

GOVT. OF MAHARASHTRA

OFF SITE DISASTER MANAGEMENT PLAN FOR OSMANABAD DISTRICT

Office of Deputy Director,
Industrial Safety & Health, Nanded.



PREFACE

In the recent past, we have experienced Industrial Disasters of serious nature. One of which is Bopal tragedy, one cannot forget. The outcome of such disasters resulted in tremendous increase in awareness of people all over the world. Governments of various countries world-wide have taken prompt action in preventing such Disasters & formalising mitigation activities in case of eventualities. Various groups, institutions, authorities are constantly working / updating such action plans.

Under the leadership of District Collector Mr. K.N.Nagargoje & Technical guidance of Mr. B.N. Kalaskar Jt. Director DISH, this Disaster management plan is prepared.

The objective of this plan is to increase awareness of Industry Management in view of mitigating the eventualities & to provide them necessary information with regard to resources available in the District. This plan deals with Industrial Disasters only.

In the year 1989, Central Govt. enforced the rules "Environment Protection Act" known as Manufacture, Storage & Import of Hazardous Chemicals Rules 1989. Under the said rules statutory provisions were laid down for preparation of On-site Emergency Management Plan by the occupiers of the Major Accident Hazard factories & Off-site Disaster Control Plan by the District Collector / District Emergency Authority designated by State Govt.

The Central Govt. subsequently gazetted additional rules in August 1996 making additional provisions with regard to Emergency Planning Preparedness & Response for chemical accidents. These rules are known as "Chemical Accidents" (Emergency Planning, Preparedness & Response) Rules 1996. Under these rules Central / State / District / Local crises groups are required to be constituted. The District crises group has to assist in the preparation of the District Off- Site Disaster Control Plan. This off-site Disaster Control Plan is prepared taking into consideration aforesaid legal requirement.

Mr. K.N.Nagargoje (I.A.S)
District Collector &
Chair Person DCG
Osmanabad

(M Y Bhalekar)
Dy. Director , DISH Nanded
& Member Secretary DCG,
Osmanabad.

TABLE OF CONTENTS

Sr. No.	INTRODUCTION	Page
A.1	Abbreviations	5
A.2	MOEF Guidelines	7
A.3	Introduction	8
A.4	Purpose of Plan	8
A.5	Plan Distribution	9
A.6	Types of Emergencies	10
A.7	Chemical Factories List	11
A.8	Legal Authorities & Responsibility of Responding	12
A.9	Planning factor	14
A.10	Phases of Emergency	14
A.11	MSDS	15
A.12	Command Structure Of DCG	16
A.13	Co-ordination of Plan	17
A.14	Integration Of Plan	17
A.15	Instruction On Plan use	18
B	EMERGENCY ASSISTANCE TELEPHONE ROSTER	18
C	RESPONSE FUNCTIONS	19
C.1	Initial Notification Of Response Agency	19
C.2	Direction & Control	20
	C.2.1. Organisational Role & Responsibilities	
C.3	Combating Disaster	26
	C.3.1 First Responder On Scene	
	C.3.2 Warning System	
	C.3.3 Emergency Procedure	
	C.3.4 Communication Among Responder	
	C.3.5 Personal Protection of Citizens	
	C.3.6 Emergency Preparedness	
	C.3.7 Emergency Response Team Organisation	
C.4	Training	33
C.5.	C.5.1 Personal Protective Equipments/Clothing	36
	C.5.2 Equipment Maintenance	
	C.5.3 Record Keeping	
C.6	Level of Response Based on Incident Severity	38
C.7	Public Information & Community Relation	39
C.8	Resource Management	40
C.8.1	Manpower	

C.8.2	Fire & Rescue	
C.8.3	Health & Medical	
C.8.4	Human Service	
C.8.5	Public Works	
C.8.6	Others	
C.8.6.1	Emergency Control Centre	
C.8.6.2	Communication	
C.8.6.3	MARG	
C.8.6.4	Media	
C.8.6.5	Crisis Groups	
C.9	Response Personal Safety	48
C.10	On Going Incident Assessment	49
C.11	Law Enforcement	50
D	CONTAINMENT AND CLEANUP	51
D.1	Techniques for Spill Containment & Cleanup	
D.2	Resources for Cleanup & Disposal	
E	DOCUMENTATION AND INVESTIGATION FOLLOW UP	54
F	PROCEDURE FOR TESTING & UPDATING THE PLAN	55
F.1	Testing the Plan	
F.2	Updating the Plan	
G	REFERENCES	61
	Annexure	
	1. Incident Information Summary	62
	2. Fire Brigade	63
	3. Hospitals/Ambulances	64
	4. Antidotes	65
	5. District Crises group	68
	6. Format for Comments	69
	7. General Guidelines in Disaster	70
	8. Safety Precaution (Response Personal Safety)	71
	9. Water Reactive Chemicals	72
	10. Emergency Assistance Telephone Roster	73
	11. HAZMAT RESPONSE Van	74
	12. Material safety Data sheet (MSDS)	79

ABBREVIATIONS

A.1 ABBREVIATIONS

SP	:	Superintendent of Police
BLEVE	:	Boiling Liquid Expanding Vapour Explosion
CPCB	:	Central Pollution Control Board
CCE	:	Chief Controller of Explosive
CCG	:	Central Crisis Group
CETP	:	Common Effluent Treatment Plan
CIDCO	:	City & Industrial Development Corporation
CFO	:	Chief Fire Officer
CMG	:	Crisis Management Group
CMO	:	Chief Medical Officer
DCG	:	District Crisis Group
DCP	:	Deputy Commissioner Of Police
DIO	:	District Information Officer
DISH	:	Directorate of Industrial Safety & Health
DGFASL	:	Director General of Factory Advice Service & Labour Institute
DGP	:	Director General of Police
DIGP	:	Deputy Inspector General of Police
EP Act	:	Environment Protection Act
ER	:	Emergency Response
EPPR	:	Emergency Preparedness & Planning Rules
ECC	:	Emergency Control Centre
EOC	:	Emergency Operating Centre
F & ERS	:	Fire & Emergency Response Station
FDA	:	Food & Drug Administration
HSD	:	High Speed Diesel
HAZMAT	:	Hazardous Material
IDLH	:	Immediate Danger Life & Health
IC	:	Incident Commander IC is responsible for Incident Activities including development and implementation of strategic decisions and for approving ordering and releasing of resources
ICS	:	Incident Commander System
KG	:	Kilogram
LPG	:	Liquefied Petroleum Gas
LC50	:	Level of Concern 50
MAH	:	Major Accident Hazard
MARG	:	Mutual Aid & Response Group
MIDC	:	Maharashtra Industrial Development Corporation
MPCB	:	Maharashtra Pollution Control Board
MSEB	:	Maharashtra State Electricity Board
MSDS	:	Material Safety Data Sheet
MTNL	:	Mahanagar Telephone Nigam Limited
MV Act	:	Motor Vehicle Act
MCL Scenario	:	Maximum Credible Loss Scenario

MIA	:	Marathwada Industries Association
NGO	:	Non Governmental Organisation
OMC	:	Osmanabad Municipal Council
NCMP	:	National Crisis Management Plan
ORG	:	Operation Response Group
PWD	:	Public Works Department
PRO	:	Public Relation Officer
PPE	:	Personal Protective Equipments
PHC	:	Primary Health Centre
RTO	:	Regional Transport Authority
SSI	:	Small Scale Industries
SCMP	:	State Crisis Management Plan
SMPV Rules	:	Static & Mobile Pressure Vessels Rules
SCG	:	State Crisis Group
TREMCARD	:	Transport Emergency Management Card
VCE	:	Vapour Cloud Explosion

A.2 MOEF Guidelines

SR.NO	ELEMENT	MOEF Guideline Section
1	Incident Information Summary	1.0
2	Promulgation Document	2.0
3	Legal Authority & Responsibility For Response	3.0
4	Table of Contents	4.0
5	Abbreviations & Definitions	5.0
6	Planning Factors, Methodology of Identifying the Hazards	6.1-6.6,6.9
7	Impact Analysis	6.6.2-6.6.3,6.8
8	Concept Of Operation	7.1-7.3
9	Co-ordination Of Plan	7.4
10	Integration of Plan	7.6-7.7,7.9-7.12
11	Mutual Aid	7.8
12	Purpose of the Plan	8.1
13	Distribution List	8.2
14	Amendments Record	9.1
15	Emergency Notification Procedures	10.1-10.8
16	Notification to Response	11.0
17	Directions & Control to Response	12.0-12.5
18	Classification Of Incident Severity Levels	12.8-12.9
19	Communication among Responders	13.0
20	Responsibilities in Public Notification	14.2
21	Public Information & Community Relations	15.0
22	Resource Management	16.1-16.6
23	Co-ordinations Of Resources Available	16.7-16.9
24	Health & Medical	17.0
25	Safety Of Response Persons	18.0
26	Personal Protections Of Citizens	19.0
27	Evacuation Procedures	20.0
28	Fire & Rescue	21.0
29	Law Enforcement	22.0
30	On-going Incident Assessment	23.0
31	Human Services	24.0
32	Public Works	25.0
33	Spill Containment & Clean-up	26.0
34	Documentation & Investigation Follow up	27.0
35	Procedures For Testing and Updating the Plan	28.0
36	Training	29.0

A.3 INTRODUCTION

Hazardous Materials - The Need for Emergency Planning :

Major disasters like that in Bhopal, India, in December 1984, which resulted in 2,000 deaths and over 200,000 injuries are rare. Reports of hazardous materials spills and releases, however, are increasing in common place. Thousands of new chemicals are developed each year. Citizens and Officials are concerned about accidents. (e.g. highway incidents, warehouse fires, train derailments, industrial incidents) happening in their communities. Recent evidence shows that Hazardous materials incidents are considered by many to be the most significant threat facing local jurisdictions. Communities need to prepare themselves to prevent such incidents and to respond to the accidents that occur.

A.4 Purpose of This Plan

The purpose of this plan is to assist public in planning for hazardous materials incidents. The Objectives of this plan are to :

- ❖ Focus public activity on emergency preparedness and response;
- ❖ Provide public with information useful in organising the planning task;
- ❖ Furnish criteria to determine risk and to help public decide whether they need to plan for hazardous materials incidents.
- ❖ Help public conduct planning that is consistent with their needs and capabilities; and
- ❖ Provide a method for continually updating a public's emergency plan..

This plan will not :

- ❖ Give a simple " fill-in-the-blanks" model plan (because each public needs an emergency plan suited to its own unique circumstances);
- ❖ Provide details on response techniques; or
- ❖ Train personnel to respond to incidents.

Public planners will need to consult other resources in addition to this plan.

ANNEXURE -1 INCIDENT INFORMATION SUMMARY

A.5 PLAN DISTRIBUTION

1. Chairman - District Collector
2. Member Secretary DCG / Deputy Director DISH, Nanded
3. Chief Medical Officer OMC.
4. Superintendent of Police, Osmanabad.
5. Chief Fire OMC, Osmanabad.
6. ARTO, Osmanabad.
7. Joint Chief Control of Explosive, CGO Complex, CBD Belapur, Navi Mumbai.
8. District Information Officer, Osmanabad.
9. District Agricultural Officer, Osmanabad.
10. RDC/ Tahsildar, Osmanabad.
11. District Supply Officer, Osmanabad.
12. Civil Surgeon, Osmanabad.
13. Medical Superintendent Medical Hospital, Osmanabad.
14. District Health Officer, Osmanabad.
15. SubRegional Officer MPCB, Osmanabad.
16. Executive Engineer MIDC, Osmanabad.
17. Executive Engineer PWD, Osmanabad.
18. NGO

A.6 TYPES OF EMERGENCIES

The Off - Site Disaster Control Plan envisages the following types of emergencies

- TOXIC RELEASE OF CHEMICAL SUSTANCES / GASES
- FIRE / EXPLOSION / BLEVE / VCE
- TRANSPORATION EMERGENCIES.
- SPILLAGE (CORROSIVE CHEMICAL) ON SITE EMERGENCIES ONLY

A.7 THE FOLLOWING FACTORIES ARE IDENTIFIED AS MAH / OTHER FACTORIES IN THE OSMANABAD DISTRICT.

MAH Unit :-

A.4.3 THE FOLLOWING FACTORIES ARE IDENTIFIED AS MAH / OTHER CHEMICAL FACTORIES IN THE OSMANABAD DISTRICT.

MAH Unit :-

Sr. No.	Name of Address of MAH Factories	Hazardous material	Maximum inventory (MT)	ACCIDENT SCENARIOS
1.	Balaji Amines Ltd., Tamalwadi, Tq. Tuljapur, Dist. Osmanabad	Ethanol, Methanol, Ammonia, Xylene, HCl, Chlorine, Hydrogen, Acetic Acid, Acetone, EO,	(320 MT.), (260 MT) (50 MT) (20 MT), (50 T), (3T), (1T), (20 MT), (20 MT), (10 MT)	Fire, Explosion & Toxic
2.	Terana Shetkari Sah. Sakhar Karkhana Ltd., (Distillery Division) Dhoki, Tq. & Dist. Osmanabad	Ethyl Alcohol	(1600 MT.)	Fire

Other Chemical Factories :-

Sr.No	Name of Factories	Address	CHEMICAL	INVENTORY	ACCIDENT SCENARIOS
1	ABBAS FIRE WORKS	TERKHEDA, TQ. WASHI	BARIUM NITRATE, ALL. POWDER, SODIUM NITRATE	70 KG	Explosion
2	DADA FIRE WORKS	TERKHEDA, TQ. WASHI	BARIUM NITRATE, ALL. POWDER, SODIUM NITRATE	70 KG	Explosion
3	GOVT. MILK SCHEME	BHOOM	AMMONIA	1 T	TOXIC
4	J. K. FIRE WORKS	TERKHEDA, TQ. WASHI	BARIUM NITRATE, ALL. POWDER, SODIUM NITRATE	70 KG	Explosion
5	MAYUR FIRE WORKS	TERKHEDA, TQ. WASHI	BARIUM NITRATE, ALL. POWDER, SODIUM NITRATE	70 KG	Explosion
6	NEW KRANTI FIRE WORKS	TERKHEDA, TQ. WASHI	BARIUM NITRATE, ALL. POWDER, SODIUM NITRATE	70 KG	Explosion

7	P. P. PATEL & CO.	TANULWADI	L.P.G. AMMONIA	1 T 2 T	FIRE & TOXIC
8	REVATE AGRO PRODUCTS PVT. LTD.	YENEGUR, TQ. UMARGA	AMMONIA	300 KG	TOXIC
9	SWAGAT FIRE WORKS	KASBE TADWADE, TQ. OSMANABAD	BARIUM NITRATE, ALL. POWDER, SODIUM NITRATE	70 KG	Explosion
10	TULJABHAVANI SAH. SAKHAR KARKHANA LTD. (DISTILLARY DIVISION)	NALDURG, TQ.TULJAPUR, DIST. OSMANABAD	ETHYLE ALCOHOL	800 MT	FIRE

A.8 LEGAL AUTHORITY AND RESPONSIBILITY FOR RESPONSE

As per Chemical Accidents Emergency Planning Preparedness & Response Rules 1996 prescribed under Environment (Protection) Act, 1986, the 4 crisis groups are formed. Authorised legislation and regulations are as follows :

Central Crisis Group

<u>Authority</u>	<u>Responsibility</u>
1. Secretary Govt. of India, Ministry of Environment & Forest	E P Act & Rules
2. Joint Secretary/ Adviser (MOEF)	-do-
3. Joint Secretary Labour	Factories Act, 1948.
3. Joint secretary /Adviser (Chemical & Petrochemicals)	Petroleum Act
4. Director – General, Civil Defence	Relief & Rescue
5. Fire Adviser, Directorate General Civil Defence	Fire & Rescue
6. Chief Controller Of Explosives	Indian Explosives Act
7. Joint Secretary (Health)	Health & Medical
8. Director – General ICMR	Health & Medical
9. Chairman CPCB	E P Act & Rules
10. Director – General ICAR	Insecticides Act
11. Director – General CSIR	Technical Advise
12. Joint Secretary (Fertilisers)	Insecticides Act
13. Director – General (Telecom.)	Telecom Act
14. Joint Secretary (Surface Transport)	MV Act & Merchant Shipping Act
15. General Manager (Rail Safety)	Railway Act
16. Adviser, Centre For Environment and Explosive Safety Act	EP Act & Indian Explosives Act
17. Controller of Mines	Mines Act-1952
18. Chief Inspector Dock Safety &	Dock Workers (Safety, Health & Welfare) Act

State Crisis Group

<u>Authority</u>	<u>Responsibility</u>
1. Chief Secretary	Overall Incharge Of the State
2. Secretary (Labour)	Factories Act 1948
3. Secretary, Environment	EP Act & Rules
4. Secretary, Health	Health & Medical
5. Secretary, Industries	Containment & Clean up
6. Secretary, Public Health Engg	Containment & Clean up
7. Chairman, MPCB	EP Act & Rules
8. Commissioner Transport	MV Act & Rules
9. Director, Industrial Safety & Health	Factories Act 1948
10. Chief Fire Officer OMC	Fire & Rescue
11. Director General Of Police	Law & Order

District Crisis Group.

<u>Authority</u>	<u>Responsibility</u>
1. District Collector Osmanabad	Overall Incharge
2. Dy. Director DISH Nanded	Factories Act 1948
3. District Emergency Officer	Same as Chairman DCG
4. Chief Fire Officer Osmanabad	Fire & Rescue
5. District Information Officer	Public Information
6. Joint Chief Controller Of Explosives	Indian Explosives Act
7. Chief, Civil Defence	Relief & Rescue
8. One representative of trade Unions	Information & help
9. Superintendent Of Police	Law & Order
10. District Health Officer/Chief Medical Officer	Health & Medical
11. CMO of OMC	Health & Medical
12. Dept of Public Health Engineering	Public Works
13. S RO MPCB	EP Act & Rules
14. District Agriculture Officer	Insecticides Act
15. 4 persons nominated by District Collector (DC)	Public Communication
16. RTO Osmanabad	MV Act
17. One representative of industry nominated by DC	Resource
18. Chairman DCG & District Collector	Prepare & Implement Offsite Plan

A.9 PLANNING FACTORS:-

The following parameters have kept in view in the formulation of this plan

- A) Control & direction over all the nine zones to rest with corporation crisis management of Osmanabad District headed by District Collector.
- B) Decentralisation of operational control to each zone to be exercise by the respective operational response group.
- C) Each to be self sufficient in first response capability within a specified time in emergency service.
- D) All the zones should have very close linkage to ensure integrated approach to emergency.
- E) All MAH industries in a zones to have a formalised mutual aid agreement covering fire fighting & Medical service.
- F) Instant alarm system to alert the people in danger zone.
- G) Quick response by radio communication network & Mobiles Phones bases on data processing Computer output.
- H) Identification of routes for transport of Hazardous Chemicals should be excluded, as there are no dedicated routes for this purpose. So only existing routes to be included.

A.10 PHASES OF EMERGENCY MANAGEMENT.

Before the emergency : Preparatory actions which include identification of specific hazards and area of vulnerability, adoption of mitigatory steps, setting up of response facilities education of communities, conducting of simulated training exercise etc.

During the emergency : It is the implementation of the operational plan corporation as a “ reflex response ‘ to reduce casualties and damage to property.

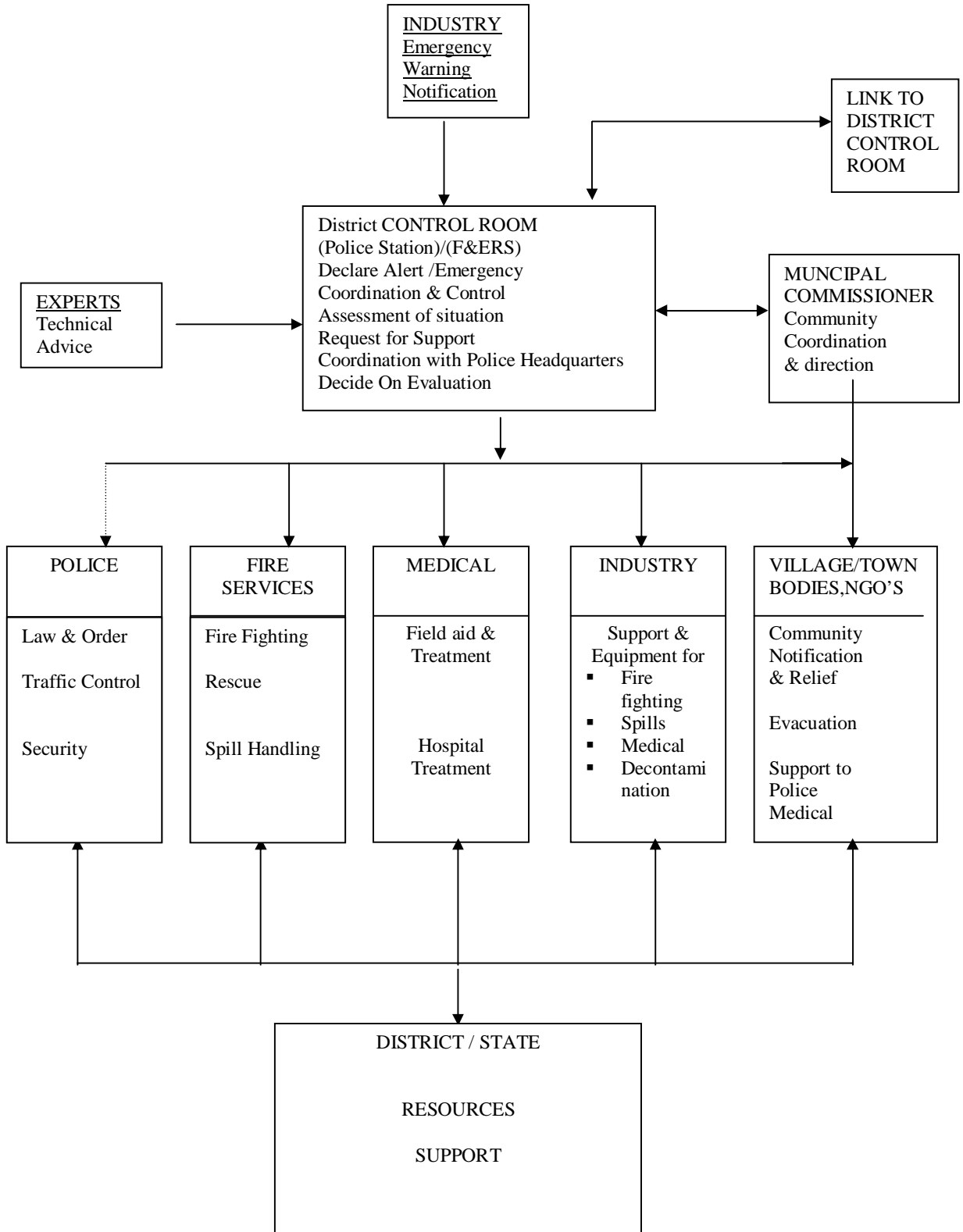
After emergency : It is phase that involve restoring normalcy and assessing the damage.It is also necessary to carry out a critique of

the causes of the accident to avoid repetition of similar occurrences.

A 11 MATERIAL SAFETY DATA SHEET

Computerised ECC of Fire & Emergency Response Station of District & Police Control Room should have MSDS of all the Hazardous Chemicals in the District. Also All Emergency Response team leaders should have access to MSDS.

A.12 COMMAND STRUCTURE OF DCG

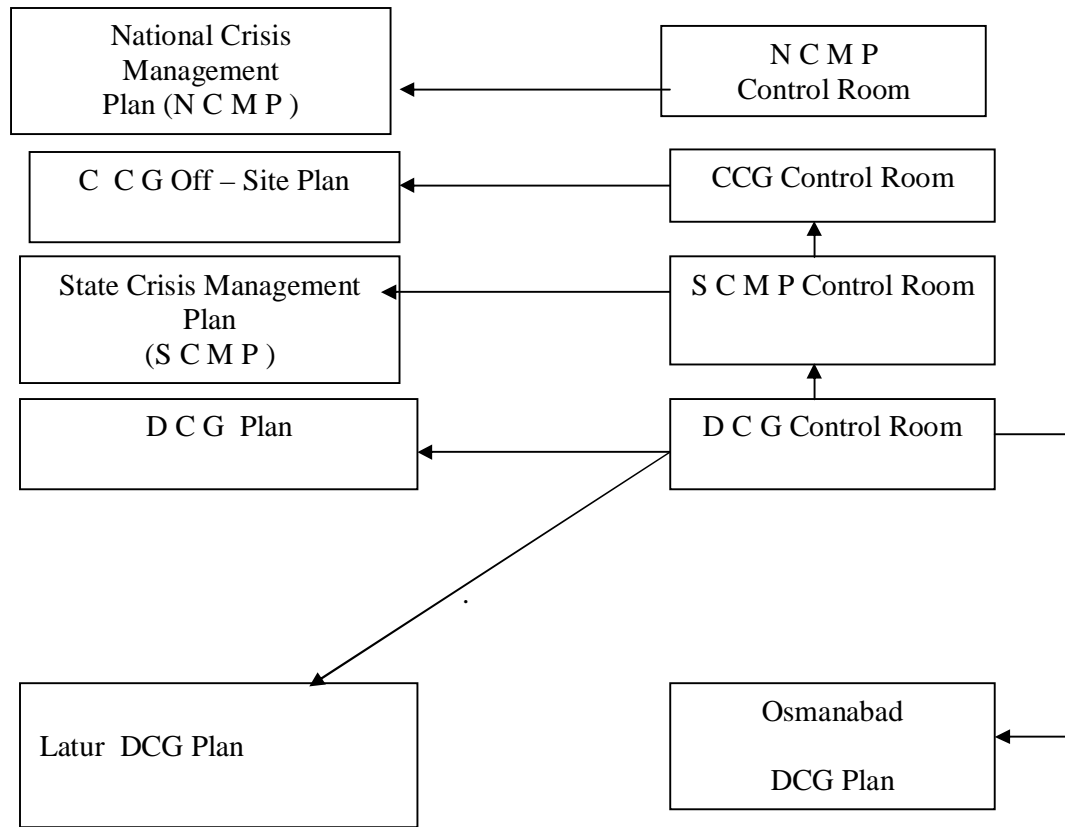


Off-Site Emergency Response Structure (District Level)

COORDINATION OF PLAN

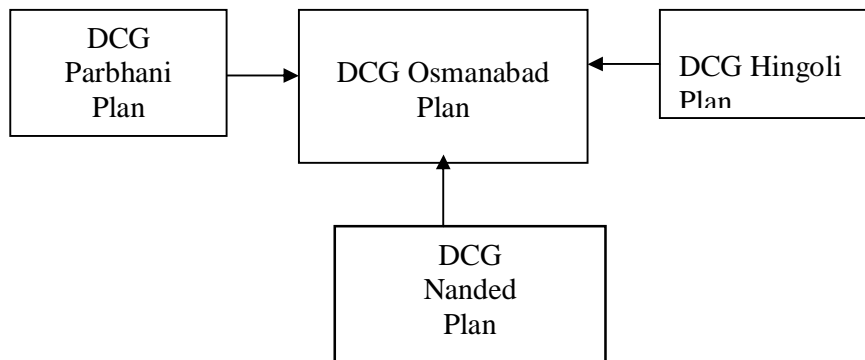
RELATIONSHIP TO OTHER PLANS.

A.13



A.14

INTEGRATION OF PLANS



A.15 INSTRUCTION ON PLAN USE:**A.9.1 Who should read this plan.?**

This plan is developed basically for the agencies under the State Govt. in understanding their roles in case of an emergency. Also the DCG and the Industries are expected to be clear in their roles and relationship concerning Disaster.

A.9.2 When this plan be used ?

This plan should be used for pre-incident planning and disaster. It should be used for guidance and clarification, where particular agency has a responsibility. For the catastrophic emergency this plan shall be used in conjunction with Osmanabad City & Osmanabad District.

B EMERGENCY ASSISTANCE TELEPHONE ROSTER

Please Refer annexure no 5

C : RESPONSE FUNCTIONS

C. 1. INITIAL NOTIFICATION OF RESPONSE AGENCIES.

Name of Agencies	Telephone No.
i. DCG Control Room	100/02472-243234
iii. SCG control Room	022-22027990
iv. CCG Control Room	
v. Other Agencies in community Service in Telephone Roster. (Fire Brigade,)	101/02472-222101

Any industry, personnel Contractors and visitors shall follow the procedures as below after discovering or witnessing an accident that involves:

- Fire and / or explosion
- Personal injury
- Release of hazardous material and / or waste
- Any emergency situation that could impact human and safety and / or the environment.
- Substantial property loss.

Incident Discovery

- i. In case of emergency :
- ii. Dial **100/02472-243234** immediately
- iii. Give your name, location, and a concise description of the emergency (e.g. fire, Personal injury, toxic gas release etc.)
- iv. Notify / alert the personnel in the immediate area of danger.
- v. If personal Safety and health is not assured, do not attempt to enter the site
- vi. By this time the emergency response team will reach the site.

Notification :

During an emergency, the command post or the first responder at site shall notify the emergency control center about severity of incident. Accordingly the ECC shall deploy resource to manage the incident. After that ECC shall issue all the internal and external notification to various agencies and shall send the call out that are contingent on the nature of the incident.

C.2 DIRECTION AND CONTROL

C.2.1 ORGANISATION ROLES & RESPONSIBILITIES (CRISIS MANAGEMENT GROUP - CMG)

This is the apex body for crisis management and is headed by the District Collector. The District Collector is assisted by member as under.

Superintendent of Police
 Chief Officer Osmanabad
 Dean Govt. Medical College / Civil Surgeon at Civil Hospital.
 Dy. Director, Industrial Safety & Health, Nanded
 Chief Fire Officer, Osmanabad
 Deputy Controller, Civil Defence.
 Commandant Home Guards
 District Information Officer
 Regional Officer, Pollution Control Board.
 Representative of the Industries
 District Health Officer
 Dy.RTO Osmanabad
 Experts in Industrial Safety & Health

The chairman may co-opt any other officer depending upon the situation, For each member of the CMG there is an alternate member. The telephone number and address and of each member are given in list.

The tasks of the CMG are as under:

1. To exercise board control over emergency operations.
2. To give guidance on matter of basic policy.
3. To provide official information and instruction to the public.
4. During normal times review the operational preparedness and take appropriate measures to rectify the defects.
5. To co-ordinate inter zone emergency response.

The duties of the CMG members are given as below :

1. **District Collector**
 - i. As Chairman of CMG implement plan
 - ii. Exercise board control on emergency operations.
 - iii. Give guidance / decision on matters of basic policy
 - iv. Review operational preparedness of Corporation emergency machinery.
 - v. Hold periodic mock drills / training exercise to ensure optimum operational preparedness. If necessary, invoke help from the Army, the Air Force, the Government and any private industries in the area of District.
 - vi. Develop Off-Site scenarios based on On-Site Plans of the industries.
 - vii. Relief Operation

2. Superintendent of Police

1. Maintain law and order
2. Regulate traffic
3. Control entry to the emergency area
4. Security arrangements at each industrial unit.
5. Protect vital installations.
6. Assist in warning public about the emergency
7. Assist in evacuating and sheltering.
8. Protect evacuated area.
9. Assist emergency services in the performance of their duties.

3. Dean Govt. Medical College / Civil Surgeon / District Health Officer

1. First aid arrangement and availability of On-Site requirements of industries.
2. set up mobile First Aid Posts at Assembly Points
3. Mobilisation of emergency medical and health service at Causality Clearance Centres and Base Hospitals.
4. Public Health Service at Reception Centres
5. Medical supply of antidotes, special medicines and life saving drugs.
6. Corpse disposal service.
7. Co-opt voluntary organisation like Rotary Clubs & Lions Clubs.
8. Prepare Plan for Health & Medical
9. Training to Medical team & Hospital staff for emergency response.

4. Deputy Director Industrial Safety & Health, Nanded.

1. Ensure On-Site Plans of Industries are vetted and approved as per Act.
2. Visit industries to see that safety norms are being followed.
3. Ensure development of On-Site Plans, Examination of risk evaluation study and Safety Audit
4. Ensure frequency of Safety Audit and Fire Drills & Mock Drills.
5. Assist the Chief Officer in developing off- Sites Scenarios
6. Ensure Safety Education, Safety awareness, Discussion along with MARG
7. Pre-emergency & Post emergency Task.
8. Member Secretary of the DCG Osmanabad.

5. Chief Fire Officer, Osmanabad

1. Mobilisation of all fire fighting units from various source.
2. Training of fire service personnel in chemical disaster operations
3. Stocking of special fire fighting agents and equipment for chemical emergencies
4. Adequacy of fire fighting / control measure at each industrial location.
5. Work out Mutual Aid Arrangement in the cluster.
6. Prepare Plan for Human Service required for the emergency response
7. Formulate Chain of Command among the Fire Fighters.
8. Prepare Plan for Response Personal safety.
9. Prepare Plan for Fire & Rescue.
10. List out Tasks of the Fire Fighters.

6. District Information Officer:

The information officer, a member of the command staff is responsible for the formulation and release of information about the incident to the news media and other appropriate agencies and organisations.

- Obtain briefing from incident commander.
- Contact the jurisdiction agency to co-ordinate public information activities.
- Establish single incident information center whenever possible.
- Arrange for necessary work space, materials, telephones, and staffing.
- Prepare initial information summary as soon as possible after arrival.
- Observe constrains on the release of information imposed by incident commander.
- Obtain approval for release from incident commander.
- Release news to news media and post information in command post and other appropriate locations.
- Attend meetings to update information releases.
- Arrange for meetings between media and incident personnel.
- Provide escort service to the media and VIP's.
- Provide fire retardant clothing for media and VIP's
- Respond to special requests for information.
- Maintain and Submit all records and logs.

7. Sub Regional Officer, Maharashtra Pollution Control Board.

1. Monitor extent and quantum of pollution during the crisis
2. Declare hazardous area safe for re-occupation by population.
3. Prepare Plan for the Containment & Clean-up
4. Prepare Plan for On-going incident assessment.

8. Regional Transport Officer, Osmanabad.

1. Ensure strict enforcement of regulations laid down improve safety in transportation of hazardous substances.
2. Organise transportation arrangement for evacuation.
3. Ensure TREMCARD is available in the Tankers transporting Hazardous Chemicals.
4. Divert Tankers transporting Hazardous Chemicals in association with Traffic Police in case of Disaster, Ganesh Chhaturthi/Chhaturdashi, any other festivals or Mass gathering to safer transport Route.
5. Train Tanker drivers in respect of the Hazards during the Chemicals transportation in consultation with MARG.

9. INCIDENT COMMANDER

The Incident Commander is responsible for incident activities including the development and implementation of strategic decisions and for approving the ordering and releasing of resources.

- Obtain incident briefing from prior incident commander
- Assess incident situation.
- Conduct initial briefing
- Activate elements of the incident command system
- Brief command staff and section chiefs.
- Ensure planning meetings are conducted.
- Approve & authorize implementation of incident action plan.
- Determine information needs and inform command personnel of needs.
- Coordinate staff activity
- Manage incident operations
- Approve requests for additional resources and requests for release of resources.
- Approve the use of trainees on the incident
- Authorise release of information to new media.
Ensure incident Status Summary is completed and forwarded to Emergency Control Center (ECC) and dispatch Center(s)
- Approve Plan for demobilisation.

10. District Crises Group Chair person / Member Secretary

- Act as a Alternate Leader, Liasion Officer, Agency Chief, in disaster.
- Check in at the incident command post. Ensure that all agency resources have completed check-in.
- Obtain briefing from liasion officer or incident commander.
- Establish working location. Advise agency personnel on the incident that the agency representative position has been filled.
- Attend planning meetings as required.

- Provide input on use of agency resources if no resource use advisors are assigned.
- Co-operate fully with incident commander and general staff on agency's involvement at the incident.
- Oversee the well being and Safety of agency personnel assigned to incident.
- Advise liaison officer of any special agency needs or requirements.
- Determine, if any special reports or documents are required.
- Report to agency dispatch or headquarters on prearranged schedule.
- Ensure that all agency personnel and/or equipment is properly accounted for and released prior to your departure.
- Ensure that all required agency forms, reports, and documents are completed prior to your departure from the incident.
- Have debriefing session with liaison officer incident commander prior to departure.

11. **GENERAL MANAGER TELECOM :**

The Communication unit officer under the direction of the Chief Fire Officer Osmanabadi responsible for developing plans for the effective use of incident communications equipment and facilities, installing & testing of communication and equipment, supervision of the Incident communications Centre, distribution of communication equipment to incident personnel, and the maintenance and repair of communications equipment.

- Obtain briefing from Chief Fire Officer, Osmanabad.
- Determine unit personnel needs.
- Advise on communication capabilities and / or limitations.
- Prepare and implement the Incident Radio Communications Plan.
- Ensure the Incident Communications Center and Message Center are established.
- Set up the telephone and public address systems.
- Establish appropriate communication distribution and/or maintenance locations within the base and/or map.
- Ensure Communications systems are installed and tested.
- Ensure an equipment accountability system is established.
- Ensure personal portable radio equipment from cache is distributed per radio plan.
- Provide technical information as required on :
 - Adequacy of communication system currently in operation.
 - Geographic limitation on communications systems
 - Equipment capabilities.
 - Amount and types of equipments available
 - Anticipated problems in the use of communication's equipment.

13. **DEPOT MANAGER MSRTC Osmanabad.**

- Ensure availability of Buses in case of evacuations.

14. **Superintending Engineer MSEDCL Osmanabad.**

- Ensure electricity supply to all MAH units, streets, Police stations, Fire brigades, Emergency Control Center & Other Offices of emergency Response Personnel.

15. DISTRICT SUPPLY OFFICER Osmanabad.

He is responsible for determining feeding requirements at all incident facilities, menu planning, determining cooking facilities required and general maintenance of the food service areas.

16. Dy. Engineer MIDC Osmanabad.

- Report to and obtain briefing and special instructions from Chief Officer OMC.
- Participate in the development of the Incident Action Plan, and review general control objectives including alternative strategies presently in effect.
- Collect and validate water resource information within the incident actions.
- Prepare information on available water resources.
- Establish water requirements needed to support fire suppression actions.
- Compare incident control objectives as stated in the plan with available water resources and report inadequacies or problems to Chief Officer OMC.
- Participate in the preparation of Incident Action Plan when requested.
- Respond to requests for water Information.
- Collect and transmit records and logs to documentation unit at the end of each operational period.
- Maintain and Submit all records and logs.

C-3 COMBATING DISASTER

C 3.1. FIRST RESPONDER ON SCENE

The first senior official responding to an Emergency is the incident Commander and begins implementing the incident command system. All emergency responders and their communications are co-ordinated and controlled through the incident commander. As more senior official arrive the position of incident commander is passed up a previously established line of authority.

The first responder at the scene of a hazardous materials emergency should complete the task necessary to protect public health and responder safety, the environment, and the property. The order in which the following tasks are completed is incident priorities.

- * Evaluate potential hazards to determine if the release or threaten release is an emergency.
- * Isolate the Scene and deny entry.
- * Establish control zones.
- * Identify spilled material or threatened release without subjecting responders to contamination.
- * Look for any casualties and identify other essential site conditions.
- * Implement Incident Command System, establish a command post, and identify a staging area for incoming resources.
- * Identify additional resources for operations beyond the capability of on-scene units.
- * Notify appropriate response and reporting agencies.
- * Designate a knowledgeable safety officer prior to engaging in operational activities.
- * Rescue victims from the hot zone using appropriate personal protective equipment.
- * Provide emergency decontamination to victims exposed to material having the potential for secondary contamination of emergency medical personnel.
- * Determine necessary public protection action (evacuation or sheltering in place).
- * Initiate control and containment within capabilities of available resources and equipment.

C 3.2 WARNING SYSTEM

A good warning system is one of the most important pre-requisite of the emergency management system to save lives, prevent injuries and mitigate losses. As soon as incident commander determines that it is necessary to warn people of a threat to public safety, a strategy appropriate to the situation will be developed and immediately implemented to ensure coverage of the affected area. The dissemination of warning shall be effected by the MAH Factories.

Types of Warning :

Warning signal will be given as under :

- **DISASTER WARNING** : Maximum credible loss scenario from the industry or transportation. The warning signal shall be high pitched long wailing siren followed by short wailing siren.
- **ALL CLEAR** : Long continuous note

Dissemination of warning by the Factories

Depending on the nature of the hazard, the size of the population of the area threatened and the time available to react, one or more of the following methods would be used to warn the public.

- Outdoor warning siren
- Public addressed system (Vehicle mounted) with the police
- Remote public address system
- Siren
- Mass media i.e. Radio and Television
- Door-to-door visits by Civil defence personnel using mask and relaying pre-recorded cassette messages.
- Telephone calls to sensitive locations like schools, organizations and institutions having a large number of employees.

In case of an toxic gas emanating from present area on to the neighbouring area due to prevailing wind direction, the information will be relayed to the district Collectorate for warning the likely affected population under their jurisdiction .

C .3.3 EMERGENCY PROCEDURE

In a chemical hazards disaster management because of varying wind direction and speed throughout the year, it is imperative to work out the emergency procedures in advance for each probable scenario of each industry for different months of the year to reduce the response time to the barest minimum.

A sample outline for one of the disaster scenario is given in the following section :

(ACTION DESIRED : A similar emergency procedures for all maximum probable disaster scenario for different months of the year should be developed by the responsible authority.)

Emergency Procedure for Scenario no. 1

Scenario

Toxic gas release of Chlorine. in the month of February with the most likely wind direction at 270⁰ morning as MCL Scenario.

Assumption

Release of 900 KG Chlorine due to total failure of one toner. The danger zone as given in MCL Scenario no.1 is 3.08 Km downwind. effects of release.

Chlorine requires careful handling due to its chemical and toxic properties. It is extremely irritating to mucous membrane / eye and respiratory tracks. Results in chronic pulmonary oedema. Concentrations of 50 ppm are dangerous for even short exposures.

Administer Oxygen as first aid and hospitalise. At the point of release, toxic exposure will be fatal.

Within a radius of 3.08 Km all vulnerable resources shall be subjected to a exposure to a concentration of 293 ppm and may result in Systematic damage or serious / leather health effects.

Emergency Response :

- The ECR will sound the disaster warning signal to the likely affected population through Siren System.
- On-Site powerful deluge system / water curtain to prevent spread of toxic could will be supplemented by fire services in Osmanabad.
- No medical resource shall be affected by the danger zone.
- The flow of casualties shall be to nearby hospital

The traffic will need to be diverted along by pass road.

- The security personnel doing above jobs would need the personal protection equipment.
- In view of short notice, warning and lethality of exposure to toxic fumes, the people must leave their houses, on hearing the warning siren at right angles to the wind direction.
- Evacuation commander will organise Assembly Points which also acts as reception centers.

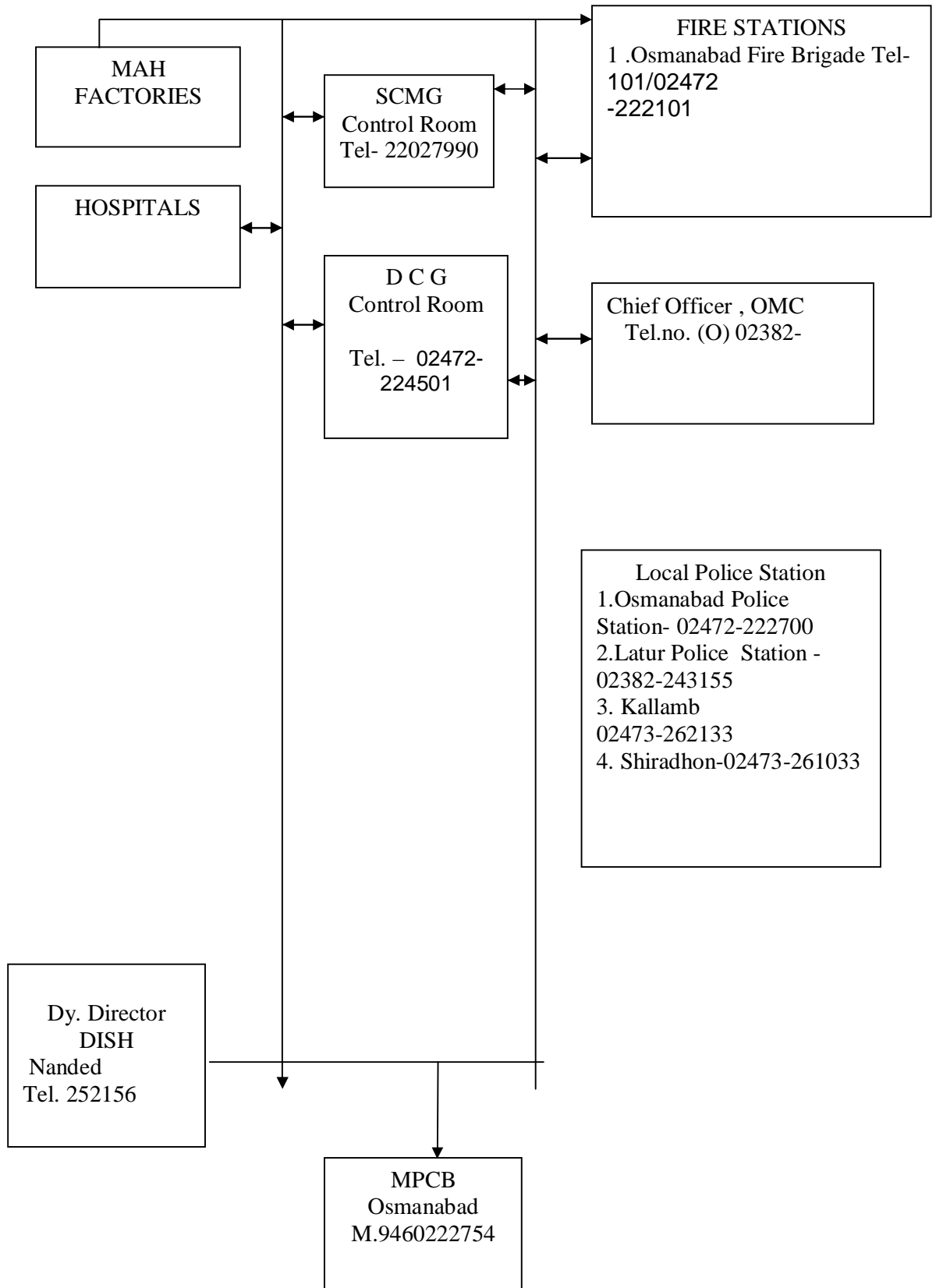
Evacuation Commander shall also arrange for water and first aid for temporarily displaced persons.

- All police personnel entering danger zone must wear personal protective equipment. In addition they must undergo training on preventive measures, in order to offer advice to the population.

CAUTION

This emergency procedures is very brief and would require modifications based on actual meteorological data, the amount of chlorine gas vaporized and other conditions at the time of toxic gas release.

C.3.4 COMMUNICATION AMONG RESPONDERS
AREA COMMUNICATION CHART



C.3.5 PERSONAL PROTECTION OF CITIZENS

- As Chairman of CMG & District Collector shall depute one Deputy Collector as alternate leader.

PLANNING TEAM

- ❖ Deputy Collector - Incharge
- ❖ DCP Osmanabad
- ❖ Civil Surgeon, Civil Hospital, Osmanabad
- ❖ District Health Officer, Osmanabad
- ❖ Executive Engineer MIDC/PWD Osmanabad
- ❖ Dy.RTO Osmanabad.
- ❖ District Information Officer, Osmanabad
- ❖ Deputy Director, Industrial Safety & Health, Nanded
- ❖ Depot Manager MSRTC Osmanabad

These team members shall prepare detailed contingency plan considering the following factors as a base:

- a) Vulnerable zones where Evacuation could be necessary and method for notifying these places
- b) Provisions for precautionary Evacuation
- c) Methods for controlling traffic flow and providing alternate traffic routes.
- d) Shelter location and other provisions for evacuations.
- e) Agreements with near by jurisdictions to receive evacuees.
- f) Agreements with Hospitals outside the local jurisdictions.
- g) Protective shelter for relocated populations.
- h) Reception and care of evacuates.
- i) Re-entry procedures.
- j) A system of working and advising the public protection and on expedient means to reduce ventilator.
- k) Relocation
- l) Water supply protection- to avoid contamination
- m) Sewage system protection : to avoid public Health threat Environment problems.

1. EVACUATION PLAN

In a disaster situation, evacuation from hazardous areas may be the most effective way to obviate casualties. It is a complex exercise requiring multi-disciplinary inputs. A comprehensive and co-ordinating preplanning is necessary to implement orderly evacuation of population. The weather conditions obtained through the meteorological department would dictate to a large extent the area to be evacuated.

On hearing the disaster warning the population should quickly move to the assembly area as announced on the public address system and should wait for the transportation facility. If assembly area is not announced than they should move out of the threatened area at the right angle to the prevailing wind away from the industrial area. Those personnel who can move out of their homes are advised to stay indoors and cover their noses with the wet cloth.

Following steps would be taken before the crisis by the District Collector :

- Public information and education on measures for chemical hazards.
- Installations of siren or Remote public address system in likely affected area.
- Formulations of detailed contingency plan of evacuation.
- Working out evacuation plan of sensitive areas like Jail prisoners, Mental/other hospitals etc.

Limitations

While in many cases evacuation is a needed life saving measure, it is not always necessary or practical. Lack of time is often the single most important limitation on the effectiveness. Large evacuation takes very long time to execute even if they are well planned in advance. The toxic cloud may pass through an area before everybody can get out when people are outside their homes, attempting to evacuate.

Keeping the area situation into account, it may be possible to stress more on the In Place Protection and attempting to reduce the air flow into their shelter. Public education on the protection provided by a structure should be a part of preparedness activities.

See Annexure 2 for General Guidelines in Disaster

C.3.6 EMERGENCY PREPAREDNESS

1. Introduction :

The purpose of this is to document the ongoing planning and maintenance components of the emergency plan. In particular following areas are addressed.

- Emergency Response Team Organisation
- Training
- Personal Protective Equipment
- Medical Surveillance
- Equipment Maintenance
- Mock Drills and Emergency Simulation Operation
- Record Keeping

The response capabilities shall be maintained sufficient to mitigate the incidents involving fire, toxic gas release, medical and rescue emergencies and/or situations beyond the scope of normal operations. This volume is to be reviewed and updated on a regular basis to assure consistency with assignments and procedures.

C.3.7. EMERGENCY RESPONSE TEAM ORGANIZATION

Organisation would have established an emergency response team that is organised trained and capable of responding to fire, hazardous materials, and other emergency in the area. The attached structure presents response team, and corresponding training level. The District Collector will ensure that emergency response programme is implemented before, during and after emergencies. The organisational structure provides the following management and operational functions.

- Implementation of emergency response training program.
- Established management roles within the team that directly relate to ICS functions that are activated during an emergency; and
- Designation of emergency response functions and levels of responsibility that are the basis for establishing training requirements.

C.4 TRAINING (Recommendations)

LEVEL	EMERGENCY RESPONSE TEAM	TRAINING
	Fire and Safety Supervisor	Emergency Response Supervisor 8
	Fire and Safety Asst. Supervisor	Emergency Response Training Supervisor 8
	Emergency Operations Center Manager	7
	Emergency Response Chiefs / Specialists Primary Response Medical Rescue	6
	Specialists Fire and safety Fire Hazmat	5
	Emergency Response Crew	4
	Assistants	3
	Maintenance Personnel	2
	Administrative Staff & Contractors	1

Emergency Response Team Functions

The following table summarizes the responsibilities of emergency team members.

Emergency Response Team Function level	ICS Roles	ER Training
ER Supervisor	Incident Commander Field IC	8
Supervisor, ER training	IC, Field IC Fire Officer	8
Fire & safety Supervisor	Safety officer	8
Fire & safety shift Supervisor	Asst. Officer	8
ECC Managers	Command staff, Planning / Finance Chief	7

ER Chiefs	Operation Chief	6
ER Specialists	Branch Officers	5
ER Crew	Asst. under Branch officers	4

Training Requirements

The training program shall be established so as to provide emergency response team members with training that is commensurable with their assigned duties. The training programme shall be comprised of eight training levels; Level 1 to Level 8. The levels correspond with increasing technical and supervisory responsibilities. The next describes the programme in detail.

DRILLS AND SIMULATION EXERCISES

The regular drills and simulation exercises is a progressive commitment to ensuring that the personnel, organisational structure, and resources identified in the area plan can function to achieve the most favourable outcome in the event of real accident.

3. TRAINING PROGRAMME

The specific objective of the training programme shall be as under :

- Define levels of training required for all personnel within the ICS including awareness training for citizens
- Designate the duration and frequency of all training courses.
- Assure attendance and proficiency of personnel
- Design and schedule tabletop exercises and drills to assess response capabilities to a variety of potential incidents.
- Maintain compliance status of all personnel with designated training level requirements develop a computerised training record keeping system to achieve this objective.

Training Levels

The wide variety of the jobs within ICS requires a range of awareness and expertise to cope with potential emergencies. Training levels have therefore designed to provide a tailored curriculum for defined levels of response capabilities, which are designed for each individual depending on his or her specific job description and stated emergency role.

A brief description of each training and its applicability to a defined emergency response role is provided below.

LEVEL .1 AWARENESS.

A fundamental level of emergency information and / or training addressing site-specific evacuation procedure, general safety considerations, and other basic information for personnel for who would not be likely to encounter or be actively involved in an emergency situation.

LEVEL 2 MAINTENANCE STAFF.

Designed for personnel who are likely to be exposed to an emergency situation; personnel at this level would not be actively engaged in offensive mitigation activities. In addition to maintenance staff, engineering personnel and long term contractors are included in this training level

LEVEL 3 OPERATIONAL SUPPORT STAFF

Designed for personnel who may provide operational support during an emergency.

This training level provides the advanced level of awareness in fire control and provides for basic training for both fire and hazardous materials emergency response activities. Personnel trained at this level, however are not considered to be certified to conduct work that requires fully encapsulated protective clothing.

Emergency Response Team.

The Emergency Response Team is responsible for handling all types of emergencies including fire, hazardous materials, and medical / rescue incidents. All Personnel are issued clearly identifiable response clothing and equipment to distinguish them from other personnel during emergency activities. The various training levels are discussed below.

LEVEL 4 Emergency Response Crew

The basic level of training required for the Emergency Response Team which emphasize fire and hazardous materials response capabilities.

LEVEL 5 Specialists

Due to the technical nature of emergencies which may occur following specialists training is developed to provide training over above that is included in level 4

- Health and safety issues
- Fire apparatus, aerial operations
- General Hazmat training plus specific training for the toxic gases being handled in the area

LEVEL 6 Supervisors

The Personnel at this level are trained for advanced ICS training, Emergency medical training for basic life support, rescue training in addition to level 5 training.

LEVEL 7 ECC Managers

Training focuses on the managing an emergency using the ICS, documentation and notification procedures, and communicating effectively with outside and corporate resources, the media and the public.

LEVEL 8 Instructors

Individuals at this training level are the most highly proficient managers like senior Fire and safety Personnel who would receive additional training to improve their effectiveness as instructors.

C.5 PERSONAL PROTECTIVE EQUIPMENTS / CLOTHING.

C.5.1

It is the policy of the management to ensure the personnel safety and limit the exposures of hazardous materials during the emergency response. The PPE programme for emergency response encompasses the selection, use and maintenance of the PPE before, during and after an emergency response.

Scope

The major components of the proposed PPE programme for emergency response shall include routine care, use during a disaster, and post - disaster procedures.

- The ongoing activities provide a solid foundation for effective emergency preparedness and for ensuring that personnel are properly trained and equipment for response. These activities shall include.
 - ◆ Inventory control
 - ◆ Calibration
 - ◆ Maintenance
 - ◆ Fit Testing
 - ◆ Training
 - ◆ Record keeping.
- The activities during Response shall be proper selection and use of equipment through training and guidance from the Incident Safety Officer. This shall include.
 - ◆ Assessment of Ambient conditions.
 - ◆ Selection of PPE
 - ◆ Operation of PPE
- The activities after Response provides for decontamination in accordance with standard procedures. The activities shall include.
 - ◆ Decontamination
 - ◆ Disposal of Cartridges
 - ◆ Maintenance and repair.

Responsibility and Implementation

The fire and safety officer shall be responsible for implementing the PPE programme for emergency response and co-ordinating the activities of various departments in administrating the programme. The ultimate effectiveness of this programme lies with each responder understanding, recognising, and controlling hazards. Implementation of programme includes following responsibilities.

- Review and prepare the written procedures.
- Conduct and document audits as deemed necessary to determine compliance.
- Maintain written records for program evaluation.
- Assist in determining conditions requiring respiratory equipment.
- Select proper respiratory equipment.
- Assure that response personnel are properly fit tested for respirators.
- Assist in training of personnel in use of respiratory protective equipment.

C.5.2 EQUIPMENT MAINTENANCE

ER equipment shall be maintained to ensure that they are effective and field ready. All the record shall be kept for their fitness.

The table showing the frequency of maintenance the equipment should be kept ready.

C.5.3 RECORD KEEPING

Record keeping plays an integral role in the administration of the emergency preparedness plan. Record are maintained to document the status of the various points of this section..

C . 6 LEVEL OF RESPONSE BASED ON INCIDENT SEVERITY

The following chart summarizes who and what are involved in three typical emergency conditions. Information about the three response levels should be provided to special facilities (e.g. school district, private schools, day care centers, hospital, nursing homes, industries detention centres)

Response Level	Description	Contact.
A. Potential Emergency Condition	An incident of threat of a release which can be controlled by the first response agencies and does not require evacuation of other than the involved structure or the immediate out door area. The incident is confined to a small area and does not pose an immediate threat to life or property.	Fire Department Emergency Medical Services Police Department Central Chief Officer DCG,RTO District Collector
II. Limited Emergency Condition	An incident involving a Greater hazard or larger area which poses a potential threat to life of property and which may require a limited evacuation of the surrounding area.	All Agencies in Level I HAZMAT team EOC Staff Public Works Department Health Department Red Cross Rotary Club SCG Control Room State Police, Public Utilities
III. Full Emergency Condition	An incident involving a severe hazard or a large area which poses an extreme threat to Life and property and will probably require a large scale evacuation or an incident requiring the expertise or resource of country, State Central, or private agencies Organisations.	All Level I and II Agencies plus the following as needed Mutual Aid Fire, Police. Emergency Medical Services SCG & CCG Control Room Maharashtra Agency Director Health Service MPCB

C-7. PUBLIC INFORMATION / COMMUNITY RELATIONS.
Planning Team

- ❖ Public Relation Officer District Collector Office
- ❖ District Information Officer
- ❖ Representative Of TV & Radio
- ❖ Editor, Lokmat, Samna, Sakal & Divya Marathi

Factors

- Method to educate the public in possible emergencies.
- Method for keeping the public informed.
- List of radio and T. V. contacts.

Comment : District Collector office should develop a public information programme to educate citizens about safety procedures during an incident. This programme could include pamphlets; newspaper stories; periodic radio and television announcements and programme for schools, hospitals, and homes for the aged.

It is important to provide accurate information to the public in order to prevent panic. Some citizens simply want to know what is happening. Other citizens may need to be prepared for possible evacuation or they may need to know what they can do immediately to protect themselves. Because information will be needed quickly, radio and television are much more important than newspapers in most hazardous materials release. In less urgent cases, newspaper articles can provide detailed information to enhance public understanding of accidental spills and procedures for containment and cleanup. One person should be identified to serve as spokesperson. It is strongly recommended that the individual identified have training and experience in public information, community relations, and / or media relations. The spokesperson can identify for the individuals who have specialised knowledge about the event. The chain of command should include this spokesperson. Other members of the response team should be trained to direct all communications and public relations to this one person.

C-8. RESOURCE MANAGEMENT.

The primary responsibilities for addressing emergencies originated from any place within the jurisdiction lies with the Incident Commander with support available through a mutual aid from neighbouring areas if required and with other companies in the area. This section provides a summary of resources available to support emergency responses within the area, and outlines procedures for accessing personnel and equipment.

C.8.1 MANPOWER

The emergency response organisation for the area includes fire and safety staff, management, and operating and maintenance personnel and other necessary staff. The emergency response team will be trained and are available at any time to support emergency response activities. Primary response, positions and responsibilities are described in this manual as above. The availability of emergency response support personnel is dependent is on the time of a day that an emergency occurs. During regular day shifts, sufficient manpower support is available.

Planning Team

- ❖ Chief Fire Officer
- ❖ Dy RTO Osmanabad
- ❖ Executive Engineer PWD
- ❖ District Health Officer / Civil Surgeon, Osmanabad.
- ❖ Deputy Controller of Civil Defence Osmanabad.
- ❖ SP Osmanabad
- ❖ Experts
- ❖ Depot Manager MSRTC

These team shall prepare the document needed for Resource Management. The Following **Factors** should be considered for the Planning.

- ◆ List Of Personnel needed for Emergency response
- ◆ Training programs including schedules for training for DCG Emergency response and Medical personnel.
- ◆ List of Vehicles needed for Emergency response.
- ◆ List of Equipment (heavy & PPE).
- ◆ Fund arrangement for response Equipment & personnel.

C.8.2 FIRE & RESCUE

Planning Team

- ❖ Chief Fire Officer

Factors for Planning

- ❖ Chain Of Command among Fire Fighters.
- ❖ List of available Support System.
- ❖ List of all Task for Fire Fighters
- ❖ Training to Fire Fighters in safety procedures when to approach the incident.
- ❖ Availability of MSDS of Hazardous Chemicals
- ❖ Communications to E.C.C.

The following fire stations are available for the district

- Osmanabad Fire station
- Nanded Fire Station
- Osmanabad fire Station
- Hingoli Fire Station.

C.8.3 HEALTH & MEDICAL

C.8.3.1 Planning Team

- ❖ Chief Medical Officer, Osmanabad Municipal Council
- ❖ Civil Surgeon, Osmanabad.
- ❖ District Health Officer, Osmanabad
- ❖ Doctors in the Area

The Following **factors** should be considered for Planning.

- ❖ Provisions for Ambulance Support.
- ❖ Provisions for Hospital Support & Treatment
- ❖ Summoning procedures of Medical Personnel
- ❖ Training to Medical Team & Hospital Personnel regards to Health Hazards of the Chemical & their Anti-dotes.
- ❖ Continuity in supply of Anti-dotes & Drugs
- ❖ List of the Hospitals /Chemist Shops
- ❖ Training for Decontamination & treating persons exposed to hazardous Chemicals.
- ❖ Protective actions recommendations for sanitation, water supply, recovery & re-entry.

AMBULANCE SUPPORT

In the area there are many ambulance services available with private hospitals, political parties, local clubs, industries etc. The list of all the ambulance available with their phone numbers and addresses is included in **annexure 3**.

(ACTION DESIRED : It is desired that one Ambulance Control Room like fire brigade be opened up with a three digit phone number for ambulance services, which in

turn will contact the relevant ambulance service with respect to equipments and distance from the site)

HOSPITAL SUPPORT

In the area there exists PHC, government hospitals and private hospitals.

C.8.4 HUMAN SERVICE

Planning Team

- ❖ Chief Officer OMC
- ❖ Chief Medical Officer
- ❖ District Health Officer, Osmanabad
- ❖ Civil Surgeon, Osmanabad.
- ❖ District Supply Officer - Food & Milk Supply
- ❖ NGO
- ❖ Executive Engineer PWD

Following **Factors** should be considered for the Planning

- ❖ List of Agencies providing Human service
- ❖ List of Human service Tasks

The Municipality Administration uses a wide variety of contractors to support routine operations and maintenance activities. Virtually any contractor service is also available to support emergency responses, especially during restoration and recovery operations. All contractor personnel will be briefed at the site prior to participation in an emergency response. The briefing will address PPE, the Chemicals involved and duties to be performed. All appropriate health and safety precautions provided to emergency responding staff shall apply to Contractor personnel.

Access to contractor support is obtained through the Public Works Department. The technical service group is also available to provide contractor engineering and testing support as needed.

TRANSPORT SUPPORT

The Osmanabad district and the MSRTC are having well organised network of the public transport. In case of emergency it is possible to obtain the services of MSRTC within shortest possible time. Many buses are also available from major industries, contractors etc.

[ACTION DESIRED : The transport officer to find out the availability of maximum no. of transport vehicles (buses, Trucks etc.) within 30 minutes of notice]

C.8.5 Public Works

Planning Team

- ❖ City Engineer
- ❖ Executive Engineer PWD
- ❖ Executive Engineer MIDC
- ❖ Regional Officer MPCB

Factors for Planning

- ❖ Describe Chain Of Command for the permanence of Public Work action in an Emergency.
- ❖ List of Task during Disaster to help containment & Clean-up

N. B. The resources under public works are requisitioned by Chairman of DCG.

C.8.6 OTHERS

C.8.6.1 EMERGENCY CONTROL CENTER

An emergency control centre is the place from where the operations for handling and controlling the emergencies is directed and co-ordinated. It is manned by the Incident Commander and assisted by other key persons. It is equipped with adequate means of communication to areas inside and outside the factory.

The emergency control centre is identified as the District Collector's office. An alternate emergency control centre in case of main emergency control centre affected by the MIA office located within the industrial area.

The ECC shall maintain continuous contact with the command post through out the duration of the incident, and will serve as the focal point of all external communications with mutual aid, regulatory agencies, the public and the media. During the moderate to catastrophic incident all planning, technical and administrative support will be provided to the IC through District Collectorate office.

The main emergency control centre shall be equipped with following resources :

1. Internal & External telephones.
2. Radio communication.
3. Public Address System.
4. Personal protective equipment.
5. Reference material including all the On-Site plan and related procedures.
6. Off-Site emergency control manuals.
7. General layout plan.
8. Material Safety Data Sheets.
9. TREMCARD booklet in English / Local language.
10. Standard instructions to Drivers for handling transport emergencies.

11. Map of surrounding area.
12. General office support including computer capabilities, telefax and copy machines.
13. List of equipment as per annexure to handle initial alarm by first response team.

C.8.6.2 COMMUNICATION

The key to the management of disaster lies in an efficient reliable communications system. The effectiveness of responses to the On-Site and Off-site emergency plans, requires an efficient communications system to alert.

- People inside the factory.
- Key factory personnel outside normal working hours.
- Off-site emergency Authorities and Services.
- Neighbouring industries in the area as well as public in the likely danger zone.

The communication system for On-Site emergency response would be handled by the respective industry. However, the Off-Site communication network would be coordinated by ECC. The emergency operations would follow the principles of communication control given below.

- Communication to respond to chain of command and control in handling emergency.
- Communications to be reliable and fullproof by building redundancy .
- Communications to ensure quick passage of information, as well as uninterrupted flow of orders / instructions.
- All DCG Members shall be provided with Cellular (Mobile) Phones.

INTERNAL & CORPORATE COMMUNICATION

The communications of declaration of a major hazard situation is by siren or by Public Address System.

Simultaneously the announcement to be made on Public Address System explaining the nature of hazard its location, location of Emergency control center & actions required to be taken .

Communications between IC, SIC & other personnel should be through radio / telephones or through personal talks or through the services of messengers with written & signed messages.

(ACTION DESIRED : It is described that the three digit telephone number to be allotted to Emergency Control Center and hotlines exists between two neighbouring industries for quick mutual aid.)

C.8.6.3 MEDIA

Media Personnel : All media personnel present at the site shall be specifically authorised by IC or his design. Under no circumstances shall media personnel; be permitted at the Command post or within the operating area of the response without an escort.

News Release : If the emergency attracts the interest of the media, or if notification of the citizen through the media is warranted, the Management Policy Group shall approve any and all statements prepared for release to the public, and information officer will issue the statement.

Public Agencies : Public Agencies shall be notified as required. The liaison officer and Information officer assigned to ECC will co-ordinate all contacts with public agencies.

C.8.6. CRISIS GROUP under Chemical Accident (EPPR) 1996

As per this Rules Central, State, District & Local Crisis Groups are formed. These groups will be main resources in future. The functions of these groups mentioned as below :

1. Functions of the Central Crisis Group
 - i). The Central Crisis Group shall be the apex body to deal with major chemical accidents and to provide expert guidance for handling major chemical accidents.
 - ii) Without prejudice to the functions specified under sub-rule (1), the Central Crisis Group shall
 - a) Continuously monitor the post accident situation arising out of a major chemical accident and suggest measures for prevention and to check recurrence of such accidents.
 - b) Conduct post accident analysis of such major chemical accidents and evaluate responses.
 - c) Review district Off-Site emergency plans with a view to examine its adequacy in accordance with the Manufacture Storage and Import of Hazardous Chemical Rules and suggest measures to reduce risks in the Industrial pockets.
 - d) Review the progress report submitted by the State Crisis Group.
 - e) Respond to queries addressed to it by the State Crisis Group and the District Crisis Group.

- f) Publish a State-wise list of experts and officials who are concerned with the handling of chemical accidents.
- g) Render in the case of a chemical accident in a State all financial and infra-structural help as may be necessary.

2. Functions of State Crisis Group

- i) The State Crisis Group shall be the apex body in the State to deal with major chemical accidents and to provide expert guidance for handling major chemical accidents.
- ii) Without prejudice to the functions specified under sub-rule (1), State Crisis Group shall, -
 - a) Review all district Off-Site emergency plans in the State with a view to examine its adequacy in accordance with the Manufacture, Storage and Import of Hazardous Chemicals, Rules and forward a report to the Central Crisis Group once in 3 months.
 - b) Assist the State Government in managing chemical accidents at a site.
 - c) Assist the State Government in the planning preparedness and mitigation of major chemical accidents at a site in the State.
- d) Continuously monitor the post accident situation arising out of a major chemical accident in the State and forwards a report to the Central Crisis Group.
- e) Review the progress report submitted by the District Crisis Groups.
- f) Respond to queries addressed to it by the District Crisis Groups.
- g) Publish a list of experts and officials in the State who are concerned with the management of chemical accidents.

3. Functions of District Crisis Group

- 1. The District Crisis Group shall be the apex body in the District to deal with major chemical accidents and to provide expert guidance for handling major chemical accidents.
- 2. Without prejudice to the functions specified under sub-rule (1), District Crisis Group shall, -
 - (a) Assist in the preparation of the district off-site emergency plan.
 - (b) Review all the on-site emergency plans prepared by the occupier of Major Accident Hazards installation for the preparation of the district off-site emergency plan.
 - (c) Assist the district administration in the management of chemical accident at a site lying within the district.
 - (d) Continuously monitor every chemical accident.
 - (e) Ensure continuously information flow from the district to the Centre and State Group regarding accident situation and mitigation efforts.
 - (f) Forward a report of the chemical accident within fifteen days to the State Crisis Group.
 - (g) Conduct at least one full scale mock-drill of a chemical accident at a site each year and forward a report of the strength and the weakness of the plan to the State Crisis Group.

4. Functions of the Local Crisis Group :

1. The Local Crisis Group shall be body in the industrial pocket to deal with chemical
pocketed to deal with chemical accident and co-ordinate efforts in planning
preparedness and mitigation of a chemical accident.
2. Without prejudice to the functions specific under sub-rule (1) the Local Crisis
Group shall
 - (a) Prepare local emergency plan for the industrial pocket;
 - (b) Ensure dovetailing of the local emergency plan with the district off-site
emergency plan
 - (c) Train personnel involved in chemical accident management.
 - (d) Educate the population, likely to be affected in a chemical accident about the
member and existing preparedness in the area.
 - (e) Conduct at least one full scale mock-drill of a chemical accident at a site
every six month and forward are port to the District Crisis Group.
 - (f) Respond to all public injuries on the subject.

C - 9 RESPONSE PERSONNEL SAFETY

Planning Team

- ❖ Chief Fire Officer - Incharge
- ❖ Deputy Controller Civil Defence Osmanabad
- ❖ SP Osmanabad.

These Members should prepare Plan for Response Personal Safety considering the following **Factors**

- Standard operating procedure for entering and leaving sites as per On-Site plan shall be adopted.
- Accountability for personnel entering and leaving the sites shall be done by concerned officials.
- Decontamination procedures : Shall be developed as per On-Site Plan & Hazards posed.
- Recommended safety and health equipment - List attached in Annexure 7
- Personal safety precautions.
- List the Equipment appropriate to various degrees of Hazards
- Training to the Emergency Responders in use of Safety equipment.
- Immediate Long Term Health Hazards to Emergency Responders.
- Insurance coverage of Emergency Responders
- Medical Surveillance

All the first responders including Key personnel and operators shall be subjected annual medical checking for their fitness to act during emergency as per their responsibility.

Similar all the responders who has taken part in combating the disaster shall be sent for complete medical check up for assessing the effects of inhalation of toxic gases or other effects.

C.10 ONGOING INCIDENT ASSESSMENT

Planning Team

- ❖ Sub Regional Officer MPCB Osmanabad– Incharge
- ❖ District Weather Monitoring Chief
- ❖ Dy.Executive engineer MIDC
- ❖ NGO Environment Protection
- ❖ Food Inspector

These team shall prepare a Plan to Monitor the release considering the following factors

FACTORS

Action

- Field monitoring teams
- Provision for environment assessment, biological monitoring and contamination surveys.
- Food / water controls.

Responsibility

OMC, MPCB,
OMC, MPCB.
MIDC / OMC.

Comment : After the notification that a release has occurred, it is crucial to monitor the release and assess its impact, both on and off site. A detailed log of all sampling results should be maintained. Health officials should be kept informed of the situation. Often the facility at which the release has occurred will have the best equipment for this purpose.

District Collector /DCG should describe who is responsible to monitor the size, concentration and movement of leaks, spills and releases and how they will do their work. Decisions about response personnel safety, citizen protection (whether indoor or through evacuation) and the use of food and water in the area will depend upon on accurate assessment of spill or plume movement and concentration. Similarly, decisions about containment and cleanup depend upon monitoring data.

C.11 LAW ENFORCEMENT

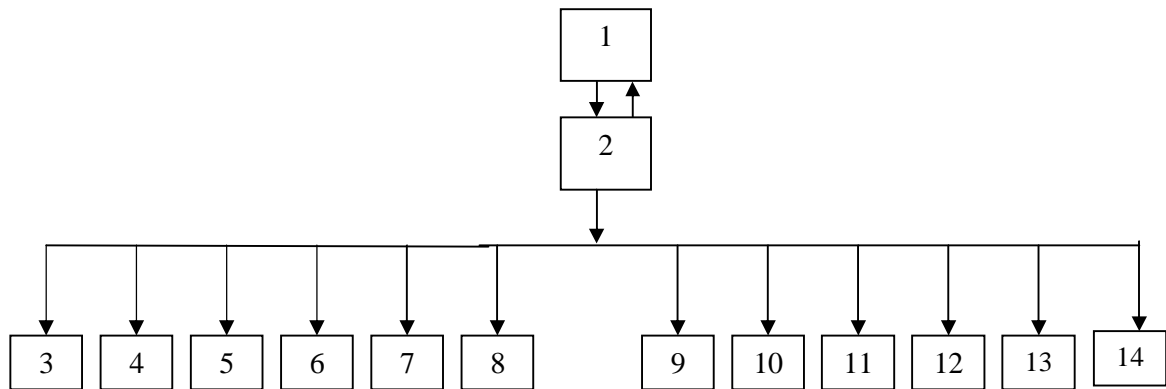
Planning Team

- ❖ District Collector, District Collector Osmanabad & Chairman District Crisis Group – Incharge
- ❖ Chief Officer OMC & Chairman DCG
- ❖ Deputy Director DISH, Nanded & Member Secretary DCG
- ❖ Superintendent Of Police, Osmanabad.
- ❖ S R O MPCB Osmanabad
- ❖ Civil Surgeon, Osmanabad.
- ❖ Chief Fire Officer, Osmanabad.

Factors for Planning

- ❖ Chain Of Command for Law Enforcement Officials
- ❖ List of all Tasks for Law Enforcement Personnel

CHAIN OF COMMAND



SR.NO.	AUTHORITY	FUNCTION
1	District Collector, Osmanabad.	Overall I/C of District
2	CO OMC	Overall I/C of OMC Area
3	Police Commissioner / Supdt. Police, Osmanabad	Rescue, Transport & Relief
4	Additional Collector	Alternate Leader & I/C Evacuation
5	District Information Officer	Public Information
6	Chief Fire Officer	Manpower, Fire & Rescue & Response Personal Safety
7	District Health Officer / Civil Surgeon	Health & Medical
8	City Engineer, OMC	Public Works
9	Sub Regional Officer MPCB, Osmanabad	On-going Incident Assessment & Containment/Clean-up
10	General Manager, Telecom Osmanabad	Communication
11	Commandant Home Guards	Rescue
12	Deputy Controller Civil Defence	Rescue
13	Dy.RTO, Osmanabad.	Transport Routes
14	Dy.Director, DISH Osmanabad	Updating & Testing of the Plan

D CONTAINMENT AND CLEANUP

Planning Team

- ❖ Sub Regional Officer MPCB – Incharge
- ❖ C M O OMC
- ❖ Dy. Executive Engineer MIDC/PWD
- ❖ Chief Fire Officer
- ❖ Dy. RTO Osmanabad
- ❖ District Agriculture Officer
- ❖ Expert From Industries
- ❖ NGO
- ❖ S. P. /Dy S.P. Osmanabad.
- ❖ Representative of Transport Contractors.

D.1 TECHNIQUES FOR SPILL CONTAINMENT AND CLEANUP

FACTORS

<u>Actions</u>	<u>Responsibility</u>
<ul style="list-style-type: none"> • Containment and mitigation actions • Cleanup methods. • Restoration of the surrounding environment. 	<p>OMC, . DISH, MPCB, CCE, RTO. OMC.</p>

Comment : District Collector office will typically emphasize the containment and stabilisation of an incident; State regularity agencies can focus on cleanup details. CCG can provide assistance during the cleanup process. It is the releaser’s legal and financial responsibility to clean up and minimise the risk to the health of the general public and workers that are involved. CCG & MOEF other government officials should monitor the responsible party cleanup activities.

A clear and succinct list of containment and cleanup countermeasures should be prepared for each hazardous material present in the community in significant quantities. This section should co-ordinated with the section on “Response Personnel Safety” So that response teams are subject to minimal danger. Planners should concentrate on the techniques that are applicable to the hazardous material and terrain area. It may be helpful to include sketches and details on how cleanup should occur for certain area where spill are more likely.

N.B. Deciding the location of Hazardous Waste Disposal Site is duty of the Govt.

See Annexure 10 for Water Reactive Chemicals

It is important to determine whether a fire should be extinguished or allowed to burn. Water used in fire fighting could become contaminated and then would need to be contained or possibly treated. In addition, some material may be water- reactive and pose a greater hazard when in contact with water. Some vapours may condense into pools of liquid that must be contained and removed. Accumulated pools may be recovered with appropriate pumps, hoses, and storage containers. Various foams may be used to reduce vapour generation rates. Water sprays for fog may be applied at down wind points away from “ cold” pools to absorb vapours and / or accelerate their dispersal in the atmosphere (Sprays and for might not reduce an explosive atmosphere). Volatile liquids might be diluted or neutralised.

If a toxic vapour comes to the ground on crops, on playgrounds, in drinking water or other places where humans are likely to be affected by it, the area should be tested for contamination. Appropriate steps must be taken if animals (including fish and birds) that may become part of the human food chain are in contact with a hazardous material. It is important to identify in advance what instruments and methods can be used to detect the materials in question.

Restoration of the area is a long-range project, but general restoration steps should appear in the plan. Specific consideration should be given to the mitigation of damages to the environment.

D.2 RESOURCES FOR CLEANUP AND DISPOSAL

FACTORS

<u>Action</u>	<u>Responsibility</u>
• Cleanup / disposal contractors and services provided.	OMC, PWD, MIDC.
• Cleanup material and equipment.	--Do--
• Communication equipment.	--Do--
• Provision for long-term site control during extended cleanups.	--Do--
• Emergency transportation (e.g. aircraft, vehicles, boats)	--Do--
• Cleanup personnel.	OMC, PWD, MIDC.
• Personal protective equipment.	OMC,
• Approved disposal sites.	OMC, MIDC.

Comment : This section is similar to the yellow pages of the telephone book. It provides plan users with the following important information :

- ◆ What types of resources are available (public, and privates);
- ◆ How much is stockpiled;
- ◆ Where it is located (address and telephone number); and
- ◆ What steps are necessary to obtain the resources.

Organisations that may have resources for use during a hazardous materials incident include:

- ◆ Public agencies (e.g. fire, police, public works, public health, agriculture, fish and game);

- ◆ Industry (e.g. chemical producers, transporters, stores, associations, spill cleanup contractors, construction companies);
- ◆ Spill / equipment co-operatives; and
- ◆ Volunteer groups (ham radio operators, vehicles clubs).

Resource availability will change with time, so keep this section of the plan up-to-date.

Hazardous materials disposal may exceed the capabilities of smaller cities and towns ; in such cases, the plan should indicate the appropriate State and / Govt. of India Agency that is responsible for making decisions regarding disposal.

Disposal of hazardous materials or wastes is controlled by a number of Central and State laws and regulations. MPCBI regulate waste disposal and it is important that this section reflect the requirements of these regulations for On-Site disposal, transportation and Off-Site disposal. The plan should include an updated list of Hazardous waste disposal facilities for possible use during an incident.

E DOCUMENTATION AND INVESTIGATIVE FOLLOW-UP

FACTORS

- List of required reports.
- Reasons for requiring the reports.
- Format for reports.
- Methods for determining whether the response mechanism worked properly.
- Provision for cost recovery.
- Follow up action to avoid similar disaster in future.

Comment: This section indicates what information should be gathered about the release and the response operation. Key response personnel could be instructed to maintain an accurate log of their activities. Actual response costs should be documented in order to facilitate cost recovery.

It is also important to identify who is responsible for the post-incident investigation to discover quickly the exact circumstances and cause of the release. Critiques of real incidents, if handled tactfully, allow improvements to be made based on actual experience. The documentation described above should help this investigation determine if response operations were effective, whether the emergency plan should be amended, and what follow-up responder and public training programs are needed.

N.B. The Following Members of this Plan shall enquire all technological disasters & transport disasters & report to DCG

- ❖ **Chief Fire Officer OMC**
- ❖ **Jt. Chief Controller of Explosives Office Address : CGO complex, CBD Belapur, Navi Mumbai. Tel No. 022 – 7575946.**
- ❖ **Subregional Officer MPCB Osmanabad**
- ❖ **SP Osmanabad**
- ❖ **RTO Osmanabad**

F PROCEDURE FOR TESTING AND UPDATING PLAN

POTENTIAL MEMBERS OF PLANNING TEAM :

- ❖ Chairman Local Crisis Group – Incharge
- ❖ Deputy Director Industrial Safety & Health & Member Secretary District Crisis Group
- ❖ Chief Fire Officer OMC
- ❖ Dy S.P. Osmanabad
- ❖ Deputy Controller Civil Defence Osmanabad
- ❖ Sub Regional Officer MPCB Osmanabad
- ❖ Chief Medical Officer OMC
- ❖ Civil Surgeon Osmanabad.
- ❖ District Health Officer Osmanabad.
- ❖ Certifying Surgeon Osmanabad
- ❖ Medical Superintendent Govt Hospital Ambejogai.
- ❖ Dy.RTO Osmanabad.
- ❖ Technical Experts in District
- ❖ NGO
- ❖ District Information Officer Osmanabad.
- ❖ Representative of TV/Radio
- ❖ Editor of Lokmat /Sakal
- ❖ Superintendent Agriculture Officer Osmanabad.
- ❖ Executive Engineer PWD/MIDC

F.1 TESTING THE PLAN

Factors

- ❖ Provision For Regular Table Top, Functional, Mock & Full Scale exercises
- ❖ Organisation Incharge Of the Exercise
- ❖ Types of the Exercise
- ❖ Frequency of Exercise

DRILLS AND SIMULATION EXERCISES

The regular drills and simulation exercises is a progressive commitment to ensuring that the personnel, Organisational structure, and resources identified in the area plan can function to achieve the most favourable outcome in the event of real accident. The terms used in this exercise are defined as:

Orientation Seminars : The orientation seminar is an informal activity which focuses on training and familiarizations with roles, procedures, responsibilities, and personalities in the management plan. The general purpose is for participants to review plans and procedures in a low stress no “ real-time environment with little or no attempt at any simulation.

Tabletop exercise : The tabletop exercise provides a specific simulation exercise whose focus is on reviewing the plans and procedures unique to the situation. This exercise makes sure that all the participants have reviewed the plan details in an interactive fashion.

Functional Exercise : The exercise is designed to taste or evaluate individual function. Each function is exercised separately. As far as possible the functional exercises should be held near the site.

Full Scale exercise : This is done by simulating an event.

Exercise Cycle

The exercise cycle is a calendar of events reflecting a series of exercise that moves the area in the direction towards preparedness. A good exercise cycle is updated regularly to account for changes in the area plan. An recommended exercise cycle may look as below.

Exercise Type	Purpose	Participants	Time	Incharge
Orientation	Review Plan	Planning Team Members	Half Yearly	District Collector
Tabletop	Review Co-ordination	Emergency Management staff & Responders	Half Yearly	Chief Fire Officer OMC assisted by CMO OMC
Orientation	Evacuation procedures	Emergency Management Staff & responders, community leaders	Half yearly	Chief Fire Officer OMC
Tabletop	Risk Communication	Emergency Management Staff, Information Officer, Media	Half Yearly	Public Relation Officer, Collector office assisted by District Information Officer
Functional	Simulated evacuation	Media	Yearly	Public Relation Officer, Collector office assisted by District Information Officer
Full Scale	Simulated toxic gas release	All emergency response system personnel and volunteers	Half Yearly	District Collector

Exercise Momentum

Motivation and enthusiasm are the keys to success in any important endeavour and emergency planning is no exception. Individually and collectively the DCG has to maintain their commitment and to be aggressive in the community to carry the message of preparedness.

Keeping the momentum going requires a creative Exercise program that is well timed and constructed so that participants are reinforced with more realistic perception of risks and consequences of chemical disasters. Following are some of the points which may be kept in mind for keeping the momentum going.

- ❖ Information and discussion about incidents happening in other area
- ❖ Field trips in a group of two or three to high risk areas to see, first hand, the source of risk and to get the mental picture of what could go wrong.
- ❖ Exchanging views with other area for various operations.
- ❖ Regular address of the District Collector/ OMC Chief Officer to DCG members.
- ❖ The OMC Chief Officer to take initiative and get the busy DCG members to come some of their meetings.

RECORD KEEPING :

Record keeping plays an integral role in the administration of the emergency preparedness plan. Record are maintained to document the status of the various points of this section.²

Following three types of records are suggested as a part of the Disaster preparedness plan.

Responder-Specific Records that pertain to individual responder, such as training required and completed, refresher course completed, medical surveillance information and respiratory fit testing.

Equipment – Specific Documentation of equipment inspection, calibration and testing.

Programmatic : Documentation and records of program activities and implementation such as safety meeting and drills, and records of incidents

- ❖ **Procedure for evaluating performance, making changes to plans, and correcting identified deficiencies in response capabilities as necessary.**

Any emergency plan must be evaluated and kept up-to-date through the review of actual responses, simulation exercises, and regular collection of new data.

Effective emergency

Preparedness requires periodic review and evaluation and the necessary effort must be sustained at the community level. Plans should reflect changes in the economy, land use, permit waivers, available technology, response capabilities, hazardous materials present, Central and state laws ,local laws and ordinances, road configurations, population change emergency telephone numbers, and facility location. This section describes key aspects of appraisal and provides specific guidance for maintaining an updated hazardous materials emergency plan.

- Plan review and approval are critically important responsibilities of the planning team. This section discusses the various means by which a plan can be reviewed thoroughly and systematically.
- Internal Review

The Planning team, after drafting the plan, should conduct an internal review of the plan. It is not sufficient merely to read over the plan for clarity or to search for errors. The plan should also be assessed for adequacy and completeness. Individual planning team members can use these questions to conduct self review of their own work and the team can assign a committee to review the total plan. Once the team accomplishes this internal review the plan should be revised in preparation for external review.

- External Review :

External review legitimises the authority and fosters community acceptances of the plan. The review process should involve elements of peer review, upper level review, and community input. The Planning team must devise a process to receive, review and respond to comments from external reviewers.

- Peer Review

Peer review entails finding qualified individuals who can provide objective reviews of the plan. Individuals with qualifications similar to those considered for inclusion on the planning team should be selected as Peer reviewers. Examples of appropriate individuals include :

- Responsible authorities from Govt. agencies
- College Professors & Safety Professionals from Hazardous Industries & Consultants familiar with hazardous materials response operations; and
- A concerned Citizens groups.

- Upper Level Review

Upper Level review involves submitting the plan to an individual or group with over sight authority or responsibility for the plan. Upper level review should take place after peer review and modification of the plan.

- Community Input :

Community involvement is vital to success throughout the planning process.

At the plan appraisal stage, such involvement greatly facilitates formal acceptance of the plan by the community. Approaches that can be include:

- Community Workshops
- Publication of Notice
- Public Meetings
- Invited reviews
- Advisory Councils

These activities do more than encourage community consensus building. Community outreach at this stage in the process also improves the soundness of the plan by increased public input and expands public understanding of the plan and thus the effectiveness of the emergency response to a hazardous materials incident.

- State /Central Review :

After local review and testing through exercises a community may want to request review of the plan by State and or Central officials. Such as a review will depend upon the availability of staff resources. District Crisis Group set up in accordance with Chemical Accidents (Emergency Planning & Preparedness) Rules 1996 are to submit a copy of the Off-Site Disaster Plan to the State Crisis Group for review to ensure co-ordination of the plan with emergency plans of other planning Districts. Central Crisis Group may review and comment upon an Off-site Disaster Plan.

- Plan approval : The planning team should indentify and comply with any local or State requirements for formal plan approval. It may be necessary for local officials to enact legislation that gives legal recognition to the emergency plan.

F.2 UPDATING THE PLAN

Factors

- ❖ Title and Organisation of responsible person(s)
- ❖ Change notification procedures
- ❖ How often the plan should be audited and what mechanisms will be used to change the plan

Comment : Responsibility should be delegated to someone to make sure that the plan is updated frequently and that all plan holders are informed of the changes. Notification of changes should be by written memorandum or letter; the changes should be recorded in the RECORD OF AMENDMENTS page at the front of the completed plan.. Changes should be consequately numbered for ease of tracking and accounting.

Following are examples of information that must regularly be checked for accuracy :

- ❖ Identify and phone numbers of response personnel
- ❖ Name, quantity, properties, and location of hazardous materials in the community. (If new hazardous ,materials are made, used, stored, or transported in the community, revise the plan as needed)
- ❖ Facility maps
- ❖ Transportation routes.
- ❖ Emergency services available
- ❖ Resource availability

KEEPING THE PLAN UP-TO-DATE

All emergency plans become outdated because of social, economic, and environmental changes. Keeping the plan current is a difficult task, but can be achieved by scheduling reviews regularly. As noted in section above the plan itself should indicate who is responsible for keeping it up-to-date. Outdated information should be replaced, and the results of appraisals exercises should be incorporated into the plan. The Following techniques will aid in keeping abreast of relevant changes.

- Establish a regular review period- yearly
- Test the plan through regularly scheduled exercises.
- Publish a notice and announce a comment period for plan review and revisions.
- Maintain a list of individuals, agencies, and organisations that will be interested in participating in the review process.
- Make one reliable organisation responsible for Co-ordination of the review and overall stewardship of the plan.
- Include a “Record of Amendments and Changes” Notice in the plan
- Include a “When & Where to Report Changes” notice in the Plan
- Make any sections of the plan that are subject to frequent changes either easily replaceable. So that old material may be crossed out and new data easily written in.

The Organisation responsible for review should do the following :

- ❑ Maintain a list of Plan holders based on the original distribution list
- ❑ Check all telephone numbers, persons named with particular responsibilities, and equipment locations and availability
- ❑ Distribute Changes. Changes should be consecutively numbered from ease of tracking.
- ❑ Attend any Plan Critics meetings & Issue Changes as may be required.
- ❑ Integrate changes with other related plans.

Incident Review

When a hazardous materials incident does occur, a review or critique of the incident is a means of evaluating the plan's effectiveness. Recommendations for conducting a incident review are :

- ❑ Assign responsibility for incident review to the same organisation that is responsible for plan update the planning team
- ❑ Conduct the review only after the emergency is under control and sufficient time has passed to allow emergency respondents to be objective about the incident.
- ❑ Use questionnaires, telephone interviews, or personal interviews to obtain comments and suggestions from emergency respondents. Follow up non-respondents.
- ❑ Identify plan and response deficiencies items that were overlooked improperly, identified, or were not effective.
- ❑ Convene the Planning team to review comments and make appropriate plan changes.
- ❑ Revise the plan as necessary . Communicate personal or departmental deficiencies informally to the appropriate person or department. Follow up to see that deficiencies are corrected.

G REFERENCES

G.1 LABORATORY, CONSULTANT, AND OTHER TECHNICAL SUPPORT RESOURCES

Telephone directory of technical support services

- Laboratories (environmental and public health)
- Private consultants
- Colleges or universities (chemistry departments and special courses)
- Local chemical plants

G.2 TECHNICAL LIBRARY

List of references, their location, and their availability

- General planning references
- Specific references for hazardous materials
- Technical references and methods for using national databases

Annexure -1 Incident Information Summary

Following is the format of incident information Summary.

- i. Date and time :
- ii. Name of person receiving call :
- iii. Name and telephone number of on -scene contact :
- iv. Location :
- v. Near populations. :
- vi. Nature (e.g. Leak explosion, spill, VCE) :
- vii. Time of release :
- viii. Possible health effects /medical emergency information.:
- ix. Number of dead or injured where dead / injured are taken.:
- x. Name of material (s) released; if known :
- xi. Characteristics of material (e.g. Colour, smell, physical effects):
only if readily detectable. :
- xii. Present physical state of the material (i.e. gas liquid, solid) :
- xiii. Total amount of material that may be released. :
- xiv. Other hazardous materials in area. :
- xv. Amount of material released so far / duration of release :
- xvi. Whether significant amounts of the material appear to be
entering the atmosphere, nearby water, storm drain, or soil.:
- xvii. Direction, height, colour , door of any vapour clouds or plumes.:
- xviii. Weather conditions (wind direction and speed) :
- xix. Local terrain conditions. :

Comment :-

Initial information is critical. Answers to some of these question may be unknown by the caller, but it is important to gather as much information as possible very quickly in order to facilitate decisions on public notification and evacuation. Some questions will apply to fixed facility incidents and others will apply only to transportation incidents. Some questions will apply specifically to air releases, while other questions will gather information about spills onto the ground or into water. Identification numbers, shipping manifests and placard information are essential to indentify any hazardous materials involved in transportation incidents, and to take initial precautionary and containment steps.

Annexure -2**Fire Brigade office contact details**

Sr. No.	Name / Place	Telephone No.
01	Osmanabad Fire station	02472-222101
02	Kallamb Fire Station	02473-262128
03	Ambejegoti Fire Station	02446-247101

Annexure -3**LIST OF HOSPITALS**

(Public & Private)

Sr. No.	Name of the Hospital	Location	Tele No
1	Civil.Hospital	Osmanabad	02473-261204
2	Avanti Clinic,	Mahatma Gandhi Nagar, Osmanabad	02472-221621
3	Public Clinic,	Bazzar Chowk, Osmanabad	223453
4	ECHS Clinic	Samata Nagar, Osmanabad	224911
5	Navjeevan Clinic	Samata Nagar, Osmanabad	232119

Annexure -4

ANTIDOTES COMMONLY USED AGAINST SPECIFIC AGENT

Specific Agent	Symptoms Requiring Treatment	Antidote	Dosage
Acetaminophen (Tylenol ®, Nebs#)	Hepatotoxicity (hepatocellular necrosis)	Z-acetylcysteine	Oral : 140 mg/kg initial does followed by 70 mg/kg every hours for 17 doses.
Anticholinergic agents	Central and/or peripheral anticholinergic symptoms and at least one of the following Hypertension Hallucinations Convulsions Coma Arrhythmias	Physostigmine	Adults : 1 or 2 mg IV slowly (1mg/Minute,) Repeat in 20 minutes if no Reversal. Then 1 to 2 mg IV for recurrent Symptoms. Children : 0.5 mg IV (0.5 mg/minute), Readminister at 5-minute intervals to Maximum of 2 mg if symptoms persist, Repeat with lowest effective trial does if life-threatening symptoms recur.
Cholinergic agents Physostigmine Neostigmine Pyridostigmine Pilocarpine Bethanechol Methacholine	Cholinergic crisis Diaphoresis Lacrimation Bronchial secretions Excessive urination and Defecation Convulsions Fasciculations	Atropine sulfate	Adults : 2 mg IV Children : 0.05 mg/kg Iv Repeat until Cessation of secretions
Cyanide (potassium cyanide,hydrocyanic acid,laetrile,nitroprusside sodium)	Cyanosis Cardiopulmonary arrest Convulsions Coma	Sodium nitrite Then Sodium thiosulfate	Adults : 300 mg IV (10 ml of 3% solution Children : Dose based on serum hemoglobin Adults : 12.5 grams IV (50 ml of 25% Solution) Cobalt E.D.T.A
Ethylene glycol	Acidosis Oxalate crystals in urine	Ethanol	Loading dose : 600 mg/kg (1 ml absolute alcohol = 790 mg) IV in D5 W over 15 minutes. Maintenance dose : To maintain blood Level of 100 mg percent. It varies Depending on drinking history of patient.

Specific Agent	Symptoms Requiring treatment	Antidote	Dosage
Neuroleptic agents Haloperidol (Haldol #) Loxapine succinate (Loxitane #) Molindone (Moban #) Phenothiazenis Chlorpromazine (Thorpromazine #) Fluphenazine (Prolixin #) Thioridazine (Mellaril #)	Extrapyramidal symptoms: Dystonia Dyskinesia Oculogyric crisis Parkinsonian sumptoms	Diphenhydramine Or Benztropine	25 to 50 mg IV, IM or 1 to 2 mg IV, IM
Iron salts (ferrous sulfate, ferrous gluconate)	Hypotension Shock Coma (free serum iron present)	Deferoxamine	Shock and/or Coma : 15 mg/kg/hour IV For 8 hours. Absence of Shock or coma but SI TIBC : 90 mg/kg IM every 8 hours* 3 doses
Methanol	Acidosis Methanol blood level Exceeding 20 mg%	Ethanol	Loading dose : 600 mg/kg/(1 ml absolute alcohol = 790 mg) IV in D2W over 15 minutes. Maintenance Dose : To maintain blood level of 100 mg percent. Varies depending on drinking history of the patient.
Methemoglobin-Producing agents Nitrates/nitrites Phenazopyridine Phenacetin	Methemoglobinemia (30%)	Methylene blue	1 to 2 mg/kg IV (0.1 to 0.2 ml/kg) of 1 percent solution. Note : Contraindicated in methemoglobinemia secondary to sodium nitrite in cyanide poisoning.

Specific Agent	Symptoms Requiring treatment	Antidote	Dosage
Narcotic analgesics And related	Respiratory depression Hypothension Coma	Naloxone	Adults : 0.8 mg IV, IM, SC. Children : 0.01 mg/kg, IV, IM, SC Repeat at 10* (times) original dose if no response
Organophosphate Insecticides Malathion Parathion	Cholinergic crisis Diaphoresis Lacrimation Bronchial secretions Excessive urination and defecation Conulsions Fasciculations Profound weakness Muscular twitching	Atropine sulfate Pralidoxime	Adults : 2 to 4 mg IV slowly; repeat every 10 to 30 minutes to attain and maintain atropinization (decreased bronchial secretions). Children : 0.05 mg/kg IV. Slowly repeat every 10 to 30 minutes to attain and maintain atropinization (decreased bronchial secretions), After atropine; Adults : 1 g IV (500 mg/minute). Repeat * 3 at 8-10-12 hour intervals if muscle weakness not relieved. Children : 25 to 50 mg/kg IV. Repeat x 3 at 8-10-12 hour intervals if muscle weakness not relieved

Annexure -5
District Crisis Group

Sr. No	Office Name	Designation	Person Name	Tel.No.
1	District Collector	Chair Person	Mr. P.M.Nagargoje	(o)02472-224501
2	Inspector of Factories, (Deputy Director, Industrial Safety & Health, Osmanabad)	Member Secretary	Mr. M Y Bhalekar	(o)02462- 252156
3	District Energy Officer Mah State Elec Distributin Co	Member	Mr. Badada	02472-223270
4	Chief Fire Officer	Member	Mr.K.S.Chavan	m-9404676754
5	District Information Officer	Member	Mr.Dipak Chavan	O-02472-222744
6	Controller of Explosive	Member	Being followed up	
7	Chief Civil Defence(Commandant, Home Guards)	Member	Mr.	02472-251389
8	One representative of Trade union to be nominated by District Collector	Member	Mr.	
9	Superintendent of Police Osmanabad.	Member	Mr.Sachin Patil	(0) 02472-227620 M-7738600001
9	Deputy Superintendent of Police	Member	Mr. Pardeshi	02472-222717
10	District Health Officer/Chief Medical Officer (Civil SURGEON Civil Hospital Osmanabad)	Member	Dr. Dhaktode	(o) 02473-261204
11	Chief Officer	Member	Mr. Jadhavr	M- 02472-225407
12	Executive engineer PWD Osmanabad	Member	Mr. Deshpande	02472-222883
13	Controller MSRTC	Member	Mr.Pradip Khobre	02472-222236
14	One representative of industry to be nominated by the District Collector	Member		

Annexure- 6

FORMAT FOR COMMENTS

To make any specific comments and/or suggestions for Plan improvement following format can be used.

Format For Comments

To,
The Member Secretary
District Crisis Group, Office Of the
Dy. .Director, Nanded
Tel.No.02462-252156

Name of the Department/Agency :
Address :

Contact Name :
Phone Number :
Fax Number :

Suggestions for Plan improvement :

Errors or inaccuracies noted in this plan :

Signature :

Date :

General Guidelines in Disaster

(Personal Protection of Citizens)

- Keep calm
- Don't Panic
- Cover mouth and Nose with wet cloth
- Don't spread rumour
- Don't crowd at incident sight
- Walk fast at right angle to the wind direction
- Close doors and windows in case of toxic gas release
- Turn off LPG gas incase of inflammable Gas leakage
- Keep phone lines clear
- Inform Police & Fire brigade
- Follow direction from proper authority
- Keep the road clear
- Give way to Emergency vehicles immediately

Annexure 8

Safety Precautions

(Response Personal Safety)

APPROACH CAUTIOUSLY FROM UPWIND.

Resist the urge to rush in; others cannot be helped until the situation has been fully assessed.

SECURE THE SCENE.

Without entering the immediate hazard area, isolate the area and assure the safety of people and the environment, keep people away from the scene and outside the safety perimeter. Allow enough room to move your own equipment.

IDENTIFY THE HAZARDS .

Placards, container labels, shipping documents and / or expert persons on the scene are valuable information sources. Evaluate all available information and consult the recommended MSDS to reduce immediate risks.

ASSESS THE SITUATION .

Consider the following

- Is there a fire, a spill or a leak?
- What are the weather conditions?
- What is the terrain like ?
- Who/what is at risk: people, property or the environment ?
- What actions should be taken: Is an evacuation necessary ?

Is diking necessary ? What resources(human and equipment) are required and are readily available ?

- ❖ What can be done immediately ?

OBTAIN HELP :

Advise your ECC notify responsible agencies and call for assistance from qualified personnel.

DECIDE ON SITE ENTRY :

Any efforts made to rescue persons, protect property or the environment must be weighed against the possibility that you could become part of the problem. Enter the area only when wearing appropriate protective gear (see the MSDS on protective clothing and equipments)

RESPOND :

Respond in an appropriate manner. Establish a command post and lines of communication. Rescue casualties where possible & evacuate if necessary. Maintain control of the site. Continually re-assess the situation & modify the response accordingly. The first duty is to consider the safety of the people in the immediate area, including your own.

ABOVE ALL :

Don't walk into or touch spilled materials. Avoid inhalation of fumes, smoke & vapours, even if no dangerous chemicals are known to be involved. Don't assume that the gases or vapours are harmless because of lack of smell – odourless gases or vapours may be harmful.

Water Reactive Chemicals (Containment & Clean-up)

Serial No.	Name of the Chemical	Toxic Vapour Produced
1	Methyldichlorosilane	HCL
2	Methytrichlorosolane	HCL
3	Tricholorosilane	HCL
4	Calcium Phosphide	PH3
5	Aluminium Phosphide	PH3
6	Lithium Amide	NH3
7	Magnesium Aluminium Phosphide	PH3
8	Sodium Phosphide	PH3
9	Stannic Phosphide	PH3
10	Stannous Chloride	HCL
11	Lithium Hypochloride	CL2,HCL
12	Potassium /Sodium Cyanide	HCN
13	Zinc Phosphide	PH3
14	Acetyl Bromide	HBR
15	Acetyl Chloride	HCL
16	Aluminium Bromide	HBR
17	Aluminium Chloride	HCL
18	Antimony Pentafluoride	HF
19	Calcium Hypochlorites	CL2, HCL
20	Phosphorus PentaChloride	HCL
21	Phosphorus Pentasulphide	H2S
22	Thionyl Chloride	HCL, So2
23	Acetyl iodide	HI
24	Sulpherdiochloride	SO2, SO3, & HCL
25	Chlorine dioxide, Hydrade	CL2

EMERGENCY ASSISTANCE TELEPHONE ROSTER

❖ Emergency Control Centre (Police)	100 / 02472-222900
❖ District Emergency Control Room	02472-225618
❖ Fire Brigade	101/ 02472-222101

1 STATE ASSISTANCE

i. Chairman State Crisis Management Committee.	(022) 22027990
ii. Secretary Environment	(022) 22026767
iii. Secretary Labour & Member Secretary SCG	(022) 22883175
iv. Transport Commissioner	(022) 22026691/22025368
v. Secretary PWD	(022) 22024800 / 22026612
vi. Secretary Health Department.	(022) 22023848
vii. Director of Health Services.	(022) 22621031 / 22621006
viii. Secretary Agriculture	(022) 22029342
ix. Director DISH	(022) 23522230-33
x. Chairman MPCB	(022) 22671356
xi. Member Secretary MPCB	(022) 22671356
xii. Divisional Commissioner, Marathwada	(0240) 22331294 / 2350044
xiii. DGI & PR	(022) 22027956
xiv. Commandant General Home guard	(022) 22022246

Annexure- 11
HAZMAT RESPONSE VAN
(Proposed)

Keeping in view of the major accident prone areas in the jurisdiction namely Osmanabaddistrict, a specialised HAZMAT team and van for road accidents shall be located at strategic point like District Collector office to respond to transportation emergencies as well as assistance to industries with limited resource. Equipment stored in HAZMAT van are special and specifically tailored to the road accidents hazards. HAZMAT team members from part of van equipment as one entry. Details of HAZMAT van equipment and HAZMAT kit are mentioned below.

The HAZMAT van will be driven to the scene of the accident by the incident commander or Field Incident Commander.

During a minor emergency, the command post will serve as the primary point of control for management, communication and implementation of counter measures. During a moderate, major or catastrophic emergency, the command post will be supplemented by Emergency Control center described in the next section.

For all types of emergency, the HAZMAT team will maintain following resources in the HAZMAT van to support emergency command post duties in addition to items as mentioned in appendix

- * A functioning radio
- * Copies of this document ; MSDS sheets of all the chemicals used in the area; and other references as needed ; and
- * A response folder containing copies of checklists and work sheets to assure compliance with applicable procedures and to facilitate incident documentation.

The command post shall be located upwind to assure a working environment safe from the effects of the incident. However the command post shall be close enough to the incident to permit observations and control of the site and ongoing operations. The command post serves as the point of perimeter control for the emergency. All access to and from the site is coordinated through the command post.

1 PROTECTIVE CLOTHING

Chemical protective suits for SCBA
 Splash apron (neoprene / butyl) large
 Proximity apron
 Acid suits
 Neoprene 14" gloves
 Viton 11" gloves
 Butyl 14" gloves
 Natural rubber gloves
 Surgical gloves
 High voltage lineman's gloves
 TYVEK coverall

Raingear (Jacket, Pants)
 Overall, abanda, TYVEK material, non-sparking zipper
 High visibility vests
 Goggles (Polycarbonate lens)
 Hard-hats with headband suspension
 Face shield (full) 10 x 19 x 0.060
 Boots (neoprene, steel toe and modsole)
 Boot cover
 Safety harness
 Ear protectors
 Turnout pants / jacket (large)

2. BREATHING APPARATUS

Positive pressure self - contained breathing apparatus
 Spare cylinder
 Full face cartridge type respirator
 Cartridges GMC - H G, C, GMP, GMC - S
 B9 five - minute escape mask
 Three cylinder cascade with manifold

3. LEAK CONTROL EQUIPEMNT

Bungs (for 55 gallon drum)
 Drum gaskets (55 gallon)
 Epoxy kit (plug and dike series p-200)
 Caulking compound (plug and dike 48p)
 Patch Kit (assorted patches) (plug and dike 24 - R, 16 - R, 8 - R)

4. MISCELLANEOUS

Duct 2-x300 tap
 Teflon thread 1" * 300 tape
 Barricade 3 / 4" * 50 yds (red & white stripped) tape
 Friction 3 / 4" * 300 tape
 Electrical 1" * 300 tape
 Box sealing / packing (paper with glue backing) tape
 Masking 1" * 300'
 Pipe pieces, assorted
 Pipe union, assorted
 Pipe caps, assorted
 Hose clamps, assorted
 Saddle clamps, assorted
 Couplings (galvanised), assorted
 Hand cleaner (waterless)

Flashlight (NS)
 Large wheel chock
 Wooden stakes (18")
 Electric flares (NS)
 Reflective triangles

5. ABSORBENT AND CONTAINERS

Absorbent Pads (3 M type 1557 - 3 / 8" * 36") (50 per bale)
 Plastic can liners / bags (55 gallon)
 Recovery drum sets 30,555,85 gallon
 Diatomaceous earth 3 cu. ft. bag
 Sponges 2" * 4" * 6"
 Nylon Salvage Covers (vinyl laminated nylon) 12" * 16"

6. NEUTRALISING AGENTS

Acid neutralising agent (neutrasorb 100 = box) (neutrasol 2 - 1 / 2 gallon
 container / carton)
 Neutraliser Neutrakit
 Chlorox

7. TOOLS AND HARDWARE

Square end, assorted sizes
 Flathead, assorted sizes
 Phillipshead, No.2 - 8, No.4 - 8 wrenches
 Hex Key / Allen, assorted sizes
 Crescent Adjustable, assorted sizes
 Basen - adjustable (4")
 M70 pipe, assorted sizes

Bung - universal (NS)
 Drum (standard) 17 - 1 / 2" length
 Socket ratchet 3 / 4" drive
 Socket 3 / 4" drive, assorted sizes
 Socket ratchet 1 / 2" drive 14 piece set 7 / 16" thr 1 - 1 / 2"
 Socket ratchet 1 / 2" drive
 Standard combination box / open end, assorted sizes
 Metric combination wrenches open / box 5 -25mm
 Bits, assorted sizes
 Drill (electrical) 1 / 2" chuck
 Drill set , assorted sizes (short length)
 Drill set , assorted sizes (large diameter)
 Slip joint 8" length 1" jaw
 Needle nosed 8", 6" plastic covered handles
 Vise grip (straight jaw) 10" Battery
 Vise brush 10" (NS)
 Curved claw 16oz

Straight claw 16oz (fibreglass handle)
 Putty knife
 paint brushes, 3", 4" polyester bristle
 Tape measure 3/8-x100' steel tape
 Folding ruler (wooden) 6'
 Pipe wire (4')
 Welding kit two stage oxy-acetylene welding outfit with say-fuel thumb
 wheel torch
 Wood chisels, assorted size blade (plastic handle)
 Cold chisels, assorted size blade
 Hacksaw 10"-12" adjustable
 Hacksaw blades 12 (24 teeth / inch high speed design 5 per package)
 Keyhole saw
 Pipe cutters 1/8"-2"
 Pry bar, assorted sizes
 Safety line 7/32-x100' roll (16" metal)
 Broom, push 24" heads (long wooden handle)
 Lantern lights (battery type)
 Battery jumpers cables (8'-10')
 Drum dollies for 55 gallon drum
 Chemical bucket (5 gal) butyl
 Rubber
 Dust pans(standard 12 " plastic)

8. MONITORING EQUIPMENT

Combustible gas and oxygen detector and calibration kit (Ranges : 0-100%,
 LEL 0-5PPM, 0-24% Oxygen)
 CO-indicator
 Multi gas detector kit (extension hose, air current, kit tubes) (Draeger CH304)
 0-13 Range, Battery
 pH paper (0-14) (Hydrin, 1/2 * 50 with dispenser) Water sample test kit (standard)

Chromium test set
 Fluorescent dye (red, green)
 Ultraviolet light, hand held, 100 volts.
 Indication wind system AC, DC recording cup and vane anemometer with meter
 Telescopic mast

9. MEDICAL FIRST AID

Extinguisher capable of handling Class A,B, C and D fires (No.20)
 First Aid kit (36 units)
 Resuscitator (B, W, S, CPR Portable with aspirator P/N 900-002-111-01
 Wood fire blankets.

10. OXYGEN TRAUMA, FIRST AID BOX, EMERGENCY BOX KIT

- a. Oxygen Cylinder
- b. Burn sheets

- c. Rescue Blankets
- d. Oxygen breathing kit
- e. Instant Glucose
- f. Paramedic Scissors
- g. Bandage Scissors
- h. Forceps
- i. Suction Unit & Stat stick
- j. Ring cutter
- k. Cervical collar (3 sizes)
- l. Eye pads
- m. Tourniquets
- n. Multi-Trauma Dressings
- o. Adaptic Dressing
- p. Flexible Bandages
- q. Pocket Masks / Eye-Wash Bottle
- r. Orthopaedic stretcher.
- s. Bag mask resuscitator
- t. Mouth- to-mask
- u. Portable respirator
- v. Ophthalmic solution
- w. Bold-pressure equipment
- x. Gloves
- y. Portable lamps / Torches

11. MISCELLANEOUS

- | | |
|--|---------------------------------|
| a. Portable flood lights (500 4 nos.) | g. Portable Foam Extinguisher |
| b. Telescopic flood light | h. Portable D.C.P. extinguisher |
| c. Emergency suits (4 nos.) | i. Two way radio |
| d. SCBA - 4 nos. | j. Hydraulic cutter |
| e. Hatler Battery operated | k. Hydraulic spreader |
| f. Hydraulic pump unit (Portable) | |

Annexure- 12**MATERIAL SAFETY DATA SHEET (MSDS)**

Sr. No.	Chemical
1	LPG
2	Ammonia
2	Chlorine
3	Ethanol
4	Hexne
5	Barium Nitrate
6	Hydrogen
7	Methanol

Material Safety Data Sheet

LPG

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : LPG

Synonyms : Liquefied Petroleum Gases; Olefins; Alky Feed; Stabilizer Bottoms, 888100004454

MSDS Number : 888100004454 **Version** : 1.2

Product Use Description : Fuel, Refinery intermediate Stream

Company : For: Tesoro Refining & Marketing Co.
19100 Ridgewood Parkway, San Antonio, TX 78259

Tesoro Call Center : (877) 783-7676 **Chemtrec**

(Emergency Contact)

: (800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Regulatory status : This material is considered hazardous by the Occupational Safety and Health

Administration (OSHA) Hazard Communication Standard (29 CFR 1910.1200).

Signal Word : DANGER

Hazard Summary :

High concentrations may exclude oxygen and cause dizziness and suffocation. Contact with liquid or cold vapor may cause frostbite or freeze burn. Simple asphyxiant. Reduces oxygen available for breathing. Exposure to concentrations above 10% of the LEL may cause a general central nervous system (CNS) depression typical of anesthetic gases or intoxicants. Aliphatic hydrocarbon gases may build up in confined spaces and may cause dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in narcosis, unconsciousness, and possibly lead to death.

Potential Health Effects

Eyes : May cause mild, short-lasting discomfort to eyes. Rapid release of gases which

are liquids under pressure may cause frost burns of exposed tissues (skin, eye) due to evaporative cooling.

Skin : Negligible irritation to skin at ambient temperatures. Rapid release of gases which are liquids under pressure may cause frost burns of exposed tissues (skin, eye) due to evaporative cooling.

Chronic Exposure : Chronic Effects And/Or Target Organ Data: May cause central nervous system

disorder (e.g., narcosis involving a loss of coordination, weakness, fatigue, mental confusion and blurred vision) and/or damage. Exposure to rapidly

Specific Hazard

Reactivity

Health

NFPA: Flammability

0

4

FLAMMABILITY

PHYSICAL

HEALTH

4
0
1

HMIS III:

0 = Insignificant, 1 = Slight, 2 = Moderate,
3 = High, 4 = Extreme

expanding gas or vaporizing liquid may cause frostbite (cold burn). Simple asphyxiant: Acts by displacing oxygen in the lungs thereby diminishing the supply of oxygen available to the blood and tissues. Symptoms include shortness of breath, rapid heart rate, incoordination, lethargy, headaches, nausea, vomiting, and disorientation. Continued lack of oxygen may result in convulsions, loss of consciousness and death. Oxygen in enclosed spaces should be maintained at normal atmospheric percentage (about 21 percent by volume).

Target Organs : Eyes, Skin

Physical and chemical hazards : Flammable Gas. Material can release vapors that readily form flammable mixtures. Vapor accumulation could flash and/or explode if ignited. Frostbite hazard - rapidly expanding gas or liquid may cause frostbite Material can accumulate static charges which may cause an incendiary electrical discharge.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component CAS-No. Weight %

Propane 74-98-6 60 - 90%

Butane 106-97-8 10 - 30%

Propene; Propylene 115-07-1 1 - 5%

Isobutane 75-28-5 1 - 5%

SECTION 4. FIRST AID MEASURES

Inhalation : Remove to fresh air. If breathing is irregular or stopped, administer artificial

respiration. Give oxygen. Seek medical attention immediately.

Skin contact : For exposure to liquid, immediately warm frostbite area with warm water not to

exceed 105°F (41°C). In case of massive exposure, remove contaminated clothing while showering with warm water. Obtain medical attention.

Eye contact : Immediately flush eyes thoroughly with warm water for at least 15 minutes.

Remove contact lenses. Rinse with water. Take victim immediately to hospital. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. If eye irritation persists, seek medical attention.

Ingestion : Ingestion is considered unlikely. If swallowed, obtain medical attention.

Notes to physician : Symptoms: Dizziness, Headache, Nausea, Frostbite, Vomiting, Discomfort

Hazards: This material may be a cardiac sensitizer; avoid the use of epinephrine. Treatment: Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.

SECTION 5. FIRE-FIGHTING MEASURES

Form : Liquefied gas

Flash point : -104 °C (-155 °F)

Lower explosive limit : 2.1 % (V)

Upper explosive limit : 9.5 % (V)

Suitable extinguishing media : Water spray, Dry chemical, Foam, Carbon dioxide (CO₂), Fire should not be extinguished unless flow of gas can be immediately stopped.

Specific hazards during fire fighting

: Flammable Gas. Vapors are heavier than air and may travel long distances to a point of ignition and flash back.

Special protective equipment for fire-fighters

: Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressuredemand self-contained breathing apparatus with full facepiece and full protective clothing.

Further information : Allow the fire to burn under controlled conditions. Fire should not be extinguished unless flow of gas can be immediately stopped. Stop leak if you can do it without risk. Evacuate area. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect personnel attempting to stop a leak. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.

Use

water to cool equipment, surfaces and containers exposed to fire and excessive heat. For large fire the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions : Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. Emergency eye wash capability should be available in the vicinity of any potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent or harsh abrasive skin cleaners for washing this product from exposed skin

areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Consider disposal of contaminated clothing rather than laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

Environmental precautions : Prevent entry into waterways, sewers, basements or confined areas.

Methods for cleaning up : Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). CAUTION: When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning. Allow liquid to evaporate from the surface. All equipment used when handling the product must be grounded. Do not direct water at spill or source of leak. Do not touch or walk through spilled material. If possible, turn leaking containers so that gas

escapes rather than liquid. Isolate area until gas has dispersed. Prevent spreading of vapors through sewers, ventilation systems and confined areas. Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material. Water Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Allow liquid to evaporate from the surface.

SECTION 7. HANDLING AND STORAGE

Handling : Keep away from fire, sparks and heated surfaces. No smoking near areas where material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.

Advice on protection against fire and explosion

: Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initated fire or explosion during transfer, storage or handling, include but are not limited to these examples:

- (1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators.
- (2) Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such gasoline or naphtha).
- (3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initated fire or explosion, see

NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

Dust explosion class : Not applicable

Requirements for storage areas and containers

: Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Advice on common storage : Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

Other data : Keep in a dry place. Keep away from heat. No decomposition if stored and applied as directed.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List Components CAS-No. Type: Value

OSHA Z1 Propane 74-98-6 PEL 1,000 ppm 1,800 mg/m³

ACGIH Propane 74-98-6 TWA 1,000 ppm

Butane 106-97-8 TWA 1,000 ppm

Isobutane 75-28-5 TWA 1,000 ppm

Protective measures : Avoid contact with skin. When using do not smoke. Keep out of reach of children.

Keep away from heat and flame.

Engineering measures : Use only intrinsically safe electrical equipment approved for use in classified areas.

Eye protection : Goggles and face shield as needed to prevent eye and face contact.

Hand protection : Neoprene gloves Any specific glove information provided is based on published

literature and glove manufacturer data. Work conditions can greatly effect glove durability; inspect and replace worn or damaged gloves. If product is hot, thermally

protective gloves are recommended. If contact with forearms is likely, wear gauntlet style gloves.

Skin and body protection : Where contact with liquid may occur, wear apron and faceshield.

Respiratory protection : NIOSH/MSHA approved positive-pressure self-contained breathing apparatus

(SCBA) or Type C positive-pressure supplied air with escape bottle must be used for gas concentrations above occupational exposure limits, for potential of uncontrolled release, if exposure levels are not known, or in an oxygen-deficient atmosphere. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection.

Work / Hygiene practices : Emergency eye wash capability should be available in the near proximity to

operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective.

Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Form : Liquefied gas

Appearance : Colorless gas. Cold vapor cloud may be white but the lack of visible gas cloud

does not indicate absence of gas. A colorless liquid under pressure.

Odor : Odorless

Flash point : -104 °C (-155 °F)

Thermal decomposition : Heating may cause a fire or explosion., Material does not decompose at ambient temperatures. Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke) are possible hazardous decomposition products.

Lower explosive limit : 2.1 % (V)

Upper explosive limit : 9.5 % (V)

pH : Not applicable

Freezing point : No data available

Boiling point : -40 °C(-40 °F)

Vapor Pressure : 23 to 132 psig at 21.1 °C (70 °F)

Liquid Density : 1.6 g/cm³

Water solubility : Negligible

Viscosity, kinematic : No data available

Percent Volatiles : 100 %

Conductivity

(conductivity can be reduced by environmental factors such as a decrease in temperature)

Hydrocarbon liquids without static dissipater additive may have conductivity below 1 picoSiemens per meter (pS/m). The highest electro-static ignition risks are associated with "ultra-low conductivities" below 5 pS/m. See Section 7 for sources of information on defining safe loading and handling procedures for low conductivity products.

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid : This product is stable at ambient temperature and atmospheric pressure. Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

Materials to avoid : Strong acids. Copper. Explosion hazard when exposed to nickel carbonyl/oxygen mixture. Strong Oxidizers.

Hazardous decomposition products

: Hydrocarbons. Smoke. Carbon oxides.

Thermal decomposition : Heating may cause a fire or explosion. Material does not decompose at ambient temperatures. Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke) are possible hazardous decomposition products.

Hazardous reactions : Vapors may form explosive mixture with air. Hazardous polymerization does not occur. Note: No decomposition if used as directed.

SECTION 11. TOXICOLOGICAL INFORMATION

Carcinogenicity

NTP : No component of this product which is present at levels greater than or equal to 0.1

% is identified as a known or anticipated carcinogen by NTP.

IARC : No component of this product which is present at levels greater than or equal to 0.1

% is identified as probable, possible or confirmed human carcinogen by IARC.

OSHA : No component of this product which is present at levels greater than or equal to 0.1

% is identified as a carcinogen or potential carcinogen by OSHA.

CA Prop 65 : This product does not contain any chemicals known to State of California to cause

cancer, birth, or any other reproductive defects.

Skin irritation : Irritating to skin.

Rapid release of gases which are liquids under pressure may cause frost burns of exposed tissues (skin, eye) due to evaporative cooling.

Eye irritation : slight irritation

Rapid release of gases which are liquids under pressure may cause frost burns of exposed tissues (skin, eye) due to evaporative cooling.

Further information : Chronic Effects And/Or Target Organ Data: May cause central nervous system

disorder (e.g., narcosis involving a loss of coordination, weakness, fatigue, mental confusion and blurred vision) and/or damage. Exposure to rapidly expanding gas or

vaporizing liquid may cause frostbite (cold burn). Simple asphyxiant: Acts by displacing oxygen in the lungs thereby diminishing the supply of oxygen available to

the blood and tissues. Symptoms include shortness of breath, rapid heart rate, incoordination, lethargy, headaches, nausea, vomiting, and disorientation.

Continued lack of oxygen may result in convulsions, loss of consciousness and death. Since exercise increases the tissue need for oxygen, symptoms will occur more quickly during exertion in an oxygen-deficient environment. Oxygen in enclosed spaces should be maintained at normal atmospheric percentage (about 21

percent by volume).

Component:

Propane 74-98-6 Skin irritation: Classification: Irritating to skin.

Result: Skin irritation

Eye irritation: Classification: Irritating to eyes.

Result: Mild eye irritation

Propene; Propylene 115-07-1 Acute inhalation toxicity: LC50 rat

Dose: 658 mg/l

Exposure time: 4 h

Eye irritation: Classification: Irritating to eyes.

Result: Mild eye irritation

SECTION 12. ECOLOGICAL INFORMATION

Bioaccumulation : Inherently biodegradable.

Accumulation in terrestrial organisms is unlikely.

Toxicity to fish : Not expected to be harmful to aquatic organisms.

Additional ecological information

: Liquid release is only expected to cause localized, non-persistent environmental damage, such as freezing. Biodegradation of this product may occur in soil and water. Volatilization is expected to be the most important removal process in soil and water. This product is expected to exist entirely in the vapor phase in ambient air.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Dispose of container and unused contents in accordance with federal, state and local requirements.

SECTION 14. TRANSPORT INFORMATION**CFR**

Proper shipping name : PETROLEUM GASES, LIQUEFIED

UN-No. : 1075

Class : 2.1

Packing group :

TDG

Proper shipping name : PETROLEUM GASES, LIQUEFIED

UN-No. : UN1075

Class : 2.1

Packing group :

IATA Cargo Transport

UN UN-No. : UN1075

Description of the goods : PETROLEUM GASES, LIQUEFIED

Class : 2.1

ICAO-Labels : 2.1

Packing instruction (cargo aircraft)

: 200

IATA Passenger Transport

UN-No. : UN1075

Class : 2.1

Not permitted for transport

IMDG-Code

UN-No. : UN 1075

Description of the goods : PETROLEUM GASES, LIQUEFIED

Class : 2.1

IMDG-Labels : 2.1

EmS Number : F-D S-U

Marine pollutant : No

SECTION 15. REGULATORY INFORMATION

OSHA Hazards : Flammable gas

Moderate skin irritant

Moderate eye irritant

TSCA Status : On TSCA Inventory

DSL Status : All components of this product are on the Canadian DSL list.

SARA 311/312 Hazards : Fire Hazard

Acute Health Hazard

PENN RTK US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Components CAS-No.

Propane 74-98-6

Butane 106-97-8

Propene; Propylene 115-07-1

Isobutane 75-28-5

MASS RTK US. Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations

Section 670.000)

Components CAS-No.

Propane 74-98-6

Butane 106-97-8

Propene; Propylene 115-07-1

Isobutane 75-28-5

NJ RTK US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Components CAS-No.

Propane 74-98-6

Butane 106-97-8

Propene; Propylene 115-07-1

Isobutane 75-28-5

SARA III US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic

Chemicals (40 CFR 372.65) - Supplier Notification Required

Components CAS-No.

Propene; Propylene 115-07-1

California Prop. 65 : This product does not contain any chemicals known to State of California to cause cancer, birth, or any other reproductive defects.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which

exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude

oil refining process and any indigenous components of such from the CERCLA Section 103 reporting

requirements. However, other federal reporting requirements, including SARA Section 304, as well as

the Clean Water Act may still apply.

SECTION 16. OTHER INFORMATION

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at

the date of its publication. The information given is designed only as guidance for safe handling, use, processing,

storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The

information relates only to the specific material designated and may not be valid for such material used in

combination with any other materials or in any process, unless specified in the text.

Template

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Revision Date : 10/05/2010
52, 1005

MATERIAL SAFETY DATA SHEET
Ammonia

SECTION 1. PRODUCT IDENTIFICATION**PRODUCT NAME:** Ammonia**CHEMICAL NAME:** Ammonia **FORMULA:** NH₃**SYNONYMS:** Ammonia, Anhydrous**MANUFACTURER:** Air Products and Chemicals, Inc.

7201 Hamilton Boulevard

Allentown, PA 18195-1501

PRODUCT INFORMATION: (800) 752-1597**MSDS NUMBER:** 1003 **REVISION:** 7**REVIEW DATE:** December 1999 **REVISION DATE:** December 1999**SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS**

Ammonia is sold as pure product (>99%).

CAS NUMBER: 7664-41-7**EXPOSURE LIMITS:****OSHA:** PEL = 50 ppm **ACGIH:** TLV/TWA = 25 ppm **NIOSH:** IDLH = 300 ppm

TLV-STEL = 35 ppm

SECTION 3. HAZARD IDENTIFICATION**EMERGENCY OVERVIEW**

Anhydrous Ammonia is an irritating, flammable, and colorless liquefied compressed gas packaged in cylinders under its own vapor pressure of 114 psig at 70 °F. Ammonia can cause severe eye, skin and respiratory tract burns. It poses an immediate fire and explosion hazard when concentrations exceed 15%; therefore, area must be ventilated before entering. Wear self-contained breathing apparatus (SCBA) when entering release area if concentrations exceed allowable exposure limits. Fully protective suits are required in large releases. Always be aware of fire and explosion potential in the case of large releases.

EMERGENCY TELEPHONE NUMBERS**(800) 523-9374 Continental U.S., Canada, and Puerto Rico****(610) 481-7711 other locations****ACUTE POTENTIAL HEALTH EFFECTS:****ROUTES OF EXPOSURE:****EYE CONTACT:** Exposure to Ammonia can cause moderate to severe eye irritation.**INGESTION:** Ingestion is not a likely route of exposure for Ammonia.**INHALATION:** Ammonia is severely irritating to nose, throat, and lungs.

Symptoms may include

burning sensations, coughing, wheezing, shortness of breath, headache and nausea. Overexposure

may also cause central nervous system effects including unconsciousness and convulsions. Upper

airway damage is more likely and can result in bronchospasm (closing of the airway). Vocal chords are particularly vulnerable to corrosive effects of high concentrations. Lower airway damage may result in fluid build up and hemorrhage. Death has occurred following a 5 minute exposure to 5000 ppm.

SKIN CONTACT: Vapor contact may cause irritation and burns. Contact with liquid may cause freezing of the tissue accompanied by corrosive caustic action and dehydration.

POTENTIAL HEALTH EFFECTS OF REPEATED EXPOSURE:

ROUTE OF ENTRY: Inhalation, eye or skin contact

SYMPTOMS: Repeated or prolonged skin exposure may cause dermatitis.

TARGET ORGANS: Eyes, skin, central nervous and respiratory systems.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: Conditions generally aggravated by exposure include asthma, chronic respiratory disease (e.g., emphysema), dermatitis and eye disease.

CARCINOGENICITY: Ammonia is not listed as a carcinogen or potential carcinogen by NTP, IARC, or OSHA.

SECTION 4. FIRST AID MEASURES

EYE CONTACT: Flush eyes with large quantities of water. Seek medical attention immediately.

INGESTION: Ingestion is not a likely route of exposure for Ammonia.

INHALATION: Remove person to fresh air. If not breathing, administer artificial respiration. If breathing is difficult, administer oxygen. Obtain prompt medical attention.

SKIN CONTACT: Flush affected area with large quantities of water. Remove contaminated clothing immediately. If liquid comes in contact with skin, remove contaminated clothing and flush with plenty of lukewarm water for several minutes. Seek medical attention immediately.

NOTE TO PHYSICIAN: Bronchospasm may be treated with the use of a bronchodilator such as albuterol and an anticholinergic inhalant such as Atrovent.

SECTION 5. FIRE FIGHTING MEASURES

FLASH POINT: AUTOIGNITION: FLAMMABLE RANGE:

Not applicable 1204 °F (651 °C) 16% - 25%

EXTINGUISHING MEDIA: Dry chemical, carbon dioxide or water.

SPECIAL FIRE FIGHTING INSTRUCTIONS: Evacuate all personnel from area. If possible without risk, stop the flow of Ammonia, then fight fire according to types of materials that are burning. Extinguish fire only if gas flow can be stopped. This will avoid possible accumulation and re-ignition of a flammable gas mixture. If possible, move adjacent cylinders away from fire area. Keep adjacent cylinders cool by

spraying with large amounts of water until the fire burns itself out. Self-contained breathing apparatus (SCBA) may be required.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Most cylinders are designed to vent contents when exposed to elevated temperatures. Pressure in a cylinder can build up due to heat and it may rupture if pressure relief devices should fail to function. Runoff from firefighting may be contaminated; check pH.

Ammonia can form explosive compounds when combined with mercury.

HAZARDOUS COMBUSTION PRODUCTS: Oxides of nitrogen

SECTION 6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Evacuate immediate area.

Eliminate any possible sources of ignition, and provide maximum explosion-proof ventilation. Shut off

source of leak if possible. Isolate any leaking cylinder. If leak is from container, pressure relief device or

its valve, contact your supplier. If the leak is in the user's system, close the cylinder valve, safely vent the

pressure, and purge with an inert gas before attempting repairs. Ammonia vapors can be controlled with

water spray, however; runoff may be contaminated. Releases that exceed 100 lbs (45.4 kgs) during a 24-

hour period must be reported. (See Section 15).

All responders must be adequately protected from exposure. Levels of Ammonia should be below levels

listed in Section 2 (Composition / Information on Ingredients) and the atmosphere must have at least 19.5%

oxygen before personnel can be allowed in the area without self-contained breathing apparatus (SCBA).

MSDS #1003 Ammonia Page 3 of 6

Pub # 320-709

SECTION 7. HANDLING AND STORAGE

STORAGE: Store cylinders in a well-ventilated, secure area, protected from the weather. Cylinders

should be stored upright with valve outlet seals and valve protection caps in place. There should be no

sources of ignition. All electrical equipment should be explosion-proof in the storage areas. Storage

areas must meet National Electrical Codes for class 1 hazardous areas.

Flammable storage areas should

be separated from oxygen and other oxidizers by a minimum distance of 20 ft. or by a barrier of noncombustible

material at least 5 ft. high having a fire resistance rating of at least ½ hour.

Ammonia

cylinders should not be stored near acids or acid-forming gases. Post "No Smoking or Open Flames"

signs in the storage or use areas. Do not allow storage temperature to exceed 125 °F (52 °C). Storage should be away from heavily traveled areas and emergency exits. Full and empty cylinders should be segregated. Use a first-in first-out inventory system to prevent full containers from being stored for long periods of time.

Caution: Ammonia cylinders are subject to theft and misuse. Cylinders should be stored and used in controlled areas.

HANDLING: Do not drag, roll, slide or drop cylinder. Use a suitable hand truck designed for cylinder movement. Never attempt to lift a cylinder by its cap. Secure cylinders at all times while in use. Use a pressure reducing regulator or separate control valve to safely discharge gas from cylinder. Use a check valve to prevent reverse flow into cylinder. Never apply flame or localized heat directly to any part of the cylinder. Do not allow any part of the cylinder to exceed 125 °F (52 °C). Once cylinder has been connected to properly purged and inerted process, open cylinder valve slowly and carefully. If user experiences any difficulty operating cylinder valve, discontinue use and contact supplier. Never insert an object (e.g., wrench, screwdriver, etc.) into valve cap openings. Doing so may damage valve causing a leak to occur. Use an adjustable strap-wrench to remove over-tight or rusted caps. All piped systems and associated equipment must be grounded. Electrical equipment should be non-sparking or explosion-proof. Only a recommended CGA connection should be used. Adapters should not be used. Use piping and equipment adequately designed to withstand pressures to be encountered. If liquid product is being used, ensure steps have been taken to prevent entrapment of liquid in closed systems. The use of pressure relief devices may be necessary. Dedicated inert gas cylinders with in line back-flow protection should be used for purging.

SPECIAL REQUIREMENTS: Always store and handle compressed gases in accordance with Compressed Gas Association, Inc. (ph.703-979-0900) pamphlet CGA P-1, *Safe Handling of Compressed Gases in Containers*. Local regulations may require specific equipment for storage or use.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION ENGINEERING CONTROLS:

VENTILATION: Provide adequate natural or mechanical ventilation to maintain Ammonia concentrations below exposure limits.

RESPIRATORY PROTECTION:

Emergency Use: Self-contained breathing apparatus (SCBA) or positive pressure airline with full face mask with escape pack should be worn in areas of a large release or unknown concentration.

EYE PROTECTION: Safety glasses for handling cylinders. Chemical goggles with full faceshield for connecting, disconnecting or opening cylinders.

SKIN PROTECTION: Leather gloves for handling cylinders. Rubber or Neoprene gloves, and chemical resistant outer garment should be worn when connecting or disconnecting cylinders. Total encapsulating chemical suit may be necessary in large release area. Fire resistant suit and gloves in emergency situations.

OTHER PROTECTIVE EQUIPMENT: Safety shoes are recommended when handling cylinders. Safety shower and eyewash fountain should be readily available.

CAUTION: Contact with cold, evaporating liquid on gloves or clothing may cause cryogenic burns or frostbite. Cold temperatures may also cause embrittlement of PPE material resulting in breakage and exposure.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE, ODOR AND STATE: Colorless gas with a sharp, strong odor similar to "smelling salts"

which is readily detectable at 20 ppm

MOLECULAR WEIGHT: 17.0

BOILING POINT (1 atm): -28.1 °F (-33.4 °C)

SPECIFIC GRAVITY (air=1): 0.59

FREEZING POINT / MELTING POINT: -107.9 °F (-77.7 °C)

VAPOR PRESSURE (At 70 °F (21.1 °C)): 114.4 psig

GAS DENSITY (At 70 °F (21.1 °C) and 1 atm): 0.045 lb/ft³

SOLUBILITY IN WATER (vol./vol. at 68 °F): 0.848

SECTION 10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable

CONDITIONS TO AVOID: High temperatures (greater than 800 °F (426 °C)). Cylinders should not be

exposed to temperatures in excess of 125 °F (52 °C).

INCOMPATIBILITY (Materials to Avoid): Copper, silver, cadmium and zinc and their alloys; mercury, tin, acids, alcohols, aldehydes, halogens and oxidizers.

REACTIVITY:

A) HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen at high temperatures.

B) HAZARDOUS POLYMERIZATION: Will not occur

SECTION 11. TOXICOLOGICAL INFORMATION

LC50 (Inhalation): 7338 - 11590 ppm (rat, 1 hour); 2000 ppm (rat, 4 hours)

LD50 (Oral): Not applicable

LD50 (Dermal): Not applicable

SKIN CORROSIVITY: Ammonia is corrosive to the skin.

ADDITIONAL NOTES: Rats exposed continuously to 180 ppm Ammonia for 90 days did not show any abnormalities of organs or tissues. Mild nasal irritation was observed in 12 out of 49 rats exposed to 380 ppm Ammonia. At 655 ppm Ammonia, 32 out of 51 rats died by day 25 of exposure and 50 out of 51 rats had died after 65 days of exposure.

SECTION 12. ECOLOGICAL INFORMATION

AQUATIC TOXICITY: Currently, the following aquatic toxicity data are available for Ammonia:

Daphnia magna (48 hour) LC50 = 189 mg/l

Rainbow trout (24 hour) LC50 = 0.97 mg/l

Fathead minnow (96 hour) LC50 = 8.2 mg/l

MOBILITY: Not available

PERSISTENCE AND BIODEGRADABILITY: Not available

POTENTIAL TO BIOACCUMULATE: Not available

REMARKS: Do not release large amounts of Ammonia to the atmosphere. It does not contain any Class I or Class II ozone depleting chemicals.

SECTION 13. DISPOSAL CONSIDERATIONS

UNUSED PRODUCT / EMPTY CYLINDER: Return cylinder and unused product to supplier. Do not attempt to dispose of unused product.

DISPOSAL: Small amounts of Ammonia may be disposed of by discharge into water. A ratio of ten parts water to one part Ammonia should be sufficient for disposal. The subsequent solution of ammonium hydroxide can be neutralized and should be properly disposed of in accordance with regulations.

SECTION 14. TRANSPORT INFORMATION

DOT SHIPPING NAME: Ammonia, Anhydrous

HAZARD CLASS: 2.2

IDENTIFICATION NUMBER: UN1005

ADDITIONAL DESCRIPTION: Inhalation Hazard

SHIPPING LABEL(s): Nonflammable gas

PLACARD (When required): Nonflammable gas

ADDITIONAL MARKING: Ammonia is also a hazardous substance regulated by the EPA. When shipping quantities of 100 lbs. or more in one cylinder, add the prefix "RQ" to the DOT shipping name on the documentation and clearly mark "RQ" on the cylinder near the label.

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure upright position in a

well-ventilated truck. Never transport in passenger compartment of a vehicle. Ensure cylinder valve is properly closed, valve outlet cap has been reinstalled, and valve protection cap is secured before shipping cylinder.

CAUTION: Compressed gas cylinders shall not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with the owner's written consent is a violation of Federal law (49 CFR 173.301).

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (NAERG #): 125

SECTION 15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

EPA - ENVIRONMENTAL PROTECTION AGENCY

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980

(40 CFR Parts 117 and 302)

Reportable Quantity (RQ): 100 lbs (45.4 kgs)

SARA TITLE III: Superfund Amendment and Reauthorization Act

SECTIONS 302/304: Emergency Planning and Notification (40 CFR Part 355)

Extremely Hazardous Substances: Ammonia is listed.

Threshold Planning Quantity (TPQ): 500 lbs (227 kgs)

Reportable Quantity (RQ): 100 lbs (45.4 kgs)

SECTIONS 311/312: Hazardous Chemical Reporting (40 CFR Part 370)

IMMEDIATE HEALTH: Yes PRESSURE: Yes

DELAYED HEALTH: No REACTIVITY: No

FIRE: No

SECTION 313: Toxic Chemical Release Reporting (40 CFR Part 372)

Ammonia is on the list of chemicals which may require reporting under Section 313.

CLEAN AIR ACT:

SECTION 112 (r): Risk Management Programs for Chemical Accidental Release (40 CFR PART 68)

Ammonia is listed as a regulated substance.

Threshold Quantity (TQ): 10,000 lbs (4535 kgs)

TSCA: Toxic Substance Control Act

Ammonia is listed on the TSCA inventory.

OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

29 CFR Part 1910.119: Process Safety Management of Highly Hazardous Chemicals

Ammonia is listed as a highly hazardous chemical.

Threshold Quantity (TQ): 10,000 lbs (4535 kgs)

STATE REGULATIONS:

CALIFORNIA:

Accidental Release Prevention Program: Threshold Quantity (TQ): 100 lbs (45.4 kgs)

Proposition 65: This product is not a listed substance which the State of California requires

warning under this statute.

NEW JERSEY:

Toxic Catastrophe Prevention Act: Registration Quantity (RQ): 5200 lbs (2358 kgs)

SECTION 16. OTHER INFORMATION**NFPA RATINGS: HMIS RATINGS:**

HEALTH: = 3 HEALTH: = 3

FLAMMABILITY: = 1* FLAMMABILITY: = 1

REACTIVITY: = 0 REACTIVITY: = 0

SPECIAL:

* NFPA rates this gas a 1 as opposed to a 4 because it is "difficult to burn".

**MATERIAL SAFETY DATA SHEET
CHLORINE****SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION****SUBSTANCE:** CHLORINE**TRADE NAMES/SYNONYMS:**MTG MSDS 22; CHLORINE MOLECULAR; DIATOMIC CHLORINE;
DICHLORINE; MOLECULARCHLORINE; UN 1017; Cl₂; MAT04600; RTECS FO2100000**CHEMICAL FAMILY:** halogens, gas**CREATION DATE:** Jan 24 1989**REVISION DATE:** Dec 16 2002**SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS****COMPONENT:** CHLORINE**CAS NUMBER:** 7782-50-5**PERCENTAGE:** 100.0**SECTION 3 HAZARDS IDENTIFICATION****NFPA RATINGS (SCALE 0-4):** HEALTH=4 FIRE=0 REACTIVITY=0**EMERGENCY OVERVIEW:****COLOR:** yellow or green**PHYSICAL FORM:** gas**ODOR:** distinct odor, irritating odor**MAJOR HEALTH HAZARDS:** harmful if inhaled, respiratory tract burns, skin burns, eye burns**PHYSICAL HAZARDS:** Containers may rupture or explode if exposed to heat. May ignite combustibles.**POTENTIAL HEALTH EFFECTS:****INHALATION:****SHORT TERM EXPOSURE:** burns, chest pain, difficulty breathing, headache, dizziness, hyperactivity, emotional disturbances, bluish skin color, lung damage, death**LONG TERM EXPOSURE:** burns, skin disorders, lack of sense of smell, lung damage**SKIN CONTACT:****SHORT TERM EXPOSURE:** burns**LONG TERM EXPOSURE:** burns**EYE CONTACT:****MATHESON TRI-GAS, INC. EMERGENCY CONTACT:****959 ROUTE 46 EAST CHEMTREC 1-800-424-9300****PARSIPPANY, NEW JERSEY 07054-0624 INFORMATION CONTACT:****973-257-1100****SHORT TERM EXPOSURE:** burns**LONG TERM EXPOSURE:** burns**INGESTION:****SHORT TERM EXPOSURE:** ingestion of harmful amounts is unlikely**LONG TERM EXPOSURE:** ingestion of harmful amounts is unlikely**SECTION 4 FIRST AID MEASURES**

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get immediate medical attention. Thoroughly clean and dry contaminated clothing and shoes before reuse. Destroy contaminated shoes.

EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Contact local poison control center or physician immediately. Never make an unconscious person vomit or drink fluids. Give large amounts of water or milk. Allow vomiting to occur. When vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

NOTE TO PHYSICIAN: For inhalation, consider oxygen. Avoid gastric lavage or emesis.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Negligible fire hazard. Oxidizer. May ignite or explode on contact with combustible materials.

EXTINGUISHING MEDIA: water

Do not use dry chemicals, carbon dioxide or halogenated extinguishing agents. Large fires: Flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. For small fires, contain and let burn. Use extinguishing agents appropriate for surrounding fire. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Evacuation radius: 800 meters (1/2 mile).

SECTION 6 ACCIDENTAL RELEASE MEASURES

AIR RELEASE:

Reduce vapors with water spray. Collect runoff for disposal as potential hazardous waste.

SOIL RELEASE:

Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Trap spilled material at bottom in deep water pockets, excavated holding areas or within sand bag barriers. Absorb with sand or other non-combustible material. Add an alkaline material (lime, crushed limestone, sodium bicarbonate, or soda ash).

WATER RELEASE:

Add an alkaline material (lime, crushed limestone, sodium bicarbonate, or soda ash). Absorb with activated carbon. Collect spilled material using mechanical equipment.

OCCUPATIONAL RELEASE:

Stop leak if possible without personal risk. Avoid contact with combustible materials. Keep unnecessary people away, isolate hazard area and deny entry. Ventilate closed spaces before entering. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Protect from physical damage. Keep separated from incompatible substances. Store outside or in a detached building. Notify State Emergency Response Commission for storage or use at amounts greater than or equal to the TPQ (U.S. EPA SARA Section 302). SARA Section 303 requires facilities storing a material with a TPQ to participate in local emergency response planning (U.S. EPA 40 CFR 355.30).

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:

CHLORINE:

1 ppm (3 mg/m³) OSHA ceiling
 0.5 ppm (1.5 mg/m³) OSHA TWA (vacated by 58 FR 35338, June 30, 1993)
 1 ppm (3 mg/m³) OSHA STEL (vacated by 58 FR 35338, June 30, 1993)
 0.5 ppm ACGIH TWA
 1 ppm ACGIH STEL
 0.5 ppm (1.45 mg/m³) NIOSH recommended ceiling 15 minute(s)

VENTILATION: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

5 ppm

Any chemical cartridge respirator with cartridge(s) providing protection against this substance.

Any supplied-air respirator.

10 ppm

Any supplied-air respirator operated in a continuous-flow mode.

Any powered, air-purifying respirator with cartridge(s) providing protection against this substance.

Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against this substance.

Any air-purifying respirator with a full facepiece and a canister providing protection against this substance.

Any self-contained breathing apparatus with a full facepiece.

Any supplied-air respirator with a full facepiece.

Escape -

Any air-purifying respirator with a full facepiece and a canister providing protection against this substance.

Any appropriate escape-type, self-contained breathing apparatus.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: gas

COLOR: yellow or green

ODOR: distinct odor, irritating odor

MOLECULAR WEIGHT: 70.906

MOLECULAR FORMULA: Cl₂

BOILING POINT: -31 F (-35 C)

FREEZING POINT: -150 F (-101 C)

VAPOR PRESSURE: 5168 mmHg @ 21 C

VAPOR DENSITY (air=1): 2.49

SPECIFIC GRAVITY: Not applicable

DENSITY: 3.214 g/L @ 0 C

WATER SOLUBILITY: 1.46% @ 0 C

PH: Not applicable

VOLATILITY: Not applicable

ODOR THRESHOLD: 0.01 ppm

EVAPORATION RATE: Not applicable

VISCOSITY: 0.01327 cP @ 20 C

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable

SOLVENT SOLUBILITY:

Soluble: alkali

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid contact with combustible materials. Minimize contact with material.

Avoid inhalation of material or combustion by-products. Keep out of water supplies and sewers.

INCOMPATIBILITIES: combustible materials, bases, metals, halogens, metal salts, reducing agents,

amines, metal carbide, metal oxides, oxidizing materials, halo carbons, acids

HAZARDOUS DECOMPOSITION:

Thermal decomposition products: chlorine

POLYMERIZATION: Will not polymerize.

SECTION 11 TOXICOLOGICAL INFORMATION

CHLORINE:

TOXICITY DATA:

293 ppm/1 hour(s) inhalation-rat LC50

CARCINOGEN STATUS: ACGIH: A4 -Not Classifiable as a Human Carcinogen

LOCAL EFFECTS:

Corrosive: inhalation, skin, eye

ACUTE TOXICITY LEVEL:

Toxic: inhalation

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: heart problems

TUMORIGENIC DATA: Available.

MUTAGENIC DATA: Available.

REPRODUCTIVE EFFECTS DATA: Available.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY DATA:

FISH TOXICITY: 390 ug/L 96 hour(s) LC50 (Mortality) Orangethroat darter (Etheostoma spectabile)

INVERTEBRATE TOXICITY: 637.5 ug/L 1 hour(s) LC50 (Mortality) Pacific oyster (Crassostrea gigas)

ALGAL TOXICITY: 50-1000 ug/L 23 hour(s) (Population)

Algae, phytoplankton, algal mat (Algae)

PHYTOTOXICITY: 20 ug/L 96 day(s) (Growth) Water-milfoil (Myriophyllum spicatum)

SECTION 13 DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste

Number(s): D001. Dispose in

accordance with all applicable regulations.

SECTION 14 TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:

PROPER SHIPPING NAME: Chlorine

ID NUMBER: UN1017

HAZARD CLASS OR DIVISION: 2.3

LABELING REQUIREMENTS: 2.3; 8

ADDITIONAL SHIPPING DESCRIPTION: Toxic-Inhalation Hazard Zone B

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

SHIPPING NAME: Chlorine

ID NUMBER: UN1017
CLASSIFICATION: 2.3, 8

SECTION 15 REGULATORY INFORMATION

U.S. REGULATIONS:

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):

CHLORINE: 10 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):

CHLORINE: 100 LBS TPQ

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):

CHLORINE: 10 LBS RQ

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):

ACUTE: Yes

CHRONIC: No

FIRE: No

REACTIVE: No

SUDDEN RELEASE: Yes

SARA TITLE III SECTION 313 (40 CFR 372.65):

CHLORINE

OSHA PROCESS SAFETY (29CFR1910.119):

CHLORINE: 1500 LBS TQ

STATE REGULATIONS:

California Proposition 65: Not regulated.

CANADIAN REGULATIONS:

WHMIS CLASSIFICATION: ACD1E

NATIONAL INVENTORY STATUS:

U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): Not determined.

SECTION 16 OTHER INFORMATION

MSDS SUMMARY OF CHANGES

SECTION 15 REGULATORY INFORMATION

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INFORMATION HEREIN.

Material Safety Data Sheet

Barium nitrate MSDS

Section 1: Chemical Product and Company Identification

Product Name: Barium nitrate

Catalog Codes: SLB4168

CAS#: 10022-31-8

RTECS: CQ9625000

TSCA: TSCA 8(b) inventory: Barium nitrate

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: Ba(NO₃)₂

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name CAS # % by Weight

Barium nitrate 10022-31-8 100

Toxicological Data on Ingredients: Barium nitrate: ORAL (LD50): Acute: 355 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Extremely hazardous in case of ingestion. Very hazardous in case of skin contact (irritant), of eye contact (irritant), of

inhalation. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory

irritation. Inflammation of the eye is characterized by redness, watering, and itching. Skin

inflammation is characterized by

itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

Extremely hazardous in case of ingestion. Very hazardous in case of skin contact (irritant), of eye contact (irritant), of

inhalation. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS:

Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, the nervous system.

Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged inhalation of

dust may lead to chronic respiratory irritation.

Section 4: First Aid Measures

p. 2

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15

minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing

and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in

presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:

Oxidizing material. Stop leak if without risk. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep

substance damp using water spray. Do not touch spilled material. Prevent entry into sewers, basements or confined areas;

dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV.

Check TLV on the MSDS and with local authorities.

p. 3

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Keep away from combustible material..

Do not ingest. Do not

breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice

immediately and show the container or the label. Avoid contact with skin and eyes.

Storage:

Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalis, reducing agents

and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 0.5 Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 261.35 g/mole

Color: White.

pH (1% soln/water): Not available.

Boiling Point: Decomposes.

Melting Point: 590°C (1094°F)

Critical Temperature: Not available.

Specific Gravity: 3.24 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

p. 4

Solubility: Partially soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 355 mg/kg [Rat].

Chronic Effects on Humans: Causes damage to the following organs: kidneys, lungs, the nervous system.

Other Toxic Effects on Humans:

Extremely hazardous in case of ingestion. Very hazardous in case of skin contact (irritant), of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Excreted in maternal milk in animal. Passes through the placental barrier in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 5.1: Oxidizing material.

p. 5

Identification: : Barium Nitrate UNNA: UN1446 PG: II

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:

Pennsylvania RTK: Barium nitrate Massachusetts RTK: Barium nitrate TSCA 8(b) inventory:

Barium nitrate SARA 313 toxic

chemical notification and release reporting: Barium nitrate

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):

CLASS C: Oxidizing material. CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS

D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R8- Contact with combustible material may cause fire. R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious

damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent.

Wear appropriate respirator

when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/11/2005 11:22 AM

Last Updated: 06/09/2012 12:00 PM

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Material Safety Data Sheet

Hexanes MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hexanes

Catalog Codes: SLH2335, SLH2032

CAS#: 110-54-3

RTECS: MN9275000

TSCA: TSCA 8(b) inventory: Hexane

CI#: Not applicable.

Synonym:

Chemical Name: Hexane

Chemical Formula: C₆-H₁₄

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name CAS # % by Weight

Hexanes 110-54-3 98.5-99.9

Toxicological Data on Ingredients: Hexane: ORAL (LD50): Acute: 25000 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of skin contact (permeator), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERAUTOGENIC

EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to peripheral nervous system, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

p. 2

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If

breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 225°C (437°F)

Flash Points: CLOSED CUP: -22.5°C (-8.5°F). (TAG)

Flammable Limits: LOWER: 1.15% UPPER: 7.5%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances:

Highly flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in

presence of static discharge: Not available.

Fire Fighting Media and Instructions:

Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

Special Remarks on Fire Hazards:

Extremely flammable liquid and vapor. Vapor may cause flash fire.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:

Flammable liquid, insoluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk.

Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled

material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful

that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

p. 3

Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material.

Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. Wear suitable protective clothing. In case

of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the

container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and

sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective

threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves (impervious).

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 500 (ppm) from OSHA (PEL) [United States] Inhalation TWA: 1800 (mg/m³) from OSHA (PEL) [United States] Inhalation

TWA: 176 (mg/m³) from ACGIH (TLV) [United States] SKIN TWA: 50 (ppm) from ACGIH (TLV) [United States] SKIN TWA:

500 STEL: 1000 (ppm) from ACGIH (TLV) [United States] Inhalation TWA: 1760 STEL: 3500 (mg/m³) from ACGIH (TLV)

[United States] Inhalation Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Gasoline-like or petroleum-like (Slight.)

Taste: Not available.

Molecular Weight: 86.18g/mole

Color: Clear Colorless.

pH (1% soln/water): Not applicable.

Boiling Point: 68°C (154.4°F)

Melting Point: -95°C (-139°F)

Critical Temperature: Not available.

Specific Gravity: 0.66 (Water = 1)

Vapor Pressure: 17.3 kPa (@ 20°C)

Vapor Density: 2.97 (Air = 1)

Volatility: Not available.

Odor Threshold: 130 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.9

Ionicity (in Water): Not available.

p. 4

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:

Soluble in diethyl ether, acetone. Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatibles.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not available.

Special Remarks on Reactivity: Hexane can react vigorously with strong oxidizers (e.g. chlorine, bromine, fluorine)

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Inhalation. Ingestion.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral

toxicity (LD50): 25000 mg/kg [Rat]. Acute toxicity of the gas (LC50): 48000 ppm 4 hours [Rat].

Chronic Effects on Humans:

MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: peripheral nervous system, skin, central nervous system (CNS).

Other Toxic Effects on Humans:

Very hazardous in case of ingestion, of inhalation. Hazardous in case of skin contact (permeator).

Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects based on animal data. May be tumorigenic based on animal data. May affect genetic material. Passes through the placental barrier in animal.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: May cause mild skin irritation. It can be absorbed through the skin in harmful amounts.

Eyes: May cause mild eye irritation. Inhalation: May be harmful if inhaled. Inhalation of vapors may cause respiratory tract

irritation. Overexposure may affect, brain, spinal cord, behavior/central and peripheral nervous systems (lightheadness, dizziness, hallucinations, paralysis, blurred vision, memory loss, headache, euphoria, general anesthetic, muscle weakness, numbness of the extremities, asphyxia, unconsciousness and possible death), metabolism, respiration, blood, cardiovascular

system, gastrointestinal system (nausea) Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation

with abdominal pain and nausea. May also affect the liver, blood, brain, peripheral and central nervous systems. Symptoms of over exposure by ingestion are similar to that of overexposure by inhalation.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

p. 5

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Hexane UNNA: 1208 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Connecticut hazardous material survey.: Hexanes Illinois toxic substances disclosure to employee act: Hexanes Illinois

chemical safety act: Hexanes New York release reporting list: Hexanes Rhode Island RTK

hazardous substances: Hexanes

Pennsylvania RTK: Hexanes Florida: Hexanes Minnesota: Hexanes Massachusetts RTK: Hexanes Massachusetts spill

list: Hexanes New Jersey: Hexanes New Jersey spill list: Hexanes Louisiana spill reporting:

Hexanes TSCA 8(b) inventory:

Hexanes SARA 313 toxic chemical notification and release reporting: Hexanes CERCLA:

Hazardous substances.: Hexanes:

5000 lbs. (2268 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

EINECS: This product is on the

European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R11- Highly flammable. R20- Harmful by inhalation. R38- Irritating to skin. R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. R62- Possible risk of impaired fertility. R65- Harmful: may cause lung damage if swallowed. R67- Vapors may cause drowsiness or dizziness. S9- Keep container in a well-ventilated place. S16- Keep away from sources of ignition - No smoking. S29- Do not empty into drains. S33- Take precautionary measures against static discharges. S36/37- Wear suitable protective clothing and gloves. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets. S62- If swallowed, do not induce vomiting: seek medical advice immediately and show this

HMIS (U.S.A.):**Health Hazard: 2****Fire Hazard: 3****Reactivity: 0****Personal Protection: g****National Fire Protection Association (U.S.A.):**

p. 6

Health: 1**Flammability: 3****Reactivity: 0****Specific hazard:****Protective Equipment:**

Gloves (impervious). Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information**References:** Not available.**Other Special Considerations:** Not available.**Created:** 10/10/2005 08:19 PM**Last Updated:** 06/09/2012 12:00 PM

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Material Safety Data Sheet

Ethyl alcohol

Section 1: Chemical Product and Company Identification

Product Name: Ethyl alcohol

Catalog Codes: SLE2248, SLE1357

CAS#: 64-17-5

RTECS: KQ6300000

TSCA: TSCA 8(b) inventory: Ethyl alcohol 200 Proof

CI#: Not applicable.

Synonym: Ethanol; Absolute Ethanol; Alcohol; Ethanol
200 proof; Ethyl Alcohol, Anhydrous; Ethanol, undenatured;
Dehydrated Alcohol; Alcohol

Chemical Name: Ethyl Alcohol

Chemical Formula: CH₃CH₂OH

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name CAS # % by Weight

Ethyl alcohol 200 Proof 64-17-5 100

Toxicological Data on Ingredients: Ethyl alcohol 200 Proof: ORAL (LD50): Acute: 7060 mg/kg [Rat]. 3450 mg/kg [Mouse].

VAPOR (LC50): Acute: 20000 ppm 8 hours [Rat]. 39000 mg/m 4 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of ingestion.

Potential Chronic Health Effects:

Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.

TERATOGENIC EFFECTS: Classified PROVEN for human. DEVELOPMENTAL TOXICITY: Classified Development toxin

[PROVEN]. Classified Reproductive system/toxin/female, Reproductive system/toxin/male [POSSIBLE]. The substance is toxic

to blood, the reproductive system, liver, upper respiratory tract, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

p. 2

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated

clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-ignition Temperature: 363°C (685.4°F)

Flash Points: CLOSED CUP: 12.78°C (55°F). OPEN CUP: 17.78°C (64°F) (Cleveland).

Flammable Limits: LOWER: 3.3% UPPER: 19%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances:

Highly flammable in presence of open flames and sparks, of heat. Slightly flammable to flammable in presence of oxidizing materials.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks, of heat, of oxidizing materials, of acids.

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:

Containers should be grounded. CAUTION: MAY BURN WITH NEAR INVISIBLE FLAME Vapor may travel considerable distance to source of ignition and flash back. May form explosive mixtures with air. Contact with Bromine pentafluoride is likely to cause fire or explosion. Ethanol ignites on contact with chromyl chloride. Ethanol ignites on contact with iodine heptafluoride gas. It ignites than explodes upon contact with nitrosyl perchlorate. Addition of platinum black catalyst caused ignition.

Special Remarks on Explosion Hazards:

Ethanol has an explosive reaction with the oxidized coating around potassium metal. Ethanol ignites and then explodes on contact with acetic anhydride + sodium hydrosulfate (ignites and may explode), disulfuric acid + nitric acid, phosphorous(III) oxide platinum, potassium-tert-butoxide+ acids. Ethanol forms explosive products in reaction with the following compound :

p. 3

ammonia + silver nitrate (forms silver nitride and silver fulminate), iodine + phosphorus (forms ethane iodide), magnesium perchlorate (forms ethyl perchlorate), mercuric nitrate, nitric acid + silver (forms silver fulminate) silver nitrate (forms ethyl

nitrate) silver(I) oxide + ammonia or hydrazine (forms silver nitride and silver fulminate), sodium (evolves hydrogen gas).

Sodium Hydrazide + alcohol can produce an explosion. Alcohols should not be mixed with mercuric nitrate, as explosive mercuric fulminate may be formed. May form explosive mixture with manganese perchlorate + 2,2-dimethoxypropane. Addition of alcohols to highly concentrate hydrogen peroxide forms powerful explosives. Explodes on contact with calcium hypochlorite

Section 6: Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, alkalis, moisture.

Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Use a respirator if the exposure limit is exceeded.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 1900 (mg/m³) from OSHA (PEL) [United States] TWA: 1000 (ppm) from OSHA (PEL) [United States] TWA: 1900 (mg/m³) from NIOSH [United States] TWA: 1000 (ppm) from NIOSH [United States] TWA: 1000 (ppm) [United Kingdom (UK)] TWA: 1920 (mg/m³) [United Kingdom (UK)] TWA: 1000 STEL: 1250 (ppm) [Canada] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Liquid.)

Odor:

p. 4

Mild to strong, rather pleasant; like wine or whiskey. Alcohol-like; Ethereal, vinous.

Taste: Pungent. Burning.**Molecular Weight:** 46.07 g/mole**Color:** Colorless. Clear**pH (1% soln/water):** Not available.**Boiling Point:** 78.5°C (173.3°F)**Melting Point:** -114.1°C (-173.4°F)**Critical Temperature:** 243°C (469.4°F)**Specific Gravity:** 0.789 (Water = 1)**Vapor Pressure:** 5.7 kPa (@ 20°C)**Vapor Density:** 1.59 (Air = 1)**Volatility:** Not available.**Odor Threshold:** 100 ppm**Water/Oil Dist. Coeff.:** The product is more soluble in water; log(oil/water) = -0.3**Ionicity (in Water):** Not available.**Dispersion Properties:** See solubility in water, methanol, diethyl ether, acetone.**Solubility:**

Easily soluble in cold water, hot water. Soluble in methanol, diethyl ether, acetone.

Section 10: Stability and Reactivity Data**Stability:** The product is stable.**Instability Temperature:** Not available.**Conditions of Instability:** Incompatible materials, heat, sources of ignition.**Incompatibility with various substances:** Reactive with oxidizing agents, acids, alkalis.**Corrosivity:** Non-corrosive in presence of glass.**Special Remarks on Reactivity:**

Ethanol rapidly absorbs moisture from the air. Can react vigorously with oxidizers. The following oxidants have been

demonstrated to undergo vigorous/explosive reaction with ethanol: barium perchlorate, bromine pentafluoride, calcium

hypochlorite, chloryl perchlorate, chromium trioxide, chromyl chloride, dioxygen difluoride,

disulfuryl difluoride, fluorine nitrate,

hydrogen peroxide, iodine heptafluoride, nitric acid nitrosyl perchlorate, perchloric acid

permanganic acid, peroxodisulfuric

acid, potassium dioxide, potassium perchlorate, potassium permanganate, ruthenium(VIII) oxide,

silver perchlorate, silver

peroxide, uranium hexafluoride, uranyl perchlorate. Ethanol reacts violently/expodes with the

following compounds: acetyl

bromide (evolves hydrogen bromide) acetyl chloride, aluminum, sesquibromide ethylate,

ammonium hydroxide & silver

oxide, chlorate, chromic anhydride, cyanuric acid + water, dichloromethane + sulfuric acid + nitrate

(or) nitrite, hydrogen

peroxide + sulfuric acid, iodine + methanol + mercuric oxide, manganese perchlorate + 2,2-

dimethoxy propane, perchlorates,

permanganates + sulfuric acid, potassium superoxide, potassium tert-butoxide, silver & nitric acid,

silver perchlorate, sodium

hydrazide, sulfuric acid + sodium dichromate, tetrachlorosilane + water. Ethanol is also

incompatible with platinum, and

sodium. No really safe conditions exist under which ethyl alcohol and chlorine oxides can be

handled. Reacts vigorously with

acetyl chloride

Special Remarks on Corrosivity: Not available.**Polymerization:** Will not occur.**Section 11: Toxicological Information**

p. 5

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral

toxicity (LD50): 3450 mg/kg [Mouse]. Acute toxicity of the vapor (LC50): 39000 mg/m³ 4 hours [Mouse].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Mutagenic for

mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Classified PROVEN for human.

DEVELOPMENTAL TOXICITY: Classified Development toxin [PROVEN]. Classified Reproductive system/toxin/female,

Reproductive system/toxin/male [POSSIBLE]. Causes damage to the following organs: blood, the reproductive system, liver, upper respiratory tract, skin, central nervous system (CNS).

Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of ingestion.

Special Remarks on Toxicity to Animals:

Lowest Published Dose/Conc: LDL[Human] - Route: Oral; Dose: 1400 mg/kg LDL[Human child] - Route: Oral; Dose: 2000 mg/

kg LDL[Rabbit] - Route: Skin; Dose: 20000 mg/kg

Special Remarks on Chronic Effects on Humans:

May affect genetic material (mutagenic) Causes adverse reproductive effects and birth defects (teratogenic) , based on moderate to heavy consumption. May cause cancer based on animal data. Human: passes through the placenta, excreted in maternal milk.

Special Remarks on other Toxic Effects on Humans:

Acute potential health effects: Skin: causes skin irritation Eyes: causes eye irritation Ingestion: May cause gastrointestinal tract

irritation with nausea, vomiting, diarrhea, and alterations in gastric secretions. May affect behavior/central nervous system

(central nervous system depression - amnesia, headache, muscular incoordination, excitation, mild euphoria, slurred speech,

drowsiness, staggering gait, fatigue, changes in mood/personality, excessive talking, dizziness, ataxia, somnolence, coma/

narcosis, hallucinations, distorted perceptions, general anesthetic), peripheral nervous system (spastic paralysis)vision

(diplopia). Moderately toxic and narcotic in high concentrations. May also affect metabolism, blood, liver, respiration (dyspnea),

and endocrine system. May affect respiratory tract, cardiovascular(cardiac arrhythmias, hypotension), and urinary systems.

Inhalation: May cause irritation of the respiratory tract and affect behavior/central nervous system with symptoms similar

to ingestion. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may casue dermatitis, an allergic

reaction. Ingestion: Prolonged or repeated ingestion will have similiar effects as acute ingestion. It may also affect the brain.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 14000 mg/l 96 hours [Rainbow trout]. 11200 mg/l 24 hours [fingerling trout].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

p. 6

Identification: : Ethanol UNNA: 1170 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer,

birth defects or other reproductive harm, which would require a warning under the statute: Ethyl alcohol 200 Proof (in alcoholic

beverages) California prop. 65: This product contains the following ingredients for which the State of California has found

to cause birth defects which would require a warning under the statute: Ethyl alcohol 200 Proof (in alcoholic beverages)

Connecticut hazardous material survey.: Ethyl alcohol 200 Proof Illinois toxic substances disclosure to employee act: Ethyl

alcohol 200 Proof Rhode Island RTK hazardous substances: Ethyl alcohol 200 Proof Pennsylvania RTK: Ethyl alcohol 200

Proof Florida: Ethyl alcohol 200 Proof Minnesota: Ethyl alcohol 200 Proof Massachusetts RTK: Ethyl alcohol 200 Proof

Massachusetts spill list: Ethyl alcohol 200 Proof New Jersey: Ethyl alcohol 200 Proof Tennessee: Ethyl alcohol 200 Proof

California - Directors List of Hazardous Substances (8 CCR 339): Ethyl alcohol 200 Proof TSCA 8(b) inventory: Ethyl alcohol

200 Proof

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

EINECS: This product is on the

European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects

(VERY TOXIC).

DSCL (EEC):

R11- Highly flammable. S7- Keep container tightly closed. S16- Keep away from sources of ignition - No smoking.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent.

Wear appropriate respirator

when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References:

-SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -Material safety data

sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -Hawley, G.G.. The Condensed

Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -The Sigma-Aldrich Library of Chemical Safety

Data, Edition II. HSDB, RTECS, and LOLI databases.

p. 7

Other Special Considerations: Not available.

Created: 10/09/2005 05:28 PM

Last Updated: 06/09/2012 12:00 PM

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Material Safety Data Sheet

Methyl alcohol

Section 1: Chemical Product and Company Identification

Product Name: Methyl alcohol

Catalog Codes: SLM3064, SLM3952

CAS#: 67-56-1

RTECS: PC1400000

TSCA: TSCA 8(b) inventory: Methyl alcohol

Cl#: Not applicable.

Synonym: Wood alcohol, Methanol; Methylol; Wood Spirit; Carbinol

Chemical Name: Methanol

Chemical Formula: CH₃OH

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name CAS # % by Weight

Methyl alcohol 67-56-1 100

Toxicological Data on Ingredients: Methyl alcohol: ORAL (LD50): Acute: 5628 mg/kg [Rat].

DERMAL (LD50): Acute: 15800

mg/kg [Rabbit]. VAPOR (LC50): Acute: 64000 ppm 4 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Slightly hazardous in case of

skin contact (permeator). Severe over-exposure can result in death.

Potential Chronic Health Effects:

Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Not available.

MUTAGENIC EFFECTS:

Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC

EFFECTS: Classified

POSSIBLE for human. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to

eyes. The substance may be

toxic to blood, kidneys, liver, brain, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS),

optic nerve. Repeated or prolonged exposure to the substance can produce target organs

damage. Repeated exposure to a

highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

p. 2

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids

open. Cold water may be used. Get medical attention.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing

and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 464°C (867.2°F)

Flash Points: CLOSED CUP: 12°C (53.6°F). OPEN CUP: 16°C (60.8°F).

Flammable Limits: LOWER: 6% UPPER: 36.5%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances:

Highly flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Explosive in presence of open flames and sparks, of heat.

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water. **SMALL FIRE:** Use DRY chemical powder. **LARGE FIRE:** Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:

Explosive in the form of vapor when exposed to heat or flame. Vapor may travel considerable distance to source of ignition and flash back. When heated to decomposition, it emits acrid smoke and irritating fumes.

CAUTION: MAY BURN WITH NEAR INVISIBLE FLAME

Special Remarks on Explosion Hazards:

Forms an explosive mixture with air due to its low flash point. Explosive when mixed with Chloroform + sodium methoxide and diethyl zinc. It boils violently and explodes.

Section 6: Accidental Release Measures

p. 3

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:

Flammable liquid. Poisonous liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk.

Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals, acids.

Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the workstation location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 200 from OSHA (PEL) [United States] TWA: 200 STEL: 250 (ppm) from ACGIH (TLV) [United States] [1999] STEL: 250 from NIOSH [United States] TWA: 200 STEL: 250 (ppm) from NIOSH SKIN TWA: 200 STEL: 250 (ppm) [Canada] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Alcohol like. Pungent when crude.

Taste: Not available.

Molecular Weight: 32.04 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 64.5°C (148.1°F)

Melting Point: -97.8°C (-144°F)

Critical Temperature: 240°C (464°F)

p. 4

Specific Gravity: 0.7915 (Water = 1)

Vapor Pressure: 12.3 kPa (@ 20°C)

Vapor Density: 1.11 (Air = 1)

Volatility: Not available.

Odor Threshold: 100 ppm

Water/Oil Dist. Coeff.: The product is more soluble in water; log(oil/water) = -0.8

Ionicity (in Water): Non-ionic.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Can react vigorously with oxidizers. Violent reaction with alkyl aluminum salts, acetyl bromide, chloroform + sodium methoxide,

chromic anhydride, cyanuric chlorite, lead perchlorate, phosphorous trioxide, nitric acid.

Exothermic reaction with sodium

hydroxide + chloroform. Incompatible with beryllium dihydride, metals (potassium and magnesium), oxidants (barium

perchlorate, bromine, sodium hypochlorite, chlorine, hydrogen peroxide), potassium tert-butoxide, carbon tetrachloride, alkali

metals, metals (aluminum, potassium magnesium, zinc), and dichloromethane. Rapid autocatalytic dissolution of aluminum,

magnesium or zinc in 9:1 methanol + carbon tetrachloride - sufficiently vigorous to be rated as potentially hazardous. May

attack some plastics, rubber, and coatings.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral

toxicity (LD50): 5628 mg/kg [Rat]. Acute dermal toxicity (LD50): 15800 mg/kg [Rabbit]. Acute

toxicity of the vapor (LC50):

64000 4 hours [Rat].

Chronic Effects on Humans:

MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC

EFFECTS: Classified POSSIBLE for human. Causes damage to the following organs: eyes. May cause damage to the

following organs: blood, kidneys, liver, brain, peripheral nervous system, upper respiratory tract, skin, central nervous system

(CNS), optic nerve.

Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

p. 5

Passes through the placental barrier. May affect genetic material. May cause birth defects and adverse reproductive

effects (paternal and maternal effects and fetotoxicity) based on animal studies.

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 29400 mg/l 96 hours [Fathead Minnow].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation:

Methanol in water is rapidly biodegraded and volatilized. Aquatic hydrolysis, oxidation, photolysis, adsorption to sediment, and

bioconcentration are not significant fate processes. The half-life of methanol in surfact water ranges from 24 hrs. to 168 hrs.

Based on its vapor pressure, methanol exists almost entirely in the vapor phase in the ambient atmosphere. It is degraded by reaction with photochemically produced hydroxyl radicals and has an estimated half-life of 17.8 days. Methanol is physically removed from air by rain due to its solubility. Methanol can react with NO₂ in polluted air to form methyl nitrate. The half-life of methanol in air ranges from 71 hrs. (3 days) to 713 hrs. (29.7 days) based on photooxidation half-life in air.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Methyl alcohol UNNA: 1230 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Connecticut hazardous material survey.: Methyl alcohol Illinois toxic substances disclosure to employee act: Methyl alcohol Illinois chemical safety act: Methyl alcohol New York release reporting list: Methyl alcohol Rhode Island RTK hazardous substances: Methyl alcohol Pennsylvania RTK: Methyl alcohol Minnesota: Methyl alcohol Massachusetts RTK: Methyl alcohol Massachusetts spill list: Methyl alcohol New Jersey: Methyl alcohol New Jersey spill list: Methyl alcohol Louisiana spill reporting: Methyl alcohol California Directors List of Hazardous Substances (8CCR 339): Methyl alcohol Tennessee Hazardous Right to Know : Methyl alcohol TSCA 8(b) inventory: Methyl alcohol SARA 313 toxic chemical notification and release reporting: Methyl alcohol CERCLA: Hazardous substances.: Methyl alcohol: 5000 lbs. (2268 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). Class D-2B: Material causing other toxic effects (TOXIC).

p. 6

DSCL (EEC):

R11- Highly flammable. R23/24/25- Toxic by inhalation, in contact with skin and if swallowed. R39- Danger of very serious irreversible effects. R39/23/24/25- Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed. S7- Keep container tightly closed. S16- Keep away from sources of ignition - No smoking. S36/37- Wear suitable protective clothing and gloves. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent.

Wear appropriate respirator

when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References:

-SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed.

1984. -Material safety

data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -

Hawley, G.G.. The

Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. LOLI,

HSDB, RTECS, HAZARDTEXT,

REPROTOX databases

Other Special Considerations: Not available.

Created: 10/10/2005 08:23 PM

Last Updated: 06/09/2012 12:00 PM

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MATERIAL SAFETY DATA SHEET

HYDROGEN

SECTION 1. PRODUCT IDENTIFICATION

PRODUCT NAME: Hydrogen, compressed

CHEMICAL NAME: Hydrogen **FORMULA:** H₂

SYNONYMS: None

MANUFACTURER: Air Products and Chemicals, Inc.

7201 Hamilton Boulevard

Allentown, PA 18195-1501

PRODUCT INFORMATION: 1-800-752-1597

MSDS NUMBER: 1009 **REVISION:** 4

REVISION DATE: June 1994

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Hydrogen is sold as pure product >99%

CAS NUMBER: 1333-74-0

EXPOSURE LIMITS:

OSHA: None **ACGIH:** Simple asphyxiant

SECTION 3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW

Hydrogen is a flammable, colorless, odorless, compressed gas packaged in cylinders at high pressure. It poses an immediate fire and explosive hazard when concentrations exceed 4%. It is much lighter than air and burns with an invisible flame. High concentrations that will cause suffocation are within the flammable range and must not be entered.

EMERGENCY TELEPHONE NUMBERS

(800) 523-9374 Continental U.S., Canada, and Puerto Rico

(610) 481-7711 other locations

POTENTIAL HEALTH EFFECTS INFORMATION:

INHALATION: Asphyxiant. It should be noted that before suffocation could occur, the lower flammability limit of hydrogen in air would be exceeded possibly causing both an oxygen-deficient and explosive atmosphere. Exposure to moderate concentrations may cause dizziness, headache, nausea and unconsciousness. Exposure to atmospheres containing 8-10% or less oxygen will quickly bring about unconsciousness without warning leaving individuals unable to protect themselves. Lack of sufficient oxygen may cause serious injury or death.

MSDS# 1009 HYDROGEN Page 2 of 5

PUB # 310-406

EYE CONTACT: None

SKIN CONTACT: None

CHRONIC EFFECTS: None

OTHER EFFECTS OF OVEREXPOSURE: None

EXPOSURE INFORMATION:

ROUTE OF ENTRY: Inhalation

TARGET ORGANS: None

EFFECT: Asphyxiation (suffocation)

SYMPTOMS: Exposure to an oxygen-deficient atmosphere (<19.5%) may cause dizziness, drowsiness, nausea, vomiting, excess salivation, diminished mental alertness, loss of consciousness, and death.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: None

CARCINOGENIC POTENTIAL: Hydrogen is not listed by NTP, OSHA or IARC.

SECTION 4. FIRST AID

INHALATION: Persons suffering from lack of oxygen should be removed to fresh air. If victim is not

breathing, administer artificial respiration. If breathing is difficult, administer oxygen. Obtain prompt medical attention.

SKIN CONTACT: None

EYE CONTACT: None

INGESTION: None

NOTES TO PHYSICIAN: None

SECTION 5. FIRE AND EXPLOSION

FLASH POINT: AUTOIGNITION: FLAMMABLE LIMITS:

Flammable gas 565.5_C (1050_F) **LOWER:** 4% **UPPER:** 74%

EXTINGUISHING MEDIA: CO₂, dry chemical, water spray or fog for surrounding area. Do not extinguish until hydrogen source is shut off.

HAZARDOUS COMBUSTION PRODUCTS: None

SPECIAL FIRE FIGHTING INSTRUCTIONS: Evacuate all personnel from danger area.

Immediately

cool container with water spray from maximum distance, taking care not to extinguish flames. If flames

are accidentally extinguished, explosive re-ignition may occur. Stop flow of gas if without risk while continuing cooling water spray.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Burns with a pale blue, nearly invisible flame.

Hydrogen is easily ignited with low-ignition energy, including static electricity. Hydrogen is lighter than air

and can accumulate in the upper sections of enclosed spaces. Pressure in a container can build up due

to heat, and it may rupture if pressure relief devices should fail to function.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Evacuate immediate area. Eliminate any possible sources of ignition, and provide maximum explosionproof

ventilation. Shut off source of hydrogen, if possible. If leaking from cylinder, or valve, call the Air Products' emergency phone number. The presence of a hydrogen flame can be detected by approaching cautiously with an outstretched straw broom to make the flame visible.

MSDS# 1009 HYDROGEN Page 3 of 5

PUB # 310-406

SECTION 7. HANDLING AND STORAGE

STORAGE: Specific requirements are listed in NFPA 50A. Cylinder storage locations should be wellprotected,

well-ventilated, dry, and separated from combustible materials. Cylinders should never knowingly be allowed to reach a temperature exceeding 125 _F (52 _C). Cylinders of hydrogen should be

separated from oxygen cylinders or other oxidizers by a minimum distance of 20 ft., or by a barrier of

noncombustible material at least 5 ft. high having a fire resistance rating of at least _ hour.

Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling

or being knocked over. Protect cylinders from physical damage; do not drag, roll, slide or drop.

Use a

suitable hand truck for cylinder movement. Post "No Smoking or Open Flames" signs in the storage

areas. There should be no sources of ignition. All electrical equipment should be explosion proof in the

storage and use areas. Storage areas must meet national electric codes for class 1 hazardous areas.

HANDLING: Do not "open" hydrogen cylinder valve before connecting it, since self-ignition may occur.

Hydrogen is the lightest gas known and may collect in the top of buildings with out proper ventilation. It

may leak out of a system which is gas-tight for air or other gases. Leak check system with leak detection

solution, never with flame. If user experiences difficulty operating cylinder valve, discontinue use and

contact supplier. Use only approved CGA connections. DO NOT USE ADAPTERS. Never insert an

object (e.g., wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve,

causing a leak to occur. Use an adjustable strap wrench to remove over-tight or rusted caps.

Never

strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit.

SPECIAL PRECAUTIONS: Use piping and equipment adequately designed to withstand pressures to be

encountered. Use a check valve or other protective apparatus in any line or piping from the cylinder to prevent reverse flow.

SECTION 8. PERSONAL PROTECTION/EXPOSURE CONTROLS

ENGINEERING CONTROLS: Provide natural or explosion-proof ventilation adequate to ensure hydrogen does not reach its lower explosive limit of 4%.

RESPIRATORY PROTECTION:

General Use: None

Emergency Use: Air supplied respirators are required in oxygen-deficient atmospheres. Before entering area you must check for flammable or oxygen-deficient atmospheres.

PROTECTIVE GLOVES: Work gloves are recommended when handling cylinders.

EYE PROTECTION: Safety glasses are recommended when handling cylinders.

OTHER PROTECTIVE EQUIPMENT: Safety shoes are recommended when handling cylinders.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AND STATE: Colorless gas at normal temperature and pressure.

ODOR: Odorless

MOLECULAR WEIGHT: 2.016

BOILING POINT (1 atm): -423.0 °F (-252.8 °C)

SPECIFIC GRAVITY (Air =1): 0.06960

FREEZING POINT/MELTING POINT: -434.5 °F (-259.2 °C)

VAPOR PRESSURE (at 70 F): Not applicable

GAS DENSITY (At 70 F (21.1 C) and 1 atm): 0.00521 lb/ft³ (0.08342 kg/m³)

SOLUBILITY IN WATER (Vol/Vol at 60 F (15.6 C)): 0.019

SPECIFIC VOLUME (At 70 F (21.1 C) and 1 atm): 192 ft³/lb (11.99m³/kg)

MSDS# 1009 HYDROGEN Page 4 of 5

PUB # 310-406

SECTION 10. REACTIVITY/STABILITY

CHEMICAL STABILITY: Stable

CONDITIONS TO AVOID: None

INCOMPATIBILITY (Materials to Avoid): Oxidizing agents. Some steels are susceptible to hydrogen

embrittlement at high pressures and temperatures.

REACTIVITY:

A) HAZARDOUS DECOMPOSITION PRODUCTS: None

B) HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

Hydrogen is a simple asphyxiant.

SECTION 12. ECOLOGICAL INFORMATION

No adverse ecological effects are expected. Hydrogen does not contain any Class I or Class II ozone

depleting chemicals (40 CFR Part 82). Hydrogen is not listed as a marine pollutant by DOT (49 CFR Part 171).

SECTION 13. DISPOSAL

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused product in the cylinder.

Return to supplier for safe disposal.

Residual product within process system may be vented at a controlled rate, to the atmosphere through a

vent stack that discharges to an elevated point. This stack should be in an isolated area away from ignition sources.

SECTION 14. TRANSPORTATION

DOT/IMO SHIPPING NAME: Hydrogen, compressed

HAZARD CLASS: 2.1 (Flammable Gas)

IDENTIFICATION NUMBER: UN1049

PRODUCT RQ: None

SHIPPING LABEL(s): Flammable gas.

PLACARD (When required): Flammable gas.

SPECIAL SHIPPING INFORMATION: Cylinder should be transported in a secure upright position in a

well ventilated truck. NEVER TRANSPORT IN PASSENGER COMPARTMENT OF A VEHICLE.

Shipment of compressed gas cylinders which have not been filled with the owner's consent is a violation

of Federal law (49 CFR Part 173.301 (b)).

SECTION 15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

EPA - ENVIRONMENTAL PROTECTION AGENCY

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (40 CFR Parts 117 and 302):

Reportable Quantity (RQ): None

MSDS# 1009 HYDROGEN Page 5 of 5

PUB # 310-406

SARA: Superfund Amendment and Reauthorization Act

SECTION 302/304: Requires emergency planning on threshold planning quantities (TPQ) and release reporting based on reportable quantities (RQ) of EPA's extremely hazardous substances (40 CFR Part 355).

Extremely Hazardous Substances: None

Threshold Planning Quantity (TPQ): None

SECTIONS 311/312: Require submission of material safety data sheets (MSDSs) and chemical inventory reporting with identification of EPA defined hazard classes (40 CFR Part 370). The hazard classes for this product are:

IMMEDIATE: No PRESSURE: Yes

DELAYED: No REACTIVITY: No

FLAMMABLE: Yes

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

Hydrogen does not require reporting under Section 313

40 CFR PART 68: Risk Management for Chemical Accidental Release. Requires the development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

Hydrogen is not listed as a regulated substance. However, any process that involves a flammable gas on site in one location, in quantities of 10,000 pounds (4,553 kg) or greater, is covered under this regulation.

TSCA: Toxic Substance Control Act: Hydrogen is listed on the TSCA inventory.

OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

29 CFR 1910.119: Process Safety Management of Highly Hazardous Chemicals. Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

Hydrogen is not listed in Appendix A as a highly hazardous chemical. However, any process that involves a flammable gas on site in one location, in quantities of 10,000 pounds (4,553 kg) or greater is covered under this regulation unless it is used as fuel.

SECTION 16. OTHER INFORMATION

OTHER INFORMATION:

NFPA RATINGS: HMIS RATINGS:

HEALTH: = 0 HEALTH: = 0

FLAMMABILITY: = 4 FLAMMABILITY: = 4

REACTIVITY: = 0 REACTIVITY: = 0

SPECIAL: = SA (CGA recommends this to designate simple asphyxiant)