitor, etc. are provided
- SCBA sets (40 Minutes) 5 Nos are available.
- Chlorine Pit with Adequate quantity of Neutralizing Agent
- Safety Shower with eye wash unit,
- Wind Indicator, siren, vehicles, messenger, Mobile Phones
- FRP Hood with suction pump arrangement
- PPE like Helmet, Dust Mask, Gum Boot, Hand Gloves, Safety Goggles, Safety belt are available

13. Details of first aid and hospital services available and its adequacy

- First Aid Box is provided at Emergency Control Room, Security Office and Admin. Office.
- Nakhatrana is about 70 Km from the Unit.
- Doctors, Beds, Other Equipment's, Ambulance etc. are available at the Government Hospital, Bhuj, which is 120 KM away from the Site and Govt. Hospital, Gandhidham, 160 KM away from the Site.



CHAPTER -2 PREMEABLE

2.1 PROLOGUE

Archean Chemical Industries Ltd is located at Greater Rann of Kutch Village Hajipir Taluka Bhuj, Dist. Kutch, and is engaged in manufacturing Sulphate of Potash Raw Material of Fertilizers and Bromine marine chemical by use of sea water and Chlorine . The Major Hazardous Chemical used in the process is Chlorine . The Chlorine is compressed gas and received in Tonners , with capacity of 900 Kg . The maximum storage of Chlorine Tonner is 300 Numbers . Further , Sulphuric Acid , Caustic Soda , Lime , etc. other hazardous chemicals , in bulk quantities ; are stored and used in the manufacturing process . Further , The Unit has Co - Generation Plant to produce electricity on coal base . Presently Plant is under installation stage . Being a chemical manufacturing Factory , the management has to prepare the “On -site Emergency Plan” for his Factory as provided under Schedule 8-A of Rule 68 -J - (1 2) (1) of GER - 1963 (2004).

2.2 Major Accident Response System :

Specific actions during actual emergency are systematically described for each designated person separately . Further , response actions for different scenarios are illustrated .

2.3 Presentation of documents

The document of On Site Emergency Plan contained in two folds , as per below ;

Part - I :Description Section

Part - II :Annexure Section

2.4 Abbreviation

Abbreviations used in this report are given at the page in beginning of the chapter .

2.5 AMENDMENT SHEET

Any amendment in this document shall be entered time to time in the sheet as provided at the end of index .



2.6 GLOSSARY OF TERMS

The Glossary of terms and certain definition related with industrial emergency / disaster are given at Appendix -T , for reference purpose.

2.7 Information to the Public

The disclosure of information to general public , as sample ; is given at Appendix –R



CHAPTER-3 INDUSTRIAL EMERGENCY

3.1 GENERAL

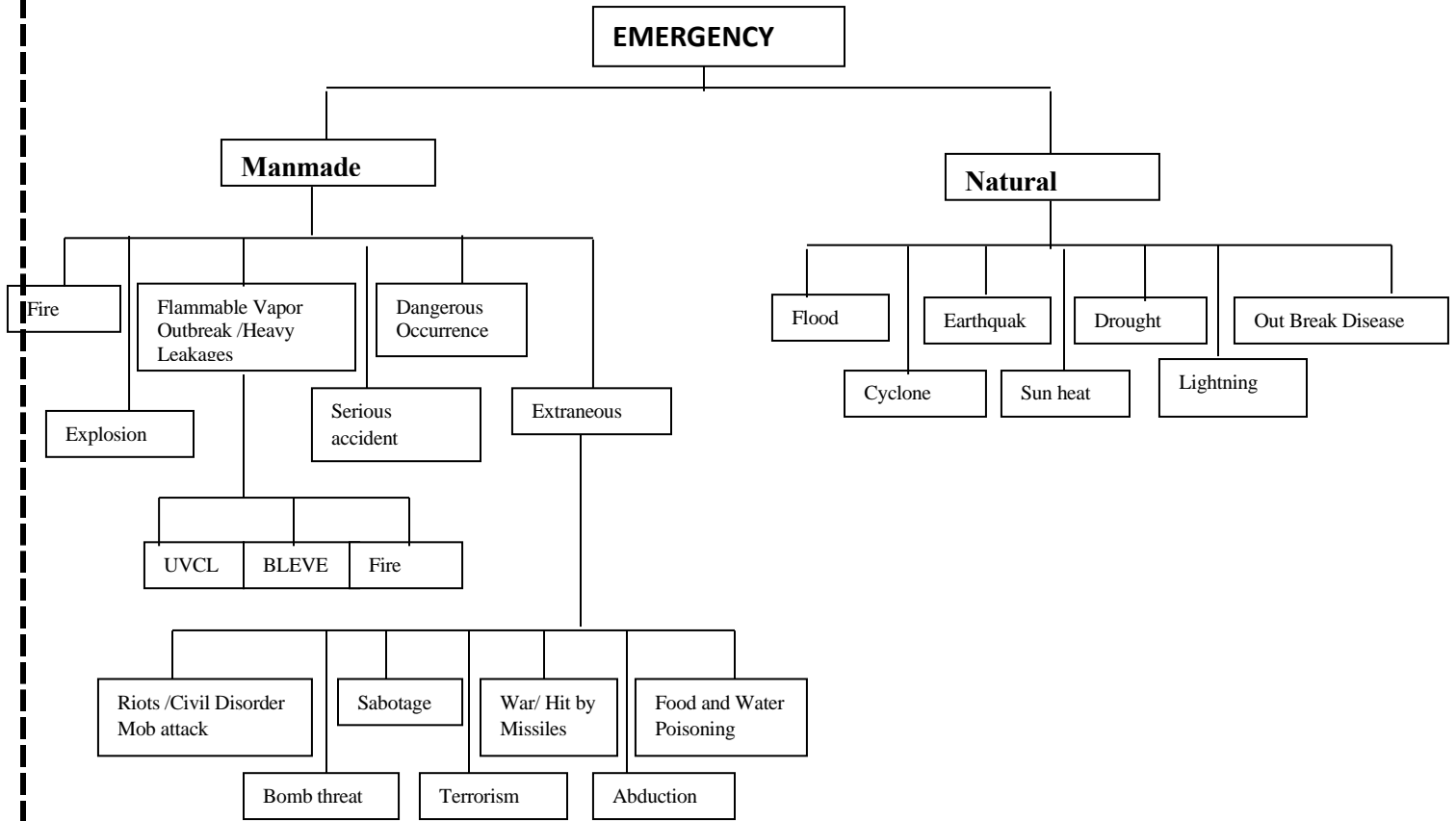
The Emergency is an undesirable occurrence of events of such magnitude and nature that adversely affect human lives and property as well as damage to the environment. The disaster may be man-made or natural type. The Unit has to be prepared against such emergency/disaster and consequence.

It is difficult to forecast the time and nature of emergency, which might strike on the road. In spite of the fact that every person is expected to take steps to assess, minimize and wherever feasible eliminate risks. Accident may occur, as risk can only be minimized, it can never be totally eliminated.

3.2 CLASSIFICATION OF EMERGENCY

Industrial plants are vulnerable to various kinds of natural and man-made emergency. Examples of Natural disasters are flood, Cyclone, earthquake, lightning etc. and manmade emergency like major fire, explosion, sudden heavy leakage of toxic/flammable gases, civil work plant failure, human errors, vehicle crash, sabotage, etc.

Thus, the Emergency can be divided in the following types, depending upon the nature



3.3 NATURE OF AN CHEMICAL EMERGENCY

Mode of Emergency may depend upon the chemical property of the hazardous materials and maximum inventory . Fire emergency may arise due to flammable property of the Hazardous material . While explosive materials may create explosion . Toxic gas dispersion in atmosphere creates Toxic release Emergency . Further , uncontrollable chemical reaction or dangerous occurrence may result into emergency . However , chemical incident can be following types

- 1 .Toxic /flammable gas /vapours release as plume /puff from container /fittings failures , tank ruptures etc . including flashing liquids stored above their atmospheric boiling point .
- 2 .Spill of a toxic / flammable liquids .
- 3 .Fire : Flash Fire , Fire Ball , Pool Fire , Heavy Fire , Fire with domino effect , etc .
- 4 .Evaporation and dispersal of toxic vapors from liquid spill pools .
- 5 .Ignition of flammable gases and vapors leading to Unconfined Vapor Cloud Explosion (UVCE) on site and /or offsite
- 6 .Boiling Liquid Evaporating Vapor Explosions (BLEVE) .
- 8 .Mechanical/confined vapor explosion (CVE)including deflagrations (slow burning) and detonations(rapid burning) .
- 9 .Explosion , Dust explosion .
- 10 . Collapse of Tank /container .



- 11 . Collision with vehicles or striking the Vehicles
- 12 . Slips / obstructed /
- 13 . Bursting of vessels /pressure plants /equipment , etc .
- 14 . Manmade incident / Disaster .
- 15 . Natural Calamity , etc

3.4 INDUSTRIAL EMERGENCY PLAN

While preparing the emergency plan , worst possible scenario of the accident or incident of the Unit should be considered . The worst effect of the maximum quantity of hazardous chemical , which create major accident must be calculated .

Controlling the emergency will require prompt action by the operating staff , the staff of various agencies , emergency teams and outsiders when called for . Minimizing the effect on people may be achieved by prompt communication , rescue , evacuation etc . , if the situation so warrants .

However , an effective emergency plan helps to minimize the losses in terms of human lives , plant assets and environmental damage and to resume the working condition as soon as possible . In all these steps SPEED IS THE ESSENCE .

3.5 STAGES OF THE PLAN

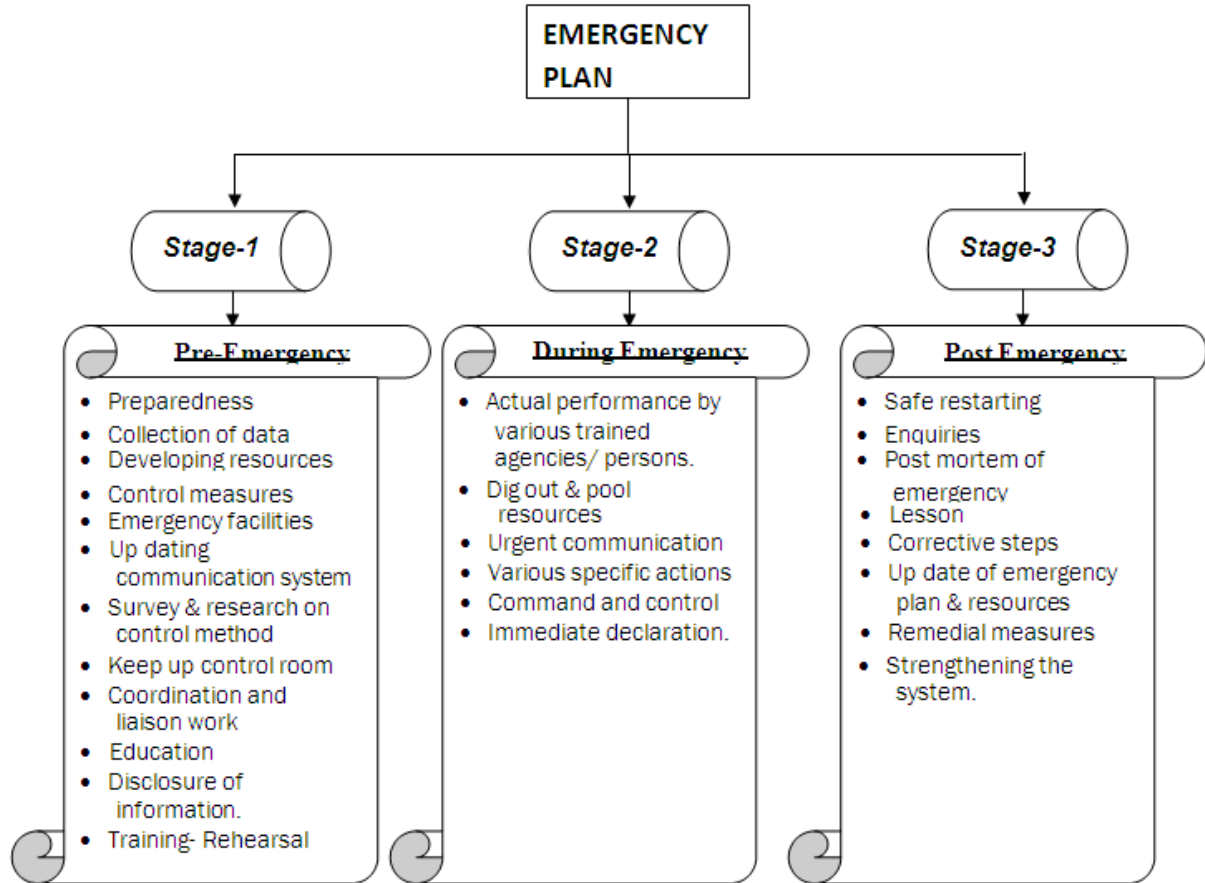
The plan consists of the actual performance of duties & responsibilities by designated personnel and other agencies . Therefore , the plan is divided into three stages . The stage one is pre -emergency period i.e. Normal activities before emergency or preparedness , awareness and training parts

While stage second explains actions during emergency period i .e . during actual emergency period , specific duties are to be performed by designated personnel , using available resources & control measures in systematic ways

The third stage indicates post emergency period , which describes how to safe rehabilitation , restarting , to face inquiry , to preserve evidences and records for remedial measures etc ; as required by various authorities . It also explains corrective steps from the incident and finding out the correct reason behind the emergency , so that such type of incident will not occur again.



The chart of emergency plan, explaining how entire arrangement is required to manage, is produced below



3.6 Level of the Emergency

The level of Emergency can be classified according to the gravity of the situation at site . The command and control will follow as per the level of emergency .

Level -I: On -Site Emergency

The type of emergency , which can be handled and controlled by the management with own resources as per On -site emergency plan , is called as On -site or Level -I .



Level -II : Mutual Aided / Local crisis (Off -site)

If the Level -1, is uncontrollable by the management, further help is needed, the neighboring units or mutual aided local units will provide their resources to tackle the situation. The emergency of the unit which is handled and controlled by the outside resources, is called as Mutual Aided local crisis or Level -II. Further, if this type of emergency is governed by Local Crisis Group then it is called as Local Crisis Level -2.

Level -III : District Crisis (Off -site)

Even after putting efforts as explained in Level -II, the situation becomes uncontrollable and beyond the control of Local Crisis Management, then the District Crisis Group will take over the charge & handle the emergency situation. This is termed as Level -III or District Crisis.

Level -IV : State Crisis / National Crisis (Off -Site)

If gravity and situation of the emergency is beyond control of Local or District Crisis Group, The State /National Crisis Group has to command and control such crisis by utilizing all resources from the State or Nation, as prevailing circumstances, and then it is called as State Crisis or National Crisis

3.7 ACTIONS DURING EMERGENCY

The basic objectives of the on -site emergency plan are to handle and control the emergency /incidence by maximum use of available own resources in shortest time by the management itself. These can be described as below :

- 1 .To identify the emergency and affecting area .
- 2 .To disclose the type of emergency & to act accordingly .
- 3 .Initially contain and ultimately bring the incident under control to minimize damages to property , life and environment .
- 4 .Rescue & treat casualties and safe guard others .
- 5 .Identify the personnel affected / dead , inform their relatives and provide help for their needs .
- 6 .Ensure the safe rehabilitation and return of normalcy in the affected areas .
- 7 .Provide authoritative information to the news media & others .
- 8 .Preserve relevant records & equipment for subsequent inquiry into the causes and circumstances which lead to the emergency ; etc . .



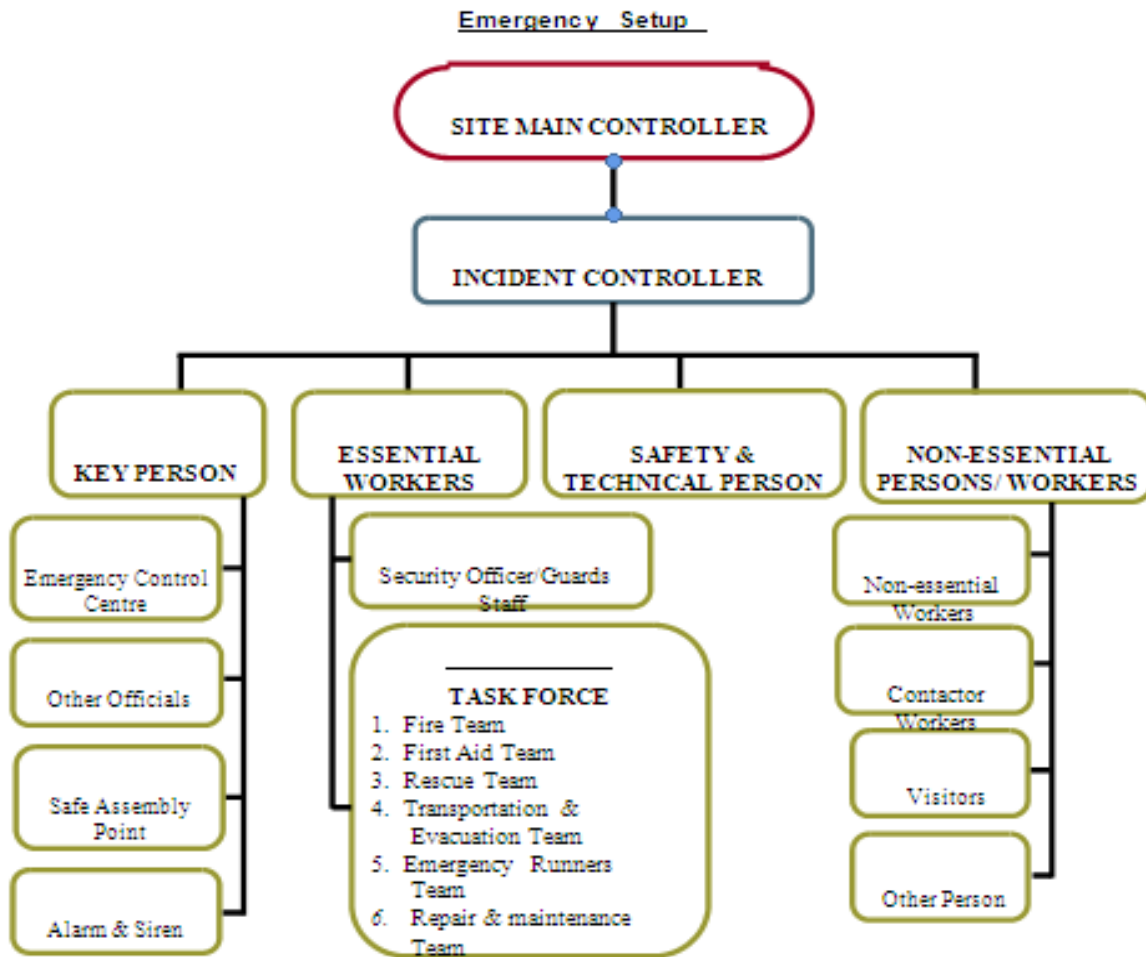
3.8 Emergency Management

The emergency management plan includes clear stating the line of command , each person 's specific responsibilities , and organizational set up available to tackle the emergency effectively . The command & control will be single structure , till emergency controlled . The personnel from the organization involved in emergency response management are identified as Designated Persons.

In order to effectively achieve the objectives of emergency planning , the critical elements that form the back bone of On Site emergency plan are ;

- Reliable and early detection of an emergency & control planning .
- The command , Co -ordination and response management structure along with efficient trained personal
- The availability of resources for handling emergency .
- Appropriate emergency response action .
- Effective notification & communication facilities .
- Regular review and updating of documents .
- Proper training to the concerned personnel .
- Periodical Mock -Drill /Exercise /Rehearsal

The participating persons as designated in the emergency management are in the following manner



3.9 INFRASTRUCTURE

3.9.1 Assembly Point

The Assembly Point is marked at a conspicuous place, i.e. near security office and entry gate. The non-essential workers include employees, who have no any duties/responsibilities allotted, contractor's person, vendors, visitors etc. have to rush at specified Safe Assembly Point, as announced, or they have to go at Assembly point as directed by IC/ Security/ Control Room, or rush to well away from areas of risk and least affected by the down wind direction. They have to report their presence to the person attending duty.



3.9.2 Emergency Control Centre

ECC is Communication Centre during the emergency. The senior and expert person shall be posted as In Charge of the ECC. ECC shall be safe & without risk. The particulars like On Site Emergency Plan, MSDS of hazardous chemicals, Plan -layout of the Unit, maps, drawing, details of storages of chemicals, tank farm, process, emergency telephone with contact person, Manual, Weather details, List of essential workers & key person etc. details shall be kept available at the ECC and incharge shall ensure the availability of such documents; while taking charge. The In-charge of communication Team will carry out the all type of communication work and arrangement.

SMC will activate E.C.C. by posting proper senior person, who obey and perform the emergency duties in time, like - sounding the siren, alert the workers /persons regarding type of emergency and response actions, direction to safe assembly point /shelter, to communicate to the authorities, surrounding people and industries, type of helps/source required from outside, and other required matter for emergency purpose. Incharge of ECC will be constant touch with SMC /I .C.

3.9.3 Alarm & Siren

Workers and other persons are engaged in their work, they should be alerted to save life and rush to the safe area, in case of emergency arise.

Thus, siren or any device is useful to alert the people immediately and it is installed at the office building, where it can be heard to all the employees.

3.9.4 Emergency Facility

The various types of equipment's, appliances, facilities, etc. are to be utilized during the emergency, which depends upon type of emergency. Therefore, the emergency facilities shall be ascertained & listed according to the hazardous chemical being stored, handled or processed including quantities. Further, it should be ensured by the concerned person that the sufficient inventories should be maintained & keep in order to handle the emergency successful. Ensure the availability of P.P.E., Safety equipment, Neutralizing Agents, D.G.Set., adequate supply of water, man power, etc.



3.9.5 Emergency Medical Services

Emergency Medical Treatment , medicines , antidotes , list of hospitals etc. shall be kept ready . FMO shall arrange casualty receiving center , para -medical staff , colour code -badges (injury wise identification of persons) , Register to maintain attended patient , required antidotes , toxicological details on hazardous chemicals used at the Unit . etc .

3.9.6 Resources

The following resources shall be available in adequately , working condition & updated for the emergency purpose .

- Emergency Telephone Numbers .
- Fire Protection Systems .
- Communication System .
- Storage of Water & Availability of source of water .
- Personnel Protective Equipment & Safety Equipment .
- Emergency Medical Treatment & Antidotes .Weather details .
- MSDS of all chemicals used , stored at site .
- List of Emergency Equipment Suppliers , Medicines Suppliers , List of Hospitals , Water Resources etc .
- Mutual Aiders list with contact person

3.9.7 Communication during emergency

- On declaration of On -Site Emergency by SMC /IC /Authorized Person , will activate the ECC and in charge of ECC will follow the instructions as illustrated as below 1 .Sounding the siren , as type of emergency .
- Call the Fire -persons , Services /fire -brigade and to start responding action .
- Call the designated persons , Safety Officer , Technical Person , FMO , and ask them to perform responding action as per situation .



- Call Incharge - person of Emergency Control Centre and ask to activate the ECC, and inform regarding on-site emergency, as per schedule, which includes, i. By sounding siren /announcing according to the type of emergency.
- Inform to Fire -Services to rush with specific responding equipment
- Inform to internally to the Designated Persons, Key Persons, Essential Workers, Officers, FMO, to report to SMC /IC immediately and start responding actions under intimation to SMC /IC.
- Inform to internally to workers, non-essential persons; directing to go to the Safe-Shelter, and report to authorized person their presence
- Inform to surrounding industries, mutual aiders, etc. to rush with required type of helps.
- Intimate regarding emergency situation to Police, Factory -Inspector, Collector, other Govt. Authorities.
- Inform the Govt. / Pvt. hospitals for making necessary arrangement.
- Inform to the relatives of injured or death persons, if so.
- Report to SMC /IC time to time and comply any pending or as directed by SMC /IC.
- To maintain the records for all communications.
- On withdrawal of emergency, it shall be communicated to all respective department /section, Key persons, Essential Workers, Assembly Point, Govt. Authority, etc.

• **3.10 Disclosure of Information to the Public**

- The public in vicinity of the Unit shall be educated on hazards existed in plant and response action required during emergency period, through pamphlets, leaflet organizing seminar or talk etc. Students from schools are trained in this respect, also. The management has tried to cover larger areas by doing various efforts to educate the people.
- As per Section 41 -B of Factories Act 1948 (1987), The occupier of every factory shall disclosed the information regarding dangerous health hazards & the measures to overcome such hazards arising from the exposure to or handling of materials in the manufacture, transportation, storage & other processes, to the workers, the chief inspector (DISH), the local authority & the general public in the vicinity. Further, refer Rule 68-K, 68-L, 68-M, 68-P & Rule 68-J (13 & 14) of the Gujarat Factories Rules 2004 and Rule 15 under MSIHC Rules - 1989.



3.11 TRAINING/EDUCATION

Training/Education plays an important role in proper implementation of various emergency – related activities and understanding the probable root causes that can lead to emergency at the Unit

3.12 MOCK-DRILL/REHEARSAL

The objectives of Mock -Drill /Rehearsal are Training and Testing on the on -site Emergency Plan . The Mock drill of the on -site Emergency Plan is to be conducted at least once in every six months as per Rule 68 - J (12) (5) of Gujarat Factories Rules 1963 (2004) & Rule 13 (4)& (5) of MSIHC Rules - 1989 and report shall be submitted to the Authorities .

3.13 DETAILS TO BE FURNISHED TO LCG/DCG AUTHORITIES

It is the duty of management of MAH Units that they have to furnish the details on On -site Emergency Plans to the LCG /DCG Authorities for incorporation into Off -site Emergency Plan as per Rule 14 (2) of MSIHC Rules - 1989.



CHAPTER -4 MAJOR RESPONDING PROCEDURE

4.1 Introduction

The growing complexity of industrialization in our country, with the increasing use of hazardous chemicals, which put danger to human being as well as property, it is pertinent that industries play a vital and responsible role to ensure to control the occurrence of any such incident. Hence, it is absolutely essential that emergency procedures shall be successful with effective control and enthusiastic management.

It is not possible to include and discuss every action, which should be taken first during emergency. It is also not possible to describe entire actions on emergency situation. The basic principle of handling emergency is to rely upon person, who has the knowledge and experience to assess the situation and give direction as per the objectives as quickly as possible. However, the aim is to control the situation by safest way in limited time within available resources. Further, it should handle with care so that loss of life, property and environment is minimized. In short, the plan should be successfully complied with.

4.2 EMERGENCY RESPONSE

- A detail of the emergency actions during the emergency period is explained below. However, every incident requires special treatment, because, it is difficult to predict what type of situation will take place & how it turns and how person will act. Considering the General Situation and based on experience, the following actions are suggestive and guide line to tackle the incident.
- On getting the information of accident/incident; the Incident Controller will rush to the incident place and enquire & he has to perform the duties under intimation to Site Main Controller
- If condition is serious, then The Site Main Controller will take over the charge of to handle the emergency situation & he will direct to the designated persons to handle the situation to carry out their duties as per required actions.



- On scrutinizing the incident , SMC observed the situation is emergency type , then will activate the Emergency Control Centre and establishing the contact with Key Personnel , Essential workers , essential emergency services , agencies & authorities , urgently .
- SMC will get the inventory of chemicals , information on Toxicological data , Special medical treatment , details of antidotes ; if required , weather details , to sound emergency siren to alarm and communicate on emergency to workers & other people , to direct the safe assembly point /shelter , arrangement for adequate fire -water , neutralizing agent ; if required , P.P.E. & safety equipment , man -power , equipment , and other arrangement for emergency purpose .
- The essential workers , who are responsible to carry out certain specific functions , have to start work immediately .
- The non -essential workers should go to the specified assembly point .
- Ensure the cordoning of the incident area .
- Spray the water on the flammable storage tank , even if not caught under fire , if required .
- Consult the experts for responding the emergency , if required .
- Give authorized statement /information to Press media / Public .
- Arrange to remove the flammable , dangerous materials , cylinders etc . at safe places and try to isolate from fire .
- Provide all assistants to fire brigade to control spreading of fire or other responding actions .
- Rescue the trapped personnel .
- Eliminate possibility of re -ignition or Explosion .
- Arrangement shall be made for emergency medical treatment to injured person to appropriate hospital .
- Arrangement for post mortem for death .
- Information to the relative of injured or dead persons

4.3 POSSIBLE MAJOR EMERGENCY

The major areas of possible emergency for the Unit can be identified from the following

- Process involving hazardous operations
- Storage & Use of major hazardous chemicals



The probable major emergency can be identified as given table below

Sr. No.	Location	Involved Chemicals	Type of Probable Emergency
1	Chlorine-shed	Chlorine	Toxic Gas Release
2	Bromine storage	Bromine	Toxic Gas Release
3	Tank Farm	Sulphuric Acid	Corrosive liquid Release
4	Tank Farm	Caustic Soda	Corrosive liquid Release
5	Process	Chlorine/Bromine	Toxic Gas Dispersion
6	Process	Excessive Pressure, System Failure	Explosion
7	Boiler	Excessive Pressure, Safety System Failure	Explosion, Fire
8	Sulphur Yard	Sulphur	Fire
9	Coal-Yard	Coal	Fire
10	Co-generation Plant	Electricity	Fire, Explosion

4.4 INCIDENT

There are possibilities of various types of accidents or mishaps occurring in the factory premises . Most are of minor type , while few cases may be major type . Sometimes there is no single incident during the life span. However ,when any incident occurs, it cannot be distinguished immediately, the subsequent development or seriousness of such occurrence is required to handle safely It should be general practice that any person noticing the accident / fire / explosion / mishap at the site , should shout , “GAS LEAK ” , “FIRE ” , “FIRE ” or “HELP” ,“HELP ” and such message should reach to Supervisor / Shift Engineer / Senior Person of the unit . This way first information will reach to responsible person . The information shall communicate regarding type of incident and type of help needed .

It is said that root cause should be removed immediately . Similarly , if any incident takes place in the premises it should be tackled with available resources , and it should be so responded that it is contained immediately before spreading . If the incident looks severe and cannot be controlled by simple efforts , the Shift Engineer or Senior Man should rush to the place and try to control by using resources at the site .



4.5 HANDLING THE EMERGENCY

Following actions are suggestive and guide line to tackle the incident . However , every incident requires special treatment , because , it is difficult to predict type of situation will take place & how it turn and how person will react

Further , if it is uncontrollable ;even after using own resources , immediately call for further help from outside ; e .g . Local Level , District Level , Mutual aiders , fire -brigade etc . Then , He (SMC) takes over as Incident Controller & continue responding actions , till arrival of outside helps

- Continuous responding actions to control the situation ,BY use outside helps , If require .
- Inform the higher authority , if turn to Off -site Emergency

4.6 SEQUENTIAL ACTIONS by emergency management

On arrival of Site Main Controller / Responsible Person , he assesses the situation and declares On Site Emergency Plan to put in operation . The incident handles as site crisis and he starts responding actions to control the On Site –Emergency

He will –

- Call the essential workers , key personals to perform their duties immediately .
- Activate the fire brigade , mutual aiders , police , medical services ,expert persons etc . as per need
- Mobilize more resources from the out -side industries and other available resources .
- The messages regarding prevailing situation to concerned authorities , agencies ,out –side industries etc . will be communicated through the control room .
- Non -essential workers , visitors , guest , contractor workers shall rush to safe assembly point and they will report to the nominated person . They have to stay there till emergency over or as instructed by responsible person .
- Try to contain by using all available resources within his command & by use of outside resources and with help of expert persons ' advice .
- On controlling the emergency , site main controller has to ascertain the risk and if he observes the safe position , then he can declare “the emergency is over ” and ask to blow the siren declaring the withdrawal of emergency .
- Only after declaration of withdrawal of emergency , the work by other people / workers should be restarted by resuming the duties .



- The site main controller , after consulting the authorities , can carry out the clearing procedure to set the interrupted work and restart the process works .
- The site main controller may constitute an engineer’s committee to investigate the incident and to suggest the corrective actions and to submit the report accordingly .
- In case of the situation of emergency is turning into more serious and uncontrollable by site main controller even utilizing own all resources , then he should immediately ask and call the Local Crisis Group to handle the situation

4.7 Available Facilities at site for communication

1. Mobile Phone : Factory : 80869-96117
2. Mobile ; Internal Phone available to each authorized person as per Annexure - 2 7 .
3. Electrical Siren , alternate Hand Siren & Bell .
4. Internet Connection .
5. Messenger and vehicle facility .
6. List of Emergency Telephone Numbers -Appendix -A
7. Form to Record Emergency Information - Annexure - 3 0 .
8. Statutory Communication - Annexure - 3 1 .
9. Emergency Instruction Booklet -Annexure - 3 3 .
10. Organization Structure - Appendix -B ,
11. Emergency Control Centre - Annexure - 2 0 ,
12. Alarm & Siren - Annexure - 2 6 .
13. Charts to initiation of Action - Appendix - N
14. Command and Control Chart - Appendix -O , etc. .



4.8 RESPONSE ACTIONS BY DESIGNATED PERSONS

The ultimate responsibility to manage the emergency rests with the occupier or site main controller of the unit for on-site emergency plan. However, handling and control of emergency operation shall be carried out by TEAM of own employees, particularly senior and experienced persons from different departments /sections /plants.

The duties, functions and responsibilities of the designated persons, in respect of responding emergency are described in brief, in foregoing Para’s. However, specific action plan can be prepared in form of task force. The working group has to evaluate the situation and actions with rapid force should be activated as per pre-decided way. However, the maximum credible scenario for the unit shall be considered.

Sr. No.	Designation	Command	Role & Responsibility as Explained in Para
1	2	3	4
1	Site Main Controller	Overall in-Charge	4.8.1
2	Incident Controller	Handling the situation	4.8.2
3	Dy. Incident Controller	In absence of IC	4.8.2
4	Key Personnel	Assist, Arrange & Advice	4.8.3
5	Essential Workers	Task Force(Expert Team to handle & Control)	4.8.4
6	Communication Officer	Emergency Control Centre	4.8.5
7	Safety Officer/Tech Person	Assist, Advice, Source on Safety, Health & Environmental	4.8.6
8	F.M.O	Medical Emergency	4.8.7



4.8.1 SITE MAIN CONTROLLER (SMC)

Responsibilities of SMC include :-

1. On receiving information on emergency, he will reach at the scene / location & get details on incident from I.C.
2. On consultation with IC, he will assess the situation and declare the emergency and activate the On Site Emergency Plan and inform to Head Office / Higher authorities.
3. Establish emergency control room
4. Ensure the information to fire brigade, police, medical, experts, Director Industrial Safety & Health, GPCB, and other statutory authorities.
5. Ensure medical treatment to injured persons
6. To ensure the accounting of personnel and search of missing persons and arrange hospitalization of victims and additional helps if required.
7. To ensure Control of traffic movement in factory premises & surrounding area.
8. If emergency is prolonged, arrange for the relief of personnel and to provide catering facility
9. Direct the close down the plant and evacuation of the persons in consultation with the I.C.
10. Ensure co-ordination among all and key personnel & essential workers are called in.
11. Ensure rehabilitation of affected areas and victims.
12. Continuous Review of developments of emergency & responding actions.
13. Ensure communication with Local or District Crisis Group for the further help if condition deteriorates.
14. To issue authorized statement to the news media and other authorities.
15. To ensure that proper consideration is given to the preservation of evidence. Arrange for photographs or video.
16. Withdrawal of emergency
17. Order restarting the plant consulting with IC, after getting clearance from Director, Industrial Safety and Health or other authorities, as required.
18. To investigate the cause of accident & corrective measure.

Duty list of S.M.C. is given at Annexure - 16.



4.8.2 INCIDENT CONTROLLER (IC) (Dy. IC)

Responsibilities of IC include :

- His primary duty is to take over the charge at the incident place immediately on getting information on the occurrence and assess the situation and start remedial measures from available resources .
- He will work under the direction of SMC & keep informed of the development ;
- Try to minimize damage to property , environment and material loss by taking necessary actions within his control .
- Start emergency action with the help of key personnel and essential workers .
- Cordon incident/ accident area and restrict unauthorized
- entry .
- Ensure immediate starting to Control gas -dispersion by use of spraying specific and adequate neutralizing agent in case of Gas -leakage -Dispersion . Or in case of fire , firefighting system like fire hose -reels , monitors , sprinklers system , sprays , and other equipment , ensuring availability of adequate quantity of water for fire .
- Ensure shut down of various plants in right sequence .
- Search in affected area for casualties .
- Call mutual aiders , if required or inform to District Authority for required helps Preserve evidences , arrange photographs , and logging of events .
- Before ordering the re -entering checks the environment conditions that it is safe and gets permission from authority .
- Do not restart till steps taken to prevent the returns of recurrence .
- Dy . Incident controller will perform the role as incident control till the arrival of incident controller Immediate rush to the scene /place /site

DUTY -LISTS of I.C . & Dy . I.C . are illustrated at Annexure - 14 , 15 .

4.8.3 ACTION PLAN FOR KEY PERSONNEL

- The key personnel shall be available at any time on duty or on call when off or on holiday .
The Role of key personnel is to carry out the instruction as given by Site Main Controller /



Incident Controller during the emergency .

- The key personnel shall be from the experienced and trained managerial staff . Generally , key personnel will be from senior levels , perform the major work on advise made by the site main Controller and pass on the messages .
- They will perform the work of conveying messages , Liaison , coordination , procuring materials , maintaining discipline amongst workers , assist , advice etc.as instructed by SMC / IC , and report actions taken and development of work to SMC/IC.

Duty -List of Key - Persons is illustrated at Annexure - 1 7

4 .8 . 4 ACTION PLAN FOR ESSENTIAL WORKERS

It is the task force of trained workers or expert teams to carry out specific job or work at site at the time of emergency and perform the duty under guidance of Incident Controller /Site Main Controller. The Work includes firefighting , repairing , helping , first Aid , instrumentation , pipe line control , Electrical , Mechanical Water work , Weldon work , Shifting the materials and other helping hands to control the emergency on urgent basis . The different teams are formed to carry out specific works by responsible way such as

- 1 . Fire Team ,
- 2 . First Aid Team
- 3 . Repair & maintenance Team
- 4 . Rescue Team
- 5 . Transportation & Evacuation Team
- 6 . Emergency Runners .

Such work shall include :

- 1) Gas leak and spill control team takes the charge .
- 2) Shutting down plant and making it safe .
- 3) Emergency engineering work e .g . Isolating equipment's ,materials , process , providing temporary by - pass lines , safe transfer of substance , urgent repairing or replacement ,electrical work etc. .
- 4) Provision of emergency power , water , lighting , instruments ,equipment's , materials etc.
- 5) Movement of equipment's , special vehicles and transport to or from the scene of the incident
- 6) Search , evacuation , rescue and welfare .
- 7) First- aid and medical help .



- 8) Inform to surrounding factories and neighboring public as directed by the site Main Controller .
- 9) Assistance at communication center , casualties , reception center , liaison with police ,etc. .
- 10) Any special help required .

Duty -List of Essential Workers is illustrated at Annexure - 1 8 .

4 .8 . 5 ACTION PLAN FOR IN –CHARGE OF EMERGENCYCONTROL CENTER I .E . COMMUNICATION OFFICER

(On Hearing Alarm / Emergency information)

Proceed to Emergency control center and perform the duties .

- Get the direction for the line of actions with IC / SMC .
- Ask key personnel & essential workers to report IC/SMC &perform their duties .
- Inform fire brigade / police / mutual aiders , as required .
- Inform all non -essential workers to reach the safe assembly point .
- Inform neighboring factories , companies , units regarding emergency .
- Communicate with statutory bodies like Factory Inspector ,Boiler , Electrical , Explosive , Insurance Agency ,Police Authority , District Magistrate etc.
- Ensure to arrange for rescue of missing & trap persons .
- Ensure to arrange for search affected area for causalities .
- Ensure cordoning of affected area .
- Instruction for movement for emergency vehicles , e .g . fire tender , etc. .
- Inform surrounding population with the help of police .
- Requisition vehicles , cars , buses , ambulance , if required and emergency equipment .
- Additional ambulance and treatment for victim . Ensure to reserve hospitalization for victim . (e .g . Burns , injuries , causalities)
- Inform relative of victims
- Ensure evacuation of neighboring population , if required .
- Check rehabilitation of victims .
- Report each action to SMC/ I.C. time to time with maintaining register .

Detail of E .C .C . is given at Annexure - 2 0 .

4 .8 . 6 ACTION PLAN FOR SAFETY OFFICER &TECHNICAL PERSONS

On receiving information on Incident /Accident

- Immediate rush to the scene /place /site



- Assess the situation & ascertain the involved chemicals ,quantities , storage details , type of hazard , leak , spread / dispersion rate , injured persons , etc
- On collecting details of involved chemicals , M.S.D.S. , Toxicological details , neutralizing agent, responding actions , special medical treatment ,antidote ,etc ,Safety Officer /Technical Officer /EHS Officer shall provide and consult the related matters with S.M.C/I.C. and immediately provide necessary helps , assistance , guidance and technical details for responding actions and specific procedure for handling the emergency on urgent basis .
- On controlling the incident , procedure for monitoring environment , clean up , restarting and restoration , etc details shall be provided , advised and assisted to the S.M.C. / I.C. Assist , advice and guidance in preparation of investigation report and reporting various Authorities .
- Other duties as allotted / required by S.M.C. /I.C. .

4.8.7 ACTION PLAN FOR FACTORY MEDICAL OFFICER

On receiving information on Incident /Accident

Factory Medical Officer has to establish 'Casualty Receiving Centre ' with para -medical staff ; necessary special medical treatment with medical equipment along with required antidotes . C.R.C. should have sufficient space , capacity and located in a safe place ,avoiding normal downwind direction . There shall be sufficient first -aiders ;properly trained . F.M.O . has to categorized the person as per injury and arrange the serious person for hospitalization immediately with necessary instruction indicating involved chemicals , special medical treatment and antidotes and toxicological details . He has to maintain the register for all persons , containing the details , with respect to type of injury , treatment given ,time of arrival ,observations ,further recommendation , discharge , etc . F.M.O . has to carry out the work with consultation with S.M.C. and I.C. .

4.8.8 ACTION PLAN FOR SECURITY GUARDS / OFFICER

- Inform emergency in -charge by telephone on getting message
- On receipt of information in case siren is not actuated , sound / blow the siren , if directed by IC /SMC



- Depute security guards to control traffic around area of emergency and cordoning of incident area .
- Keep visitors out & prevent unauthorized entry .
- Control Traffic at gate / inside and outside Plant premises .
- Await further instructions from in charge of emergency center .
- Inform others as directed by in charge of emergency center .
- Search affected areas for causalities .
- Eliminating ignition sources .
- Removal of tank , Lorries from unit .
- Instruct non-essential workers to go to the safe assembly point and Head Count .
- Observe Evacuation of site (Partially or full) .
- Guide the mutual aiders ,fire brigade, government officers, emergency vehicles , etc. for safe way towards emergency incident and safe parking .
- Other matters as instructed by SMC /IC

4 . 8 . 9 ACTION PLAN FOR NON - ESSENTIAL WORKERS :

Upon hearing emergency siren /alarm or message , the non -essential workers , who have no any duties allotted during emergency , they have to follow :

- Leave the site /place immediately by safest route to safe assembly point , as directed
- Proceed at right angles to wind direction or cross wind direction to safe place .
- Do not re -enter site unless directed personally or via PA system.
- Assist in head count at assembly point.
- Inform contractor personnel to stop work upon hearing fire / gas alarm and ask to assemble at the Safe Assembly point or main security gate.
- Do not go to incident place unless specifically instructed by Emergency in -charge .
- Avoid Panic & do not spread any rumors .
- Do not smoke .
- Extinguish any source of ignition , cigarette , bidi , lighter , gas , etc..
- Ask others to keep calm & discipline manner

4 . 9 Action plan During road Transportation Emergency

4 . 9 . 1 General



The transportation of chemicals by road has got significant hazards . It is great need for precaution and actions during the Transport Emergency for mitigating the effect of the chemicals in the surroundings as well passersby on the road

4.9. 2SAFETY MEASURES FOR CHEMICALS DURING TRANSPORTATION

4.9.2.1 Labeling

1.Containers like Barrels , Carboys , Drum etc. . are marked /Labeled with the details , such as Name of content , quantity , Name and address of manufacturers , physical & Health hazards , precaution during handling , personal protective equipment's to be used during handling etc. , The drivers / helpers are educated accordingly .

2.Following items are required with the truck /tanker carrying Hazardous Goods / Chemicals on the road.

- Safety Equipment
- Self-Contained Breathing Apparatus in ready to use condition 45 minutes duration Two numbers. And one spare cylinder .

3.Personnel Protective Equipment , Complete PVC Suit Two no's . PVC Hand Gloves , Chrome leather Hand gloves , Face shield , Safety Goggles two pairs , Gum Boots two pairs . Tool Box with required tools . Non sparking Tools ;like Hammer etc. Safety Torch , First Aid Box fully equipped , etc. .

4.9.2.2 Transportation Of Hazardous Chemicals

A . Following information shall be displayed on panel board of tanker / vehicles used for transporting Hazardous chemicals .

- Correct Technical Name
- UN No .
- HAZCHEM CODE
- Emergency Contact No.
- Hazardous Class Label
- Specialist Advise /Instruction

B . UN classification of Hazardous Chemicals is given below



Class	Chemical Classification	
1	Explosive Substances	
2	2.1	Flammable Gas
	2.2	Nonflammable Compressed Gas
	2.3	Toxic gas
3		Flammable Liquid
4	4.1	Flammable Solid
	4.2	Substance liable to spontaneous combustion
	4.3	Substances which in contact with water emit Flammable gases
5	5.1	Oxidizing Substance
	5.2	Organic Peroxides
6		Poisonous (Toxic) Substance
7		Radioactive Substances
8		Corrosive
9		Miscellaneous Dangerous Substances




C . HAZCHEM Code :

1	:	Jet
2	:	FOG
3	:	Foam
4	:	Dry Agent

P	V	Full Body Protective Clothing With SCBA	Dilute
R			
S	V	SCBA	Contain
S		SCBA for Fire Only	
T		SCBA	
T		SCBA for Fire Only	
W	V	FULL	
X			
Y	V	SCBA	
Y		SCBA for Fire Only	
Z		SCBA	
Z		SCBA for Fire Only	
E	Consider Evacuation		

**4.9.2.3 Panel Board Sample (Chlorine) : Emergency Information Panel**

Name of Chemical	Chlorine Cl ₂
U N no.	1017
Haz chem Code	2XE
Emergency Contact No.	100 Intercom
NFPA Hazards	H:3, F:0, R:0, SP
Class Label	
Special advice	Chlorine is greenish yellow irritating , bleach like chocking odor, nonflammable ,but corrosive liquefied gas. Avoid contact .Use self-contained breathing apparatus neutralize spillages with soda ash and drain with abundant water . Run away from the gas clouds , in the direction perpendicular to wind direction



4.9.2.4 TRANSPORT EMERGENCY CARD (ROAD) –INSTRUCTIONS

LOAD: BROMINE OR BROMINE SOLUTION

NAME OF SUBSTANCE : Bromine

- Reddish brown color fuming liquid
- Immiscible with water
- Heavier than water

NATURE OF DANGER:

- Highly corrosive
- May evaporate quickly
- Contact with liquid causes severe damage to eyes, skin, air passage
- Attack many metals with liberation which is flammable and forms explosive mixture with air
- Toxic: by absorption through skin, by inhalation, by ingestion
- The vapor poisons: by inhalation
- The vapor is heavier than air and spreads along ground.
- Heating produces toxic fumes and will cause pressure rise with risk of bursting.

PERSONAL PROTECTION:

- Respiratory protective device enabling driver to escape e.g. hood or mask with combined gas particle cartridge.
- Goggles or face shield.
- Protective clothing and gloves.
- Protective footwear.
- Eyewash bottle with clean water.
- Two self-standing warning signs, hand lamp, warning vest.

GENERAL ACTIONS BY THE DRIVER:

- Stop the engine.
- No naked lights.
- No smoking.
- Mark roads with self-standing warning signs and warn other road users or passers-by.
- Keep public away from danger area.
- Keep upwind.
- Notify police and fire brigade as soon as possible.



ADDITIONAL AND/OR SPECIAL ACTIONS BY THE DRIVER:

- Put your respiratory protective devices on and keep out of the danger area.
- If substance has entered a water course or sewer or been spilled on soil or vegetation, advise police.

FIRST AID:

- If substance has got into eyes, immediately wash out with plenty of water.
- Remove contaminated clothing immediately and drench affected skin with plenty of water, then wash with soap and water.
- Seek medical treatment.
- Persons who have inhaled the fumes produced in a fire or in chemical reaction may not show immediate symptoms, they should be taken to a doctor with this card. Patient must be kept under medical supervision for at least 24 hours.

SUPPLEMENTARY INFORMATION FOR EMERGENCY SERVICES:

- If vapor cloud drifts towards populated area, warn inhabitants and keep them indoors. On the advice of an expert consider evacuation.
- Extinguish with water, foam or dry chemical.
- Keep containers cool by spraying water if exposed with fire.
- Do not use water jet.
- Use water spray to "knock down" vapor.
- Sewers must be covered and basements and work pits evacuated.
- Keep remaining cargo dry.
- Do not flush road with water.

4.9.3 Action Plan during transportation emergency for owner of the Company(Factory-Occupier)

Safe handling , control , mitigation , public disclosure and caution , etc during road transportation emergency are main activities . On receiving the information from driver or transporters regarding the Accident of the transport vehicle , the owner will form emergency team of three to four members ; with consultation of the plant Manager and SHE Department , and ensure to reach immediately to the site . The team will rush to the site of the accident with all necessary PPE , tools , MSDS of the chemicals , self-contained Breathing Apparatus , First Aid Box , etc .

The team members shall consist of following category :

- 1 . Plant personnel as a Leader - Supervisory level & Knowledgeable
- 2 . Plant Maintenance Personnel who has handle such type of Emergency in the plant
- 3 . Plant Safety Personnel with caution tape , Dragger tubes etc for measuring the toxic gas concentration and taking necessary safety precautions.



4. On reaching to the site , the team will assess the situation ,get the details on the mishap and start responding actions ,to handle , control and mitigate the road emergency with carefully , keeping liaison with emergency services like , fire -services police , local authority , etc .

4 .10 DISCIPLINE

The plan assumes certain discipline at site during emergency , as follows ;

- Do not get panicky .
- Do not approach the site of incident , as a spectator .
- Do not engage telephone unnecessarily .
- Do not move about unnecessarily .
- Do not approach unnecessarily for information or more inquiry
- Arrange medical / first aid care to the injured .
- Do not allow unnecessary crowd nearby incident .

4 .11CHECK SCHEDULE

The following arrangements are to be maintained and up -dated for preparedness of emergency purpose during pre -emergency period .

4.11.1 UPDATION OF EMERGENCY TELEPHONE NUMBERSWITH CONTACT PERSONS

The telephone or mobile numbers with name of contact persons shall be updated time to time and keep liaison with them for emergency purpose. The telephone/ mobile numbers as indicated in different Annexure /Appendix shall be checked and verified . The said lists are Annexure : 1,14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, etc, Appendix - A.

4.11.2 M .S.D .S. (Annexure - 5)

M .S.D .S. for Hazardous materials , which are handled and stored are given in Annexure - 5 . Any updating or new information about hazardous chemicals shall be incorporated in M.S.D.S

4.11.3 WEATHER CONDITION DATA (Annexure - 13)

The Meteorological data is given in Annexure - 13 , which will be updated periodically and record shall be maintained accordingly .



4.11.4 COMMUNICATION SYSTEM

Emergency Telephone No. with name of contact person etc . are given in Annexure - 1, 4, 6, 7, 8, 14,15,16,17,18,19,20,21,22,23,26,27,28,29,31&Appendix- A . Time to time modification shall be carried out for changes .

4.11.5 EMERGENCY CONTROL CENTER

The Equipped Central Control Room shall be in working order . The plant layout maps , drawing , storage details , M.S.D.S , emergency operations , manuals etc. documents shall be kept and shall be maintained up to date . List of Emergency telephone No . shall also be maintained up to date . The senior and expert person shall be posted as in charge of the control room . The details shall be up - dated in Annexure - 1 , 20 , 27 , 28 , 29 .

4.11.6 FIRE PROTECTION

Check all the fire - fighting equipment , units and machineries for their conditions , physical availability , workable and take necessary actions on replacement and maintenance , if required . Check resources of water and keep necessary telephone No . of suppliers for the same . Maintain the co - ordination with other fire - services . The water showers should be checked periodically for working conditions . The details shall be up -dated in Annexure - 21 , Appendix -H .

4.11.7 PERSONNEL PROTECTIVE EQUIPMENTS

Check all the personnel protective equipment provided at different places for their condition , working , maintenances and replacement , whenever required . Also keep sufficient stock of required personnel protective equipment . Also , maintain the relation with the mutual aiders for their supply of Personnel Protective Equipment at the time of emergency . The details shall be up -dated in Annexure - 19 , 20 , 21 , 22 . Further , the detail of Personal Protective Equipment is give at Appendix -K .

4.11.8 SAFETY SYSTEMS

Check the working of all safety devices ; interlock systems , safety -guard , railing , and fencings , in position . The safety equipment shall be maintained in working condition . The safety motivation and safety training are continuous process and arrange such type of training , periodically . Check the monitoring instruments , if provided , for correct working .Check the alarm systems for its working condition . The details shall be updated in Annexure -4 , 6 , 7 , 10 , 11 , 12 , 25 , 26 . The care shall be taken in respect of wind sock /cock that it shall remain always in the position



4.11.9 THE MEDICAL FACILITIES

The First Aid Boxes provided at the plant area shall be adequately filled with requisite medicines and equipment. Arrangement shall be made that at least one trained person should be available during the working hours. The name and address with telephone No. of Doctors shall be displayed in the Control Room along with General Hospital & Ambulance facilities. The details shall be up-dated in Annexure - 22.

4.11.10 MONITORING THE ENVIRONMENT

A suitable type of flameproof and portable combustible gas indicator / sensor shall be provided and sample of various locations shall be measured & record shall be maintained in Form No.37.

4.11.11 MAINTENANCE OF RECORDS

Keep the records of the monitoring conditions, safety systems, storage levels, process condition, etc. and maintain the log-books, registers etc. Keep the M.S.D.S. and onsite emergency plan with required details at the emergency control center.

4.11.12 EXERCISES / MOCK DRILL / REHEARSAL

Organize the periodical mock drill / rehearsal as per suggested format on emergency situation so as to keep up preparedness & awareness to overcome shortcomings. Give prior information with reasonable time to the emergency services and public for proper response & training. Record the deficiencies of the system during the trial and take appropriate action to improve the effectiveness of the plan in terms of preparedness and response. A format on such mock drill is appended in Appendix-S. Further, separate chapter No. 9, illustrate the detail information on Mock Drill / rehearsal.

4.11.13 POTENTIALITY ON LIAISON

Keep constant liaison with mutual aiders, fire services, police department, medical services, statutory authorities, District administration, during pre-emergency situation. Keep liaison with local Crisis Group and District Crisis Group. Please refer Annexure - 21,22,23, & Appendix-A, for mutual Aid Arrangement and their Phone Numbers.

4.11.14 PUBLIC EDUCATION

Efforts are to be made to educate the surrounding public about the existing hazards of the plant, the possible emergency actions and the precautions required to be taken in such condition. Leaflet



containing such details can be distributed amongst the public . The training program can be arranged in the school or public institution /building . It can be circulated to news media , TV , Video - channels , newspapers etc . Disclosure of Information to the public can be issued as part of Statutory Compliance . A typical detail is given at Appendix -R .

4.11.15 TRAINING (INTERNAL) TO WORKERS

The education & training to the workers , with the help of efficient plant supervisors , inspectors , and Sr . officials ; are to be kept alive all the time and to ensure good housekeeping , discipline ; by display of safety slogans , operative instructions and motivation on safety . Further , all the persons from the emergency services organization is to be trained to respond the emergency .

4.11.16 SIREN TESTING

The siren shall be checked & tested periodically at certain intervals so that awareness & preparedness can be checked .

4 .12 SHUT DOWN PROCEDURE

We cannot neglect the adverse effect of the running plant during emergency . Therefore , it is advisable and safe that the safe shut down procedure should be adopted , if running . First of all main electrical supply line should be cut-off . Similarly , the pipelines carrying flammable gas , liquid or chemicals are to be isolated immediately . If reaction in the any vessel is in process , it should be stopped & safely shut down .

- Arrange to transfer or remove the flammable , toxic , dangerous , explosive , poisonous materials , goods , cylinders , drums etc . to safe place or try to isolate from the fire .
- Arrange the water shower on flammable storage tanks to keep it in cool conditions , if near the fire .
- The shutdown procedure should be laid down in the process manual , which will be useful during such emergency .

4 .13 POST EMERGENCY

On controlling the emergency and ascertaining for no possibility of re-occurrence , the management will initiate the following actions .



- (1) Declare termination of Emergency & blow the siren accordingly .
- (2) Disclose the authentic statement on incident to the authority & news media .
- (3) Collect & preserve the documents , records , instruments , evidence etc . on incident .
- (4) To set up the internal enquiry committee, appointing the internal or external expert person (5)
Cleaning work after obtaining the permission from Authority .
- (6) Preparation of restarting the process work .
- (7) Detailed related work & procedure , as described below ;
 - Sound the emergency clear siren .
 - The rehabilitation work will start in the affected area .
 - To ensure that all fires are extinguished and there is no risk of re -ignition , before starting work
 - To ensure that there is no chance of secondary explosion .
 - Do not disturb wreckage and debris except to rescue the injured or recover bodies , until permitted to do so by statutory authority .
 - All victims , dead or alive , are systematically identified and keep the records accordingly .
Give information to their relatives , if asked .
 - Record all relevant information .
 - Take photograph/ video or make suitable sketches of the incidence .
 - Report the accident / incident , with details , to the statutory authorities , if not informed
 - Permission for restarting is required to be obtained from statutory authorities .
 - Keep registers for recording the entries , details , inventory , list of persons etc . & preserve all the documents , log books , maps , registers & all records taken from the site .
 - Keep the record of help ; Co -operation , Mutual aiders sought from others & write thanks giving letters to them .
 - Arrange the compensations to the affected persons , injured persons , dead etc . as per circumstance and if applicable ,keep the records accordingly .
 - Estimate the expenses incurred during the emergency .
 - Estimate the various expenses under different head &prepare the total expenditures statement .
 - Appoint the internal committee to investigate into the causes of the accident/ incident , if necessary and get report .



CHAPTER -5 EMERGENCY ACTION FOR SPECIFIC EMERGENCY

5.1 General

The natural or man-made emergency /disaster can be identified as like, Earthquake, flood, Cyclone/ Hurricane, Thunder Storm/ Lightning Strike, Bomb Threat (Terrorism); etc. The Response Actions on each disaster are explained as below;

5.2 Earthquake

1. DURING EARTHQUAKE, If indoors:

- 1 If possible escape to nearby open area away from electrical lines or other tall structures / trees
- 2 Take cover under a piece of heavy furniture or against an inside wall and hold on.
- 3 Stay inside.
- 4 The most dangerous thing to do during the shaking of an earthquake is to try to leave the building because objects can fall on you.

5.2.2 DURING EARTHQUAKE, If outdoors:

- 1 Move into the open , away from buildings , street lights ,and utility wires .
- 2 Once in the open , stay there until the shaking stops .

5.2.3 DURING EARTHQUAKE, If in a moving vehicle:

- 1 Stop quickly , park the vehicle on left side of the road , and if possible escape to nearby open area away from electrical lines or other tall structures / trees .
- 2 Once the shaking has stopped , proceed with caution Avoid bridges or ramps that might have been damaged by the quake .

5.2.4 AFTER EARTHQUAKE

1. Be prepared for aftershocks . Although smaller than the main shock , aftershocks cause additional damage and may bring weakened structures down . Aftershocks can occur in the first hours , days , weeks , or even months after the quake .
2. Help injured or trapped persons .



3. Give first aid where appropriate .
4. Do not move seriously injured persons unless they are in immediate danger of further injury.
5. Call for help .
6. Listen to a battery -operated radio or television for the latest emergency information .
7. Remember to help your neighbors who may require special assistance --infants, the elderly, and people with disabilities.
8. Stay out of damaged buildings .
9. Return home only when authorities say it is safe .
10. Use the telephone only for emergency calls .
11. Clean up spilled chemicals or other flammable liquids immediately. Leave the area if you smell gas or fumes .

5.3 Flood

5.3.1 SOURCE

Following conditions are the sources of flooding inside the plant or buildings ;

- a .Cloud bursting
- b .Heavy Rainfall
- c .Cyclone
- d .Tsunami
- e .High tide in River or Ocean
- f .Release of water from Dam or other nearby dam

5.3.2 RESPONSE

- a. Assess the situation through flood control room and inform Emergency Control Centre .
- b. b .Go to the high level , if escape is not possible
- c. Shut off hazardous chemical supply valves . Close the other operations .
- d. Remain calm , reassuring . Alert staff to potential hazards .
- e. Look for loose or grounded / downed power lines . Avoid area . Report problems to Emergency Control Centre
- f. Look for electrical system damage : sparks , broken /frayed wires , smell of burning insulation . Turn off electricity at main switch , if you can without risk .
- g. Do Not re -enter the Building until declared safe by authority or emergency management officials.
- h. Stay well clear of any downed or damaged power lines . Establish a safe distance from the lines and report the incident to the responsible authority . Only adequately -trained authorized electrician will handle damaged power l lines for corrective action .
- i. Electrician will first assess the hazards present in order to minimize the chances of exaggerating the situation . Idle the lines involved will be de -energized
- j. When working on downed or damaged power lines , electrical workers must utilize proper electrical safe work practices and proper personal protective equipment .



5.3.3 DOs & DON'Ts

- Remember flood -warning signs and alert signals .
- Go to the safest routes to shelters .
- Don't walk through flooded areas . As little as six inches of moving water can knock you off your feet Snakes and other reptiles may be flowing through flooded water .
- Stay away from downed power lines and electrical wires . Electrocutation is another major source of deaths in floods Remember electric current passes easily through water
- If the water start to rise inside your plant /Building before you have evacuated , go to the higher levels .
- Take dry clothing , a flashlight and a portable radio with you . Then , wait for help .
- Don't try to swim ; wait for resource to come to you .
- If outdoors , climb to high ground and stay there .
- There is a possibility of spread of water born diseases after flood , and he medical treatment shall be taken immediately .
- Inspect plant /Building for any cracks or other damage . Check all the walls ,floors , ceilings , doors and windows ,so that any chance of house falling down can be ascertained and you will be aware about the imminent danger .
- Move to your process /plant only when instructed by the HOD . It is not safe
- to believe that the problems have ended after the floodwaters have receded .
- Check properly all the electric circuits , gas cylinders , or electric equipment like motor pump etc . Check whether any inflammable or explosive material has not entered along with the floodwater .
- Sewerage system will be checked and any damage shall be repaired immediately so as to curtail spread of diseases .
- Empty the water clogged in the basement with help of De -watering that damage to infrastructure can be minimized .
- Rescue work will be undertaken immediately after flood situation as per the instruction .
- Do not follow any short cut for rescue work
- Do not try to leave the safe shelter to go back plant /home until the official declare
- normalcy after flood and instruction to return home /plant are not given



5.4 CYCLONE/ HURRICANE

5.4.1 General

The nature of a cyclone provides for more warning than other natural and weather disasters .

5.4.2 Preparation

- Stay calm and await instructions from the Emergency Coordinator or the designated officials .
- Continue to monitor local TV and radio stations for instructions .
- Move early out of low -lying areas , at the request of officials .
- If you are on high ground , plan to stay , secure the building , moving all loose items indoors and close windows and openings .
- Collect drinking water in appropriate containers .

5.4.3 Warning

Be ready to evacuate as directed by the Emergency Coordinator and /or the designated official .

5.4.4 During a Cyclone

Remain indoors and consider the following :

- 1 .Small interior rooms on the lowest floor and without windows ,
- 2 .Remain on the lowest floor away from doors and windows , and Rooms constructed with reinforced concrete , brick , or reinforced blocks with no windows .
- 3 .Stay away from outside walls and windows .
- 4 .Use arms to protect head and neck .
- 5 .Remain sheltered until the cyclone threat is announced to be over .

5.5 THUNDERSTORM & LIGHTNING STRIKES

5.5.1 BEFORE

Thunderstorm is invariably accompanied by lightning A single stroke of lightning has 125 ,000 ,00 volts of electricity . That's enough power to light a 100 -watt light bulb for more than 3 months , or enough to seriously hurt or to kill someone . Know what steps to take in the event of an oncoming thunder storm & lightning . Lightning is something you should not be careless about , so seek a safe shelter immediately ! Be warned , lightning can and does strike just about any object in its path . When you see lightning , follow these safety rules.



5.5.2 INDOORS

- Stay or go indoors , If you hear thunder , don't go outside unless absolutely necessary . Stand clear from windows , doors , and electrical appliances .
- Stay away from anything that could conduct electricity . This includes electric lines , Electric Instruments , wires etc and phones . Unplug appliances well before a storm strikes .
- Don't use any plug-in electrical appliances like Cell phones , TV , music system , mixer , blender , iron press , hair dryer , or electric razor etc . If lightning strikes your house , these electrical / electronic gadgets can conduct the charge to you .
- Don't use the telephone during the storm. Lightning may strike telephone lines outside. Use the telephone quickly only for emergency purposes. Avoid contact with piping including sinks , baths and faucets .

5.5.3 OUTDOORS

- When outdoors , seek shelter from lightning ! Buildings are best for shelter but if no buildings are available, you can find protection in a cave , ditch , or campus . Trees are not good cover . Tall trees attract lightning. Never use a tree as a shelter .
- Stay in your vehicle if you are travelling , vehicles gives you excellent lightning protection . Get in a hard topped car .
- If you can't find shelter avoid the tallest object in the area . If only isolated trees are nearby , your best protection is to crouch in the open , keeping the distance twice the height of isolated trees . Avoid areas that are higher than the surrounding landscape .
- Don't use metal objects outside . Keep away from metal objects including bikes , electric or telephone poles , fencing , machinery etc .
- Get out of the water. Immediately get out and away from pools , lakes , and other bodies of water.
- When you feel the electrical charge - if your hair stands on end or your skin tingles - lightning may be about to strike near you . Immediately crouch down and cover your ears . Do not lie down or place your hands on the ground .
- Victims of lightning shock be administered CPR(Cardiopulmonary resuscitation) i.e . Artificial respiration , if necessary .Seek medical aid .



5.6 Bomb Threat (Terrorism)

5.6.1 Response For Bomb Threat (Terrorism)

In the case of a threat being received at the site , the telephonic / security staff will record details of the threat using the Bomb Threat Checklist . Receiver of bomb threat information will immediately inform the control Room / Security In charge . He will decide whether to alert the rest of the Emergency Response Team .

The following factors are to be considered :

1. The seriousness of the threat .
2. Resources available at the time .(e .g . For threats received out of normal working hours)
3. communication with local authorities , i.e . Police/ Fire Services
4. Act on advice from local authorities .
5. Decide on the following action :
 - a) To search and evacuate if anything suspicious is
 - b) Evacuate and then search
 - c) To evacuate immediately.
 - d) In the event of a search , if an area was specified in the call , this would be searched first
 - e) At our site the most vulnerable areas to be searched first if no area is specified .
 - f)

5.6.2 ACTION FOR PERSON WORKING IN AN AREA WHERE A SUSPECT PACKAGE , PARCEL OR LETTER BOMB IS FOUND

1. Do not touch or tamper with the object .
2. Report finding to Security /Emergency Control Room immediately .
3. Evacuate immediately the affected surrounding area for safety and security of working personnel 4 . Do not create panic .

5.6.2.1 SUSPECT VEHICLE

Actions

1. Check person 's car registration list (Security) .
2. Commercial vehicles currently on the site during an emergency will be documented in the security record book .
3. Inform Security officer /Plant manager /HR manager .
4. Inform Local authorities /Emergency control Centre .



5 . 6 . 2 . 2 SUSPECT PERSONS / INDIVIDUALS

Actions

- 1 Inform Security /Human Resources .
- 2 Do not approach , wait for security .
- 3 Observe from a distance if possible and make notes .



CHAPTER-6 EMERGENCY ACTION FOR OFF-SITE EMERGENCY

6.1 Off Site Emergency

When the industrial disaster cannot be controlled by using unit's own resources, then, it is necessary to involve Govt. and other external resources to control such emergency. Even when Industrial disaster spread outside its premises and likely to affect / ought to be affected surrounding population, other industries, out-side land, etc. then also Govt. resources, etc. need to control it. This emergency called as Off Site Emergency & it will intervene to control by Local or District Authority under District Crisis group (DCG) / (Local crisis group (LCG)), as per seriousness of incident and situation.

The emergency location will not change but the line of actions will be governed by crisis group instead of unit's authorities. The unit's own authority has to extend facilities, liaison, and coordination to the Local Crisis Group or District Crisis Group as per the requirement or situation

6.2 Probability For Off-Site Emergency

The following incidents are identifying which may create Off Site Emergency from On Site Emergency

Probable Scenario

Toxic Gas Dispersion- (Chlorine, Bromine)

Fire -Explosion -(Coal-yard, Power Gen. Plant, Pressure-Vessel)

6.3 Outside Participation/ Government Body

The emergency operations outside the factory premises are not different in character from those applicable to on sites. Hence the approach to and preparation for on-site emergency detailed in previous chapters will be applicable in case of Off-Site action also. However, the following points should be kept in mind:

- The groups involved are not as enlightened and responsible as those within the factory.
- In off-site actions, the local participants particularly the administration, fire & police play the dominant role. Industrial management has a limited and comparatively submissive role.
- The diversities of the problems and response are bigger.



- Humanitarian work assumes more importance .

The correct management strategy in this situation will be to involve the local participants ' fully in emergency operation and provide technical and financial support to them to manage the emergency . This task is more difficult than managing the on -site emergency operation in many ways and call for elaborate and consistent efforts .

6.4 Mutual Aid and Interaction

There is mutual aid is available and we had communicated to Disaster management cell and Disaster management plan shall be submitted.

6.5 PREPAREDNESS FOR OFF -SITE

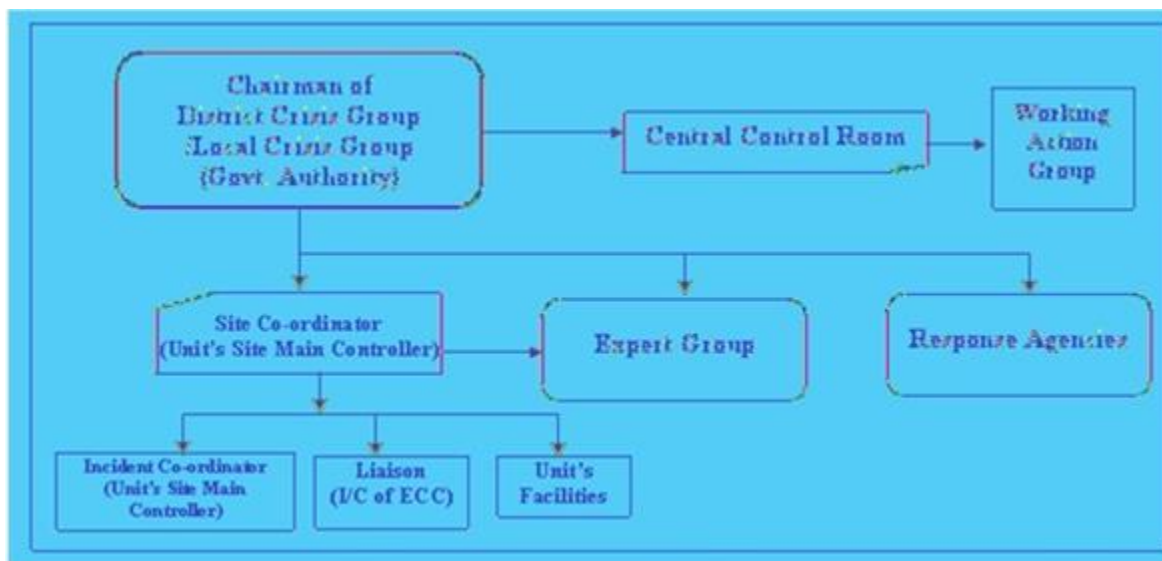
If On site emergency turns to off -site , the SMC /Chief Co - coordinator /OIC , has to provide the following information /details to the Authority with explaining the situation and to provide the required resources .

- 1.Type of Chemical Accident , involved chemicals , with quantities ,(Ann - 4 & 5) worst scenarios , effect (which can escalate in to off -site emergency) , probable duration , casualties , damaged(Ann - 10 , 11 , 12 , 13) .
- 2 .Location of Hazardous chemicals with stock , and their M .S .D .S .
- 3 .Resources can be spared by the management of Affected Unit .
- 4 .Availability of special Medical treatment and Antidotes .
- 5 .Location of Safe Assembly Points , Emergency Control center with In -charge Person , Parking Area and Approach route , Medical center , etc. .
- 6 .List of required helps , resources(Type of Fire Fighting materials ,Damage Control System , Repair Items etc.) , Neutralizing Agents ,Type of emergency equipment , etc.
- 7 .Matter to notify to Public , Evacuation arrangement .
- 8 .Arrangement of disposal of waste , clean up , etc.



6.6 Actions By Site Main Controller(SM) & Incident Controller (IC) -During Off Site Emergency In Brief

The Unit's Site Main Controller, Incident Controller and In charge of ECC have to perform the duties and responsibility different from On Site Emergency Plan. The Government Authority (Chairman of DCG /LCG) will take charge of situation and they will be called as "Site Main Controller" or Chairman for Off Site Emergency plan. Therefore, the Unit's Site Main Controller will act "Site Coordinator", Incident Controller will act as "Incident Coordinator" and In charge of ECC will act as Liaison Man, which is shown in chart as below;



6.6.1 DUTIES OF SITE COORDINATOR [SMC] (Now Site Coordinator)

During Off Site Emergency, Unit's Site Main Controller becomes Coordinator and his duties are as follows :

1. He has to extend liaison, co-ordination and facility to the Chairman of local crisis group or Chairman of district crisis group.
2. He has to explain about disaster, his efforts and what type of help is needed in brief to Chairman of Local Crisis group (Govt. Authority) and Control Room.
3. He has to communicate about available resources, fatality /injury to his own employees and probable affected surrounding area with maximum credible scenario.
4. He has to keep ready with maps, layout of unit, records, documents, On Site Emergency Plan, M.S.D.S., Details of Process Hazards, Safe Handling procedure on specific hazardous chemicals etc.



5. He has to advise for special medical treatment and availability of antidotes .
6. He has to divert Communication system for Offsite emergency .
7. He has to divert all available resource for Off-site emergency .
8. He has to provide aid and assistance for Off Site Emergency .
9. Shutdown plant safely , if hazards is not involved .
10. He has to reorganize the work of Key personal & essential worker .
11. Arrangement of food , water , rest etc. . for the person engaged i n the duty .
12. Arrangement of disposal of contaminated water , effluent , solid waste , etc.

6.6.2 DUTIES OF UNIT'S INCIDENT CONTROLLER (Now Incident Coordinator)

- 1 . He has to show the actual incident place to off-site action group .
- 2 . He has to provide proper information to all incoming off site action group .
- 3 . He has to also explain safe route for off-site team members , fire crew members , etc. .
- 4 . He has to describe available resources, other hazardous material near disaster, available PPE's, Neutralizing Media , etc. .
- 5 . He has to show safe & proper parking arrangement for off-site action group members .

6.6.3 DUTIES OF INCHARGE OF EMERGENCY CONTROL CENTRE (Now Liaison Man)

The Unit 's In charge of Emergency Control Centre have to perform the duties as liaison man and to communicate messages to emergency services , outsiders and as instructed by authorities of DCG / LCG .

6.6.4 COMMUNICATION DURING OFF -SITE EMERGENCY

During off -site emergency , Emergency Control Centre will work as base communication center and directives will be given by District Crisis Group and as instruction from Emergency Control Room .

6.6.5 DUTIES OF OTHER OFFICERS DURING OFF -SITE EMERGENCY

Key persons , Safety Officer , FMO , Manager (HR) , Security Officer and others have to co-operate , help & assist and coordinate with SMC and I.C . during Off -site Emergency till control and clean -up etc.

6 .6 WITHDRAWAL OF EMERGENCY(CALLING OFFEMERGENCY)

The emergency declared both within the works and the community should be called off only after making sure that the incident is brought under control and that no further danger is possible to property or life . The authority will ask to GPCB /competent person



to carry out the environment monitoring and report immediately The Site Main controller , Govt . Authority in consultation with the work groups concerned , should take a decision to this effect . The decision has to be based on prudence and actual information of assessment by work groups and should not be one based on hearsay or speculation . A system of documentation recording the recommendations of work groups , opinion of senior officers and endorsement by the works main controller - will be a check against hurried decisions .

Once the decision to call off the emergency is taken , the concerned persons should be informed . The coordinator of the off -site emergency operation and local participants has to be informed . The coordinator in turn will give information to the other local participants and members of the public . The declaration of the withdrawal of emergency will be announced by sounding of siren or by public address system by the authority.

Even after calling off the emergency certain operations may need to continue . Hence the work groups should be released only after ensuring that the jobs attended to by them are over .

The works main controller should take the decision . Also after the cessation of emergency the plant involved should not be left unmanned for quite some time and should be watched.

6.7 POST-EMERGENCY-ACTIONS

Cleanup, re-starting, treatment to admitted injured persons and providing information to their relatives , collection of equipment's , etc. , preparation of report , face the enquiries from various departments , press -media , etc. are the major actions to be carried out by the management .



CHAPTER-7 THE UNIT

7.1 Introduction

Archean Chemical Industries Ltd . , is situated at Greater Rann of Kutch , Hajipir , Taluka Bhuj , District Kutch and Office is located at Gandhidham.

The Management of Archean Chemical Industries Ltd. has wide vision. The AIM of management has ventured into unconventional business , and this has been there as on for their consistence growth. However , they strive to deliver through constant endeavors , smart thinking and advance Technology . They have no limit growth by geographies , but set fort wherever there is opportunity . Archean Chemical Industries Ltd is establishing manufacturing of Industrial salt, bromine & Sulphate of Potash Plant at Greater Rann of Kutch , Village Hajipir , Taluka Bhuj , Dist. . Kutch . Being chemical process , the Unit will operate round the clock , continuously and employing maximum 8 7 5 workers , including staff and contractors ' persons .

7.2 LOCATION

Archean Chemical Industries Ltd . is situated at Greater Rann of Kutch , Village Hajipir , District Kutch , which is 70 KM from the Nakhatrana i n North and 120 KM from Bhuj . Bhuj is the Railway Station on Western Railway .

The surrounding of the unit is totally barren area . Further , neither any activity nor any public building /road is located in neighboring area . The direction of location is described , based on Unit 's structures , as below ;

- East Side : Main Entry Gate, Road.
- West Side : KTMS Stock Yard
- North Side : KTMS Crystallizer
- South Side : CAMP Area

7.3 LAYOUT OF FACTORY

The total area of installation is approx. . 50 ,00 ,000 40000000 M² having a rectangular shape . The premise has different five Gates .



Gate - 1 : Main Entrance Gate , East side of the Unit .

Gate - 2 : Coal Gate , East side of the Unit .

Gate - 3 : Material Gate , North side of the Unit .

Gate - 4 : Product -Dispatch Gate , West side of the Unit .

Gate - 5 : Raw Material -Salt Gate , West side of the Unit

The Unit -installation consists of ;

- 1 . SOP Office Building
- 2 . SOP -Plant
- 3 . Bromine Plant
- 4 . Bromine Bottling Plant
- 5 . Chemical Storage Building
- 6 . Tank Farm (Toxic)
- 7 . SOP Silos & Storage
- 8 . ISO -Containers Storage Area
- 9 . Chlorine Tonners Shed
- 10 . Bromine Storage
- 11 . . Liquid Bromine Storage
- 12 . . Lime and Caustic Storage
- 13 . Salt Storage
- 15 . Ware House
- 16 . Desalination Unit
- 17 . Coal -Yard
- 18 . Heavy vehicle Work -Shop
- 19 . Co -Generation Power Plant
- 20 . Boiler Area
- 21 . Switch Yard
- 22 . LAB -R & D
- 23 . Time Office
- 24 . OHC
- 25 . ETP
- 26 . Ash -Pit



- 27. EHS Section
 - 28. Water Reservoir , O /H Tank .
 - 29. Canteen
 - 30. Drinking Water & Shelter .Rest Room
 - 31. Sanitary Block
 - 32. Security Cabin ,
 - 33. Parking Area , etc.
 - 34. 27A
 - 35 STO Project Building
 - 36 Diesel Storage Area
- A Layout of the unit is shown in Annexure - 3

7.4 PRODUCTS

Sr. No.	NAME OF PRODUCT	CAPACITY MT/Year
1	Sulphate of Potash	1,00,000
2	Liquid Bromine	30,500
3	Green Bromine	2,500
4	Epsomite	81,000
5	Co-generation Plant-(Coal-Base)	10 MW

7.5 Major raw materials

The list of major raw materials is given at Appendix –E



7.6 Hazardous Chemicals

The Unit is storing, handling & using the various chemicals. The major chemicals are identified as “Hazardous Chemicals” as specified against Sr. Nos. of respective provisions mentioned below

Sl. No.	Hazardous Chemical	UN no.	CAS No.	Hazardous Classification	Schedule –I of 68J of GFR 1963 (2004)	Schedule –I of MISHC Rules - 1989 (2000)	Schedule –I of CA (EPPR)
1	Chlorine	1017	7782-50-5	Toxic	88	119	84
2	Bromine	1744	7726-95-6	Toxic	53	84	53
3	Sulphuric Acid	1830	7664-93-939-4	Corrosive	371	591	370
4	Caustic Soda	1823/ 1824	1310-73-2	Corrosive		571	
5	Sulphur		7704-34-9	Toxic			
6	HSD	1202		Flammable	Part 1(b(ii))	Part 1(b(iii))	Part 1(b(ii))

7.7 HAZARDOUS ACTIVITY

The process is involved with Chlorine, Bromine, etc hazardous chemicals, hence, process is termed as “Hazardous Activity” as per Rule 68-J (1)(b) of GFR-2004.

7.8 M.A.H. Units

The maximum storage capacity of one of hazardous chemicals, i.e. Chlorine Tonner is 270 MT, which is more than threshold quantities as specified under Rule 2 (g) of CA (EPPR) Rules 1996. Therefore, The Unit is identified as MAH Unit.

7.9 INDUSTRIES INVOLVING HAZARDOUS PROCESSES

Chlorine, Bromine, Alkaline (Caustic Soda Lye) and Acid (Sulphuric Acid) are listed against Sr. No. 17, “Chemical Industries” of The First Schedule under Section 2 (cb) of the Factories Act - 1948 (1989).



7 .10 Dangerous Manufacturing Process (Rule 102)

The Unit is storing , handling and processing the hazardous chemicals like , Chlorine , Bromine , Sulphuric Acid , Caustic Soda , etc ; and is declared as Dangerous Manufacturing Process under Rule 102 of GFR 1995 , against Schedule No . XII and XIX

WORK- SCHEDULE AND MAN POWER

Sr. No.	Name of Shift	Shift Timing	Maximum Person at a Time						
			Direct Employees		Contractor Person		Security/ Watchman	Total	
			M	F	M	F		M	F
1	General (G)	09:00 to 18:00	215	-	165	-	15	415	-
2	Shift (A)	07;00 to 15:00	80	-	65	-	10	155	-
3	Shift (B)	15:00 to 23:00	80	-	65	-	10	155	-
4	Shift (C)	23:00 to 07:00	75	-	65	-	10	150	-
TOTAL			450	-	360	-	45	875	-

7 .12 HEALTH & SAFETY POLICY

The management has declared Occupational Health & Safety Policy , which is given at Appendix - C .

7 .13 Organization Structure

The Organization Structure is given at Appendix -B .

7 .14 Safety Officer

Presently , Mr. Rajendra Tak , AGM (EHS)
 Mr. Hasmukh Dadhaniya
 Mr. HarshadGiri Aparnathi
 Mr. Saunak Patel
 Mr. Surendra singh Gurjar

7 .15 Occupational Health Centre



Dr. B.G.Sodha, FMO , Nakhatrana , is appointed as Visiting Doctor . OHC will be housed in adequate area . Further , First Aid Boxes will be provided at different locations and keep in charge of First Aid Trained Persons

7.16 PARTICULARS AT A GLANCE

Sl. No.	Description	Details
	Name and Address of Unit	Archean Chemical Industries Ltd. Grater Rann of Kutch, Village Hajpir, Taluka: Bhuj, Dist. Kutch- 370 605 Ph. No. M-94298 96989
	Office Address	Archean Chemical Industries Ltd. 'Anandam' D/4, NU-10-B, Shaktinagar, Opp. Lions Club, Gandhidham Dist: Kutch - 370201. Ph. No. 02836-234259,234158,233841
	Name & Address of Occupiers of Factory	Mr. S. Meenakshisundram, Director Archean Group 20/43, K B Dasan Road Teynampet, Chennai – 600 018
	Manager of Factory	Mr. Bhupathi K, Grater Rann of Kutch, Village Hajpir, Taluka: Bhuj, Dist. Kutch- 370 605
	Raw Materials	<ol style="list-style-type: none"> 1. Sea-Bittern 2. Chlorine 3. Sulphuric Acid 4. Caustic Lye 5. Coal 6.Sulphur
	Finished Products	<ol style="list-style-type: none"> 1. Sulphate of Potash 2. Bromine 3. Epsomite 4. Industrial Salt



	Hazardous Chemicals	Sr. No.	Name of Hazardous Chemicals	Sr. No. as per Sch.-I GFR-1963 (2004)	Sr. No. As per Sch.-I MSIHC Rules (2000)	Sr. No. As per Sch.-I CA(EPP R0 Rules
		1.	Chlorine	84	119	84
		2.	Sulphuric Acid	371	591	370
		3.	Caustic Lye	-	571	-
		4.	Bromine	53	84	53
		5.	HSD	Part I (b) (iii)	Part I (b) (v)	Part I (b) (iii)
	M.A.H. Factory	Maximum storage capacity of Chlorine is 300 Tones which is more than threshold quantity (10 Tons), therefore the unit is classified as M.A.H. Factory				
	Factory License from Factory Inspectorate, Gujarat State	Approved				
	Plan Approval	Approved				
	Petroleum & Explosive Safety Organization	Approved				
	GPCB Consent	Approved				
	Boiler	Approved				
	Organization Structure	Organization structure is given in Appendix - B				
	Safety & Health Policy	As per Appendix - C				
	Fire Water	1. On Ground sea Water Reservoir - 12550 M ³ 2. O/H Tank- 630 M ³				
	Safety Officer	Mr. Rajendra Tak;				
	Occupational Health Centre	<ol style="list-style-type: none"> 1. Dr. B.G.Sodha, FMO, Nakhatrana 2. First Aid Box 3. Trained Persons in First Aid 4. First Aid Room and Staff 				



CHAPTER-8 PROCESS & STORAGE

8.1 INTRODUCTION

Archean Chemical Industries Ltd. is manufacturing of Sulphate of Potash and Bromine, by modern technology at Greater Rann of Kutch, Village Hajipir, Taluka Bhuj, Dist. Kutch. The work -place is isolated from populated area and located near the sea area . Being chemical process , the Unit will operate round the clock , i.e. continuous process . The Unit will employ maximum 875 workers , including staff and contractors ' persons .

8.2 Plants/Sections

The major Chemical process plants /sections are as per below :

- A . Sulphate of Potash (SOP) Plant .
- B . Bromine Plant .

8.3 RAW MATERIALS

The major raw materials are used in the process :

8.3.1 SOP (Sulphate of Potash) Plant

- 1 .Harvested Salt Mixture - received from company 's Pond in crude form .
- 2 .Magnesium Salt - received from company 's Pond in crude form .
- 3 .Sea Water - received from company 's pond area in liquid form .

8.3.2 Bromine Plant .

- 1 .Chlorine : It is compressed Gas and received in container ,i.e.tonner, having storage capacity of 900 Kg , each supplied in truck -load by out -side manufacturer.
- 2 .Sulphuric Acid : Liquid , received by tanker load
- 3 .Caustic Soda Lye : Liquid , received by tanker load
- 4 .Quick Lime (CaO) : Solid , received by tanker load
- 5 .Feed Bittern : Liquid , transfer from our Pond

The details of major raw materials are given at Appendix –E



8.4 PRODUCTS

1. Sulphate of Potash
2. Bromine

The details of finished Products are given at Appendix -D.

8.5 Process

Processes are listed as below :

1. Sulphate of Potash
2. Industrial salt
3. Liquid Bromine .

8.6 Process Description

8.6.1 SULPHATE OF POTASH

Kainite Type Mixed Salt (KTMS) is transported by trucks into the feed hopper of section 100. There the material is crushed to an appropriate grain size for leaching and transported into section 200. In this section the KTMS is partially dissolved and partially converted to a mixture of Schoenite and Leonite by contacting it with a mixture of seawater and cooled mother liquor from the later Pot. Sulphate process.

The resulting slurry is thickened and centrifuged. The brine is pumped to the solar pond area. The crystallized Schoenite / Leonite mixture (primary Schoenite) enters the section 300.

In section 300 the SOP mother liquor coming from section 400 is cooled in a cooling crystallizer unit to 15 °C, in order to recover secondary Schoenite. The cooling crystallizer is working with several chambers. Vacuum is applied directly or indirectly to all chambers of this crystallizer. The exhaustion of the system is effected by means of exhaustion steam jet pumps. The vapors are condensed in mixing condensers. The connected vacuum pump VP compresses the inert gases to atmospheric pressure. The brine from which the secondary Schoenite is crystallized flows consecutively in all chambers. According to this flowing sequence of the brine, the conditions in each chamber are defined by different temperatures and pressures. In order to keep crystals sufficiently mixed thus to transfer the



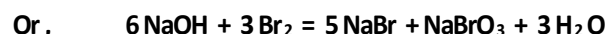
suspension from chamber to chamber ,a small rate of atmospheric air is sucked in into each chamber . At the outlet of the cooling crystallizer a centrifugal pump transfers the crystals slurry to a stirred interim storage vessel . The primary Schoenite coming from section 200 is also added to this vessel in order to covert Leonite into pure Schoenite . In section 400 the secondary Schoenite is contacted with hot seawater . According to the equilibrium conditions at this temperature and the mass relation of mixing Schoenite is decomposed , whereas K_2SO_4 crystallizes . $MgSO_4$ remains in solution as far as sufficient seawater is added . The secondary Schoenite is contacted with seawater and the hot mother liquor is pumped to section 300 . The solid material , SOP , after separation is transported to dryer and stored as dry product in the products storage shed . Process Flow Chart is given at Annexure -G - 1

8.6.2 Liquid Bromine

Feed bitterns from reservoir will be acidified to 3.5 pH by addition of acid in a feed tank and pumped to the top of stripping tower packed with pall rings . Steam and chlorine will be injected at the bottom of the tower . Liberated bromine will be condensed and purified in a separate tower by heating with indirect steam , Bromine will again get condensed and refluxed backed to top of tower and liquid bromine will be drawn from the bottom of this purifying tower , cooled and bottled in glass bottles and /or filled in ISO tanks for dispatch .

Air Blow out Process(ABO) for Liquid Bromine /Green Bromine :

Bittern from the reservoir will be acidified to pH 3.5 by the addition of acid in a feed tank and pumped to the top of stripping tower packed with pall rings , air and chlorine will be injected at the bottom venting of un reacted air by circulating in series of packed towers The reaction in the absorber reactor is as follows :



Part of this enriched alkaline solution (AB Solution) will be the mixture of bromide , bromated compounds from which again Bromine will be regenerated by the addition of acid . Regeneration of bromine will be done by a method similar to steaming out process but with smaller equipment as the feed liquor will be highly concentrated .



Regenerated bromine led out by steam given at the bottom of the will be condensed separated and processed further in distillation unit for the removal of impurities and packed in glass bottles and / or in ISO tanks for dispatch

8.6.3 GREEN BROMINE :

Part of AB solution - the bromide bromated mixture from air blow out process will be taken for the addition of chlorine to convert bromide to bromate and to maintain the ratio at



2 : 1. This converted mixture will be again mixed with alkaline solution and proper concentration of bromated will be maintained at a neutral pH by addition of caustic soda . This will be green bromine in a solution . It can be evaporated to form solids by crystallizing in open pan of closed evaporator , cooled , packed i n bags and sold . It can be sold as liquid in containers

Process Flow Chart is given at Annexure -G - 2 .

8.7 REACTION VESSELS

- 1 . Vessels are installed on Platform with railing and toe guard .
- 2 . Safety Valve, Pressure Gauge ,Temperature Gauge , Manhole , Charging line etc. are provided on reactor vessels .
- 3 . Stirrer arrangement with Low Speed .
- 4 . Flameproof Electric Motor
- 5 . Inspection , Examination & Testing of Vessels
- 6 . Earthing
- 7 . Drain

8.8 BY -PRODUCT

8.8.1 EPSOMITE

In Section 500 of Sulphate of Potash Plant , a sulphatic mixed salt containing Sodium Chloride and Magnesium Sulphate is treated i n order to produce Epsomite and brine . This salt mixture is crystallized in the solar evaporation field in section 690 . It is dissolved with hot seawater until saturation of Magnesium Sulphate is nearly reached . Sodium Chloride is separated from the stream , dissolved in seawater and then pumped to solar pond field . The Magnesium Sulphate process liquor is cooled to 15 °C whereby Epsomite crystallizes

This crystalline crop is separated from the stream by centrifuging and stored as wet material in the products storage shed . The brine is partially disposed to solar pond field and partially recycled .

In Section 690 the Schoenite End Liquor (SEL) emanating from section 200 is evaporated in a solar pond field . This field consists of 2 main pond areas .The clear liquid from the first pond area passes to the second one , in which a 2 -step solar evaporation process makes part . In the first step a mixture of Epsomite / Hexahydrate and Halite crystallizes which becomes harvested for the purpose of section 500 . In the second step a KTMS results and is used as feedstock for section 200 besides the KTMS from the Kainite area .



8.8.2 INDUSTRIAL SALT

Solar evaporation system for sea-water in pond and wet salt is collected and shifted to open field for making dry. Dry Salt is dispatched to customers, as per requirement..

8.9 STORAGE OF CHLORINE TONNERS

The Chlorine is the major raw material and hazardous chemical; stored, used and handled by unit, having maximum storage capacity of 270 Tons (300 Tonners). The capacity of each Tonner is 900 Kg and separate shed is provided to store the tonners. Chlorine is greenish yellow gas having toxic and corrosive effect. It is heavier than air and slightly soluble in water. Its TLV is 1 ppm. The major safety measures, like; Chlorine detector -sensors with alarm system, Chlorine -Kit, Monorail for handling the tonners, FRP Hood with sucker, Neutralizing pit, Cautionary Notice, Water Shower with eye washer, Training to the workers/operatives, etc.

8.10 STORAGE OF BROMINE

Bromine is the finished product and it is in form of liquefied and fuming substance. It is packed in Glass Bottle of 5 Kg with crate of 6 Bottles. Further, it is also supply in ISO Container, with capacity of 1000 Kg. The separate storage shed is provided.

8.11 STORAGE OF SOP

Sulphate of Potash is finished product and in form of Solid /lump. It is packed in Bags of 1000 Kg each and Silo of 1000 Kg.

8.12 STORAGE OF COAL

Coal is another raw material, used in power plant only. It is solid /lump and is stored at separate open yard. It is combustible.

8.13 STORAGE OF RAW SULPHUR

Sulphur is another raw material, and in form of granules. The separate storage shed is provided.

8.14 STORAGE OF OTHER RAW SUBSTANCES/chemicals

The Liquid Toxic chemicals, like; Sulphuric Acid, Caustic Lye, Lime, etc are stored at Tank-farm. The storage details of hazardous chemicals are given at Appendix -E.



8 .15 OTHER STORAGES AREA

Salt Storage ; ware House , Scrape Yard , Engineering Stores , etc .

8 .16 PERSONAL PROTECTIVE EQUIPMENTS

Personal Protective Equipment and Safety equipment are provided and details are given at Appendix - K , L .

8 .17 M.S.D .S.

The M .S.D .S. of hazardous chemicals prepared and they are available at the office & Responsible Person .

The M .S.D .S. of certain hazardous chemicals are given at Annexure - 5 .

8 .18 WIND INDICATOR & SIREN

The wind indicator will be installed at highest part of building . An electrical siren will be provided .

8 .19 Emergency power

The Unit has provided Nine D . G . sets at different locations , with capacity ranges from 250 KVA -1,320 KVA -1,500 KVA -3,750 KVA - 4 .Over & above , we have own power generation plant .

8 .20 WATER STORAGES & SOURCES

Water Source: sea Water, alternative source of supply is outsider		
Water Storages		
Source	Storage Type	Capacity
Sea Water	Pond	Plenty
Out side	Sea Water Reservoir	12550 M3
Out side	A/G Tank	630 M3x2

8 .21 UTILITY

1. Co -Generation Power Plant -Coal based .
2. D . G . Set .
3. Air Compressor Room .



4. Desalination Unit .
5. Switch -Yard
6. Work -shop .
7. Laboratory /R&D Department .
8. E.T.P .
9. Cooling Tower , Chillers , Day Tank .
10. R.O . Water Tank .
11. Ash Pit .
12. Belt -Conveyors , etc .

8.22 SAFETY MEASURES

1. M .S .D .S .
2. Separate Storage of Chlorine Tonners
3. Gas detector with alarm system
4. Chlorine scrubber .
5. Chlorine Kit , Caustic Pit , FRP Hood with sucker
6. Mono Rail for Tonner - Handling .
7. Neutralizing Agent .
8. Water shower with eye washer & Cautionary Notice
9. Water Pipe Line net work
10. Fire extinguishers at various locations .
11. Qualified and trained Supervisors /Operatives
12. Provisions of P .P .E .
13. Earthing & bonding to equipment .
14. Emergency -Instructions
15. Permit to work System .
16. Labelling and marking of materials .
17. Loading /Unloading Instruction .
18. Process -Parameter Panels with warning system .
19. Safety Committee .
20. Provision of training to workers , operatives , supervisors ,Contractors ' persons , etc .



CHAPTER-9 MAJOR HAZARDS

9.1 INTRODUCTION

Hazard is a physical situation or phenomena which can cause human injury , damages to property or the environment or combination of these criteria . Hazard Identification provides vital information to risk management and based on these information , management can keep ready the essential facilities , trained the persons against the probable emergency .

9.2 IDENTIFICATION OF HAZARD

Considering the major storage of Chlorine the major hazards can be identified as below ;

9.2.1 POTENTIAL AREA FOR TOXIC HAZARD

- 1 Chlorine: Tonner -Storage -Shed
- 2 Chlorine: Pipe line
- 3 Chlorine: Process Area
- 4 Scrubber : Scrubber Vent
- 5 Bromine: Reactors
- 6 Bromine : Storage Area .
- 7 Tank -Farm - Sulphuric Acid , Caustic Soda , etc. .

9.2.2 POTENTIAL AREA FOR EXPOSITION

- 1 Chlorine Tonner –Shed : Chlorine tonner
- 2 Co - Generation Plant : Plant
- 3 Process Area : Reactor , Distillation , vessel
- 4 Boiler Area : Boiler
- 5 Air Compressor: Air Receiver



6 .D . G . Set D . G . Set , etc.

9.2.3 FIRE POTENTIAL AREA

1. Tank Farm : Containing Flammable liquid , HSD
2. D . G . Set : D.G . Set
3. Boiler Area : Boiler
4. Co -Generation Plant - Coal Base
5. Coal Yard : Coal

9.2.4 ELECTRICAL FIRE

- Co -Generation Plant - Electricity
- General Electric Lighting , Electrical Cable Trays , etc ; are the possible Fire Hazard area .

9.3 COMMON CAUSES OF FAILURE

Failure of Containment may be caused by various reasons resulting in spillage/ leakage of Liquids and gases. It may be due to manmade ,unsafe act , unsafe situation or natural .

9.3.1 Unsafe Act and Unsafe Situation

- a .Inadequate design against internal pressure , external forces ,corrosion and temperature .
- b .Mechanical failure of Pipes , Vessels , Elbows due to corrosion , erosion , impact , liquid expansion etc.
- c .Failure of manual and automatic control system and safe guard .
- d .Failure of safety systems .
- e .Weld failure , Gasket failure .
- f .Unsafe operation / maintenance .
- g .Fire/ Emergency in neighboring units .
- h .Heating of electrical coils may result into fire .
- i .Spillage , leakage of flammable material , if get any sources of ignition , result into fire .
- j .Uncontrolled vehicle movement result into fire , explosion or accident .
- k .Wrong operating valve , mixing or overflowing of chemicals from the tanks , result into fire or mishaps .
- l .Any source of Ignition catch to flammable liquid materials may be caused reason of emergency



9.3.2 Deliberate

- a .Sabotage
- b .Terrorism
- c .Commotion / Arm conflicts
- d . Plane crash / Air raid
- e . Wars

9.3.3 Natural

- a .Storm
- b .Cyclone
- c .Wind
- d .Flood
- e . Frost
- f .Earthquake
- g .Lightening
- h .Heavy rainfall
- i .High temperature

9.3.4 STRESS & STRAIN CAUSED DURING NORMAL OPERATION

Stress & Strain occur in manual and in mental work , yet its sensation is appreciated in the mind only . The result of Stress and Strain on worker generally inefficient and accident prone is a fairly recent one and not always appreciated . The muscular stress and Fatigue , mental and nervous fatigue , Boredom and Chronic fatigue , improper environment , climate , lighting , noise ,vibration , ventilation , some effect of Insomnia (frequent sleep problem) etc are the stress & strain effects . There are nearly always potential accident hazards .

9 .4 EVALUATION OF POTENTIAL HAZARDS



Considering the various substances used , stored & handled at site , the following probability can be evaluated as below :

TABLE

Sr. No.	Type of Accident	Involved Hazardous substance	Place/area
1	Toxic Gas Dispersion	Chlorine	Chlorine Tonner Storage Area
		Chlorine	Chlorine Tonner Storage Area
		Chlorine	Chlorine Tonner Storage Area
		Chlorine	Tonner Loading/Unloading
		Chlorine	Process area
		Bromine	Storage Process area
2	Fire	Flammable substance	HSD tank farm
		Coal	Coal yard
		Diesel	D.G. Set
		Electricity Production	Co-generation plant
		Steam generation	Boiler
3	Toxic Liquid Spillage	Sulphuric Acid	Process area
		Caustic Soda	
4	Explosion	Compressed air	Air compressor
		Steam	Boiler
		Reactor	Process area

9.5 M.S.D.S. & SALIENT PROPERTIES OF MAJOR HAZARDOUS CHEMICALS

M.S.D.S. of major substance is given at Annexure - 5 .The salient property of major hazardous substance is given at Appendix -F .

9.6 Meteorological Details

Meteorological information in respect of Wind Velocity , Wind Direction , Maximum Temperature , rain etc . is given at Annexure - 13 . These factors may also contribute the maximum credible scenarios , if emergency strikes .



9.7 MAXIMUM CREDIBLE SCENARIO

The maximum credible scenario is considered as catastrophic failure of Chlorine Tonner . Generally , the possibility of one tonner may explode at a time . Hence , the total maximum quantity 900 kg of Chlorine may disperse from a tonner to atmosphere . The various damage distances are estimated by using various software and mathematical formulae , which is given in Annexure - 10 . Actual distance may be varying with quantity , prevailing weather condition , time of action , personal initiative , etc . .

9.8 Consequences

The potential hazardous at the unit is dealt with storage , process and handling area possible major scenarios are identified as per table given in 8.4.

If chlorine is not handled properly, then chances of chlorine leak cannot be ignored which may result into toxic gas dispersion. Such situation shall be handled tactfully i.e. by use of personal protective equipment particularly self-breathing apparatus , FRP Hood , Neutralizing media , PPEs , chlorine kit etc.

Further , if due care is not taken timely , then , It may result into -

- 1 . Toxic effect to persons On -Site or Off -Site .
- 2 . Fire and explosion .
- 3 . Toxic chemical spillage .
- 4 . It degrades and damages to surrounding environment conditions .
- 5 . The Financial losses due to injuries or fatalities to the people .
- 6 . The volatile components will fly away & cause adverse effect on environment .



CHAPTER-10

FLOOD MANAGEMENT

Introduction

The term "flood" is a general or temporary condition of partial or complete outpouring of normally dry land areas from overflow of inland or tidal waters or from the unusual and rapid accumulation or runoff of surface waters from any source.

Flooding and flash flooding are the deadliest of natural disasters. Floodwaters claim thousands of lives every year and render millions homeless. One of the more frightening things about flooding is that it can occur nearly anywhere, at any time. It can result from excess water jams on rivers, even moderate rain, or a single very heavy downpour.

1.0 PURPOSE

This plan describes the emergency response plan to handle the situation during Flood for prevention of human injuries, casualties or property damage.

2.0 SCOPE

All individuals and assets inside all the factories premises.

3.0 RESPONSIBILITY

Each and every employee including contractors working in the company premises.

RESPONSE PLAN FOR FLOOD

- a. Check what quantity of water can affect which areas up to what level. Study contour for affected area.
- b. Identify low and high spots, mark and highlight suitably in the Plant Layout Drawing.
- c. Arrange for pumps, hose pipes, generator sets for pumping water out of the affected area, where possible.
- d. Keep drainage lines clean so that water can be drained without delay.
- e. Keep blowers and industrial fans ready to dry water and moistures from machines/panels.
- f. Keep a stock of dry food and drinking water for the rescue team for at least three days inside the



premises.

- g. Keep mobile phones with charging facility and with additional batteries.
- h. Arrange for rapid communication arrangements like Portable Mega-phone & emergency sirens.
- i. Arrange for adequate numbers of Life-Jackets and train personnel about its usage.
- j. Constitute a Rescue Team consisting of persons from different departments and with different skills like fire, first aid, security, management, workmen, office staff & drivers.
- k. Educate Rescue Team for Plant Layout, high and low spots, structural strengths of different buildings / structures, Assembly Points, probable affected area/locations/equipments, electrical installations, electrical cable path, pipelines, etc.
- l. Decide one communication point (HO/Director/Plant In-charge Residence) away from the affected area and keep in contact with it.

ACTION PLAN FOR FLOOD

Considering the locations and height of water level, initiate the following actions –

A. To Prevent Property Damage:

- a. Identify locations and shift furniture, small machines, where possible to higher level.
- b. Arrange to disconnect heavy machinery from electrical supply.
- c. Wrap machines with plastic sheets, if possible.
- d. Identify electrical cables, which are going to remain under water. Arrange for disconnection of all those lines.
- e. Shift vehicles to higher level.
- f. Shift all records and computers to safe location.
- g. Take backups of all the important computers.
- h. Restrict entry of water by building temporary small walls (sand bags) at entrances

B. To Safeguard Humans:

- a. Relieve employees from duties. Vacate/evacuate the buildings/shop floors immediately, only required personnel remain present.
- b. Identify good swimmers for rescue operation.
- c. Carry out headcount and rescue the persons being affected
- d. Immediately arrange to send injured persons to nearby hospitals

C. To Prevent Hazardous material from contaminating Land/Water/Air

- a. Check for hazardous material (raw material + waste) location wise and arrange to pack them suitably to protect from water.
- b. Check their conditions, if found mixing with water or mixing with air, try to stop the same else call pre-assigned concerned persons to control the situation.
- c. Use suitable PPEs like helmet, goggles, gas masks or SBA, hand gloves, apron and gum boots or safety shoes, etc. along with Life-Jackets.



D. To Prevent Loss of Stored Material

- a. Ensure that no material is lying/stored directly on floor anywhere inside the premises.
- b. Considering the expected flood water level, shift material to safer height.
- c. Restrict entry of water in stores area. Build temporary wall (sand bags), plug entries

E. Mitigation Activities

- a. Pump out residual water immediately with the help of pump.
- b. Clean the area of sand and mud on the top priority.
- c. If any hazardous waste/material has contaminated the water, arrange to collect that water in separate tanks. Process them in ET Plant and then only dispose to sea/lake or corporation drainage.
- d. Isolate ruined, wet furniture/materials and initiate action to dry or repair them.
- e. Before starting power ensure water is removed from all corners, mud is removed from electrical panels, connections and moisture is dried.
- f. While cleaning mud, use suitable PPEs like helmet, goggles, gas masks or SCBA, hand gloves, apron and gum boots or safety shoes, etc.
- g. Use antiseptic solutions to wash hands/legs after cleaning the area.
- h. After flood water is receded and cleaning of area, spread pesticide solution to make area/furniture free from insects and fungus.
- i. As per the advice of Factory Medical Officer provide medicines to rescue team to prevent malaria/Flue/Viral infections



CHAPTER-11 MOCKDRILL REGEARSAL/EXCERSISE

a. SUBJECT

Exercise / Rehearsal / Simulation on ON -SITE -EMERGENCY PLAN ,Considering any one of the event related with hazardous chemical which may create maximum credible scenario .

10.2 AIM

It is necessary that all aspect of emergency plan is tested , often to ensure that they carry out their responsibility & function as specified and in particular to :

10.2.1 Test the response from workers , emergency services , and other responsible persons .

10.2.2 Test and evaluate the interaction of various agencies authorities involved and ensure that all components are properly coordinated .

10.2.3 Evaluate the available resources ,equipment's ,i ts effectiveness , accuracy etc .

10.2.4 Gain experience to create the confidence to handle & control the emergency amongst the participating persons / workers .

10.2.5 The Mock drill of the on -site Emergency Plan is to be conducted at least once in every six months (Please see Rule 68 -J (12) (5) of Gujarat Factories Rules 1963 (2004) .

10.3 AUTHORITY OF EXERCISE / REHEARSAL

The Director / Occupier is required to assume responsibilities & make decisions as seen to be legitimate .

10.4 TABLE DISCUSSION

The first part of exercise is 'Table Top' exercise to test that emergency plan do not interrupt the day -to -day running of their concerns . This will identify the difficulties involved and practical approaches . The scenarios will be decided and consideration shall be given to live practical involving all concerned at suitable intervals , i n addition to those of a theoretical nature .



10.5 BLUE PRINT

A blue print is prepared as guideline to act , accordingly in a selected scenario . The details , maps , affected areas , role & responsibility will be specific and information will be supplied to all concerned persons . The scenario will be explained by coordinator . The On Site Emergency Plan will be helpful .

10.6 CODE-NAME FOR REHEARSAL

The code name shall be given to identify the case of rehearsal not real incident . So that , on getting message , there will be no panicky amongst the operative person . The code name will not be indicated , in case of real emergency strikes . Further , the code name will be announced to conveying the message to authority , operative persons , etc while carrying out the exercise /mock drill /rehearsal .

10.7 NATURE

Origin , Date & time , location and Duration of exercise etc . will be pre -decided in particular manner .

10.8 AFFECTED AREA

It is the indication of the spread of disaster . This will be reflected in Blue print & give details of original place , units , surrounding identities , villages , roads , locations etc

10.9 EMERGENCY CONTROL CENTRE

An Emergency Control Centre will be established for exercise purpose where communication & other activities can be performed . The control center will have emergency facilities . The required documents like On -Site Emergency Plan , Details on weather conditions , list of persons to participate , Emergency scenario , maps , affected areas , emergency telephone numbers , list of hospitals , list of emergency vehicle & equipment will be kept ready . An experienced & expert person will be posted in Emergency Control Centre .

10.10 PREPARATION STAGE

The responsibilities & duties will be allotted to each group , services and involving all personnel . Educative meeting will be arranged to explain the role of each participant . Blue print , scenarios and arrangements will be discussed at large . Charts , maps , Posters , Banners etc . will be prepared for good performance .



10.11 RESOURCES AND FACILITIES

Certain essential facilities shall be provided to the participants as required during actual emergency period. Further, adequate resources shall be made available to handle the situation. The some dummy -person have to select as to play and act as dead, serious injured, minor injury for purpose of realization of scenario, and they will be identified by colour badges like, RED indicates as dead, GREEN indicates as immediate admission to the hospital for cooperation, YELLOW indicates first aid treatment, WHITE indicates no physical injury. The Experienced person shall be invited as OBSERVERS and separate identity cards shall be issued to them.

10.12 SEQUENTIAL ACTIONS

The whole exercise /rehearsal will be arranged in sequential actions as per on -site emergency plan. Thus rehearsal will be conducted, as actual performance.

10.13 OBSERVATIONS

The outsiders / third party will perform the role of observers and they will submit their reports on various site - observations with shortcomings & good features.

10.14 DE-BRIEF MEETING

On completion of exercise, de -brief meeting will convene to discuss the conducted exercise, give views on performance of each areas; explain difficulties, resources, limitation, planning etc. All these observations, with corrective steps will be noted & reports will be prepared.

10.15 PHOTOGRAPHS, VIDEO & PRESS COVERAGE

Photography, videography shall be carried out for the work performed, and that shall be used to educate company's employees, contract workers, etc.

10.16 format for rehearsal/exercise/mock drill

A format for rehearsal / exercise / mock drill is given in Appendix – S