

MANUAL ON EMERGENCY PLANNING

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FOREWORD

The country has witnessed a fast growth in the industrial sector in the last decade and this is a sure sign of development. Extreme care is needed at all the stages of work to avert any possible danger due to industrial mishaps involving wide range of hazardous chemicals.

A number of Government agencies are functioning to deal with the matters related to management and handling of chemicals under various statutory provisions, viz. Factories Act 1948 (Amended in 1987), Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989, (amended in 1994 & 2000), Public Liability Insurance (PLI) Act, 1991, Central Motor Vehicle Rules, 1989, Chemical Accidents (EPPR) Rules, 1996. The agencies responsible for implementation of these regulations ensure strict implementation in the interest of environment and mankind. In spite of keeping a constant vigil and strict implementation of statutory norms possibility of occurrence of accidents can not be ruled out. In view of this it is essential to prepare ourselves and keep ready to meet any emergency situation arising due to industrial accidents. Prior preparations can also help in minimizing the consequences and this requires an emergency preparedness plan to negotiate an eventuality of chemical industries.

Though it is mandatory under various environmental rules for industries and districts administrative authorities to prepare an on-site and off-site emergency plan but still lot needs to be done in this area. These plans should be designed to provide measures to control accidents and minimize the effects caused due to mishaps involving chemical spill, escape of toxic gases, fire, explosion, processing, transportation etc. The exercise of planning for on-site and off-site emergency are different but these should compliment each other for an effective management.

An effort has been made to compile a manual as supportive document for the concerned Government and industrial authorities to give them an idea about basic components which need to be considered while preparing emergency plan. Besides, other components must also be taken in to account, based on the local and specific needs, to improve the capability and ability to consciously meet the obligatory needs. This useful compilation is the outcome of work by a team of staff colleagues including Dr. (Mrs.) Reeta Kori, Sr. Scientific Officer, Dr. A.K. Saxena, Chief Chemist and Dr. Rajendra Chaturvedi, Scientist, Emergency Response Centre, Bhopal who have been involved in chemical accident prevention and other emergency activities, under the guidance of Dr. P.C. Seth, Chief Scientific Officer.

I hope this compilation, brought out by the Emergency Response Centre, M.P. Pollution Control Board, Bhopal would prove to be useful and help to achieve the basic objectives for the preparation of emergency plan with pious aim to protect the environment and mankind.

Bhopal
Date :

Sd/-
(Dr. A.K. Singh)
SECRETARY

ON-SITE EMERGENCY PLAN

1.0 Introduction :

An on-site emergency is caused by an accident that takes place in a chemical installation and the effects are confined to the factory premises involving only the people working in the factory. On-site emergency plan to deal with such eventualities, is the responsibility of the occupier and is mandatory.

Apart from the provisions in the Hazardous Chemicals Rules, Section 41 B(4) of the Factories Act, 1948 (as amended) also requires that every occupier is to draw up an on-site emergency plan (O.S.E.P.) with detailed disaster control measures for the factory and to educate the workers employed in the factory premises. The obligation of an occupier of hazardous chemicals to prepare an emergency plan are stipulated in Rule 13 of the Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989, amended 1994 & 2000. The format giving components of OSEP, as prescribed in the Rules may be referred in Annexure I. The general public living in the vicinity are also to be Informed and educated about safety measures and actions required to be taken in the event of an accident.

The preparation of an on-site emergency plan and furnishing relevant information to the District Emergency Authority for the preparation of the off-site emergency plan are statutory responsibilities of the occupier of every industry and other units handling hazardous substances. An on-site emergency plan should contain the following key elements :

- * basis of the plan : Hazard analysis:
- * accident prevention procedure/measures:
- * accident/emergency response procedure/measures :
- * recovery procedure.

2.0 Elements of Planning

2.1 Hazard Analysis

Hazard analysis is a critical component in planning for emergencies. To analyze the safety of a major installation as well as its potential hazards, a hazard analysis should be carried out covering the following areas :-

- (i) Which toxic, reactive, explosive or flammable substance in the installation constitutes a major hazard.

- (ii) Which failures or errors could cause abnormal conditions leading to a major accident ?
- (iii) The consequences of a major accident for the workers, people living or working outside the installation and the environment ?
- (iv) Preventive measures for accidents.
- (v) Mitigation of the consequences of an accident.

2.2 Hazard Identification

Hazard identification is the first step in hazard analysis and entails the process of collecting information on following points :

- the types and quantities of hazardous chemicals in production, storage, processing, transportation and disposal in an installation ;
- the location of the facilities – process, storage, product or use ; and
- potential hazard associated with spills or releases.

2.3 Procedure for Hazard Identification

2.3.1 Identification of Hazardous Substances

Chemicals can be identified either by their CAS Number, or their ID Numbers (UN Nos). Based on the respective criteria, chemicals can be classified as toxic, flammable or explosive.

2.3.2 Quantities of Hazardous Substances

The estimation of the notifiable quantity of each chemical at a site should include the amounts likely to be on-site under the control of the occupier and should include the following :

- i. Activities involving storage, manufacture and use in process.
- ii. Vehicles used exclusively for on-site transportation since any quantity such a vehicle is carrying, is liable to be either stored or used in the installation.
- iii. Any Vehicle, for example road or rail tanker used as a storage vessel either on-site or within 500 meters of site.
- iv. Any off-site pipeline which is 500 meters of the boundary of the site and connected to it. This would include pipeline used for transfer operations, to and from a remote outlet. This may also include road tankers, ships or other vessels.

- v. Any neighboring site within 500 meters of any part of the boundary storing, processing or handling the same hazardous chemicals.

2.4 Charts and Maps Indicating Hazardous Substances and Zones

After assessment of hazard on the basis of above points, the charts and maps should be placed in the premises at strategic locations. The charts and maps should highlight the accident-prone areas of the industry so that in case of an emergency, it provides a basis for taking any action.

2.5 Appointment of key Persons and Their Role

To deal with an emergency, the arrangement for immediate deployment or appointment of key personnel and their specific duties must be laid out. It may be noted that in smaller installations, two or more tasks, referred hereunder, may have to be assigned to and performed by one person because of the availability position of personnel to deal with the eventuality, effectively and promptly.

2.5.1 Emergency Personnel's Responsibility during normal working hours:

- A. Site Controller** -- The General Manager (however called) or his nominated deputy will assume overall responsibility for the factory / storage site and its personnel. His duties are to :
 - i. assess the magnitude of the situation and decide if staff need to be evacuated from their assembly points to identified safer places ;
 - ii. exercise direct operational control over areas other than those affected;
 - iii. undertake a continuous review of possible developments and assess in consultation with key personnel as to whether shutting down of the plant or any section of the plant and evacuation of personnel are required:
 - iv. liaise with senior officials of police, Fire Brigade, Medical and Factories Inspectorate and provide advice on possible effects on areas outside the factory premises :
 - v. look after rehabilitation of affected persons on discontinuation of emergency ;
 - vi. issue authorised statements to news media and ensure that evidence is preserved for enquiries to be conducted by the statutory authorities.
- B. Incident Controller** -- A Production Manager or an officer of similar rank of the unit may be nominated to act as the Incident Controller Immediately on knowing about an emergency, he will rush to the incident site and take overall charge and report to the Site Controller. On arrival, he will assess the extent of emergency and decide if major

emergency exists and inform the communication officer accordingly. His duties will be to :

- i. direct all operations to stop within the affected area taking into consideration priorities for safety of personnel, minimize damage to the plant, property and environment and minimize loss of materials:
- ii. provide advice and information to the Fire and Security Officers and the local fire service:
- iii. ensure that all non-essential workers/staff of the areas affected are evacuated to the appropriate assembly points and the areas are searched for casualties;
- iv. set up communication points and establish contact with Emergency Control Centre in the event of failure of electric supply and thereby Public Address System (PAS) and internal telephones:
- v. report on all significant development to the communication officer: and
- vi. have regard to the need to preserve the evidence so as to facilitate any enquiry into the cause and circumstances which caused or escalated the emergency.

C. Personnel/Administrative Manager – He will also work as Liaison Officer and will be stationed at the main entrance (Gate House) during the emergency. He will , under the direction of the Site Controller, handle Police, Press and other enquiries, receives reports from assembly points and pass on the absentee information to the Incident Controller. His responsibilities shall be :

- i. to ensure that casualties receive adequate attention / to arrange additional help if required and inform relatives;
- ii. to control traffic movements into the factory and ensure that alternative transport is available when need arises ;
- iii. when emergency is prolonged, arrange for the relief of personnel and organise refreshments catering facility.

D. Communication officer -- He will, on hearing the alarm, proceed to Control Room and maintain communication with the Incident Controller. He will :

- i. advise the Site Controller of the situation, recommending (if necessary) evacuation of staff from assembly points;
- ii. recruit suitable staff to act as runners between the accident Controller and himself if the telephone and other system of communication fail. Also maintain contact with congregation points like Canteen etc.

- iii. Maintain prior agreed inventory in the Control Room;
 - iv. maintain a log of the incident on tape ;
 - v. in case of a prolonged emergency involving risk to outside areas by wind-blown materials contact local meteorological office to receive early notification of changes in weather conditions.
- E. Fire & Security Officer** – The Chief Fire and Security Officer will be responsible for the fire fighting. On hearing the fire alarm, he shall reach the fire station immediately and advise fire and security staff in the factory of the incident zone and cancel the alarm. He will also announce on PAS or convey through telephones or messengers or canteens to the Communication Officer, Incident Controller and Site Controller about the incident zone. He will open the gates nearest to the incident and stand by to direct the emergency services.
- F. Telephone Operator** – on hearing the emergency alarm, he will immediately contact Site Controller and on his advice call the local fire-brigade or mutual-aid scheme members. In case the PAS internal/external telephone system becomes inoperative, he shall inform the Communication Officer through a messenger. In case fire is detected and the alarm is not in operation, he shall receive information about location from the person who detected the fire and thereafter immediately consult the Incident Controller and make announcement on PAS or telephone telling the staff about location of the incident and to evacuate to their assembly points. He will continue to operate the switch board advising the callers that staff are not available and pass all calls connected with the incident to the Communication Officer.
- G. Departmental Heads** -- The Department Heads will report to Incident Controller and provide assistance as required. They will decide the staff they require at the incident site.
- H. Engineer in-charge and Electricians** - They will report the scene of the incident and close down the services as directed by the Incident Controller.
- I. Fire-pump Attendant** - Two persons identified in each shift will work as fire pump attendants. On hearing the fire alarm, they will immediately proceed to the pump house to ensure that pumps are operating and stand by to maintain them. At the end of emergency, they will be relieved of their duty by the Fire and Security Officers.

2.5.2 Responsibilities of Emergency Personnel outside normal working hours of the factory :

- A. Shift Executive incharge :**
- i. As soon as he becomes aware of the emergency and its location, he will proceed to the scene. On arrival, he shall assess the scale of the incident and direct operations within the affected areas with the following priorities :

- * Secure the safety persons, which may require evacuation to the assembly points in the event of escape of material if the wind is from an adverse direction.
 - * Minimise damage to plant, property and the environment.
 - * Prevent spreading and damage to outside the premises.
 - * Minimise loss of materials ; and
 - * Have regard to the need for preserving evidence that may facilitate subsequent enquiry.
- ii. Inform shift engineer-in-charge as to what services are/are not required.
 - iii. Hand over charge of operations to the Incident Controller when he arrives at the site.
 - iv. Advise the Fire & Security Officer at Gate House whether to make an announcement on PAS or not to call the Senior Staff to the factory, if necessary.

B. Fire & Security Officer -- On hearing the call, he shall rush to the Gate House. He shall advise the Fire & Security Staff at the incident point of the factory zones. He shall cancel the fire alarm and, on advise of Shift Executive Incharge, inform the local fire brigade (or active mutual aid system where exists). He shall :

- i. Announce over the PAS in which zone the incident has occurred and on the advice of the Shift Executive Incharge inform the staff to evacuate the assembly service.
- ii. Inform the Shift Executive Incharge, if there is any large escape of gas.
- iii. Call out in the following order :
 - * Incident Controller or his nominated deputy.
 - * Engineering Manager and Service Manager
 - * Personnel and Administrative Manager
 - * Departmental Head in whose plant the incident occurred.

C. First-Aid Teams

The Personnel Manager shall keep the roll call lists for the Fire and First-Aid team on duty, Roll call leaders and first-aiders are appointed by each Departmental Head for his shift team. Roll call leaders shall check their rolls as members of the services and report for emergency duty. Names of unaccounted

persons or absentees will be informed to the Fire and Security officer. Members of the first-aid teams will report to the Shift Executive Incharge/Incident Controller on hearing the alarm and follow his directions.

- D. Factory Fire Brigade Personnel** -- The duty Fire-Brigade personnel under the command of the Fire and Security Officer shall be responsible for fire fighting and rescue. On hearing the alarm, they shall proceed to the place of incident, if known; otherwise they will report at the Fire Station. The men at fire station shall find out the location of the emergency, the equipment and proceed to the site of occurrence. At the site, all the squad members will respond to the direction given by the Incident Controller.

3.0 Infrastructure

- 3.1 Emergency Control Room** -- Emergency Control Room is to be set up and marked on the site plan. The Control Room will be the focal point in case of an emergency from where the operations to handle the emergency are directed and coordinated. It will control site activities and should be furnished with external and internal telephone connections, list of essential telephone numbers, list of key persons and their addresses.

- 3.2 Assembly Points** -- Assembly points are to be set up farthest from the location of likely hazardous events, where pre-designated persons from the works, contractors and visitors would assemble in case of emergency. Up-to-date list of pre-designated employees of various departments (shift – wise) must be available at these points so that roll call could be taken. Predesignated persons would take charge of these points and mark presence as the people come into it.

4.0 Operational System during Emergency

- 4.1 Communication System** -- There are different types of alarms to differentiate one type of an emergency from other as described below:-

Fire or Gas	Normal Fire Siren
Emergency / Evacuation	High-pitched wailing siren
All clear Continuous	Fire Siren

Alarms should be followed by an announcement over Public Address System. In case of failure of alarm system, communication should be by telephone operator who will make announcement in industrial complex through Public Address System which should be installed. walkie-talkie and paging system are very useful for communication during emergency, with predetermined codes of communication. If everything fails a messenger could be used for sending the information.

- 4.2 Warning System and Control** -- The Control Centres should be located at an area of the minimum risk or vulnerability in the premises concerned, taking into account the wind direction, areas which might be affected by fire / explosion, toxic release, etc.

4.2.1 Service and Control

For promptness and efficiency, the factory premises/storage sites may be divided into 'X' number of zones, which should be clearly marked on the site plan.

- i. **Emergency Services** -- Under this each factory should describe the facilities of fire-fighting, first-aid and rescue, alternate sources of power supply for operating fire pumps, communication with local bodies, fire brigade, etc. should also be clearly indicated.
- ii. An adequate number of external and internal telephone connection should be installed.

4.2.2 Work Plan Illustration

- a. areas with large inventories of hazardous material.
- b. location of radio-active sources, if any.
- c. Sources of safety equipment.
- d. Fire-hydrant system and alternate supply sources.
- e. Stock of other fire-fighting materials.
- f. Assembly points, first-aid centres.
- g. Surrounding habitation within ½ km distance.
- h. Availability of first-aid equipment.

5.0 Mutual Aid

It is essential to have mutual aid arrangement as it is useful in cases of major fire and other emergencies. Mutual aid arrangements are to be worked out in the plan to facilitate additional help in, say, fire-fighting or medical attention which might be beyond the capacity of an individual factory / unit. To make the mutual aid plan a success, the following are considered essential :

- i. Written procedure which spells out how call for help will be made and how it will be responded.
- ii. The type of equipment which would be used and procedure for making replacement.
- iii. A quick hot-line method of communication.
- iv. A brief mention of the type of hazard in each plant and fire-fighting measures.

- v. Orientation and joint training programme for staff.
- vi. Joint inspections and drills.

6.0 Declaration of off-site Emergency

The person responsible for declaring the emergency (Site Controller) will assess the situation and in case its effects are likely to be felt outside the factory premises, he would get in touch forthwith with the District authorities who will at once take over the management of emergency situation and declare off-site emergency. The situation should also be immediately declared by Coded Siren which will help to inform the people in the vicinity of the industry / unit about the emergency situation. They should be helped to move to the safer area as prescribed in the off-site plan. The management of emergency henceforth has to be conducted by the District Crisis Management Group from a Control Room under the supervision of the District Collector.

OFF-SITE EMERGENCY PLAN

7.0 Introduction

If an accident takes place in a chemical industry / unit and its effects are felt outside its premises, the situation thus created is called an “off-site” emergency. It no longer remains the concern of the factory management alone but also becomes a concern for the general public living outside or passing by the premises of the factory or storage site involved. To meet such situations off-site emergency plans are to be prepared as stipulated and put into operation as and when required.

It is mandatory under Rule 14 of the MSIHC Rules 1989, amended in 1994 & 2000 for District authorities to prepare an off-site emergency plan in respect where accidents are likely to have an off-site adverse effect. Annexure II may be referred for components of Off-Site Emergency Plan. In case of Nuclear Power Plants, the responsibility for preparation of the plan is that of the Plant authorities and Atomic Energy Regulatory Board.

The off-site emergency plan should detail how emergency related to major accidents on the site will be dealt with. For preparing the plan, the concerned district authorities should consult the industries and other persons who would be concerned with its execution should such an emergency arise. The following points should be noted by all concerned in respect of an off-site emergency plan :

- i. The industrial or storage units to be covered under the plan should provide all the necessary information related to industrial activities under their respective control to the concerned authorities.
- ii. In case of any new industrial activity proposed or being set up in the area, an on-site emergency plan should be prepared before the activity is commenced.
- iii. All districts having major hazard installation should have an off-site emergency plan.
- iv. The off-site emergency plan should be updated from time to time, especially when a new process is started or new units are established.
- v. The off-site emergency plan should be tested for its efficacy through mock drills or simulation exercises.
- vi. The persons outside the site, who may be affected by a major accident, should be informed about :--
 - a) the nature of the major accident hazard
 - b) safety measures to be adopted.

8.0 Responsibility for Planning an Off-Site Emergency

The planning for emergency response to chemical disaster requires cooperation among the responders to know the persons responsible for various activities. This understanding is facilitated through personal interaction and close working in devising and updating a plan. Therefore, the pre-requisite for preparing a plan is the formation of a planning team. The possible composition of the planning team is given below :-

Planning Team-Members

Collector/Deputy Collector

Emergency Response Centre

District authorities Incharge of Fire Services, Police

Medical Services

Factory Inspectorate

Pollution Control Board

Industries and Transport

Co-opted members on need basis

District authorities concerned

Civil Defense

Publicity Department

Municipal Corporation and

Non-Officials such as elected representatives, MPs / MLAs and Voluntary Organisation.

The District Collector or his nominated representative would be the team leader who shall conduct the planning task in a systematic manner.

9.0 Number and Type of Industries to be covered under this Plan

A list of 652 chemicals with the threshold quantities for which off-site emergency plan is required to be prepared is prescribed in Management, Storage & Import of Hazardous Chemicals (Amendment) Rules, 2000. The off-site plans are also to be prepared in case of Transit Depots, Warehousing Corporation and during transportation of Hazardous Chemicals.

10.0 Compilation of Geographic, Demographic, Meteorological and Seismic Information

Details of public transport network including information of local conditions around the hazardous industries, are required for preparation of off-site plan. The information required includes :--

10.1 Geographic Information

Public transportation network, details of road network including conditions of road width, traffic load and connecting road with industries and the rail network are to be collected and shown on map.

-- **Pipeline network**

Details of pipeline network carrying flammable and toxic materials are to be shown in the map to indicate possible impact.

-- **Land use (actual and future use)**

Land use plan in the vicinity of the hazardous industries would require in-depth analysis to determine the likely effect of any spill in the area.

-- **Water supply**

10.2 Demographic Information

The population of the industry as well as the neighboring areas is a key factor for this type of planing. The information to be collected in this regard is :--

- neighboring population
- housing colonies of industries
- sensitive institutions i.e. schools, hospitals
- type of housing
- Cattle / livestock

10.3 Meteorological Information

Meteorological data for a period of 10 years related to wind speed / direction, humidity and temperature inversion is essential for preparation of dispersion models for toxic gas release.

10.4 Seismic Data

Information regarding seismic zone and record of earthquake is considered to be an important input in off-site planning.

11.0 Elements of off-site Planning

Typical off-site emergency plan should have the following important components:

Plan Pre-requisite (Background information)

- * Plan requirement (Aims & Objectives of the plan)
- * Planning Team
- * Hazard Analysis and Quantification
- * Scenario development
- * Assessment of Capabilities

Plan Development

- * Incident information
- * Authority for responding
- * Basic Assumption
- * Operation of the plan
- * Coordination with other plans

Emergency Assistance

- * Names and addresses of the key personnel
- * Telephone numbers

Response Functions

- Initial Notification
- Control Room
- Access
- Direction and Control
- Communication amongst responders

- Warning System / Emergency Notification
- Public information
- Resources Mobilization and Management
- Health and Medical Response
- Public protection including evacuation
- Fire and Rescue
- Law and order
- On-going Incident Assessment

Besides the above, other elements of off-site planning are containment, clean up and Disposals; Documentation and Investigation; Plan Testing and Updating and Community Awareness, Preparedness and Training.

For developing an off-site plan of a particular locality, the elements of relevance to the plan should be carefully selected. The elements would be based on locational situations, hazards present, existence of vulnerable area in the vicinity and resource availability etc.

The main-requisite of an off-site emergency plan is to define and lay down the clear-cut objectives and requirements. As stated earlier, a planning team representing local industries, response agencies and other bodies should be formed. The plan should be based on a systematic hazard analysis of the units in the area and scenarios based thereon. This should be done by the units and made available for updating the plan. Resource planning has to be based on the assessment of capabilities in the area.

Plan development should clearly indicate the format to be used for reporting information related to accidents, basic assumptions in preparing the plans, plan operation and dovetailing with other plans. The plan should include the names and contact telephone numbers of persons responsible for emergency assistance. Complete detailing of the response functions is the most important part of the plan. The plan should cover details about Central Control Room, access to and from the incident area, direction and control of emergency public information, resource management, communication during emergencies, response personnel safety, on-going incident assessment etc.

Specific roles of the police, fire fighting and medical personnel should be worked out in the plan. The aspect of containment, clean-up and disposal should also be covered in the plan. If it is not done properly, there could be secondary effect from the accident. Testing and updating of the plan needs lot of preparatory work in the form of training of teams, developing assessment mechanisms using observes and

mobilisation of resources. The role of adjacent awareness are also important aspects of the plan.

11.1 List of Hazardous Installations

It is important to identify the hazardous units located in the area. Up-to-date information regarding the on-site plans prepared by each individual unit is required to be compiled for formulating the off-site plan for the area.

11.2 Off-site Control Room

The control of crisis during major accidents is to be exercised through a Control Room established at an easily accessible central location in the area. This Control Room should be capable of functioning on being required to be activated at any time. The Control Room for off-site plan is thus over and above the Control Room set up by each unit for its on-site plan. The Control Room shall :-

- (i) Act as a focal point of emergency management.
- (ii) Keep records of all messages.
- (iii) Inform operation officer on receipt of first information relating to accident.
- (iv) Monitor implementation of mutual aid.
- (v) Serve as the focal point for meeting of the Crisis Management Group (CMG).

In order to operate the Control Room round the clock, manpower and transport are required on a shift basis. The Control Room should be equipped with proper communication system, data processing network and should be a storehouse of information to combat emergencies.

11.3 Key Personnel and Their Duties

The ultimate responsibility for the management of the major emergency rests on the District Magistrate / Collector.

He will be assisted by representatives from all concerned organizations, departments and services at the District level. This group of officials forms the District Crisis Management Group (CMG). The designation of the key personnel of CMC and their duties are given in Annexure - III.

The members of the group may vary according to the District and local conditions. The CMG will:-

- (a) Control all emergency operations.
- (b) Guide on matters related to policy issues.
- (c) Provide official information and instructions to the general public.

An Operation Response Group (ORC) will have to be put up to implement the directions of the CMG. Probable members of this group may be as per Annexure-4. The duties of the ORG are as under :-

- (a) To develop an integrated response strategy based on the available information.
- (b) To plan deployment of field units to ensure the availability of appropriate force to deal with the situation.
- (c) To coordinate the functioning of various agencies.
- (d) To deal with crisis and implement decisions of CMC.
- (e) To monitor the progress till the crisis ends and keep the CMG posted with the development.

11.4 Communication Systems Network

An efficient and reliable Communication System is required for the success of the off-site emergency plan. The efficient communication system is required to alert :

- (a) Off-site Emergency Authorities and Services.
- (b) Neighboring factories in the area and public in the vulnerable zone.

A communication network of the following type may be helpful :-

- (i) Radio communication between Control Room to Unit Control Rooms of the Industrial Units and respondents out side the area.
- (ii) Hotlines between Control Room to industrial units, Emergency Services, Meteorological Station and the Media.
- (iii) Paging system with the Control Room for alerting the members of the CMG and ORG.
- (iv) P&T Telephone Lines.
- (v) Data Processing Network hooked to all Computers / PCs.

A communication flow chart is to be prepared and kept in the Control Room. An up-to-date Telephone Directory of personnel concerned with the

emergency should be available at all times. In coordinating the communication system efficiently, there should be a Communication Officer in Control Room to ensure that all the modes of communication are functional round-the-clock. All communication operators should maintain a Log-book for the messages received in/out and actions taken. These activities should be incorporated in the data processing system.

11.5 Warning System

In an Off-Site Management Plan, one of the most important pre-requisites is a good 'Warning System'. Efficient Warning System will save lives, prevent injuries and reduce losses. Emergency Commander will decide the appropriate Warning System and implement it. The Commissioner of Police will be responsible for implementation of the Warning System.

The Warning System are of the following types :-

- (a) Disaster Warning (Maximum Credible Loss Scenario)

High pitched Continuous Wailing Siren.

- (b) Fire/Toxic Release

Long Siren Followed by short Siren

- (c) All Clear

Long Continuous

Depending upon the nature of hazards and the area affected, other methods of warning may be as follows :-

- (a) Out-Door Warning Sirens.

- (b) Public Address System with Police.

- (c) ARP Sirens.

- (d) Mass Media

- (e) Door to door visit by Civil Defense Personnel

- (f) Telephonic contact with schools and other organizations/public institutions.

- (g) Information to be provided at common gathering places such as canteens, shops etc.

11.6 Public Information System

During a crisis following an accident, the people of the area and large number of media representatives would like to know about the situation from time to time and the response of the district authority to the crisis. It is important to give timely information to the public in order to prevent panic and rumor mongering. The emergency public information could be carried out in three phases.

i. **Before the Crisis.**

This will include the safety procedure to be followed during an emergency through posters, talks and mass media in different languages including local languages. Leaflets containing do's/don'ts should be circulated to educate the people in the vicinity.

ii. **During the Crisis**

Dissemination of information about the nature of the incidents, actions taken and instructions to the public about protective measures to be taken, evacuation, etc. are the important steps during this phase. This can be done by using PAS, through radio/ television/ press.

iii. **After the Crisis**

Attention should be focussed on information concerning restoration of essential services, travel restrictions, etc.

Various tasks of the public information system could include :-

- (a) Quick dissemination of emergency instructions to the public.
- (b) To receive all calls from media/public regarding emergency situations and respond meticulously.
- (c) Obtain current information from the Central Control Room.
- (d) Prepare news release.
- (e) Brief visitors / media.
- (f) Maintain contact with hospital and get information about the casualties.

11.7 Fire fighting System

The industrial areas having major accident-prone hazardous installations should have special fire fighting arrangements. In most of the industries, gaseous hydro-carbons or liquid hydro-carbons having low flash points are used thereby posing great risk of fire explosion, spillage of hazardous liquid

or release of toxic gases. In order to tackle such possible situations, there is need for constant preparedness to mobilize all available fire fighting and toxicity control resources in minimum time. There should be an inside control of all fire fighting resources in the affected areas under the overall charge of the Chief Fire Officer. The operational response will be coordinated from the Central Control Room. The planning for fire fighting should be as follows :-

A. Before the Crisis

- (i) Proper road and means of escape should be identified.
- (ii) Considering the possible hazards, there must be adequate water supply.
- (iii) Training of the personnel in fire fighting duties in the industry.
- (iv) Provision of adequate and proper arrangement of fire fighting vehicles is important.

B. During the Crisis

Immediate response to an emergency should be coordinated by the Control Room by matching all the resources. In a major emergency having wide off-site implications, more than one industry would be affected necessitating concurrent fire fighting operations at a number of places. In this case, the whole area may be divided in different fire zones. The task of the fire zone commanders should be as under :-

- i. Command and control of all fire fighting resources in the respective fire zones.
- ii. Deployment of additional fire resources allocated by Control Room.
- iii. Coordination of fire fighting institutes.

11.8 Mutual Aid

All the industrial units in the affected areas should have mutual aid arrangement for getting/extending help in fire fighting facilities, special fire fighting agents, trained manpower, etc. The Control Room will allocate additional resources to fire zone including protective equipment kept centrally as a pool.

11.9 Services Support System

11.9.1 Health and Medical

A major off-site emergency in an area may affect a number of units and the surrounding colonies resulting in more casualties. The medical response plan has to cater for immediate pooling of all available medical resources and provide emergency medical treatment to the victims of the incident. For an emergency from poisoning of all available local medical resources in the incident area as well as the additional resources should be mobilized under the overall charge of the District Health Department. The operational response should be coordinated by the Chief Medical Officer from the control Room. Before the crisis, the following actions should be carried out :-

- i. Specialized training of doctors relating to chemicals hazards.
- ii. Blood grouping of all employees working in the industrial unit.
- iii. Maintenance of list of blood donors group wise.
- iv. Arrangement of adequate buffer stock of essential medicines.
- v. Stocking of anti-dotes and special medicines for hazardous substances.
- vi. Planning of additional capacity in the base hospital for large-scale casualties.

During the crisis, medical plan in terms of manpower, transport and equipment as per organizational response be implemented. The organizational response be implemented. The organizational response structure should be set up as under :

- (a) First-aid Post
- (b) Casualty Response Centre
- (c) Base Hospital

It is essential to guide medical relief and establish public health measures like sanitation, immunization, etc. In the absence of proper information about the chemical exposure, their symptoms, first-aid and treatment, the physicians attending such emergencies are generally faced with great problems. The Emergency Response Centre, Bhopal do have the information on widely used toxic chemicals and this may be contacted in times of such needs.

11.9.2 Transportation

A large number of ambulances would be necessary to transport casualties to the casualty response centre and base hospital. For this purpose, jeeps/matadors/special wagons which can be converted as ambulance at short notice should be kept at the unit and the Control Room.

11.9.3 Security and Police

Security , protection of life and property and traffic control and maintenance of law and order are the traditional and statutory functions of the police. During an emergency, duties and responsibilities of the police may be :-

- i. Cordoning of the incident area
- ii. Warning public about the hazards
- iii. Traffic Control
- iv. Assist fire fighting services
- v. Assist first-aid medical teams
- vi. Assist evacuation and ensure protection of property in evacuated areas.

Control of security operations in the area should be exercised by the Deputy Commissioner of Police. Different phases of emergency management practices would be as under :-

(a) **Before the Crisis**

Contingency plan of manpower, transport and communication network to coordinate possible incident areas and to regulate traffic should be made for each industry in the area.

(b) **During the Crisis**

The Security Commander of the area will set in motion the relevant contingency plan to control the operation.

(c) **After the Crisis**

Protect property in the evacuated area.

11.9.4 Media

The Control Room should release an up-to-date information to the media.

11.10 Evacuation Including Safe Evacuation Areas

In a disaster situation, evacuation is the movement of people from the place of danger to places of relative safety. It is most effective action to protect people. A comprehensive and coordinated planning is necessary to implement orderly evacuation of population.

The process of evacuation should be based on the nature of threat. Possibility of spreading of toxic gases and weather conditions. In this case, the hazard analysis in maximum credible loss scenario would help in planning of evacuation. The people of the area should be advised to leave the threatened area and to take shelter in the nearest reception centres. The whole process is required to be completed within quickest possible time. The command and control of the evacuation should be under the supervision of the District Development Officer. The evacuation process should be carried out in three phases.

A. Before the Crisis

- (i) The public should be informed and educated properly for chemical hazards. Local police should warn the people in this regard and install the siren in the vulnerable places.
- (ii) The probable affected should be divided in several evacuation centres which are entirely site specific.
- (iii) Detailed contingency plan of evacuation of various scenarios should be prepared.
- (iv) Availability of all transport resources needs to be ensured. Planning of adequate reception centers including accommodation, food, water supply and sanitary arrangements for the affected population should be done.

B. During Crisis

Implementation of the plan should be done in the quickest possible time.

C. After the Crisis

Once the crisis is over, the affected people should be rehabilitated and the follow up measures should be taken up.

11.11 Relief to the Victims

Post emergency activities include the relief to the victims. The Public Liability Insurance Act (PLI Act), 1991 provides for the owner who has control over handling hazardous substances to pay specified amount of money to the victims as interim relief by taking insurance policy for this purpose. The District Collector has definite role in implementation of the PLI act, 1991. After proper assessment of the incident, he may invite applications for relief, conduct an enquiry into the claims and arrange payment of the relief amount to the victims.

12.0 Checklist for Capability Assessment

The checklist will help in assessing the preparedness, prevention and response resources capabilities. A detailed checklist is given in Annexure – IV. The points included in the checklist are only indicative and the planner should closely examine the local requirements while preparing the checklist.

COMPONENTS OF ON-SITE EMERGENCY PLAN

(As per Schedule 11 of MSIHC Rules)

1. Name and address of the person furnishing the information.
2. Key personnel of the organization and responsibilities assigned to them in case of an emergency
3. Outside organizations if involved in assisting during on-site emergency :
 - (a) Type of accident .
 - (b) Responsibilities assigned
4. Details of liaison arrangement between the organisations.
5. Information on the preliminary hazard analysis :
 - (a) Type of accidents
 - (b) System elements or events that can lead to a major accident
 - (c) Hazards
 - (d) Safety relevant components.
6. Details about the site :
 - (a) Location of dangerous substances.
 - (b) Seat of key personnel.
 - (c) Emergency control room
7. Description of hazardous chemicals at plant site :
 - (a) Chemicals (Quantities and toxicological data).
 - (b) Transformation, if any, which could occur.
 - (c) Purity of hazardous chemicals.
8. Likely dangers to the plant.
9. Enumerate effects of :
 - (I) stress and strain caused during normal operation
 - (II) fire and explosion inside the plant and effect, if any, of fire and explosion out side.
10. Details regarding :
 - (i) warning, alarm and safety and security systems.

- (ii) alarm and hazard control plans inline with disaster control and hazard control planing, ensuring the necessary technical and organizational precautions.
 - (iii) reliable measuring instruments, control units and servicing of such equipment.
 - (iv) Precautions in designing of the foundation and load bearing parts of the building.
 - (v) Continuous surveillance of operations.
 - (vi) Maintenance and repair work according to the generally reorganized rules of good engineering practices.
11. Details of communication facilities available during emergency and those required for an off-site emergency.
12. Details of fire fighting and other facilities available and those required for an off-site emergency.
12. Details of first aid and hospital services available and its adequacy.

COMPONENTS OF OFF-SITE EMERGENCY PLAN

(As per Schedule 12 of MSIHC Rules)

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

DUTIES OF CRISIS MANAGEMENT GROUP (CMG) MEMBERS

1. Collector/District Magistrate

- (a) As Chairman of CMG, implement off-site plan.
- (b) Exercise control on emergency operations.
- (c) Give guidance/decision on matters of basic policy.
- (d) Review operational preparedness of district emergency machinery.
- (e) Hold periodic mock/training exercise to ensure optimum operational preparedness.
- (f) Develop off-site scenarios, domino and cascading effect based on on-site plans of the industries.
- (g) Provide relief under Public Liability Insurance Act, 1991.

2. Commissioner of Police

- (a) Maintain law & order during emergency.
- (b) Regulate traffic in and around the emergency area.
- (c) Control entry to the emergency area.
- (d) Security arrangements at each industrial unit.
- (e) Protect vital installations.
- (f) Warn public about the emergency.
- (g) Assist in evacuating and sheltering.
- (h) Protect evacuated areas.
- (i) Assist emergency services in the performance of their duties.

3. Municipal Commissioner

- (a) Organise Reception Centres.
- (b) Arrange shelter, food, water, etc. for evacuees.
- (c) Co-ordinate resources of voluntary organisations.
- (d) Organise transportation arrangements for evacuation.

4. Deputy Director Health

- (a) Mobilisation of emergency medical and health services.
- (b) Public health services in Reception Centres.
- (c) First aid arrangements and availability of on-site requirements for industries.
- (d) Medical supply of antidotes.
- (e) Corpe disposal services.
- (f) Co-opt voluntary organisation like Red Cross, etc.

5. Pollution Control Board

The Pollution Control Board shall have the following roles and responsibilities :

Upon receipt of information from the District Control Room, an officer of the Pollution Control Board shall proceed to the affected site.

Pollution Control Board officer shall conduct investigation that may be necessary on the incident including collection of data and information relating there to.

In the event of a spill, the pollution Control Board officer shall ensure that the spill has been totally contained with no further damage possible to human and the environment.

In case of any contamination to the environment, to arrange, with the help of the industry and other agencies, the decontamination of the area. Further, to declare the area fit for re-entry after the decontamination is completed.

In the case of an environmental disaster, the Pollution Control Board officer shall, based on the contaminant released into the environment, carry out, with the help of the industry and other agencies, such investigations as may be necessary to establish the degree of contamination. He shall then arrange for suitable decontamination using the resources available in the area as well as with the Board.

OPERATIONAL RESPONSE GROUP (ORG)

S. No.	Members	Add.	Tel. No. Off. / Res.	Alternate Add. Member	Tel. No. off. / Res.
1.	Resident Deputy Collector,				
2.	Principal Industrial Health Officer				
3.	Representative of Police Commissioner				
4.	Representative of RTO/ Divisional Controller				
5.	Representative of Sr. Inspector of Factories				
6.	Representative of Concerned industry				
7.	Representative of Civil Defence				
8.	Executive Engineer (R & D)				
9.	Representative of Railways.				
10.	Representative of Dy. Controller, Explosives				
11.	Representative of Army				
12.	Representative of Telecommunications				
13.	Meteorological officer				

CHEMICAL RESISTANCE CHART FOR GLOVES

Chemical	%	Neoprene	Nitrile	Plastic PVC	Natural Rubber
<u>Acids, Mineral</u>					
Chromic		F	F	F	NR
Hydrochloric (HCl)	10%	G	G	G	G
Hydrochloric (HCl)	36%	F	F	P	F
Hydrofluoric	10%	G	G	G	F
Muriatic		G	G	G	G
Nitric	10%	G	F	G	F
Nitric	20%	F	F	F	P
Sulfuric	10%	E	E	E	G
Sulfuric	20%	E	E	E	F
<u>Organic Acids</u>					
Acetic	84%	F	F	E	G
Citric		G	G	G	G
Formic		G	F	G	G
Lactic	88%	G	E	E	E
Oxalic		G	G	G	G
<u>Alcohol</u>					
Benzyl		G	G	G	F
Ethyl		E	E	E	G

Methyl		G	F	F	G
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Aldehydes

Acetaldehyde		G	F	G	F
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Benzaldehyde		P	G	F	P
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Formaldehyde		G	G	E	G
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Aliphatic Solvents

Mineral Spirits		E	E	E	P
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Alkalis

Amm. Hydroxide	26%	G	E	E	G
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Pot. Hydroxide	45%	G	E	E	G
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Sod. Hydroxide	50 %	G	E	G	G
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Aromatic Solvents

Benzene		P	F	P	NR
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Stoddards		G	G	F	P
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Toluene		P	F	P	NR
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Xylene		P	E	F	NR
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Chlorinated Solvents

Carbon tetrachloride		F	F	P	NR
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Chlorobenzene		P	F	P	NR
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Perchloroethylene		P	P	P	NR
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Trichloroethylene		P	P	F	NR
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Acetates

Butyl Acetate		F	F	P	P
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Ethyl Acetate	F	F	P	P
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Esters

Diethylamine	G	G	G	F
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Methylamine	F	F	F	F
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Ethers

Ethyl Ether	G	G	P	F
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Oils and Fats

Airplane Hydraulic Oil	F	F	P	P
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Animal Fats	G	G	G	P
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Cutting Oil	F	G	E	F
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Linseed Oil	F	G	F	P
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Mineral Oil	G	G	F	P
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Vegetable Oil	F	G	F	F
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Oxides

Carbon Dioxide	G	G	G	G
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Nitrous Oxide	F	F	G	F
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Ketones

Acetone	F	P	P	G
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Methyl Ethyl (MEK)	P	NR	NR	G
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Methyl Isobutyl	F	P	NR	G
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Inorganic Salts

Copper Sulfate	G	G	G	G
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CHEMICAL RESISTANCE / PHYSICAL PROPERTIES CHART FOR SUITS

	Chemgard Clothing	Chempruf Clothing	TYVEK Fabric Clothing
<u>Alcohol</u>			
Methanol, Butyl alcohol, Glycerin Ethanol, Isopropanol	P	E	E
<u>Caustics</u>			
Ammonium hydroxide 38% Sodium hydroxide 50% Potassium hydroxide 50%	E	E	E
<u>Chlorinated Solvents</u>			
Carbon tetrachloride Perchlorethylene, Trichloroethylene Ethylene dibromide	F	F	G
<u>Ketones</u>			
Methyl Isobutyl ketone, Acetone	NR	G	G
<u>Petroleum Solvents</u>			
White gasoline, Naphtha, Mineral, thinner, Kerosene	G	F	G
<u>Organic Acids</u>			
Citric, Formic, Tannic, Acetic	E	E	E

Inorganic Acids

Hydrochloric 38%			
Hydrochloric 10%			
Sulfuric 10%, Nitric 10%	G	E	G
Chromic			
Sulfuric 98%, Nitric 70%	G	E	F

Hydrocarbons

Stoddard solvent, Toluene			
Benzene, xylene	F	P	F
Coal tar distillate	F	G	G
Styrene	G	P	G

Miscellaneous

Lacquer thinner	F	F	F
Cutting oil	E	E	E
Battery acid	E	E	G
Phenol	NR	E	E
Insecticides	E	E	E
Printing ink	F	G	E
Dyestuffs	E	E	E
Pentane	E	G	G
Formaldehyde, Isodecaldehyde	F	E	E
Vegetable oil	E	G	E
Animal fat	E	G	F
Acrylonitrile, Acetonitrile	NR	E	G
Steam	E	E	G
Aniline	F	E	F

Hydraulic fluid	E	P	E
Turpentine	E	F	G
Linseed Oil	G	F	E
Soya bean oil	G	F	E
Carbon disulfide	F	F	F
Creosote	G	G	F
Paint and varnish remover	F	F	G

Physical Properties

Abrasion resistance	E	G	G
Cut resistance	G	E	F
Snag resistance	G	E	F
Heat resistance	F	G	P
Low-temperature resistance	G	E	G
Flexibility	G	E	E

Key to Ratings :

- E - Excellent – Chemical has no apparent effect as tested in a laboratory.
- G - Good – Chemical has very little effect.
- F - Fair - Chemical has minor or moderate effect.
- P - Poor – Chemical has a pronounced effect.
- NR - Glove is not recommended for use.

HAZARDOUS CHEMICALS

S.No	Name of Chemical	C.A.S. No.	R.T.E.C.S.	Remarks
1.	Acetaldehyde	75-07-0	AB 1925000	T, F
2.	Acetic acid	64-19-7	AF 1225000	C
3.	Acetic anhydride	108-24-7	AK 1925000	C
4.	Acetone	67-64-1	AL 3150000	F
5.	Acetone cyanohydrin	75-86-5	OD 9275000	T
6.	Acetone thiosemicarbazide	1752-30-3	-	-
7.	Acetonitrile	75-05-8	AL 7700000	T, F
8.	Acetylene	74-86-2	AO 9600000	F, R
9.	Acetylene tetra chloride	79-34-5	KI 8575000	T
10.	Acrolein	107-02-8	AS 1050000	T, F
11.	Acrylamide	79-06-1	AS 3325000	T
12.	Acrylonitrile	107-13-1	AT 5250000	T, F
13.	Adiponitrile	111-69-3	AV 2625000	-
14.	Aldicarb	116-06-3	-	T
15.	Aldrin	309-00-2	IO 2100000	T
16.	Ally alcohol	107-18-6	BA 5075000	T, F
17.	Allyl amine	107-11-9	BA 5425000	HR-3, T, F
18.	Allyl chloride	107-05-1	UC 7350000	T
19.	Aluminium (powder)	7429-90-5	BD 0330000	-
20.	Aluminium azide	39108-14-0	-	HR-3
21.	Aluminium borohydride	-	-	E, F
22.	Aluminium chloride	7446-70-0	BD 0525000	HR-3, R
23.	Aluminium fluoride	7784-18-1	BD 0725000	HR-3, R
24.	Aluminium phosphide	20859-73-8	BD 1400000	HR-3, T
25.	Amino diphenyl	92-67-1	DU 8925000	T
26.	Amino pyridine	504-29-0	US 1575000	T
27.	Aminophenol-2	95-55-6	SJ 49500000	HR-3, T
28.	Aminopterin	54-62-6	-	T
29.	Amiton	78-53-5	-	T
30.	Amiton dialate	-	-	
31.	Ammonia	7664-41-7	BO 0875000	T
32.	Ammonium chloro platinate	16919-58-7	-	T
33.	Ammonium nitrate	6484-52-2	BR 9050000	HR-3, T
34.	Ammonium nitrite	-	-	E
35.	Ammonium picrate	131-74-8	BS 3855000	HR-3, O
36.	Anabasine	494-52-0	BV 4375000	HR-3, T
37.	Aniline	62-53-3	BW 6650000	T
38.	Aniline2,4,6-Trimethyl	88-05-1	-	T
39.	Anthraquinone	84-65-1	CB 4725000	HR-2, T
40.	Antimony pentafluoride	7783-70-2	CC 5800000	HR-3, T

41.	Antimycin A	1397-94-0	CD 0350000	HR-3
42.	ANTU	86-88-4	YT 9275000	T
43.	Arsenic pentoxide	1303-28-2	CG 2275000	HR-3, T
44.	Arsenic trioxide	1327-53-3	CG 3325000	HR-3, T
45.	Arsenous trichoride	7784-34-1	-	T
46.	Arsine	7784-42-1	CG 6475000	T
47.	Asphalt	8052-42-4	CI 9900000	HR-3, T
48.	Azinphos-ethyl	2642-71-9	-	T
49.	Azinphos methyl	86-50-0	TE 1925000	HR-3, T
50.	Bacitracin	1405-87-4	CP 0175000	HR-3
51.	Barium azide	18810-58-7	CQ 8500000	HR-3, E
52.	Barium nitrate	10022-31-8	CQ 9625000	R
53.	Barium nitride	12047-79-9	-	HR-3, E
54.	Benzal chloride	100-44-7	-	T
55.	Benzenamine, 3-Trifluoromethyl	-	-	
56.	Benzene	71-43-2	CY 1400000	T, F
57.	Benzene sulfonyl chloride	98-09-9	DB 8750000	HR-3, T
58.	Benzene, 1-(chloromethyl)-4 Nitro	-	-	-
59.	Benzene arsenic acid	-	-	T
60.	Benzidine	92-87-5	DC 9625000	T
61.	Benzidine salts	92-87-5	DC 9625000	HR-3, T
62.	Benzimidazole, 4,5-Dichloro-2 (Trifluoromethyl)	-	-	-
63.	Benzoquinone-P	106-51-4	DK 2625000	HR-3, T
64.	Benzotrichloride	-	-	T
65.	Benzoyl chloride	-	-	R, T
66.	Benzoyl peroxide	94-36-0	DM 8575000	T, E
67.	Benzyl chloride	100-44-7	XS 8925000	T
68.	Beryllium (powder)	7440-41-7	DS 1750000	T
69.	Bicyclo(2,2,1) Heptane-2-carbonitrile	-	-	-
70.	Biphenyl	92-52-4	DU 8050000	T
71.	Bis (2-chloroethyl) sulphide	505-60-2	-	T
72.	Bis (Chloromethyl) Ketone	534-07-6	-	-
73.	Bis (Tert-butyl peroxy) cyclohexane	-	-	R
74.	Bis (Terbutylperoxy) butane	-	-	R
75.	Bis (2,4,6-TriNitrophenyl) amine	-	-	T, E
76.	Bis (Chloromethyl) Ether	542-88-1	-	-
77.	Bismuth and compounds	7440-69-9	-	T
78.	Bisphenol-A	80-05-7	-	-
79.	Bitoscanate	-	-	-
80.	Boron Powder	7440-42-8	ED 7350000	HR-3, T
81.	Boron trichloride	10294-34-5	ED 1925000	HR-3, T
82.	Boron trifluoride	7637-07-2	-	T
83.	Boron trifluoride comp. with methylether 1:1	353-42-4	-	T
84.	Bromine	7726-95-6	EF 9100000	T
85.	Bromine pentafluoride	7789-30-2	EF 9350000	T, C
86.	Bromo chloro methane	74-97-5	PA 5250000	T

87.	Bromodialone	28772-56-7	-	-
88.	Butadiene	106-99-0	-	R
89.	Butane	106-97-8	EJ 4200000	F
90.	Butanone-2	78-93-3	EL 6475000	T, R
91.	Butyl amine tert	75-64-9	EO 3330000	HR-3, T, F
92.	Butyl glycidal ether	2426-08-6	TX 4200000	HR-D
93.	Butyl isovalarate	-	-	-
94.	Butyl peroxy maleate tert	-	-	-
95.	Butyl vinyl ether	-	-	-
96.	Butyl-n-mercaptan	109-79-5	EK 6300000	-
97.	C.1. Basic green	-	-	-
98.	Cadmium oxide	1306-19-0	EV 1930000	T
99.	Cadmium stearate	-	-	T
100.	Calcium arsenate	7778-44-1	CG 0830000	
101.	Calcium carbide	75-20-7	EV 9400000	HR-3
102.	Calcium cyanide	592-01-8	EW 0700000	HR-3
103.	Camphchlor (Toxaphene)	-	-	-
104.	Cantharidin	-	-	-
105.	Captan	133-06-2	GW 5075000	
106.	Carbachol chloride	51-83-2	GA 0875000	HR-3
107.	Carbaryl	63-25-2	FC 5950000	T
108.	Carbofuran (Furadan)	1563-66-2	FB 9450000	T
109.	Carbon tetrachloride	56-23-5	FG 4900000	T
110.	Carbon disulphide	75-15-0	FF 6650000	T, F
111.	Carbon monoxide	630-08-0	FG 3500000	T, F
112.	Carbophenothion	786-19-6	-	T
113.	Carvone	-	-	-
114.	Cellulose nitrate	8050-88-2	-	E, F
115.	Chloroacetic acid	79-11-8	AF 8575000	HR-3
116.	Chlordane	57-74-9	PB 9800000	
117.	Chlorofenvinphos	470-90-6	-	T
118.	Chlorinated benzene	-	-	-
119.	Chlorine	7782-50-5	FO 2100000	T
120.	Chlorine oxide	10049-04-4	FO 3000000	T
121.	Chlorine trifluoride	7090-91-2	FO 2800000	
122.	Chlormephos	24934-91-6	TD 5170000	HR-3
123.	Chlormequat chloride	999-81-5	-	-
124.	Chloroacetal chloride	-	-	C
125.	Chloroacetaldehyde	107-20-0	AB 2450000	-
126.	Chloroaniline-2	-	-	-
127.	Chloroaniline-4	106-47-8	-	-
128.	Chlorobenzene	108-90-7	CZ 0175000	T, F
129.	Chloroethyl chloroformate	-	-	-
130.	Chloroform	67-66-3	FS 9100000	T
131.	Chloroformyl morpholine	-	-	T
132.	Chloromethane	74-87-3	PA 6300000	-
133.	Chloromethyl methyl ether	107-30-2	KN 6650000	T
134.	Chloronitrobenzene	25167-93-5	CZ 0855000	HR-D
135.	Chlorophacinone	3691-35-8	NK 5335000	HR-3

136.	Chlorosulphonic acid	7790-94-5	-	C
137.	Chlorothiophos	21923-23-9	TF 1590000	HR-3
138.	Chloroxuron	1982-47-4	-	-
139.	Chromic acid	1333-82-0	GB 6650000	T, E
140.	Chromic chloride	10025-73-7	-	T, E
141.	Chromium powder	7740-47-3	GB 4200000	T, E
142.	Cobalt carbonyl	10210-68-1	GG 0300000	T
143.	Cobalt Nitrilmethylidyne compound	-	-	T
144.	Cobalt (powder)	7440-48-4	GF 8750000	HR-3, T
145.	Colchicine	64-86-8	-	-
146.	Copper and compounds	7440-50-8	GL 5325000	T
147.	Copper oxychloride	-	-	T
148.	Coumafuryl	-	-	-
149.	Coumaphos	56-72-4	-	-
150.	Coumateralyl	-	-	-
151.	Crimidine	-	-	T
152.	Crotenaldehyde	123-73-9	-	-
153.	Crotonaldehyde	4170-30-3	GP 9499000	T, F
154.	Cumene	98-82-8	GR 8575000	
155.	Cyanogen bromide	-	-	-
156.	Cyanogen iodide	-	-	-
157.	Cyanophos	-	-	-
158.	Cyanothoate	-	-	T
159.	Cyanuric fluoride	-	-	-
160.	Cyclo hexylamine	108-91-8	GX 0700000	
161.	Cyclohexane	110-82-7	GU 6300000	
162.	Cyclohexanone	108-94-1	GW1050000	T, F
163.	Cycloheximide	66-81-9	-	T
164.	Cyclopentadiene	542-92-7	GY 1000000	T, F
165.	Cyclopentane	287-92-3	GY 2390000	
166.	Cyclotetramethylenetetranitramine	-	-	E
167.	CyclotrimethylenetrinitraMine	121-82-4	XY 9450000	E
168.	Cypermethrin	-	-	-
169.	DDT	50-29-3	KJ 3325000	HR-3, T
170.	Decaborane (1:4)	17702-41-9	HD 1400000	HR-3
171.	Demeton	298-03-3	TF 3125000	HR-3, T
172.	Demeton S-Methyl	919-86-8	TG 1750000	HR-3
173.	Di-n-propyl peroxydicarbonate (Conc. 80%)	-	-	R
174.	Dialifos	-	-	T
175.	Diazodinitrophenol	-	-	E
176.	Dibenzyl peroxydicarbonate (Conc > = 90%)	-	-	-
177.	Diborane	19287-45-7	HQ 9275000	-
178.	Dichloroaceylene	7572-29-4	AP 1080000	HR-3
179.	Dichlorobenzalkonium chloride	-	-	-
180.	Dichloroethyl ether	-	-	-
181.	Dichloromethyl phenylsilane	-	-	-
182.	Dichlorophenol-2,6	87-65-0	SK 8750000	HR-3

183.	Dichlorophenol-2,4	120-83-2	SK 8575000	HR-3
184.	Dichlorophenoxy acetic acid	94-75-7	AG 6825000	HR-3
185.	Dichloropropane-2,2	594-20-7	-	HR-3
186.	Dichlorosalicylic acid-3,5	320-72-9	VO 2450000	HR-3
187.	Dichlorvos (DDVP)	62-73-7	TC 0350000	T
188.	Dicrotophos	141-66-2	TC 3850000	-
189.	Dieldrin	60-57-1	IO 1750000	HR-3
190.	Diepoxy butane	298-18-0	EJ 8400000	HR-3
191.	Diethyl carbamazine citrate	1642-54-2	TL 1225000	HR-3
192.	Diethyl chlorophosphate	814-49-3	TD 1400000	HR-3
193.	Diethyl ethanolamine	100-37-8	KK 5075000	HR-3
194.	Diethyl peroxydicarbonate (Conc. 30 %)	-	-	R
195.	Diethyl phenylene diamine	-	-	-
196.	Diethylamine	109-89-7	HZ 8750000	HR-2, T
197.	Diethylene glycol	111-46-6	ID 5950000	HR-3
198.	Diethylene glycol dinitrate	693-21-0	ID 6825000	HR-3, E
199.	Diethylene triamine	111-40-0	IE 1225000	HR-3
200.	Diethyleneglycol butyl ether	112-34-5	KJ 9100000	HR-3
201.	Diglycidyl ether	2238-07-5	KN 2350000	HR-3
202.	Digitoxin	71-63-6	IH 2275000	HR-3
203.	Dihydroperoxypropane (Conc > = 30%)	-	-	R
204.	Diisobutyl peroxide	-	-	R
205.	Dimefox	115-26-4	-	T
206.	Dimethoate	60-51-5	-	-
207.	Dimethyl dichlorosilane	75-78-5	-	-
208.	Dimethyl hydrazine	57-14-7	MV 2450000	HR-3
209.	Dimethyl nitrosoamine	62-75-9	IQ 05250900	HR-3
210.	Dimethyl P phenylene diamine	99-98-9	ST 0874000	HR-3
211.	Dimethyl phosphoramido cyanidic acid (TABUM)	-	-	T
212.	Dimethyl phosphorochloridothioate	2524-03-0	TD 1830000	HR-3
213.	Dimethyl sulfolane (DMS)	1003-78-7	XN 0525000	HR-3
214.	Dimethyl sulphide	75-18-3	-	HR-3
215.	Dimethylamine	124-40-3	IP 8750000	HR-3
216.	Dimethylaniline	121-69-7	BX 4725000	HR-3, T
217.	Dimethylcarbonyl chloride	-	-	T
218.	Dimetilan	-	-	-
219.	Dinitro O-cresol	1335-85-9	GO 9450000	HR-3
220.	Dinitrophenol	25550-58-7	SL 2625000	HR-3, T, E
221.	Dinitrotoluene	25321-14-6	XT 1300000	HR-3
222.	Dinoseb	-	-	-
223.	Dinoterb	-	-	-
224.	Dioxane-p	123-91-1	JG 8225000	HR-3, T, F
225.	Dioxathion	78-34-2	TE 3350000	HR-3
226.	Dioxine N	1746-01-6	HP 3500000	-
227.	Diphacinone	82-66-6	-	T
228.	Diphosphoramidate octamethyl	-	-	-

229.	Diphenyl methane di-isocyanate (MDI)	101-68-8	NQ 9350000	HR-3
230.	Dipropylene Glycol Butyl ether	29911-28-2	UA 8225000	HR-2
231.	Dipropylene glycol methylether	34590-94-8	JM 1575000	HR-1
232.	Disec-butyl peroxydicarbonate (conc. > 80 %)	-	-	-
233.	Disufoton	298-04-4	TD 9275000	T
234.	Dithiazamine iodide	-	-	-
235.	Dithiobiurate	541-53-7	EC 1575000	HR-3
236.	Endosulfan	115-29-7	RB 9275000	-
237.	Endothion	2778-04-3	TF 8225000	HR-3
238.	Endrin	72-20-8	IO 1575000	HR-3
239.	Epichlorohydrine	106-89-8	TX 4900000	T, F
240.	EPN	2104-64-5	TB 1925000	T
241.	Ergocalciferol	50-14-6	KE 1050000	HR-3
242.	Ergotamine tartarate	379-79-3	-	-
243.	Ethanesulfenyl chloride, 2 chloro	-	-	-
244.	Ethanol 1-2 dichloracetate	-	-	-
245.	Ethion	563-12-2	TE 4550000	T
246.	Ethoprophos	13194-48-4	-	-
247.	Ethyl acetate	141-78-6	AH 5425000	HR-3, F
248.	Ethyl alcohol	64-17-5	KQ 6300000	HR-3, F
249.	Ethyl benzene	100-41-4	DA 0700000	HR-3
250.	Ethyl bis amine	-	-	-
251.	Ethyl bromide	74-96-4	KH 6475000	T
252.	Ethyl carbamate	-	-	-
253.	Ethyl ether	60-29-7	KI 5775000	HR-3
254.	Ethyl hexanol-2	-	-	-
255.	Ethyl mercaptan	75-08-1	KI 9625000	T, F
256.	Ethyl mercuric phosphate	-	-	-
257.	Ethyl methacrylate	97-63-2	-	-
258.	Ethyl nitrate	625-58-1	QU 7900000	HR-3, TER
259.	Ethyl thiocyanate	542-90-5	XK 9900000	HR-3
260.	Ethylamine	75-04-7	KH 2100000	-
261.	Ethylene	74-85-1	KU 5340000	HR-3
262.	Ethylene chlorohydrine	107-07-3	KK 0875000	T
263.	Ethylene dibromide	106-93-4	KH 9275000	HR-3
264.	Ethylene diamine	107-15-3	KH 8575000	C, F
265.	Ethylene diamine hydrochloride	-	-	-
266.	Ethylene flourohydrine	371-62-0	-	-
267.	Ethylene glycol	107-21-1	KW 2975000	HR-3
268.	Ethylene glycol dinitrate	628-96-6	KW 5600000	HR-3, T, E
269.	Ethylene oxide	75-21-8	KX 2450000	HR-3, TFR
270.	Ethyleneimine	151-56-4	KX 5075000	T, F
271.	Ethylene di chloride	75-34-3	KI 0175000	-
272.	Fenamiphos	22224-92-6	TB 3675000	-
273.	Femitrothion	122-14-5	-	-
274.	Fensulphothion	115-90-2	TF 3850000	-
275.	Fluenetil	-	-	T

276.	Fluorine	7782-41-4	LM 6475000	HR-3, T
277.	Fluoro 2-hydroxy butyric acid amide salt ester	-	-	T
278.	Fluoroacetamide	640-19-7	AC 1225000	HR-3, T
279.	Fluoroacetic acid amide salts and esters	-	-	T
280.	Fluoroacetylchloride	-	-	-
281.	Fluorobutric acid amide salt esters	-	-	T
282.	Fluorocrotonic acid amides salts esters	-	-	T
283.	Fluorouracil	51-21-8	YR 0350000	HR-3
284.	Fonofos	944-22-9	TA 5950000	-
285.	Formaldehyde	50-00-0	LP 8925000	HR-3, T
286.	Formetanate hydrochloride	-	-	-
287.	Formic acid	64-18-6	LQ 4900000	HR-3
288.	Formoparanate	17702-57-7	FB 9880000	HR-3
289.	Formothion	2540-82-1	-	-
290.	Fosthiotan	21548-32-3	-	-
291.	Fuberidazole	-	-	-
292.	Furan	110-00-9	LT 8524000	HR-3
293.	Gallium Trichloride	7440-55-3	LW 8610000	HR-3
294.	Glyconitrile (Hydroxyacetonitrile)	107-16-4	AM 0350000	-
295.	Guanyl-4-nitrosaminoguinyl-1-tetrazene	-	-	E
296.	Heptachlor	76-44-8	PC 0700000	HR-3, E
297.	Hexa methyl tertra-oxyacyclononate (conc. 75%)	-	-	R
298.	Hexachlorobenzene	118-74-1	DA 2975000	HR-3
299.	Hexachlorocyclohexan (Lindane)	58-89-9	GV 4900000	-
300.	Hexachlorocyclopentadiene	77-47-4	GY 1225000	HR-3
301.	Hexachlorodibenzo-p-dioxin	57653-85-7	HP 3280000	HR-3
302.	Hexachloronapthalene	1335-87-1	QJ 7350000	HR-3
303.	Hexafluoropropanone sesquihydrate	13098-39-0	UC 2660000	HR-3
304.	Hexamethyl phosphoroamide	680-31-9	TD 0875000	HR-3
305.	Hexamethylene diamine N N dibutyl	-	-	-
306.	Hexane	110-54-3	MN 9275000	HR-3
307.	Hexanitrostilbene 2,2,4,4,6,6	-	-	E
308.	Hexene	592-41-6	MP 6600100	HR-3
309.	Hydrogen selenide	7783-07-5	MX 1050000	HR-3, T
310.	Hydrogen sulphide	7783-06-4	MX 1225000	HR-3, T, F
311.	Hydrazine	302-01-2	MU 7175000	HR-3
312.	Hydrazine nitrate	-	-	-
313.	Hydrochloric acid (Gas)	7647-01-0	MW4025000	HR-3, T
314.	Hydrogen	1333-74-0	MW8900000	HR-3, F, R
315.	Hydrogen bromide	10035-10-6	MW3850000	-
316.	Hydrogen cyanide	74-90-8	MW6825000	T, F
317.	Hydrogen fluoride	7664-39-3	MW7875000	T, C
318.	Hydrogen peroxide	7722-84-1	MX 0900000	HR-3
319.	Hydroquinone	123-31-9	MX 3500000	HR-3
320.	Indene	95-13-6	NK 8225000	HR-3

321.	Indium powder	7440-74-6	NL 1050000	HR-3
322.	Indomethacin	53-86-1	NL 3500000	HR-3
323.	Iodine	7553-56-2	NN 1575000	-
324.	Iridium tetrachloride	10025-97-5	NO 3610000	HR-3
325.	Iron penta carbonyl	13463-40-6	NO 4900000	-
326.	Isobenzan	297-78-9	-	T
327.	Isoamyl alcohol	123-51-3	EL 5425000	HR-3
328.	Isobutyl alcohol	78-83-1	NP 9625000	HR-3
329.	Isobutyro nitrile	78-82-0	TZ 4900000	HR-3
330.	Isocyanic acid 3 4-dichlorophenyl ester	102-36-3	NQ 8760000	HR-3
331.	Isodrin	465-73-6	IO 1925000	HR-3, T
332.	Isofluorophosphate	-	-	-
333.	Isophorone diisocyanate	4098-71-9	NQ 5400000	HR-3
334.	Isopropyl alcohol	67-63-0	NT 8050000	HR-3
335.	Isopropyl chlorocarbonate	108-23-6	LQ 6475000	HR-3
336.	Isopropyl formate	625-55-8	LQ 8750000	HR-3
337.	Isopropyl methyl pyrazolyl dimethyl carbamate	-	-	-
338.	Juglone (5-Hydroxy Napthalene-1, 4 dione)	-	-	T
339.	Ketene	463-51-4	OA 7700000	HR-3
340.	Lactonitrile	78-97-7	OD 8225000	HR-3
341.	Lead arsenite	10031-13-7	OF 8600000	HR-3
342.	Lead at high temp (molten)	7439-92-1	OF 7525000	-
343.	Lead azide	13424-46-9	OF 8650000	HR-3, E
344.	Lead styphanate	-	-	-
345.	Leptophos	21609-90-5	TB 1720000	HR-3
346.	Lenisite	-	-	-
347.	Liquified petroleum gas	68476-85-7	SE 7545000	HR-2
348.	Lithium hydride	7580-67-8	OJ 6300000	HR-3
349.	N-Dinitrobenzene	-	-	-
350.	Magnesium powder or ribbon	7439-95-4	OM 2100000	HR-3
351.	Malathion	121-75-5	WM8400000	-
352.	Maleic anhydride	108-31-6	ON 3675000	HR-3, T
353.	Malononitrile	109-77-3	OO 3150000	HR-3
354.	Managanese Tricarbonyl cyclopentadiene	-	-	-
355.	Mechlor ethamine	-	-	-
356.	Mephospholan	950-10-7	JP 1050000	HR-3
357.	Mercuric chloride	7487-94-7	-	-
358.	Mercuric oxide	21908-53-2	OW 8750000	HR-3
359.	Mercury acetate	7439-97-6	OV 4550000	-
360.	Mercury fulminate	628-86-4	OW 4050000	HR-3, E
361.	Mercury methyl chloride	115-09-3	OW 1225000	HR-3
362.	Mesitylene	108-67-8	OX 6825000	HR-3
363.	Methacrolein diacetate	10476-95-6	-	-
364.	Methacrylic anhydride	760-93-0	OZ 5700000	HR-3
365.	Methacrylonitrile	126-98-7	UD 1400000	-

366.	Methacryloyl oxyethyl isocyanate	-	-	-
367.	Methanidophos	-	-	-
368.	Methane	74-82-8	PA 1490000	HR-3
369.	Methanesulphonyl fluoride	558-25-8	PB 2975000	HR-3
370.	Methidathion	950-37-8	-	-
371.	Methiocarb	-	-	-
372.	Methonyl	16752-77-5		
373.	Methoxy ethanol (2-methyl cellosolve)	-	-	-
374.	Methoxyethyl mercuric acetate	151-38-2	OV 6300000	HR-3
375.	Methyacrylol chloride	-	-	-
376.	Methyl 2-chloroacrylate	80-63-7	AS 6380000	HR-3
377.	Methyl alcohol	67-56-1	PC 1400000	HR-3, F
378.	Methyl amine	74-89-5	PF 6300000	HR-3, C, F
379.	Methyl bromide (Bromomethane)	74-83-9	PA 4300000	T
380.	Methyl chloride	74-87-3	PA 6300000	T
381.	Methyl chloroform	71-55-6	KJ 2975000	T, F
382.	Methyl chloroformate	79-22-1	-	-
383.	Methyl cyclohexene	591-47-9	-	HR-2, F
384.	Methyl disulphide	-	-	-
385.	Methyl ethyl ketone peroxide (conc. 60 %)	1338-23-4	EL 9450000	R
386.	Methyl formate	107-31-3	LQ 8925000	HR-3
387.	Methyl hydrazine	60-34-4	MV 5600000	HR-3
388.	Methyl isobutyl ketone	108-10-1	SA 9275000	-
389.	Methyl isocyanate	624-83-9	NQ 9450000	HR-3, T, F
390.	Methyl isothiocyanate	8066-01-1	TX 9665000	HR-3
391.	Methyl mercuric dicyanamide	502-39-6	-	-
392.	Methyl Mercaptan	74-93-1	PB 4375000	-
393.	Methyl Methacrylate	80-62-6	OZ 5075000	HR-3
394.	Methyl phencapton	3735-23-7	TD 6125000	HR-3
395.	Methyl phosphoric dichloride	676-97-1	TA 1840000	HR-3
396.	Methyl thiocyanate	556-64-9	XL 1575000	HR-3
397.	Methyl trichlorosilane	75-79-6	VV 4550000	HR-3
398.	Methyl vinyl ketone	79-84-4	-	HR-3
399.	Methylene bis (2-chloroaniline)	101-14-4	CY 1050000	-
400.	Methylene chloride	75-09-2	PA 8050000	T
401.	Methylenebis-4, 4(2-chloroaniline)	101-14-4	CY 1050000	T
402.	Metolcarb	1129-41-5	-	-
403.	Mevinphos	7786-34-7	GQ 5250000	T
404.	Mezacarbate	315-18-4	-	-
405.	Mitomycin C	50-07-7	-	-
406.	Molybdenum Powder	7439-98-7	QA 4680000	HR-3
407.	Monocrotophos	6923-22-4	TC 4375000	HR-3
408.	Morpholine	110-91-8	QD 6475000	HR-3
409.	Muscinol	2763-96-4	-	-
410.	Mustard gas	505-60-2	-	-
411.	N-Butyl acetate	123-86-4	-	-
412.	N-Butyl alcohol	71-36-3	-	-

413.	N-Hexane	110-54-3	MN 9275000	-
414.	N-Methyl-N, 2,4,6-Tetranitroaniline	479-45-8	BY 6300000	C, F
415.	Naphtha	8030-30-6	DE 3030000	HR-3, E
416.	Naphtha solvent	-	-	E
417.	Naphthalene	91-20-3	QJ 0525000	F
418.	Naphthyl amine	134-32-7	QM 1400000	HR-3, T
419.	Nickel carbonyl/nickel tetracarbonyl	13463-39-3	QR 6300000	HR-3, T, F
420.	Nickel Powder	7440-02-0	QR 5950000	HR-3, T
421.	Nicotine	54-11-5	QS 5250000	-
422.	Nicotine sulphate	65-30-5	QS 9525000	HR-3
423.	Nitric acid	7697-37-2	QU 5775000	HR-3
424.	Nitric oxide	10102-43-9	QX 0525000	T
425.	Nitrobenzene	2491-52-3	CN 2710000	HR-3, T
426.	Nitrocellulose (dry)	9004-70-0	-	-
427.	Nitrochlorobenzene	100-00-5	CZ 1050000	-
428.	Nitrocyclohexane	1122-60-7	GV 6600000	HR-3
429.	Nitrogen	7727-37-9	QW9700000	HR-3
430.	Nitrogen dioxide	10102-44-0	QW9800000	HR-3, T
431.	Nitrogen oxide	10024-97-2	QX 1350000	HR-3, T
432.	Nitrogen trifluoride	7783-54-2	QX 1925000	HR-3
433.	Nitroglycerine	55-63-0	QX 2100000	HR-3, T, E
434.	Nitropropane-1	108-03-2	TZ 5075000	HR-3
435.	Nitropropane-2	79-46-9	TZ 5250000	HR-3, T, F
436.	Nitroso dimethyl amine	156-10-5	JK 0175000	HR-3
437.	Nonane	27214-95-8	RA 8550000	HR-1
438.	Norbormide	991-42-4	RB 8750000	HR-3
439.	O-Cresol	95-48-7	GO 6300000	-
440.	O-Nitro Toluene	88-72-2	TX 3150000	-
441.	O-Toluidine	95-53-4	XU 2975000	-
442.	O-Xylene	95-47-6	ZE 2450000	-
443.	O/P Nitroaniline	100-01-6	BY 7000000	-
444.	Oleum	-	-	-
445.	OO Diethyl S ethyl suphiny l Methyl phosphorothioate	-	-	T
446.	OO Diethyl S propylthio methyl phosdithiodate	-	-	T
447.	OO Diethyl S ethylsulphinylmethylphosphorothioate	-	-	T
448.	OO Diethyl S ethylsulphonylmethylphosphorothioate	-	-	T
449.	OO Diethyl S ethylthiomethylphosphorothioate	-	-	T
450.	Organo rhodium complex	-	-	-
451.	Orotic acid	65-86-1	RM 3180000	HR-2
452.	Osmium tetroxide	20816-12-0	RN 1140000	HR-3
453.	Oxabain	-	-	-
454.	Oxamyl	23135-22-0	-	-

455.	Oxetane 3,3-bis(chloromethyl)	-	-	-
456.	Oxidiphenoxarsine	-	-	-
457.	Oxy disulfoton	2497-07-6	TD 8600000	HR-3, T
458.	Oxygen (liquid)	7782-44-7	RS 2060000	HR-3, T
459.	Oxygen difluoride	7783-41-7	RS 2100000	HR-3, O
460.	Ozone	10028-15-6	RS 8225000	HR-3, T
461.	P-nitrophenol	-	-	-
462.	Paraffin	8002-74-2	RV 0350000	HR-3
463.	Paraxon (Diethyl 4 Nitrophenyl phosphate)	311-45-5	-	T
464.	Paraquat	1910-42-5	DW 275000	-
465.	Paraquat methosulphate	-	-	-
466.	Parathion	56-38-2	TF 4550000	HR-3, T
467.	Parathion methyl	298-00-0	TG 0175000	T
468.	Paris green	-	-	-
469.	Penta borane	19624-22-7	RY 8925000	HR-3, T, F
470.	Penta chloro ethane	76-01-7	KI 6300000	HR-3
471.	Penta chlorophenol	87-86-5	SM 6300000	HR-3, T
472.	Pentabromophenol	608-71-9	SM 6125000	HR-3
473.	Pentachloro naphthalene	1321-64-8	QK 0300000	HR-3
474.	Pentadecyl-amine	2570-26-5	RZ 2450000	HR-3
475.	Pentaerythritol tetranitrate	78-11-5	RZ 2620000	HR-3, T, E
476.	Pentane	109-66-0	RZ 9450000	HR-2
477.	Pentanone	107-87-9	SA 7875000	HR-3
478.	Perchloric acid	7601-90-3	SC 7500000	HR-3
479.	Perchloroethylene	127-18-4	KX 3850000	-
480.	Peroxyacetic acid	79-21-0	SD 8750000	HR-3
481.	Phenol	108-95-2	SJ 3325000	HR-3/T
482.	Phenol, 2,2-thiobis (4,6-Dichloro)	-	-	-
483.	Phenol 2,2-thiobis (4 chloro 6 methyl phenol)	-	-	-
484.	Phenol, 3-(1-methyl ethyl)-methylcarbamate	-	-	-
485.	Phenyl hydrazine hydrochloride	59-88-1	-	-
486.	Phenyl mercury acetate	62-38-4	-	-
487.	Phenyl silatrane	2097-19-0	YJ 9050000	HR-3
488.	Phenyl thiourea	103-85-5	YU 1400000	HR-3
489.	Phenylene p-diamine	106-50-3	SS 8050000	HR-3
490.	Phorate	298-02-2	TD 9450000	HR-3, T
491.	Phosazetin	4104-14-7	-	T
492.	Phosfolan	947-02-4	NJ 6475000	HR-3
493.	Phosgene	75-44-5	SY 5600000	HR-3, T
494.	Phosmet	-	-	-
495.	Phosphamidon	13171-21-6	-	T
496.	Phosphine	7803-51-2	SY 7525000	HR-3, T, F
497.	Phosphoric acid	7664-38-2	TB 6300000	HR-3
498.	Phosphoric acid dimethyl (4-methyl thio) phenyl	3254-63-5	-	T
499.	Phosphorothioic acid dimethyl S(2-	-	-	T

	bis) Ester			
500.	Phosphorothioic acid methyl (ester)	-	-	T
501.	Phosphorothioic acid, OO Dimethyl S-(2methyl)	-	-	T
502.	Phosphorothioic, methyl-ethyl ester	-	-	T
503.	Phosphorous	7723-14-0	TH 3495000	HR-3, T, F
504.	Phosphorous oxychloride	10025-87-3	TH 4798000	T, F
505.	Phosphorous pentoxide	1314-56-3	TH 3945000	HR-3, T, F
506.	Phosphorous trichloride	7719-12-2	TH 3675000	HR-3, T, F
507.	Phosphorous penta chloride	10026-13-8	TB 6125000	HR-3, T, F
508.	Phthalic anhydride	85-44-9	TI 3150000	HR-3
509.	Phylloquinone	84-80-0	-	-
510.	Physostigmine	57-47-6	TJ 2100000	HR-3
511.	Physostigmine salicylate (1:1)	57-64-7	TJ 2450000	HR-3
512.	Picric acid (2,4,6-trinitrophenol)	88-89-1		T, E
513.	Picrotoxin	124-87-8	TJ 9100000	HR-3
514.	Piperidine	110-89-4	TM 3500000	HR-3
515.	Piprotal	5281-13-0	BF 4911000	HR-3
516.	Pirinfos-ethyl	23505-41-1	-	-
517.	Platinous chloride	10025-65-7	TP 2275000	HR-3
518.	Platinum tetrachloride	13454-96-1	TP 2275500	HR-3
519.	Potassium arsenate	10124-50-2	CG 3800000	HR-3
520.	Potassium chlorate	3811-04-9	FO 0350000	HR-3
521.	Potassium cyanide	151-50-8	TS 8750000	HR-3
522.	Potassium hydroxide	1310-58-3	TT 2100000	HR-3
523.	Potassium nitride	29285-24-3	-	HR-3
524.	Potassium nitrite	7758-09-0	TT 3750000	HR-3
525.	Potassium peroxide	17014-71-0	TT 4450000	HR-3
526.	Potassium silver cyanide	506-61-6	TT 5775000	HR-3
527.	Powdered metals and mixtures	-	-	-
528.	Promecarb	2631-37-0	-	-
529.	Promurit	5836-73-7	-	-
530.	Propanesultone	1120-71-4	RP 5425000	-
531.	Propargyl alcohol	107-19-7	UK 5075000	-
532.	Propargyl bromide	-	-	-
533.	Propen-1,-2-chloro-1,3-diol diacetate	-	-	T
534.	Propiolactone beta	57-57-8	RQ 7350000	-
535.	Propionitrile	107-12-0	UF 9625000	-
536.	Propionitrile, 3-chloro	-	-	-
537.	Propiophenone, 4-amino	-	-	-
538.	Propyl chloroformate	109-61-5	-	-
539.	Propylene dichloride	78-87-5	TX 9625000	F
540.	Propylene glycol allylether	1331-17-5	UA 4900000	HR-3
541.	Propylene imine	75-55-8	CM 8050000	R
542.	Propylene oxide	75-56-9	TZ 2975000	-
543.	Prothoate	2275-18-5	-	-
544.	Pseudocumene	95-63-6	DC 3325000	-
545.	Pyrazoxon	-	-	T
546.	Pyrene	129-00-0	UR 2450000	HR-3

547.	Pyridine	110-86-1	UR 8400000	HR-3, T
548.	Pyridine, 2-methyl-3-vinyl	140-76-1	-	-
549.	Pyridine, 4-nitro-1-oxide	-	-	-
550.	Pyridine 4-nitro-1-oxide	-	-	-
551.	Pyriminil	53558-25-1	YT 9690000	HR-3
552.	Quinaliphos	-	-	-
553.	Quinone	106-51-4	DK 2625000	T, F
554.	Rhodium trichloride	10049-07-7	VI 9275000	HR-3
555.	Salcomine	14167-18-1	-	-
556.	Sarin	-	-	-
557.	Selenious acid	7783-00-8	-	-
558.	Selenium Hexafluoride	7783-79-1	VS 9450000	-
559.	Selenium oxychloride	7791-23-3	-	-
560.	Semicarbazide hydrochloride	563-41-7	-	-
561.	Silane (4-aminio butyl) diethoxy-meth	-	-	-
562.	Sodium	7440-23-5	VY 0686000	HR-3
563.	Sodium anthra-quinone-1-sulphonate	128-56-3	-	-
564.	Sodium arsenate	7631-89-2	-	-
565.	Sodium arsenite	7784-46-5	CG 3675000	HR-3
566.	Sodium azide	26628-22-8	VY 8050000	HR-3
567.	Sodium cacodylate	124-65-2	-	-
568.	Sodium chlorate	7775-09-9	FO 0525000	HR-3, T
569.	Sodium cyanide	143-33-9	VZ 7525000	HR-3
570.	Sodium fluoro-acetate	62-74-8	AH 9100000	HR-3
571.	Sodium hydroxide	1310-73-2	WB 4900000	HR-3, ERO
572.	Sodium pentachloro-phenate	131-52-2	SM 6490000	HR-3
573.	Sodium picramate	-	-	T, D
574.	Sodium selenate	13410-01-0	-	-
575.	Sodium selenite	10102-18-8	VS 7350000	HR-3, T, E
576.	Sodium sulphide	1313-82-2	WE 1905000	HR-3
577.	Sodium tellorite	10102-20-2	WY 2450000	HR-3
578.	Stannane acetoxy triphenyl	-	-	-
579.	Stibine (Antimony hydride)	7803-52-3	WJ 0700000	HR-3
580.	Strychnine	57-24-9	WL 2275000	HR-3
581.	Strychnine sulphate	60-41-3	WL 2550000	HR-3
582.	Styphinic acid (2,4-6-trinitroresorcinol)	82-71-3	VH 3540000	HR-3
583.	Styrene	100-42-5	WL 3675000	HR-3
584.	Sulphotep	3689-24-5	XN 4375000	T
585.	Sulphoxide, 3-chloropropyl octyl	-	-	-
586.	Sulphur dichloride	10545-99-0	WS 4500000	HR-3, T
587.	Sulphur dioxide	7446-09-5	WS 4550000	HR-3, T
588.	Sulphur monochloride	10025-67-9	WS 4300000	HR-3
589.	Sulphur tetrafluoride	7783-60-0	WT 4800000	HR-3
590.	Sulphur trioxide	7446-11-9	-	-
591.	Sulphuric acid	7664-93-9	WS 5600000	HR-3
592.	Tellurium (Powder)	13494-80-9	WY 2625000	HR-3
593.	Tellurium hexafluoride	7783-80-4	WY 2800000	HR-3

594.	TEPP (Tetraethyl pyrophosphate)	107-49-3	UX 6825000	HR-3, T
595.	Terbufos	13071-79-9	-	-
596.	Tert-Butyl alcohol	75-65-0	-	-
597.	Tert-Butyl peroxy carbonate	-	-	-
598.	Tert-Butyl peroxy isopropyl	-	-	-
599.	Tert-Butyl peroxyacetate (Conc > = 70 %)	-	-	-
600.	Tert-Butyl peroxyvalate (Conc >= 77%)	927-07-1	-	-
601.	Tert-Butylperoxyiso-butyrate	-	-	-
602.	Tetra hydrofuran	109-99-9	LU 5950000	HR-3, T, F
603.	Tetra methyl lead	75-74-1	TP 4725000	HR-3
604.	Tetra nitromethane	509-14-8	PB 4025000	HR-3
605.	Tetra-chlorodibenzo-p-dioxin 1,2,3,7,8,(TCDD)	-	-	-
606.	Tetraethyl lead	78-00-2	TP 4550000	HR-3
607.	Tetrafluoriethyne	116-14-3	-	-
608.	Tetramethylene disulphotetramine	-	-	T
609.	Thallic oxide	1314-32-5	XG 2975000	HR-3, T
610.	Thallium carbonate	6533-73-9	XG 4000000	HR-3, T
611.	Thallium sulphate	10031-59-1	XG 6600000	HR-3, T
612.	Thallos chloride	7791-12-0	XG 4200000	HR-3, T
613.	Thallos malonate	2757-18-8	OO 1770000	HR-3, T
614.	Thallos sulphate	7446-18-6	XG 6800000	HR-3, T
615.	Thiocarbazide	2231-57-4	-	-
616.	Thiocynamicacid, 2-(Benzothioazolyethio) methyl	21564-17-0	-	-
617.	Thiofamox	39196-18-4	-	-
618.	Thiometon	640-15-3	-	-
619.	Thionazin	-	-	-
620.	Thionyl chloride	7719-09-7	XM 5150000	HR-3, C
621.	Thiophenol	108-98-5	DC 0525000	-
622.	Thiosemicarbazide	79-19-6	VT 4200000	HR-3
623.	Thiourea (2-chloro-phenyl)	5344-82-1	-	-
624.	Thiourea (2-methyl phenyl)	-	-	-
625.	Tirpate (2,4-diemthyl 1-1,3-di-thiolane)	-	-	T
626.	Titanium powder	7440-32-6	XR 1702000	HR-3
627.	Titanium tetra-chloride	7550-45-0	XR 1925000	HR-3
628.	Toluene	108-88-3	XS 5250000	HR-3, T
629.	Toluene 2,4-di-isocyanate	584-84-9	CZ 6300000	HR-3, T, F
630.	Toluene 2,6-di isocyanate	584-84-9	CZ 6300000	-
631.	Trans 1 4-di chloro-butane	-	-	-
632.	Tri nitro anisole	-	-	T
633.	Tri (Cyclohexyl) methylstannyl 1,2,4 triazole)	-	-	-
634.	Tri(Cyclohexyl) stannyl-1H-1,2,3-triazole	-	-	-
635.	Triaminotrinitrobenzene	3058-38-0	-	HR-3

636.	Triamphos	1031-47-6	-	-
637.	Triazophos	24017-47-8	TF 5635000	HR-3
638.	Tribromophenol 2,4,6	118-79-6	SN 1225000	HR-3
639.	Trichloro naphthalene	1321-65-9	QK 4025000	HR-3
640.	Trichloro chloromethyl silane	1558-25-4	-	-
641.	Trichloroacetyl chloride	76-02-8	AO 7140000	HR-2
642.	Trichlorodichlorophenylsilane	-	-	-
643.	Trichloroethyl silane	-	-	-
644.	Trichloroethylene	79-01-6	KX 4550000	HR-3
645.	Trichloromethane sulphenyl chloride	594-42-3	PB 0370000	HR-3
646.	Trichloronate	327-98-0	-	-
647.	Trichlorophenol 2,3,6	933-75-5	SN 1300000	HR-3
648.	Trichlorophenol 2,4,5	95-95-4	SN 1400000	HR-3
649.	Trichlorophenyl silane	98-13-5	VV 6650000	HR-3
650.	Trichlorophon	-	-	-
651.	Triethoxy silane	998-30-1	VV 6682000	HR-3
652.	Triethylamine	121-44-8	YE 0175000	HR-2
653.	Triethylene melamine	-	-	-
654.	Trimethyl chlorosilane	75-77-4	VV 2710000	HR-3
655.	Trimethyl propane phosphite	824-11-3	-	-
656.	Trimethyl tin chloride	1066-45-1	-	-
657.	Trinitro aniline	-	-	-
658.	Trinitro benzene	99-35-4	DC 3850000	HR-3, T, E
659.	Trinitro benzoic acid	129-66-8	DI 0920000	HR-3, T, E
660.	Trinitro phenetole	-	-	T, E
661.	Trinitro-m-cresol	602-99-3	GP 3675000	HR-3, T, E
662.	Trinitrotoluene	118-96-7	XU 0180000	HR-3
663.	Tri orthocresyl phosphate	78-30-8	TD 0350000	-
664.	Triphenyl tin chloride	639-58-7	-	-
665.	Tris (2-chloroethyl) amine	-	-	-
666.	Turpentine	8006-64-2	YO 8400000	HR-3
667.	Uranium and its compounds	-	-	T
668.	Valinomycin	2001-95-8	YV 9468000	HR-3
669.	Vanadium pentoxide	1314-62-1	YW 2450000	HR-3, T
670.	Vinyl acetate monomer	108-05-4		
671.	Vinyl bromide	593-60-2	KU 8400000	HR-3
672.	Vinyl chloride	75-01-4	KU 9625000	HR-3, T
673.	Vinyl cyclohexane dioxide	106-87-6	RN 8640000	HR-3
674.	Vinyl fluoride	75-02-5	YZ 7351000	HR-3, T
675.	Vinyl norbornene	3048-64-4	RC 0350000	HR-1
676.	Vinyl toluene	25013-15-4	WL 5075000	T, F
677.	Vinylidene chloride	75-35-4	YZ 8061000	HR-3
678.	Warfarin	81-81-2	GN 4550000	T, E
679.	Warfarin Sodium	-	-	-
680.	Xylene dichloride	28347-13-9	-	-
681.	Xylidine	1300-73-8	ZE 8575000	HR-3, T
682.	Zinc dichloropentanitrile	1300-73-8	-	-
683.	Zinc phosphide	1314-84-7	ZH 4900000	HR-3
684.	Zirconium & compounds	7440-67-7	ZH 7070000	F

Abbreviations

CAS	--	Chemical Abstract Society
C	--	Corrosive
CMG	--	Crisis Management Group
E	--	Explosive
EPPR	--	Emergency Preparedness, Planning & Response
F	--	Flammable
HR	--	Hazard Rating
ID	--	Identity
MSIHC	--	Manufacture, storage & Import of Haz. Chemicals
O	--	Oxidizer
OSEP	--	On-site Emergency Plan
ORG	--	Operation Response Group
PLI	--	Public Liability Insurance
PVC	--	Polyvinyl chloride
PAS	--	Public Address System
R	--	Reactive
RTECS	--	Registry of Toxic effects of chemical substances
RTO	--	Road Transport Office
T	--	Toxic
UN	--	United Nations