

# Chapter 7

## Additional Studies

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### 7.1 Public Consultation

In response to the application, Madhya Pradesh Pollution Control Board (MSPCB) organized public consultation/hearing for the proposed “Environmental Impact Assessment Study and Preparation of Environmental Management Plan for Proposed Multi-product Special Economic Zone/Industrial Park at Saunsar Tehsil, Chhindwara, MP” as a part of Environmental Clearance from Ministry of Environment, Forest & Climate Change, Govt. of India.

The public hearing was held on 03/06/2019 at 12:00 noon at Public Works Department, Rest House, Saunsar, District Chhindwara, Madhya Pradesh for the proposed project.

Dr. Shrinivas Sharma, District Collector and Shri. Sunil Shrivastava, Regional Officer, MPSPCB, Chhindwara, presided over the public hearing and Shri. Sunil Srivastava convened and conducted the proceeding of the public hearing.

Details of public hearing is described in **Chapter 13**. Comparison of issues raised during public hearing and commitment made project proponent with time bound action plan is given in **Chapter 13**.

### 7.2 Risk Assessment

Risk assessment (RA) is the process of comparing the level of risk against a set of criteria as well as identifying major risk contributors. Risk Assessment study comprises identification of hazards, consequence analysis due to the accidental release of hazardous chemicals, mitigation measures to reduce risk and delineation of disaster management plan. The study requires a thorough knowledge of credible accident scenarios, failure probability, vulnerability of population and atmospheric conditions at the site. The consequence analysis includes the computation of damage distances for fire, explosion and toxic release scenarios. The mitigation measures are recommended based on the outcome of the risk quantification. However, this is a typical exercise for risk assessment to evaluate consequences due to any accidental leakage of common hazardous chemicals. Further, the industries that will finally come in the SEZ & IP shall need to carry out risk assessment study, for the type of chemicals, products being handled by them.

### 7.3 Objectives of RA Study

The main objective of this study is to evaluate the potential risk levels for personnel due to accidental release of hazardous chemicals from loss of containment scenarios in the proposed SEZ. Following are the objectives of the study:

- ◆ Hazard identification through computation of fire, explosion and toxicity indices (FETI)



and Special Process Hazard (SPH) factor. The GPH factor is computed according to presence of exothermic reactions and loading and unloading operations. The penalties due to each of these reactions / operations are summed up to compute GPH factor. Similarly, the SPH factor can be evaluated for the operations close to flammable range or operating pressures different from atmospheric pressure. Penalties of these operations for both factors can be obtained from Dow's FEI index form.

Fire and explosion index is then calculated as the product of Material Factor (MF) and Process Unit Hazard Factor. Degree of hazards based on FEI and TI is given in the following **Tables 7.1** and **7.2**.

**Table 7.1 Degree of Hazards Based on FEI**

FEI Range	Degree of Hazard
0 – 60	Light
61-96	Moderate
97 - 127	Intermediate
128 - 158	Heavy
159 and Above	Severe

**Table 7.2 Degree of Hazards Based on TI**

TI Range	Degree of Hazard
0 – 5	Light
5 – 10	Moderate
Above 10	High

Preventive and protective control measures are recommended based on degree of hazard. Therefore, FEI indicates the efforts to be taken to reduce risks for a particular unit. The fire and explosion indices computed for different hazardous chemicals storages are given in **Table 7.3**.

**Table 7.3 Fire, Explosion and Toxicity Indices**

Sr. No.	Unit Name	FEI	Nature of Hazard
<b>Fire &amp; Explosion Index</b>			
1	Diesel Storage Tank	91.77	Moderate
2	LPG Tank	83.79	Moderate
3	Hydrogen Cylinder	73.64	Moderate
<b>Toxicity Index</b>			
1	Chlorine Cylinder	34.78	High

## **7.5 Maximum Credible Accidents (MCA) Analysis**

The MCA analysis encompasses defined techniques to identify the hazards and compute the consequent effects in terms of damage distances due to heat radiation, vapour cloud explosion etc. A list of probable or potential accidents of the



major units in the facility arising due to use, storage and handling of the hazardous materials are examined to establish their credibility. Depending upon the effective hazardous attributes and their impact on the event, the maximum effect on the surrounding environment and the respective damage caused can be assessed. Flow chart of accidental release of hazardous chemicals is presented in **Figure 7.1**. Hazardous substances can cause damage on a large scale if they are accidentally released. The extent of the damage is dependent upon the nature of the release and the physical state of the material. In the present study, the consequences for flammable hazards are considered and the damages caused due to such releases are assessed at different combinations of weather conditions to simulate worst possible scenario.

The following steps are involved in the MCA analysis:

- ◆ Identification of potential hazardous sections and representative failure cases
- ◆ Visualisation of release scenarios with recourse to consequence analysis
- ◆ Damage distance computations for the released cases

The flammable substances on release may cause fire and/or explosion causing possible damage to the surrounding area. The extent of damage depends upon the nature of the release. The release of flammable materials and subsequent ignition result in heat radiation wave or pressure waves depending upon the flammability and its physical state. Damage distances due to release of hazardous materials depend on atmospheric stability and wind speed. It is important to visualize the consequence of the release of such substances and the damage caused to the surrounding areas. Computation of damage distances are carried out at various atmospheric stability conditions for various wind velocities and the result is tabulated. Pasquill-Giffard atmospheric stability classes with corresponding weather conditions are listed in **Table 7.4**. The probable worst case scenarios for the proposed units can be an accidental release from a small hole (25 mm or 50 mm in size) of process equipment, storage tank or from a pipeline. The hole sizes of 25 and 50 mm have been considered as per CPR 18 E (Guidelines for quantitative risk assessment - Purple Book) standards.

**Table 7.4 Pasquill – Giffard Atmospheric Stability**

Sr. No.	Stability Class	Weather Conditions
1.	A	Very unstable – sunny, light wind
2.	A/B	Unstable - as with A only less sunny or more windy
3.	B	Unstable - as with A/B only less sunny or more windy
4.	B/C	Moderately unstable – moderate sunny and moderate wind
5.	C	Moderately unstable – very windy / sunny or overcast / light wind
6.	C/D	Moderate unstable – moderate sun and high wind
7.	D	Neutral – little sun and high wind or overcast / windy night
8.	E	Moderately stable – less overcast and less windy night than
9.	F	Stable – night with moderate clouds and light / moderate wind
10.	G	Very stable – possibly fog

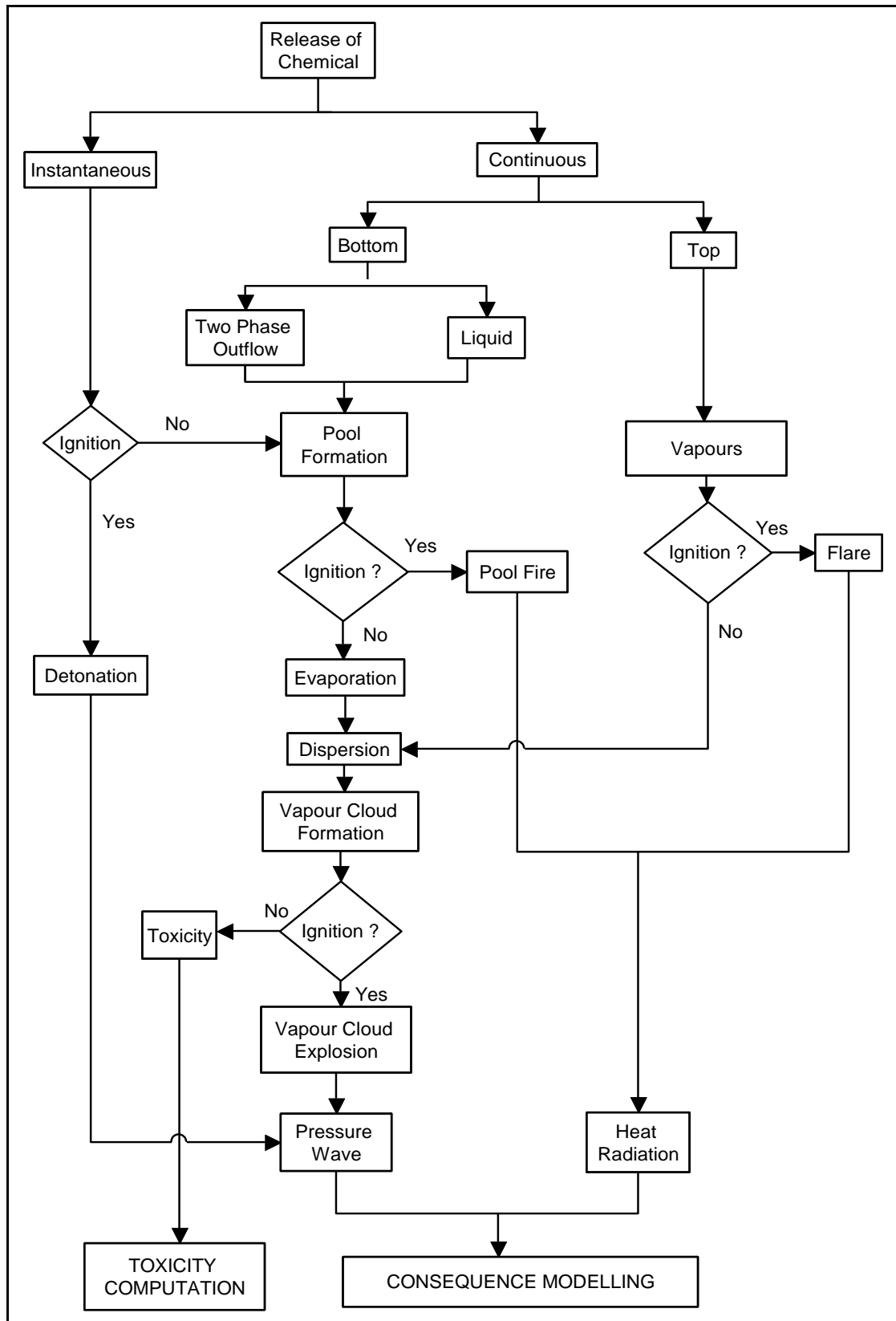


Figure 7.1 Accidental Release of Chemicals: A Scenario



## **7.5.1 Fire and Explosion Scenarios**

Fire can occur when flammable material, oxygen and sufficient ignition energy are available. Explosion depends on an atmosphere of a mixture of flammable material with oxygen. On process plants, this normally occurs as a result of a leakage or spillage. Depending on the physical properties of the material and the operating parameters, the combustion of material in a plant may take on a number of forms like jet fire, flash fire, pool fire and vapour cloud explosion.

### **Jet Fire**

Jet fires typically result from the combustion of a material as it is being released from a pressurized process unit. Ejection of flammable material from a vessel, pipe or pipe flange may give rise to a jet fire and in some instances the jet flame could have substantial “reach”. Depending on wind speed, the flame may tilt and impinge on pipeline, equipment or structures. The thermal radiation from these fires may cause injury to people or damage equipment some distance from the source of the flames.

### **Flash Fire**

A flash fire is the non-explosive combustion of a vapor cloud resulting from a release of flammable material into the open air. which after mixing with air, ignites. A flash fire results from the ignition of a released flammable cloud in which there is essentially no increase in combustion rate. The ignition source could be electric spark, a hot surface, and friction between moving parts of a machine or an open fire.

Flash fire may occur due to its less vapour temperature than ambient temperature. Hence, as a result of a spill, they are dispersed initially by the negative buoyancy of cold vapour and subsequently by the atmospheric turbulence. After the release and dispersion of the flammable fuel the resulting vapour cloud is ignited and when the fuel vapour is not mixed with sufficient air prior to ignition, it results in diffusion fire burning. Therefore the rate at which the fuel vapour and air are mixed together during combustion determines the rate of burning in the flash fire.

The main dangers of flash fire are radiation and direct flame contact. The size of the flammable cloud determines the area of possible direct flame contact effects. Radiation effects on a target depend on several factors including its distance from the flames, flame height, flame emissive power, local atmospheric transitivity and cloud size. Most of the time, flash combustion lasts for no more than a few seconds.

### **Pool Fire**

Releases of hydrocarbons in the absence of immediate ignition would form an unconfined pool, which on ignition would result in a pool fire. Radius of pool depends upon mass flow rate, ambient temperature, heat of vaporization of material released, vapour pressure of material released and discharge duration. Emissive power generated from the pool surface depends upon pool burning rate, heat of combustion of release material, atmospheric transitivity and area of pool.



The pool fire being either tank or bund fire consists of large volumes of flammable material at atmospheric pressure burning in an unconfined space. The flammable material will be consumed at the burning rate depending on factors including the prevailing winds. During combustion heat will be released in the form of thermal radiation. Temperature close to the flame centre will be high but will reduce rapidly to tolerable temperatures over a relatively short distance. Any plant building or persons close to the fire or within the intolerable zone will experience burn damage with the severity depending on the distance from the fire and the time exposed to the heat of the fire. In the event of a pool fire the flames will tilt according to the wind speed and direction. The flame length and tilt angle affect the distance of thermal radiation generated.

The consequence analysis in this section is mainly aimed at estimating the radiation that would be emitted in different scenarios of tank fires and pool fires. The results of the analysis have obvious implications in the design of installations intended to contain flammable liquids, as well as the distances to be maintained between different units of the plant.

### **Vapour Cloud Explosion**

The Vapour Cloud Explosion (VCE) begins with a release of a large quantity of flammable vaporizing liquid or gas from a storage tank, transport vessel or pipeline producing a dangerous overpressure. These explosions follow a well-determined pattern. There are basically four features, which must be present for an effective vapour cloud explosion to occur with an effective blast. These are:

- ◆ First, the release material must be flammable and at a suitable condition of temperature and pressure which depends on the chemical. The materials which come under this category, range from liquefied gases under pressure (e.g. butane, propane); ordinary flammable liquids (e.g. cyclohexane, naphtha) to non-liquefied flammable gases (e.g. ethylene, acetylene)
- ◆ Second, before the ignition, a cloud of sufficient size must have been formed. Normally ignition delays of few minutes are considered the most probable for generating the vapour cloud explosions
- ◆ Third, a sufficient amount of the cloud must be within the flammable range of the material to cause extensive overpressure
- ◆ Fourth, the flame speed determines the blast effects of the vapour cloud explosions, which can vary greatly
- ◆ The flammable content of a gas cloud is calculated by three-dimensional integration of the concentration profiles, which fall within the flammable limits. If the gas cloud ignites, two situations can occur, namely non-explosive combustion (flash fire) and explosive combustion (flash fire followed by explosion)

### **Lower and Upper Flammability Limit**

Flammability is a measure of the extent to which a vapor concentration of a fuel in a mixture ignites and propagates a flame. The upper flammability limit is



defined as the concentration of the most concentrated mixture that is flammable and the lower flammability limit as the concentration of the most dilute fuel-air or fuel-diluent mixture that is flammable. The concentration range lying between the lower and the upper limit is called as flammable range.

### 7.5.2 Models for the Calculation of Heat load and Shock Waves

If a flammable gas or liquid is released, damage resulting from heat radiation or explosion may occur on ignition. Models used in this study for the effects in the event of the ignition of a gas cloud will be discussed in succession. These models calculate the heat radiation or peak overpressure as a function of the distance from the torch, the ignited pool or gas cloud. The physical significance of the various heat loads is depicted in **Table 7.5**.

**Table 7.5 List of Damages Envisaged at Various Heat Loads**

Sr. No.	Heat loads (kW/m <sup>2</sup> )	Type of Damage Intensity	
		Damage to Equipment	Human Injury
1	37.5	Damage to process equipment	100% lethality in 1 min. 1% lethality in 10 sec
2	12.5	Minimum energy required to melt plastic tubing	1% lethality in 1 min
3	4.0	--	First degree burns, causes pain for exposure longer than 10 sec

Source: World Bank (1988). Technical Report No. 55: Techniques for Assessing Industrial Hazards, Washington, D.C: The World Bank.

### 7.5.3 Model for Pressure Wave

A pressure wave can be caused by gas cloud explosion. The following damage criteria are assumed as a result of the peak overpressure:

- ◆ 0.03 bar overpressure wave is taken as the limit for the occurrence of wounds as a result of flying fragments of glass
- ◆ Following assumptions are used to translate an explosion in terms of damage to the surrounding area:
  - Within the contour area of the exploding gas cloud, Casualties are due to burns or asphyxiation. Houses and buildings in this zone will be severely damaged
  - In houses with serious damage, it is assumed that one out of eight persons present will be killed as a result of the building collapse. Within the zone of a peak over pressure of 0.3 bar the risk of death in houses is  $0.9 \times 1/8 = 0.1125$ , and in the zone with a peak over pressure of 0.1 bar the probability of death is  $0.1 \times 1/8 = 0.0125$ , i.e. one out of eighty people will be killed

The significance of the peak over pressures 0.3 bar, 0.1 bar, 0.03 bar and 0.01 bar are depicted in **Table 7.6**.

**Table 7.6 Damage Criteria for Pressure Waves**

Human Injury		Structural Damage	
Peak Over Pressure (bar)	Type of Damage	Peak Over Pressure (bar)	Type of Damage
5-8	100% lethality	0.3	Heavy (90% damage)
3.5-5	50% lethality	0.1	Repairable (10% damage)
2-3	Threshold lethality	0.03	Damage of Glass
1.33-2	Severe lung damage	0.01	Crack of windows
1-1.33	50% Eardrum rupture	-	-
Source: Marshall, V.C. (1977) "How lethal are explosives and toxic escapes."			

#### 7.5.4 Computation of Damage Distances

Damage distances for the accidental release of hazardous materials have been computed at 2F, 3D and 5D weather conditions. In these conditions, 2, 3 and 5 are wind velocities in m/s and F and D are atmospheric stability classes. These weather conditions have been selected to accommodate worst case scenarios to get maximum effective distances. DNV based **PHAST 6.51**, software has been used to carry out consequence analysis. The computed damage distances for different hazardous chemical storages are given in **Tables 7.7 to 7.10**.

**Table 7.7 Damage Distances for Diesel Storage Tank**

Diesel Storage Tank							
Scenario	Source Strength (kg/sec)	Leak Size (mm)	Weather	Damage Distance (m)			
				Flash Fire at LFL conc.	Pool Fire		
					37.5 kW/m <sup>2</sup>	12.5 kW/m <sup>2</sup>	4.0 kW/m <sup>2</sup>
Leak	4.17	25	2F	6	12	23	34
			3D	6	13	24	34
			5D	6	13	26	35
	16.70	50	2F	7	-	25	44
			3D	8	-	27	46
			5D	7	-	29	47
Catastrophic	-	-	2F	18	-	48	101
			3D	19	-	49	108
			5D	19	-	52	117

Table 7.8 Damage Distances for LPG Cylinder

LPG Cylinder														
Scenario	Source Strength (kg/sec)	Leak Size (mm)	Weather	Damage Distance (m)										
				Jet Fire			Flash Fire at LFL conc.	VCE: Over pressure				BLEVE		
				37.5 kW/m <sup>2</sup>	12.5 kW/m <sup>2</sup>	4.0 kW/m <sup>2</sup>		37.5 kW/m <sup>2</sup>	0.3 bar	0.1 bar	0.01 bar	0.3 bar	0.1 bar	0.01 bar
Leak	0.34	25	2F	-	8	10	5	-	-	-	-	-	-	-
			3D	-	-	10	5	-	-	-	-	-	-	-
			5D	-	8	10	5	-	-	-	-	-	-	-
	1.38	50	2F	-	17	22	11	-	23	27	58	-	-	-
			3D	6	17	22	10	-	23	27	56	-	-	-
			5D	14	18	22	9	-	13	16	43	-	-	-
Catastrophic	-	-	2F	-	-	-	28	-	68	117	577	21	39	268
			3D	-	-	-	38	-	73	116	562	21	39	268
			5D	-	-	-	58	-	88	124	574	21	39	268

**Table 7.9 Damage Distances for Hydrogen Cylinder**

Hydrogen Cylinder						
Scenario	Source Strength (kg/sec)	Leak Size (mm)	Weather	Damage Distance (m)		
				VCE: Over pressure		
				0.3 bar	0.1 bar	0.01 bar
Explosion	-	-	2F	28	55	318
			3D	28	55	318
			5D	28	55	318

**Table 7.10 Damage Distances for Chlorine Storage Tank**

Chlorine Storage Tank				
Scenario	Source Strength (kg/sec)	Leak Size (mm)	Weather	Damage Distance (m)
				IDLH conc. distance
Leak	11.60	25	2F	345
			3D	289
			5D	253
	46.40	50	2F	725
			3D	585
			5D	475
Catastrophic	-	-	2F	436
			3D	448
			5D	472

## 7.6 Risk Mitigation Measures

The risk mitigation measures to minimize occurrence of hazardous event for project site have been incorporated in this section. Specific recommendations for particular facility as well as general recommendation are detailed

### 7.6.1 Specific Recommendations

Following are specific recommendations based on the outcome of MCA analysis:

#### 7.6.1.1 Flammable Oil Storages

Following are mitigation measures for the storage of flammable materials like diesel etc.

- ◆ Shut off and isolation valves should be easily approachable in emergencies
- ◆ Escape routes should be provided at strategic locations and should be easily accessible
- ◆ Necked flame, welding, hot surfaces or any other ignition source should not be permitted in storage area
- ◆ Gas and hydrocarbon detector should be provided in storage area to detect leakage

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- ◆ The fire proofing material/coating resistant to weather effects such as chalking and erosion having adequate adhesion, strength and durability should be applied
- ◆ The separation /space between the storage tanks in the storage areas should be according to the OISD guidelines and sufficient to escape in case of any emergency
- ◆ The inspection and checking of fire fighting facilities should be done periodically
- ◆ All storage facility have been provided with water spray cooling system and foam pourer system
- ◆ A wind direction pointer should be installed at storage site, so that in an emergency the wind direction can be directly seen and downwind population cautioned
- ◆ Signboards including phone numbers, no smoking signs and type of emergencies should be increased to cover all the locations of the plant

#### **7.6.1.2 Chlorine**

- ◆ To prevent the large release of chlorine, monitoring and feedback facilities for early detection leaks and emergency shutdown shall be provided
- ◆ There should be facilities in the form of shed or water curtains, as shown in **Figures 7.2** and **7.3**, for absorption of chlorine released during an emergency as chlorine is highly soluble in water
- ◆ Flow control valves at key points should be installed to prevent excessive chlorine flow from the tonner with multiple safety levels
- ◆ Immediate actions needs to be taken for evacuation of all personnel in case of accidental release of chlorine
- ◆ Eye wash stations and emergency shower stations should be provided at appropriate locations especially in the vicinity of Chlorine storage and dosing facilities
- ◆ The stand-by chlorine tonners shall be kept/stored at isolated covered warehouse at safe distance. It shall be provided with sufficient high(about 6 m) roof ventilation, chlorine detection and water spray system inside storage facility
- ◆ Conduct awareness programmes, regarding precautions to be taken in case of chlorine exposure, on regular basis for educating workers and villagers around the project. The consequences of possible health hazards should also be included in awareness programme
- ◆ Chlorine gas unit should be stored close to the point of application, convenient for truck loading and safe container handling

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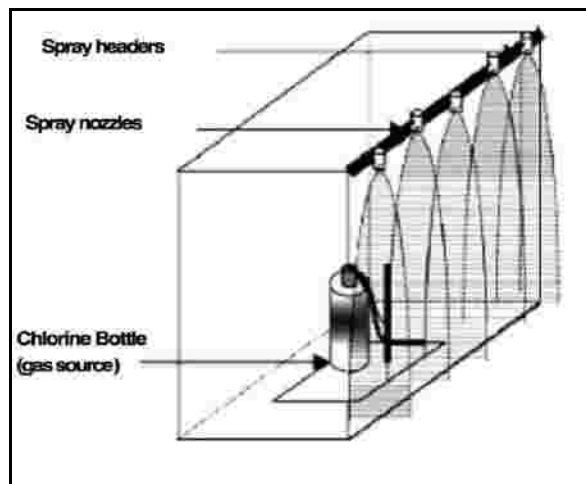
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- ◆ Adequate arrangements for air circulation and cross ventilation should be made in the rooms
- ◆ Chlorine container storage rooms should have restricted entry for workers
- ◆ Storage rooms for chlorine should be provided with chlorine gas alarm device
- ◆ Provision should be made for emergency disposal of chlorine from leaking containers by providing recommended alkaline solutions



**Figure 7.2 Shed for Chlorine Tonner**



**Figure 7.3 Water Curtain for Chlorine Tonner**

**7.6.1.3 Hydrogen**

Following mitigative measures should be implemented to avoid accidental release of hydrogen gas.



- ◆ Preventive measures against fires involving hydrogen should include automatic or manual process shutdown systems, sprinklers, deluge systems, water spray systems, and dry-chemical extinguishing systems.
- ◆ Hydrogen fires normally are not extinguished until the supply of hydrogen is shut off because of the danger of explosion. Hence, large quantities of water should be sprayed on adjacent equipment to cool the equipment and prevent its involvement in any fire that occurs
- ◆ Small hydrogen fires should be extinguished by dry chemical extinguishers or with carbon dioxide, nitrogen, and steam
- ◆ Water spray systems should be provided for hydrogen storage containers, grouped piping, and pumps where potential fire hazard exists
- ◆ Hydrogen gas is colourless and odourless and normally not detectable by human senses. Hence, a combination of portable and fixed installation hydrogen sensors should be used to detect hydrogen.

#### **7.6.1.4 Pipeline**

- ◆ All process piping should be complied with ASME B31.3 guidelines.
- ◆ Inspection of piping should be carried out at regular interval to assess the corrosion / erosion in the pipelines.
- ◆ Pressure/ flow indication, hydrocarbon / smoke / toxic gas detectors should be available for early detection of any leakage and quick response.
- ◆ Overhead power lines should not be allowed to cross directly over the process piping.
- ◆ Gasket used in piping should have sufficient strength to resist crushing under the applied load and defy rupture under pressure. Gaskets should be chemically resist to fluid under all temperatures and pressures conditions.
- ◆ Selection of the valve type for process piping should be based on service experience. For example - Ball, Globe, Poppet vales should be used for high pressure and temperature pipelines.
- ◆ Proper lubricant should be used for threads of bolts and nuts during maintenance. Low or no chloride content lubricants should be used.

Leakage detected in welded joints shall be repaired by draining, repair welding, non-destructively examining in accordance with original requirements, and re-tested to the original test pressure.

#### **7.6.1.5 Relief Valve Vent Fire**

Following are the mitigation measures to tackle relief valve vent fire

- ◆ Open drain line from the vent line to make sure that all the oil is drained



- ◆ Cut stream to the vent
- ◆ If there is evidence that a relief valve has opened and will not re-set, proceed to take the equipment out of service and depressurise
- ◆ If liquid hydrocarbons overflow through the vent, apply high pressure water fog working upwards from the lowest flames
- ◆ Apply water spray to the entire structure engulfed in flame at point of advantage around the base of the structure to prevent heat damage to structural members

#### **7.6.1.6 Control Room**

Following are the facilities to be provided at the control room to tackle the emergency scenarios:

- ◆ Fire Detection System should be installed in the control room
- ◆ VHF base station with a range of 25 km and VHF handsets of range 5 km should be installed for ready communication in emergency
- ◆ Public address system should be installed to ease the communication to various corners of the site
- ◆ The duties and responsibilities of different co-ordinators of Onsite Disaster Management Plan should be displayed in the Emergency Control Room.

#### **7.6.2 General Recommendations**

Following are general recommendations to be followed:

- ◆ Surrounding population (includes all strata of society) should be made aware of the safety precautions to be taken in the event of any mishap within the plant. This can effectively be done by conducting the safety training programs
- ◆ Buildings possibly subjected to external blast waves should be made of reinforced concrete. The windows should be made of blast resistant glass with strong frame
- ◆ Air intakes should not be placed at grounds level, to prevent combustible dense gas from entering into building
- ◆ Buildings possibly subjected to internal explosion should have a strong frame structure supporting roof and intermediate floors. The walls should be open. If a solid wall is needed, use low weight wall panels to facilitate early explosion venting
- ◆ Safety escape routes should be provided at strategic locations and should be easily accessible
- ◆ Grating and vent panels should be provided to minimize domino effects
- ◆ Critical switches and alarm should be always kept in line



- ◆ Fire extinguishers should be tested periodically and should be always kept in operational mode
- ◆ Fire detectors should be installed near those units which handle large amount of explosive material and operate under high temperature and pressure
- ◆ Periodical mock drills should be conducted so as to check the alertness and efficiency of the DMP and EPP and records should be maintained
- ◆ Proper training should be given to staff to handle any emergency situation
- ◆ Signboard including phone numbers, no smoking signs and type of emergencies should be installed at various locations

### **7.6.2.1 Fire Protection Systems**

The typical fire fighting system for the various facilities described under this project is outlined. The exact details of the fire fighting systems and capabilities to be installed and developed should be finalised after the completion of detailed engineering in consultation with the concerned process and equipment vendors. It is also to be understood that not all facilities described below will be applicable for every installation. The outline of the fire system proposed is described below.

Fire protection system shall be designed in accordance with the requirements of OISD, NFPA standards, design requirements and safe engineering practices and will have full capability for early detection and suppression of fire. The system will primarily consist of:

- ◆ Hydrant system
- ◆ Foam protection system
- ◆ Deluge sprinkler system
- ◆ Portable fire extinguisher
- ◆ Fire detection and alarm system

#### **Hydrant System:**

The system should essentially consists of firewater storage, pumping, system pressurisation and all inter connected pipe work and auxiliary fire fighting appliances. The water storage and pumping capacity and other features of this system should be finalised.

Adequate number of diesel engine driven / electric motor driven fire water pumps should be provided. The pumps should automatically start in the event of drop in header pressure. The actuation should be through pressure switches, the setting of which should be staggered to achieve sequential starting of the pumps to meet the system demand. When power supply is available, the electric motor driven pump should start first and in case of further pressure drop the engine driven pump should start. However when electric power is not available, the engine driven pump should cut-in depending on the system demand. The pumping capacity would meet the



simultaneous water demand for foam protection of one oil tank, and supplementary foam hose stream in the oil dyke area, which is the maximum water demand in a single occurrence of fire.

The outdoor hydrant system should be provided all over the plant for exterior protection. The hydrant mains should be laid underground. Hose houses, complete with all accessories, should be provided at suitable intervals. The overall plant should be divided in several fire zones, where the fire fighting action can be pursued effectively. The pressurised main should also be connected to Sprinkler/emulsifier System for protection of transformers and Fuel Oil storage tanks.

### **Sprinkler System:**

Automatic deluge sprinkler system should be provided for the protection of power transformer. An array of spray nozzles should be provided all around the protected area. The nozzles should be connected to the automatic deluge valve. A set of heat or smoke detectors, located in the area should sense the fire. Deluge valve should automatically open once two independent detectors sense fire.

Manually initiated water spray system should be provided for exposure protection of oil storage tanks, so that when one tank is on fire, the other tank can be cooled to guard against exposure heating. Pressurized water supply to all sprinkler systems should be tapped from the outdoor hydrant main.

### **Portable Fire Extinguisher:**

Besides, fire hydrant arrangement, portable fire extinguishers of suitable categories should be placed at control rooms, electrical switchgear room and various utility buildings for immediate use in the event of fire. Three different kinds of extinguishers i.e. foam, CO<sub>2</sub> and multipurpose dry chemical (MPDC) should be provided. Each type of extinguisher has its own characteristic to fight a particular class of fire. The size and type of extinguishers should be decided as per recommendations of NFPA and should be placed in convenient accessible locations.

#### **7.6.2.2 Electricity Hazard**

- ◆ All electrical equipment shall be provided with proper earthing. Earthed electrode shall periodically tested and maintained
- ◆ Emergency lighting shall be available at all critical locations including the operator's room to carry out safe shut down of the plant, ready identification of fire fighting facilities such as fire water pumps and fire alarm stations
- ◆ All electrical equipment shall be free from carbon dust, chemical deposits, and grease
- ◆ Use of approved insulated tools, rubber mats, shockproof gloves and boots, tester, fuse tongs, discharge rod, safety belt, hand lamp, wooden or insulated ladder and not wearing metal ring and chain
- ◆ Flame and shock detectors and central fire annunciation system for fire safety should be provided



- ◆ Temperature sensitive alarm and protective relays to make alert and disconnect equipment before overheating
- ◆ Danger from excess current due to overload or short circuit should be prevented by providing fuses, circuit breakers and thermal protection
- ◆ Carbon dioxide, halon or dry chemical fire extinguishers are to be used to extinguish electrical fires

### **7.6.2.3 Personal Protective Equipment (PPE)**

Personal Protective Equipment (PPE) provides additional protection to workers exposed to workplace hazards in conjunction with other facility controls and safety systems. The PPE is considered to be a last resort that is above and beyond the other facility controls and provides the worker with an extra level of personal protection. The **Table 7.11** presents general examples of occupational hazards and types of PPE available for different purposes. Recommended measures for use of PPE in the workplace include:

- ◆ Active use of PPE if alternative technologies, work plans or procedures cannot eliminate or sufficiently reduce a hazard or exposure
- ◆ Identification and provision of appropriate PPE that offers adequate protection to the worker, co-workers, and occasional visitors, without incurring unnecessary inconvenience to the individual
- ◆ Proper maintenance of PPE, including cleaning when dirty and replacement when damaged or worn out. Proper use of PPE should be part of the recurrent training programs for employees
- ◆ Selection of PPE should be based on the type of hazards to be handled

**Table 7.11 Details of Personal Protective Equipment**

<b>Objective</b>	<b>Workplace Hazards</b>	<b>Suggested PPE</b>
Eye and face protection	Flying particles, molten metal, liquid chemicals, gases or vapours, light radiation	Safety glasses with side-shields, protective shades, etc.
Head protection	Falling objects, inadequate height clearance, and overhead power cords	Plastic helmets with top and side impact protection
Hearing protection	Noise, ultra-sound	Hearing protectors (ear plugs or ear muffs)
Foot protection	Falling or rolling objects, points objects. Corrosive or hot liquids	Safety shoes and boots for protection against moving and falling objects, liquids and chemicals
Hand protection	Hazardous materials, cuts or lacerations, vibrations, extreme temperatures	Gloves made of rubber or synthetic material (Neoprene), leather, steel, insulation materials, etc.
Respiratory protection	Dust, fogs, fumes, mists, gases, smokes, vapours	Facemasks with appropriate filters for dust removal and air purification (chemical, mists,

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Objective	Workplace Hazards	Suggested PPE
		vapours and gases). Single or multi-gas personal monitors, if available
	Oxygen deficiency	Portable or supplied air (fixed lines). Onsite rescue equipment
Body / leg protection	Extreme temperatures, hazardous materials, biological agents, cutting and laceration	Insulating clothing, body suits, aprons etc. of appropriate materials

#### 7.6.2.4 Occupational Health Hazards

Following are measures to tackle occupational health hazards:

- ◆ Detect the possible onset of an occupational disease
- ◆ Monitor personal exposure with the help of biological monitoring
- ◆ Check the effectiveness of preventive and control measures on regular basis
- ◆ Where there is potential for exposure to substances poisonous by ingestion, suitable arrangements are to be made for provision of clean eating areas where workers are not exposed to the hazardous or noxious substances
- ◆ Adequate supplies of potable drinking water should be provided from a fountain with an upward jet or with a sanitary means of collecting the water for the purposes of drinking
- ◆ Water supplied to areas of food preparation or for the purpose of personal hygiene (washing or bathing) should meet drinking water quality standards
- ◆ Periodic medical hearing checks should be performed on workers exposed to high noise levels
- ◆ Preventing spread of communicable diseases through food handlers
- ◆ Provisions should be made to provide orientation training to all new employees to ensure they are apprised of the basic site rules of work at / on the site and of personal protection and preventing injury to fellow employees
- ◆ Contractors that have the technical capability to manage the occupational health and safety issues of their employees should be hired, extending the application of the hazard management activities through formal procurement agreements
- ◆ Two ambulances and full fledged first aid treatment facilities should be available at all times

#### 7.6.2.5 Falling Objects

- ◆ Provide safety helmets to protect workers below against falling objects





### **7.7.2 Causes of Disaster**

Various causes that can lead to a disaster are as follows:

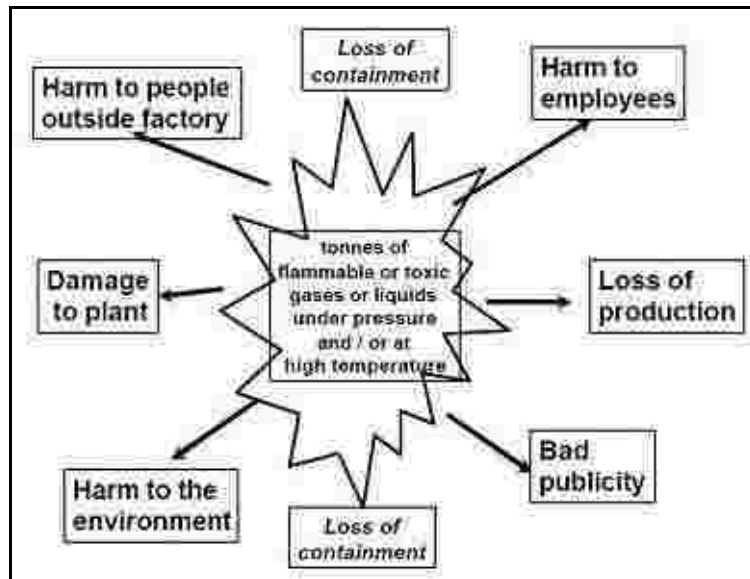
- ◆ In-plant emergencies like fire, explosion or toxic release due to deficiencies in operations, maintenance and equipment failure occurring due to improper design
- ◆ Natural calamities like flood, earth quake, cyclone, storm, cloud burst and lightning
- ◆ Deliberate acts of human beings leading to sabotage and riots. Projectile hitting the facility can also lead to disaster

### **7.7.3 Objectives of Disaster Management Plan**

The purpose of DMP is to give an approach to detail organizational responsibilities, actions, reporting requirements and support resources available to ensure effective and timely management of emergencies associated to production and operations in the site. The overall objectives of DMP are to:

- ◆ Ensure safety of people, protect the environment and safeguard commercial considerations
- ◆ Immediate response to emergency scene with effective communication network and organized procedures
- ◆ Obtain early warning of emergency conditions so as to prevent impact on personnel, assets and environment
- ◆ Safeguard personnel to prevent injuries or loss of life by protecting personnel from the hazard and evacuating personnel from an installation when necessary
- ◆ Minimize the impact of the event on the installation and the environment, by:
  - Minimizing the hazard as far as possible
  - Minimizing the potential for escalation
  - Minimizing accidental release scenarios

The **Figure 7.4** presents the consequences due to the loss of containment from the process.



**Figure 7.4 Effects due to Loss of Containment from the Process**

#### **7.7.4 Different Phases of Disaster**

##### **Warning Phase:**

Many disasters are preceded by some sort of warning. For example, with the aid of satellites and network of weather stations, many meteorological disasters like cyclones, hurricanes and floods can be predicted and preventive actions can be taken to eliminate / reduce their effect.

##### **Period of Impact Phase:**

This is the period when the disaster actually strikes and very little can be done to reduce the effects of disaster. The period of impact may last for a few seconds (like fire, dust explosion, gas leak) or may prolong for days. This is the time to bring the action plan in force. The coordinators in organization structure will perform the responsibilities assigned to them. Needless to emphasize that prompt and well organised rescue operations can save valuable lives.

##### **Rescue Phase:**

The rescue phase starts immediately after the impact and continues until necessary measures are taken to rush help and combat with the situation.

##### **Relief Phase:**

In this phase, apart from organization and relief measures internally, depending on severity of the disaster, external help should also be summoned to provide relief measures like evacuations to a safe place and providing medical help, food, shelter clothing etc. This phase will continue till normalcy is restored.

##### **Rehabilitation Phase:**

This is the final and the longest phase. It includes rebuilding damaged property, estimating the damages and payment of compensation. The revenue or insurance authorities can be contacted to assess the damage and quantum of compensation to be paid.



### **7.7.5 Key Elements**

Following are the key elements of Disaster Management Plan:

- ◆ Basis of the plan
- ◆ Accident/emergency response planning procedures
- ◆ On-site Disaster Management Plan
- ◆ Off-site Disaster Management Plan

#### **7.7.5.1 Basis of the Plan**

Identification and assessment of hazards are crucial for site emergency planning and it is therefore necessary to identify what emergencies could arise in and around the proposed facility.

#### **7.7.5.2 Emergency Planning and Response Procedures**

Emergency rarely occurs; therefore activities during emergencies require coordination of higher order than for planned activities carried out according to fixed time schedule or on a routine day-to-day basis. To effectively coordinate emergency response activities, an organizational approach to planning is required. The important areas of emergency planning are organization and responsibilities, procedures, communication, transport, resource requirements and control centre. Offsite emergency requires additional planning over and above those considered for onsite plans which should be properly integrated to ensure better coordination.

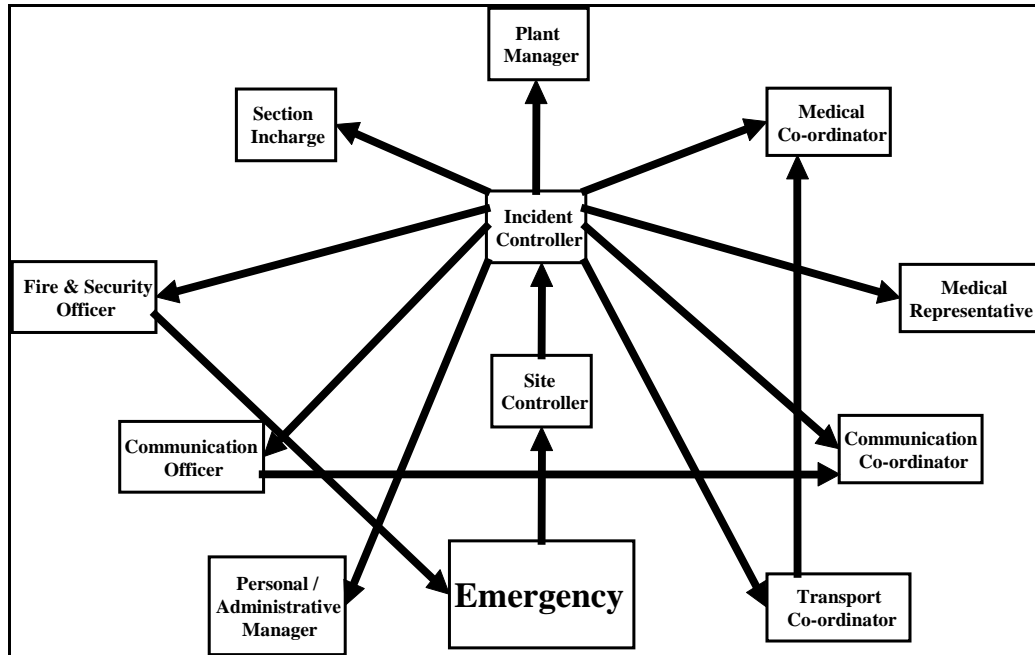
The emergency planning includes anticipatory action for emergency, maintenance and streamlining of emergency preparedness, and ability for sudden mobilization of all forces to meet any calamity.

### **7.7.6 On-site Disaster Management Plan**

Onsite disaster is an unpleasant event of a magnitude which may cause extensive damage to life and property due to plant emergencies resulting from deficiencies in operation, maintenance, design and human error, natural calamities like flood, cyclone and earthquake; and deliberate and other acts of man like sabotage and riot. The purpose for the on-site disaster management plan is:

- ◆ To protect persons and property of processing equipments in case of all kinds of emergencies
- ◆ To inform in-plant and surrounding people about emergency if it is likely to adversely affect them
- ◆ To inform project site authorities and helping agencies like doctors, hospitals, fire, police transport in advance and also at the time of actual happening
- ◆ To identify, assess, foresee and work out various kinds of possible hazards, their places, potential and damaging capacity. It can be possible to review, revise, redesign, replace or reconstruct the process, plant vessels and control measures, if so assessed.

In order to handle emergency situations, an organizational chart showing the involvement of key personnel of the project site and coordination among them are shown in **Figure 7.5**.



**Figure 7.5 Onsite DMP - Disaster Control / Management System**

Following fire protection facilities should be available to combat the emergencies. The single facility or combination of the facilities can be applied depending on the level of the emergency

- ◆ Fire Water System
- ◆ Carbon Dioxide System
- ◆ Foam System
- ◆ First Aid Fire Fighting Equipment
- ◆ Mobile Fire Fighting Equipment
- ◆ Gas / Fire Detection and Alarm System.

**Before Crisis:**

The following activities should always be available to tackle any kind of emergency effectively

- ◆ A detailed plan of the project site highlighting the probable areas of various hazards which may lead to like fire, explosion, toxic releases. The location of assembly points, fire station or equipments room, telephone room, first aid or ambulance room, emergency control room, main gate, emergency gates, normal wind direction, outside fire station, hospital and other services. Their distances from proposed activities should also be mentioned.

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- ◆ The fire protection equipment shall be kept in good operating condition at all the time and it should be periodically tested for people functioning logged for record and corrective action.
- ◆ The fire fighting training shall be provided to all officers, truck drivers and other employees who are likely to be present at the project site
- ◆ There should be regular mock fire drills once a month and a record of such drills shall be maintained
- ◆ Every employee or authorized person working at the project site shall be familiarized with the fire alarm signal and shall know the location of fire alarm point nearest to place of work
- ◆ Identification key plant personnel who can take immediate actions in case of any emergency
- ◆ Risk associated with each operation and inform about it to all personnel involved

#### **During Crisis:**

Following actions need to be taken during the emergency

- ◆ Monitor the extent of the emergency and evacuate the project site accordingly
- ◆ Perform no other duties that may interfere with their primary responsibilities
- ◆ Notify the attendant if they experience any warning signs or symptoms of exposures or detect a dangerous condition
- ◆ Exit the permit space when instructed by attendant
- ◆ Reporting procedure for the person seeing the accident is
- ◆ Will dial the nearest telephone
- ◆ Will state his name and exact location of emergency
- ◆ The person will remain near the accident location to guide the arriving emergency crew
- ◆ The person can also activate the nearest available push button type instrument which will automatically sound an alarm in fire control room indicating the location of fire

#### **After Crisis:**

Following actions should be taken after crisis:

- ◆ Report injuries or blood or body fluid exposures to the appropriate supervisor immediately
- ◆ Wash wounds and skin sites that have been affected with soap and water



- ◆ Workers should be seen as soon as possible by a health professional
- ◆ Provide information to the relevant public authority and community including other closely located facilities regarding the nature of hazard and emergency procedure in event of major accident
- ◆ Record and discuss the lessons learned and the analysis of major accidents and misses with employees and employee representative

#### **7.7.6.1 Emergency Organization Structure**

Following are the key personnel and the process units in the plant which are responsible to take appropriate actions during emergencies

##### **Site Main Controller:**

President/SSM - (the senior most functionary available at site).

The President/Site Shift Manager (SSM) will be designated as the Site Main Controller at the time of an emergency and report at the Emergency Control Centre (ECC) which will be the Primary Command Post. He will be the Chief Co-ordinator and take overall command of the emergency management. He will be assisted by other co-ordinators as designated for various functions. The Site Main Controller will provide all decisions support and resources support to the Site Incident Controller at the incident site for initiating appropriate actions for emergency control. He will also liaise with mutual aid members and all outside agencies including Local Crisis Management Committee, District Contingency Plan Committee (District Collector), Police, Civil Defence, Factories Inspectorate, etc. to seek assistance/help and provide necessary information to them.

Normally, the SSM is available on round the clock duty at the site to co-ordinate overall manufacturing activities and management of emergency. In the event of an emergency, the Site Shift Manager (SSM) will assume the charge of the Site Main Controller till the Executive or the President arrives.

##### **Site Incident Controller:**

AVP/GM/DGM/Sr. Mgr. / Mgr. - (next lower to the senior most functionary of operation available at site).

The next lower to senior most functionary of operation available at site will be Site Incident Controller. On receiving information about the emergency, he will report at the incident site and take over from the Deputy Incident Controller (shift-in-charge). He will take overall command of the emergency control operation as the Site Incident Controller and will take decisions in co-ordinations with Site Main Controller for controlling emergency situation. He will co-ordinate with all the key personnel, fire fighting and rescue team leaders and other support services and provide necessary information and advice to them for effectively managing control measures / actions.

##### **Deputy Incident Controller:**

The shift-in-charge is available on round the clock duty in every plant. He is competent for plant operation and responsible for all activities related to production / maintenance including prevention / control of incidents and handling emergencies (if



any) in the plant. He will be designated as the Deputy Incident Controller. In the event of an emergency in the plant, he will immediately assume the charge of the site Incident Controller and take decisions in consultation with the Site Main Controller. To initiate immediate actions for controlling/mitigating emergency situation at the incident site till the Site Incident Controller (next senior personnel in production) arrives.

**Co-ordinators:**

(The senior most functionaries available in the various divisions)

The senior most functionaries available at site in the respective services will be the co-ordinators at the time of an emergency. They will report at the Emergency Control Centre (ECC), known as the Primary Command Post, unless and otherwise instructed by the Chief Co-ordinator (The Site Main Controller). They will assist and advise the Site Main Controller in all matters for effectively managing control measures and mitigating operations.

**Emergency Control Centre (ECC) (The Primary Command Post):**

In the event of an emergency, SSM Office will be designated as the Emergency Control Centre, which will be known as the Primary command Post. If, the SSM office is likely to be affected due to unfavourable wind direction or any other reasons, the Emergency Control Centre will be shifted to a room which will be having necessary facilities to connect communication links as provided in the SSM Office.

**Field Command Post (Incident Site):**

An emergency requires co-ordination of numerous activities beyond spill containment and countermeasure efforts from a safe location at the incident scene. The Field Command Post will be established in the "Cold Zone" for staging deployed apparatus, resources and equipment with means of communications and manning to effectively co-ordinate control efforts.

**Assembly Points:**

Assembly points shall be set up farthest from the location of likely hazardous events, where pre-designed persons from the works, contractors and visitors would assemble in case of emergency. Up-to-date list of pre-designed employees shift wise must be available at these points so that roll call could be taken. Pre-designated persons would take charge of these points and mark presence as the people come into it. Two alternate locations for safe assembly points should be earmarked at all the operating plants. These locations are designated for assembling non-essential workers, visitors, and other persons who are not required in the plant site at the time of emergency but they are to be moved to safer places. These locations have been provided with sign boards displaying "Assembly Points" for easy identification

The persons required to be assembled at the assembly point should choose safer assembly point out of the two, considering the wind direction at that time. The plant control room will also announce the same on the plant PA system, if possible. The person assembled at the assembly point shall follow the instruction for evacuation



of the plant area and move to safe locations as directed. They should move in the cross wind direction or up-wind direction, whichever is more safer

#### **7.7.6.2 Role and Responsibilities of Key Personnel**

Roles and responsibilities of various key personnel are outline in this section.

##### **Site Main Controller:**

The Site Main Controller will be the chief co-ordinator and shall be assisted by other co-ordinators (senior most functionaries in the respective divisions). He will take overall command of the emergency management and his duties and the responsibilities are as below:

- ◆ Report at the Emergency Control Centre as soon as he gets information about the emergency at site and will assume overall responsibility if taking decisions and directing actions as necessary for mitigating the situation and managing the emergency effectively with due consideration and priorities for personnel safety, safety to the company's property and the environment
- ◆ Assess the magnitude of the situation in co-ordination with the Incident Controller / Dy. Incident Controller and decide whether major emergency exists or is likely to develop, requiring external assistance. Accordingly, he will decide to inform Local/District emergency Chief and other emergency control groups for help and the nature of help required including assistance from mutual aid members and declare on-site emergency
- ◆ Decide the safe route of entry for external assistance/help to reach at site of the incident considering wind direction and the place of the incident and also the place of reporting such assistance. He will also direct the security to guide them properly
- ◆ Ensure that the key personnel and co-ordinators are called in
- ◆ Ensure that all non-essential workers, visitors, contractors are safely moved to assembly points and direct for search and rescue operation within the affected areas, if necessary
- ◆ Be in constant communication with the Site Incident Controller to continuously review and assess the situation and possible developments
- ◆ Direct actions for safe shut down of plant(s) or section of the plant and evacuation of plant personnel and other necessary action is in consultation with the other co-ordinators
- ◆ Exercise direct operational control over areas in the complex other than those affected in consultation with other co-ordinators
- ◆ To liaise with the local meteorological office to receive early notification of changes in wind direction and weather conditions

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- ◆ Liaise with the senior officials of Police, Fire Brigade, Medical and Factories Inspectorate and pass on information on possible effects to the surrounding areas outside the factory premises and necessity of evacuating the area and moving the people to safe places
- ◆ Liaise with various co-ordinators to ensure that various teams are functioning well, casualties are receiving attention and traffic movement within the works is well regulated
- ◆ Arrange for a log of the emergency to be maintained in the Primary Command Post
- ◆ Release authorized information to press through the media co-ordinator
- ◆ Control rehabilitation of the affected persons and the affected areas after cessation of the emergency

#### **Site Incident Controller:**

The Site Incident Controller is the key personnel for operations function reporting at the incident site and will take the overall command of actions for emergency control operation on his arrival at the incident site. He will be supported by other key personnel representing various emergency services and initiate emergency control actions under the direction of the Site Main Controller (Primary Command Post). The duties and the responsibilities of the Site Incident Controller include the following:

- ◆ Report at the incident site immediately after getting information about an emergency. Upon his arrival at the site, he will assess the scale of emergency in consultation with the Deputy Incident Controller and evaluate, if a major emergency exists or is likely to develop and inform Emergency Control Centre (primary Command Post) accordingly asking for assistance and indicating kind of support needed
- ◆ Take overall control of handling the emergency at site and take action for isolation of source of containment loss to the extent feasible. Simultaneously, in case of fire organize appropriate fire response in co-ordination with Key personnel (Fire & Safety) to get the situation under control and to prevent it's escalation
- ◆ Set up communication point (Field Command Post) and establish contact with Site Main Controller (Primary Command Post) and keep him informed about the development
- ◆ Keep on assessing the emergency situation at the site and communicate to the Site Main Controller (Primary Command Post) and keep him informed about the development
- ◆ Co-ordinate the activities of other key personnel reporting at the Field Command Post, under his overall command
- ◆ Direct all operation with the affected areas giving due priorities for safety of personnel and to minimize damage to environment, plant and property

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- ◆ Provide advice and information to Fire fighting and rescue personnel, external fire services and other emergency services/teams as and when they arrive at the incident site and co-ordinate with them for effective control actions
- ◆ Ensure that all non-essential workers and staff within the affected area are evacuated to appropriate assembly points and that areas are searched for casualties
- ◆ Organize rescue teams for search of casualties in the affected areas (if any) and send them to safe areas / medical centre for first aid and medical relief
- ◆ Seek additional support and resources as may be needed through Primary Command Post
- ◆ Send decision support from the Primary Command Post for decision such as precautionary shut down of neighbouring facilities, precautionary evacuation of people in the neighbouring facilities, activating mutual aid plan, etc.
- ◆ Be in constant liaison with the Site Main Controller and keep him informed about the situation at the incident site
- ◆ Preserve all evidences so as to facilitate any inquiry into the cause and circumstances, which caused or escalated the emergency (to arrange photographs, video, etc.)
- ◆ Arrange for head count after the emergency is over with respect to the personnel on duty in the affected areas

#### **Deputy Incident Controller:**

Normally, the Shift-in-charge of a plant being always available at the plant site and well aware of the plant operating conditions at all times will be designated as the Deputy Incident Controller and assume the charge of the Site Incident Controller at the time of an emergency till the Site Incident Controller arrives at the incident site, he will assist the Site Incident Controller on his arrival and work under his direction in emergency control operation.

The responsibilities and duties of the Deputy Incident Controller will be as defined for the Site Incident Controller. In addition he will ensure the following:

- ◆ In the event of an emergency, caused due to any incident in the plant, he will immediately activate plant level emergency siren (hooter) to warn the field personnel, contractors' employees, etc. and also arrange for announcement about the emergency and necessary instruction for them for assembling at the safe assembly point or evacuation, etc.
- ◆ Ensure that the SSM and senior plant personnel have been informed about the emergency



### **Fire Services Personnel:**

Main role of fire services personnel is fire fighting and rescue operations, helping in operations like prevention of loss of containment of hydrocarbon, spill/leak containment, etc. Their main responsibilities and duties are described specifically as below

#### **Chief of Fire (or next senior most fire personnel available):**

- ◆ He will be the Key Personnel for the Fire and Safety Services at the incident scene and co-ordinating and commanding all the related operations in consultation with the Site Incident Controller
- ◆ He will report at the Field command Post (Incident Site) immediately after receiving the information about an emergency at site, contact the Site Incident Controller and the first turn out leader for necessary information/advice to decide control strategies
- ◆ He will take overall command of fire fighting/rescue operations and other measures as necessary to control and mitigate the situation and lead the fire fighting crew including outside / mutual aid fire fighting teams
- ◆ He will assess the severity/magnitude of the situation and decide the level of the emergency in consultation with the Site Incident Controller and inform the Site Main Controller (Primary Command Post) at ECC. He will also advise him for declaring on-site emergency (if necessary)
- ◆ He will call for additional resources/help from other Depts. (AFS personnel), mutual aid members, etc. through Primary Command Post as necessary and deploy them appropriately for fire fighting and rescue operation at the incident scene. He will also co-ordinate with other key personnel
- ◆ He will ensure that sufficient personnel protective equipment, masks, Breathing Air sets, Spare Breathing Air, Cylinders etc. are available at the field Command Post for use by the crew members and ensure that no one access the "Hot Zone" without adequate personnel protection. He will call for logistic support (mobilising additional supplies through Primary Command Post (Site Main Controller/HSE&F Co-ordinator)
- ◆ He will keep constant contact with Primary Command Post and seek decision support from the Site Main Controller in critical matters/operations and also inform him, if other plants in the complex or surrounding population are likely to be affected
- ◆ He will co-ordinate with Security Key Personnel for access control and barricading the affected area in order to prevent vehicular movement
- ◆ He will assist in rescue and first aid operations



**Shift Fire Officer (Riding Officers):**

- ◆ Upon receiving emergency call/alarm, he will quickly prepare for the fire turn out and mount the leading fire tender along with the crew members and rush to the incident site taking a safe route of entry considering the wind direction
- ◆ Report to the Dy. Incident Controller/the Incident Controller and Position the Fire Tender strategically at a location in consultation with the Dy. Incident Controller/the Incident Controller
- ◆ He will decide the line of action for fire fighting and/or other control actions at the scene in consultation with the Dy. Incident Controller/Incident Controller and take appropriate actions for fire fighting and control measures
- ◆ He will guide and lead the fire fighting crew in fire fighting and rescue operation till the arrival of F&S Key person (the Chief of Fire or next senior most person)
- ◆ He will ensure the safety of the crew members and that crew members are fully equipped with necessary personnel protection prior to enter "Hot Zone"
- ◆ He will assess the severity of the situation and may call for second turnout/additional help through the Dy. Incident Controller/Incident Controller (Field Command Post)
- ◆ He will keep constant contact with the key personnel (F&S) at the Field Command Post and inform about the situation and probable developments

**Firemen on Duty at the Fire Control Room:**

- ◆ The fireman on duty at the Fire Control Room will acknowledge the emergency alarm received on the panel and promptly note the plant area/where the incident occurred
- ◆ He will note down the information, if emergency call is received through telephone, hot line or messenger
- ◆ He will sound the fire bell to inform the fire crew to get ready and take their positions, simultaneously brief the Shift Fire Officer about the emergency message
- ◆ He will intimate the Site Shift Manager and the Security Dept. about the emergency giving short description about the occurrence (if known)
- ◆ He will actuate emergency siren after receiving instruction from Primary Command Post (Site Main Controller/HSE&F Co-ordinator)
- ◆ He will ask telephone operator to pass on to the communication about the emergency to the Auxiliary Fire Squad of all the plants/selected plants on receiving the instruction from HSE&F Co-ordinator/Site Main Controller



- ◆ He will always be ready and alert for receiving any message / instructions from Primary Command Post/Field Command Post

**Auxiliary Fire Squad Members:**

AFS Members shall be ready on hearing emergency siren and will report to site incident controller at site (Field Command Post) on receiving message from ECC

- ◆ They will do the fire fighting under the instruction of Shift Officer. Help to bring firefighting equipment from nearby plants

AFS Members of the plant under emergency will immediately go to the emergency site and will start first aid fire fighting

- ◆ As per the emergency situation they will use the fixed fire fighting equipment to protect plant equipment from heat exposure
- ◆ They will guide non-essential personnel in case of evacuation
- ◆ They will do monitoring/closing of storm water drains if required
- ◆ They will help key personnel for taking action on site. Help to Security Personnel for traffic Control

**Non-essential Personnel:**

The plant employees, contractors' employees, visitors, etc., (other than emergency response personnel) present at the incident site are not required to be present at the incident site during the emergency at the site. In the event of declaration of an emergency in the plant/area, these persons shall quickly assemble at the safe assembly point of the plant/area and shall respond as instructed by the Site Incident Controller.

**Instruction to the Non-essential Personnel:**

- ◆ Do not panic. Ensure that persons in your immediate vicinity are warned
- ◆ Remain alert for announcement from the Control Room, such "Proceed to Safe Assembly Point" and act accordingly
- ◆ Do not rush to the scene to be a spectator
- ◆ Await instructions at the Assembly Point, report your presence to the superiors/ or the Site Incident controller, inform his whereabouts of your colleagues if they have not arrived
- ◆ Do not engage telephone/talk back system and other communication channels, unnecessarily
- ◆ Do not approach Control Centres without urgent/or important reasons
- ◆ If you are not assigned any specific role, move away as directed
- ◆ Do not offer non-authentic information/unconfirmed facts/fact/or conjecture

### **Telephone Operator:**

At the time of emergency, communications both inwards as well as outward are very essential and telephone operator's swift action becomes very important. He plays very important part in communicating information/ messages to the concerned personnel/outside agencies/mutual aid members/ staff members etc. and also receiving a large numbers of outside calls. His main responsibilities and duties are as below:

- ◆ He will keep the board free to the extent possible for incoming calls
- ◆ He will immediately convey message to the "Key Personnel" and the "Co-ordinator" about the emergency as per the instruction of the Site main controller.
- ◆ The telephone operator will follow instructions from the Site Main Controller/or Media Co-ordinator only, for passing on any information to outside agency about the emergency or direct all such queries to the media co-ordinator for appropriate reply
- ◆ As far as possible he should not entertain unknown/unimportant outside calls/inquiries during initial few hours of the emergency

### **HSE Coordinator:**

- ◆ He will report at the Emergency Control Centre (Primary Command Post) immediately after receiving information about the emergency. He will assist the Site Main Controller for taking critical decisions and provide necessary advice and information
- ◆ He will co-ordinate with Key Person (Fire & Safety) and will assist the Site Main Controller for providing decision support and resources support to the Key Persons (F&S), as may be necessary
- ◆ He will arrange for mobilizing off-duty fire personnel from their residence; and call other members of the staff for assistance
- ◆ He will co-ordinate with the materials/stores co-ordinator and mobilize additional resources, viz., spillage containment equipment/fire fighting equipment/material, personal protective equipment, spare breathing air cylinders, etc., as may be required at the incident site for control measures
- ◆ He will liaise with Factory Inspectorate / Pollution Control authorities in consultation with the Site Main Controller and provide necessary information. He will also ask for the help, if necessary to evacuate neighboring area outside the complex as advised by the Site Main Controller
- ◆ He will organize relieving groups for fire fighting
- ◆ He will also initiate necessary actions to minimize impact on Environment



### **Medical Coordinator:**

The Chief Medical Officer (or the next in command available at site) will be the Medical Co-ordinator and perform the following duties:

- ◆ He will contact the Site Main Controller immediately after receiving the information about the emergency
- ◆ He will report immediately at the Emergency Control Centre (Primary Command Post) or OHC as instructed by the Site Main Controller and contact the Key personnel (Medical) and take stock of the situation
- ◆ He will assist and advise the Site Main Controller in all critical decisions in the area of health/medical services to the affected persons and keep constant liaisons with him
- ◆ Organize rescue and first aid arrangements for the affected persons at the site in the "cold Zone", as may be necessary with essential staff/equipment and post additional ambulance for transporting seriously injured persons
- ◆ Ensure that adequate paramedical staff, equipment and medicines are available at the OHC. He will mobilize additional resources from neighbouring industries, if necessary
- ◆ To liaise with the Local Medical Authorities and City Hospitals, if the casualties are more and situation demands treatment at additional medical centres
- ◆ To co-ordinate with the Transport Co-ordinator for transporting victims to various hospitals
- ◆ To arrange for additional ambulances from other hospitals/ Municipal Corporation
- ◆ The Medical Co-ordinator should ensure the upkeep of agreed medical supplies, antidotes and equipment that should always be kept in stock for treating victims of burns and hazardous chemicals. The medical authorities should be aware of the type of treatment to be administered
- ◆ He will liaise with the media co-ordinator for release of news to the press

### **Security Co-coordinator:**

The Chief of Security or the next in command available at site shall be the Security Co-ordinator. He will have the following duties / responsibilities:

- ◆ He will instruct and deploy plant security personnel to ensure that the law and order is maintained ; and unnecessary gathering of the personnel at the scene of emergency is prevented and ensure control of traffic movement in and out of the factory areas
- ◆ He will instruct the security personnel / Security Gates to direct and guide external emergency vehicles (Fire tenders/ambulances etc.) called

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for assistance/help from neighboring industries/Local administration, to the scene of incident

- ◆ He will instruct security personnel who could be spared to assist Site Incident Controller/Key Personnel (fire and Safety) in fire fighting and evacuation of personnel, at the Incident Site
- ◆ He will take action to regulate traffic movement and prevention of traffic jams inside the works as well as outside the factory gates for proper and speedy movement of the emergency vehicles, ambulances, other vehicles carrying outside resources, etc.
- ◆ He will mobilize additional security force for help, as necessary
- ◆ He will liaise with the police and other local authorities for external help, as necessary for evacuation of the neighboring areas outside the factory premises in consultation with the Site Main Controller
- ◆ If necessary, he will arrange for announcement through the mobile P.A. system for alerting and instructing the population in the surrounding areas as directed by the Site Main Controller

#### **Engineering Co-coordinator**

- ◆ He will report to the Site Main Controller at the Emergency Control Centre (Primary Command Post) immediately after receiving information about On-site emergency
- ◆ He will take stock of the situation and assist/advise the Site Main Controller in deciding control strategies
- ◆ He will mobilize the team from the Maintenance Dept. to assist the Site Incident Controller in control operation at the Field Command Post
- ◆ Arrange isolation of electrical lines from distribution point/substations as required by the Site Incident Controller by calling the Electrical Engineer / Electricians
- ◆ Provide all other engineering support, as may be required
- ◆ Liaise with Key Personnel (Eng./Maintenance) and co-ordinate with other groups

#### **Communication Coordinator:**

Communication Co-ordinator plays very important part at the time of an emergency particularly when extensive disruption of services takes place. He has the following duties and responsibilities:

- ◆ To ensure all available communications links remain functional
- ◆ To quickly establish communication links between the Field command Post and (if this happens to be in remote off site area) and the Primary Command Post

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- ◆ To arrange for announcement on the public address system and maintain contacts with congregation points like canteen, main gate, control rooms etc.
- ◆ To ensure that previously agreed inventory of various types of communication equipment is maintained in working condition and frequent checks are carried out and records maintained
- ◆ To maintain voice record of significant communications with timings received/passed from the Primary Command Post
- ◆ To provide additional/alternate communication facilities as required at the site

#### **P&A Coordinator:**

He will report at the Primary Command Post (ECC) immediately after getting information about an emergency at the site and assist/advise the Site Main Controller in taking important decisions in the matters related to welfare/necessities/of emergency personnel at site, care/needs of the affected persons. His duties and responsibilities include the following:

- ◆ He will ensure that a record of affected personnel is prepared with their local/permanent addresses and telephone numbers
- ◆ He will ensure that the relatives of the affected personnel have been informed
- ◆ Assign officials at the hospitals to look after the needs of the affected personnel under medical treatment
- ◆ Co-ordinate with the Finance Co-ordinator for necessary funds required to cater the needs of affected personnel, emergency purchases and for other requirements
- ◆ To arrange for refreshments, snacks, food, and other needs as may be required for the emergency personnel from time to time
- ◆ Co-ordinate with the Purchase Co-ordinator for necessary emergency procurement of necessary items
- ◆ Ensure that staff personnel as necessary for assistance and help are informed/called from their residences
- ◆ he will co-ordinate with the instruct Key Personnel transport/welfare & canteen for mobilizing additional resources, as may be required
- ◆ To co-ordinate with the neighbouring industries for additional vehicles/ambulances and other resources as may be required
- ◆ To liaise with the Local Administration for additional assistance/help as may be needed

#### **Transport Coordinator:**

The Transport Co-ordinator shall perform the following duties

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- ◆ Mobilize all available company's vehicles for emergency use alongwith the drivers
- ◆ Arrange for transport of victims to hospitals/dispensaries
- ◆ Arrange for duty rotation of the drivers to meet the emergency situation
- ◆ To direct refueling of the vehicles
- ◆ To co-ordinate with the neighboring industries for additional vehicles / ambulances as may be required
- ◆ To co-ordinate with the neighboring industries for additional vehicles / ambulances as may be required
- ◆ To arrange for vehicles from outside local transport agencies, if required
- ◆ To keep in contact with the Site Main Controller for evacuation of personnel and transportation of victims

#### **The Welfare / Canteen Coordinator:**

The Welfare Co-ordinator will have the following responsibilities:

- ◆ Ensure that casualties receive adequate attention and arrange additional help (ex-gratia payment etc.), if required with consultation with the Chief Co-ordinator
- ◆ Inform the relatives of the victims
- ◆ When emergency is prolonged, he will arrange for relieving personnel and organize refreshment / catering facilities and arrangements for their rest (bedding, and other necessities)
- ◆ He will arrange to procure and keep stocks of necessary food items and other necessary supplies as may be required for the personnel working round-the-clock
- ◆ He will arrange for hot drinks / snacks and food and other necessary items for emergency response personnel, as required

#### **Media Coordinator:**

The Media Co-ordinator will co-ordinate the following under the direction of the Site Main Controller (The Chief Co-ordinator):

- ◆ He will liaise with various media and release written statements to the press through prior concurrence of the Chief Co-ordinate
- ◆ He will handle media interview with various media groups make arrangements for televising the information about the incident, the number of casualties, etc
- ◆ He will inform State and Central Government and the statutory bodies of the nature and magnitude of the incident, the number of casualties, etc.

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- ◆ He will locate himself such that media persons/third parties do not need to go past the complex security gates and that adequate communication links exist
- ◆ Media personnel often insist on visiting incident scene. He will escort media team(s) If such visits are approved by the Chief Co-ordinator
- ◆ He will be in constant contact with the Medical Co-ordinator, and other co-ordinators to be aware of latest development and closely liaise with the Chief Co-ordinator

#### **Finance Coordinator:**

- ◆ He will report at the Emergency Control Centre immediately after getting information about the emergency at site
- ◆ He will release finance (cash / cheques, etc) as directed by the Site Main Controller (Chief Co-ordinator)
- ◆ He will assist the Purchase Co-ordinator for emergency procurement
- ◆ He will liaise with Insurance Company personnel as directed by the Site Main Controller

#### **Purchase Coordinator:**

The Purchase Co-ordinator will report at the Emergency Control Centre as soon as he is informed about an emergency at site

- ◆ He will assist the Site Main Controller and arrange for emergency purchase of necessary items as may be required during the emergency
- ◆ He will co-ordinate with the Materials Co-ordinator and other co-ordinator for necessary emergency items to be procured
- ◆ He will mobilize necessary manpower as may be required, etc.

#### **Materials Coordinator:**

The Materials Co-ordinator will ensure:

- ◆ Availability of the materials required by the Site Incident Controller
- ◆ Arrange issues of materials from the General Stores round-the-clock during an emergency
- ◆ Arrange emergency procurements from local dealers / vendors or from neighbouring industries
- ◆ Arrange transportation of materials from General Store to the Incident Site in co-ordination with the Transport Co-ordinator

### **7.7.7 Off-site Disaster Management Plan**

Emergency is a sudden unexpected event, which can cause serious damage to personnel life, property and environment outside the boundary wall of the project site as a whole, which necessitate evolving off-site emergency plan to combat any such eventuality. In offsite disaster management plan, many agencies like revenue,

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public health, fire services, police, civil defence, home guards, medical services and other voluntary organization are involved. Thus, handling of such emergencies requires an organized multidisciplinary approach.

Evacuation of people, if required, can be done in orderly way. The different agencies involved in evacuation of people are civil administration (both state and central), non-Govt. organizations, factory inspectorate and police authorities.

### **Before Crisis:**

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

- ◆ People in vicinity of hazardous installation, and others who are potentially affected in the event of an accident, should be aware of the risks of accidents, know where to obtain information concerning the installation, and understand what to do in the event of an accident
- ◆ Non-governmental Organizations (NGOs) such as environmental, humanitarian and consumer group should motivate their constituents and others, to be involved in risk reduction and accident prevention efforts. They should help to identify specific concerns and priorities regarding risk reduction and prevention, preparedness and response activities
- ◆ NGOs should facilitate efforts to inform the public and should provide technical assistance to help the public analyze and understand information that is made available
- ◆ Public authorities and management team of hazardous installation should establish emergency planning activities/ programs for accidents involving the hazardous substance
- ◆ Emergency alert system should be in place to warn the potentially affected public in the surrounding area
- ◆ The system chosen should be effective and provide timely warning. Suitable warning system could include or a combination of for e.g.: sirens, automatic telephone message, and mobile public address system

### **During Crisis:**

- ◆ **Central Control Committee:** As the off-site plan is to be prepared by the Government authorities, a central control committee should be formed under the chairmanship of area head. Other officers from police, fire, factory, medical, engineering, social welfare, publicity, railway, transport and requisite departments shall be incorporated as members. Some subject experts will also be included for guidance. The functions of committee should be:
  - To work as main co-coordinating body constituted of necessary district heads and other authorities with overall command,



- coordination, guidance, supervision, policy and doing all necessary things to control disaster in shortest times
- To prepare, review, alter or cancel this plan and to keep it a complete document with all details
  - To take advice and assistance from experts in fields to make plan more successful
  - To set in motion all machineries to this plan in event of disaster causing or likely to cause severe damage to public, property or environment
  - The incident control committee, traffic control committee and press publicity committee will first be informed as they play important role during initial hours of emergency
- ◆ **Medical Help, Ambulance and Hospital Committee:** This committee consisted of doctors for medical help to the injured persons because of disaster. Injuries may be of many types. As such doctors are rarely available we have to mobilize and utilize all available doctors in the area. Functions and duties of the committee include:
- To give medical help to all injured as early as possible
  - Civil surgeon is the secretary who will organize his team
  - On receiving information to rush to spot he will immediately inform his team and will proceed with all necessary equipments
  - First aid and possible treatment shall be provided at the spot or at some convenient place and patients may be requested to shift to hospitals for further treatment
  - All efforts shall be made on war basis to save maximum lives and to treat maximum injuries
  - Continuity of the treatment shall be maintained till the disaster is controlled
- ◆ **Traffic Control, Law and Order Committee:** The committee is headed by District Superintendent of Police. Functions and duties of this committee should be:
- To control traffic towards and near disaster , to maintain law and order
  - To evacuate the places badly affected or likely to be affected
  - To shift the evacuated people to safe assembly points
  - To rehabilitate them after disaster is over

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- Necessary vehicles, wireless sets and instruments for quick communications shall be maintained and used as per need

#### **After Crisis:**

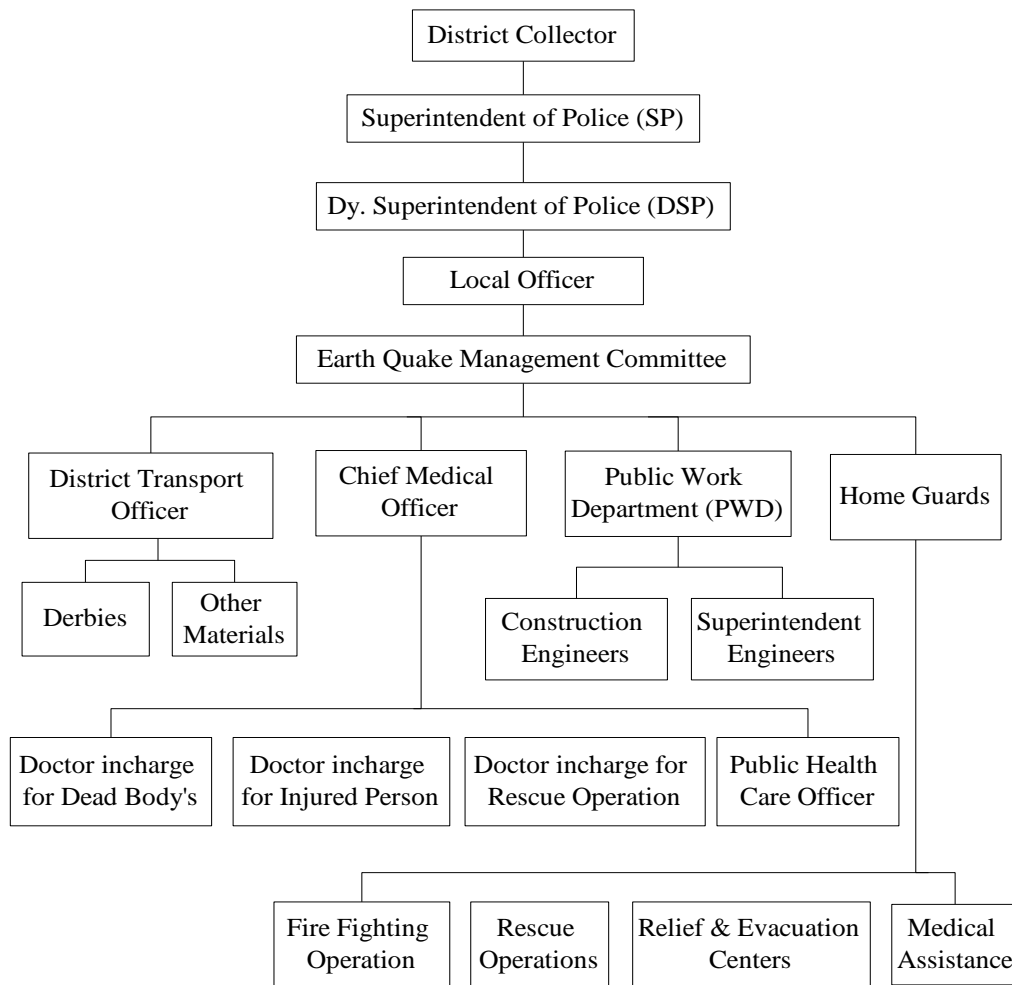
- ◆ At the time of disaster, many people may badly be affected. Injured people shall be treated by medical help, ambulance and hospital committee, but those not injured but displaced kept at assembly points, whose relative or property is lost and houses collapsed shall be treated by the welfare and restoration committee. Functions and duties of the committee are:
  - To find out persons in need of human help owing to disastrous effect. They may give first aid if medical team is not available
  - They will serve the evacuated people kept at assembly points. They will arrange for their food, water, shelter, clothing, sanitation, and guidelines to reach any needful places
  - They will look for removal and disposal of dead bodies, for help of sick, weak, children and needy persons for their essential requirements
  - The team will also work for restoration of detached people, lost articles, essential commodities etc.
  - The team will also look after the restoration of government articles
  - The team will also ensure that the original activities, services and systems are resumed again as they were functioning before the disaster

### **7.7.8 Management for Natural and Technological Emergencies**

#### **7.7.8.1 Natural Hazards**

##### **Earthquake**

Earthquakes often affect multiple departments or multiple agencies and require data to be collected and assembled from a variety of locations quickly under adverse conditions. Structural mitigation in earthquake prone areas includes seismic retrofits of property and the securing of items inside a building to enhance household seismic safety. It may include the mounting of furniture, refrigerators, water heaters and breakables to the walls. Flow chart for Earthquake Emergency Response Plan is given below:



### **Quick Response Team for Earthquake Disasters**

#### **Role and Responsibilities of Earthquake Management Team:**

Earthquake associated risk poses obstacle to developmental process as well as threat to the livelihood of the resident population, especially in metropolitan cities in developing countries. Roles of key personnel in tackling earthquake emergency are listed below

- ◆ Superintendent of police (SP)/ Dy. Superintendent of police (Dy. SP): To maintain law and order and provide free passage to evacuees.
- ◆ Local Officers: To provide food, drinking water and milk.
- ◆ Chief medical officer: To coordinate with PHCs and provide medical relief.
- ◆ PWD Department: To provide transport to Evacuees and undertake repairs to roads and buildings.

In order to mitigate and manage the natural disasters, there is an urgent need to adopt various techniques to design and develop a procedure that will enable



the city administrators and responsible disaster management personnel to evaluate earthquake severity and potential impact on the facilities, and suggested associated levels of post-earthquake monitoring response for different magnitude earthquakes occurring within certain distances from the urban amenities and facilities. Vulnerability analysis was derived from population and estimated building property while Post-quake relief planning focus on quake-hit areas and compared with available general amenities and services such as hospitals, police stations, fire stations etc.

### **Mitigation Measures:**

Mitigation is a several-stage planning and management process which involves

- ◆ Seismic zoning building codes should be enforced in all new constructions through local planning bodies and authorities
- ◆ Regulatory agencies like urban development authorities should ensure undertaking of adequate remedial measures while constructing public buildings, private multi-storeyed apartments and commercial structures
- ◆ A specialized agency should be commissioned to study the nature of buildings and other structures in each urban settlements / centre and make an assessment of possible damages that may occur in the event of earthquake striking such centres. This will lead to assessment of the population and structures that may be affected in the event of an earthquake.
- ◆ Publicity materials should be distributed to the public in respect of community awareness and preparedness
- ◆ Publicity materials should also be prepared on low-cost and high resistant buildings using local materials for distribution to the public, especially in rural areas

### **Flood**

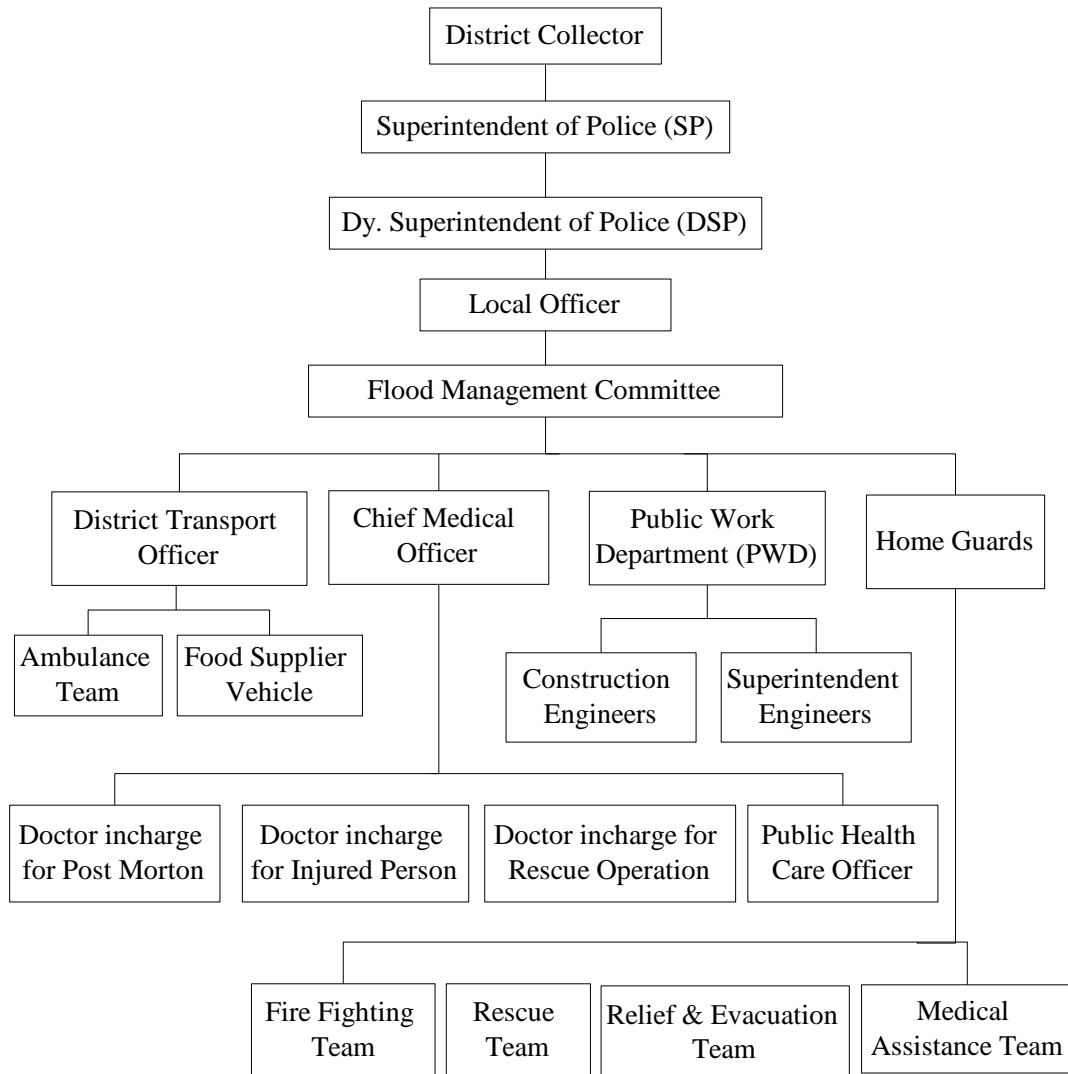
Preventive measures that are taken during flood are given below.

- ◆ Focus resources on minimizing the spread of water into other areas of the plant
- ◆ Protect property and records by removing items from floors and /or covering with water resistant coverings.
- ◆ Attempt to move items of value to "higher ground" if possible.
- ◆ Evacuate personnel as needed. Utilize the fire alarm system if an immediate evacuation is required.
- ◆ Mitigative measures can be structural or non-structural. Structural measures use technological solutions, like flood levees. Non-structural measures include legislation, land-use planning (e.g. the designation of nonessential land like parks to be used as flood zones), and insurance.



- ◆ The response phase includes the mobilization of the necessary emergency services and first responders in the flood area. This is likely to include a first wave of core emergency services, such as fire-fighters, police and ambulance crews. They may be supported by a number of secondary emergency services, such as specialist rescue teams.

Following is the flow chart of quick response team to tackle flooding:



### Quick Response Team for Flood

The various measures to be adopted for flood mitigation are of two types are as follow:

#### Structural:

The Structural measures aim at preventing or reducing the flow rate of floodwaters from reaching the potential damage centres. The followings are some structural measures for flood control

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- ◆ Dams and Reservoirs
- ◆ Embankments, flood walls, sea walls
- ◆ Natural detention basin
- ◆ Channel and drainage improvement
- ◆ Diversion of flood waters
- ◆ Channel alterations
- ◆ High flow diversions

#### **Non-structural:**

The non-structural measures aim at reducing the susceptibility to flood damage as well as minimising the loss burden. The various non-structural measures which can be implemented are

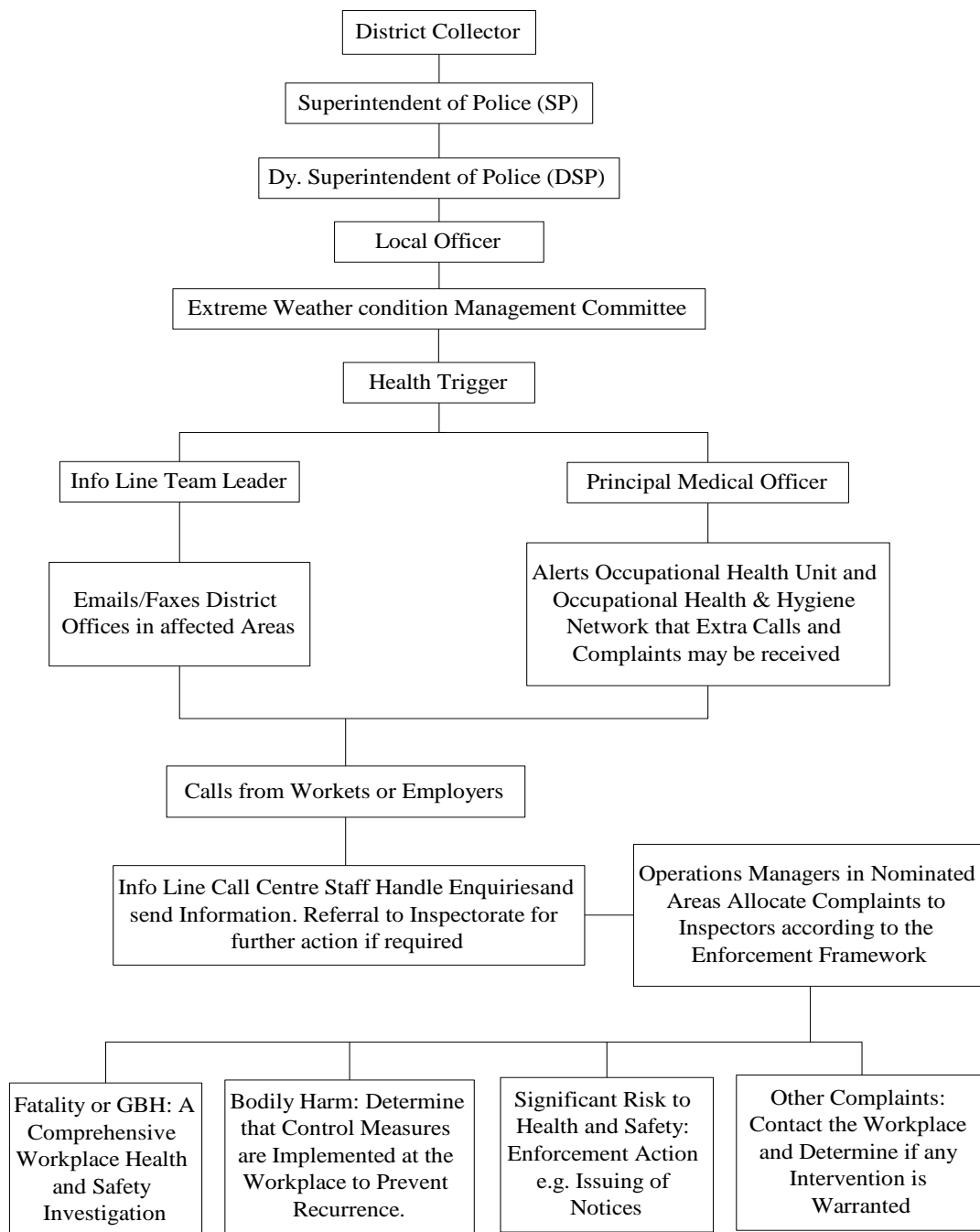
- ◆ Reducing the susceptibility to flood damages through:
  - Flood plain management
  - Flood proofing including disaster preparedness and response planning
  - Flood forecasting and warning.
- ◆ Minimising the flood loss burden through
  - Disaster Relief
  - Flood fighting including Public Health Measures
- ◆ Flood forecasting and warning services like automatic data collection system by means of sensors, transmission of data by latest techniques of communication and formulation of forecast using computer based programme models should be installed
- ◆ Low lying areas, close to the coast and flat lands in the river valley are prone to flooding so should be avoided
- ◆ Flash flooding generally occurs in geologically younger river valleys and rivers originating from mountains
- ◆ It is important to review the history of flooding in a particular area including mapping and assessing the extent of land flooded, assessing the height of flooding etc.

#### **Severe Summer Weather/Extreme Heat Conditions**

Severe floods, windstorms, and heat-waves caused dramatic political, social, environmental and health consequences in India over the past few years. In response to these events, ministries of health and other public health authorities, along with national and international meteorological services and organizations, are focusing increased attention on developing appropriate strategies and measures to prevent health effects from extreme weather and climate events in the future.



Efforts should be made to understand the lessons learnt from past events to evaluate the effectiveness of the measures taken and early warning systems in place, and to use the knowledge gained to target future activities. The recent events have also increased interest in whether the intensity and frequency of future extreme weather and climate events could be expected to change as one result of a changing climate. Following is the flow chart of quick response team for extreme heat conditions.



**Quick Response Team for Extremes Heat Conditions**



Following are few mitigations to tackle extreme heat conditions:

- ◆ People working under conditions of high temperature and humidity should be encouraged to drink plenty of water.
- ◆ Continuous exposure to a hot and humid work environment should be cut down.
- ◆ If signs, such as headache and dizziness are reported, the concerned person shall be removed from the place of work to cooler environment and necessary treatment should be given.
- ◆ The clothing worn should be light, made of cotton, loose and of light colours.
- ◆ Protective goggles, umbrella, shoes etc. should be used in hot days to avoid the extreme sun glare and direct impact of the hot sun on the head and rest of the body.
- ◆ Temperature and humidity in the work environment should be controlled through proper ventilation and air-cooling.
- ◆ Acclimatization should be achieved by gradual exposure to the hot environment during a heat wave.
- ◆ Awareness to the public towards preventing loss of life during heat wave conditions should be made.
- ◆ Adequate stock of medicines for treatment of heat stress patients in all health centres should be made available
- ◆ Ambulance with staff and mobile health units to be kept in readiness to shift the patients to hospitals and other referral centres within the shortest time period.

### **Landslides**

Heavy rainfall over a short period of time results in flash floods, landslides and urban flooding. It is because the speed and quantity of inflow of water outpace drainage systems. Sometimes, this high speed water evades the traditional path and carries with it mudflows, Earth flows, debris flows and Rock falls. Such flows and floods hardly give any time for preparation. Flash floods inundate areas suddenly and remain for a short period of time. Yet its damaging potential is as high as that of the general floods.

Advance planning and response through trigger mechanism is the best way to tackle the situations arising out of flash floods. Administration requires being fully alert and communities totally prepared in advance for the situation.

Safety tips for general floods and landslides are as follows.

- ◆ Develop landslide-specific planning for landslide risk in the area.
- ◆ Contact local officials, state geological surveys or departments of natural resources, and university departments of geology.

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- ◆ Ask for information or a professional referral for a very detailed site analysis and corrective measures to be taken
- ◆ Listen to weather bulletins of Radio and television for warnings of intense rainfall.

### **Drought**

Droughts are the resultant of acute water shortage due to lack of rains over extended periods of time affecting various human activities and lead to problems like widespread crop failure, unreplenished ground water resources, depletion in lakes/reservoirs, shortage of drinking water and, reduced fodder availability etc. Following measures can be adopted to tackle draught conditions

- ◆ Rain Recording Station (RRS) should be installed to facilitate early detection of drought.
- ◆ A master plan for achieving maximum irrigation potential should be prepared to prevent draught
- ◆ A large number of private irrigation projects like tube wells, bore wells and river lift irrigation points should be taken up by utilizing the subsidy available from different sources, especially only under the State Agriculture Policy and other central sector schemes
- ◆ Rainwater harvesting structures covering all potential watersheds should be created
- ◆ Tree plantation along with soil conservation measures should be promoted as the most important measures for long-term drought proofing.
- ◆ Adequate training for government staff, NGOs and farmers along with promotion of dry land farming, alternative crops, cropping pattern and promotion of alternative occupations should receive topmost priorities.
- ◆ Efforts to promote non-paddy, low irrigation requirement crops and promotion of other livelihood activities should also be given priority in chronic drought prone areas
- ◆ Rainfall received during the monsoon season should be captured and stored by building hundreds of rainwater harvesting structures through diversion structures constructed across medium and minor streams.
- ◆ Use of vermicompost, other organic manure and adoption of various farming practices should be promoted to increase the moisture retention capacity of the soil
- ◆ Different land use patterns to be enforced with a defined area under tree cover

### **Cyclones**

Following are mitigation measures for cyclones:

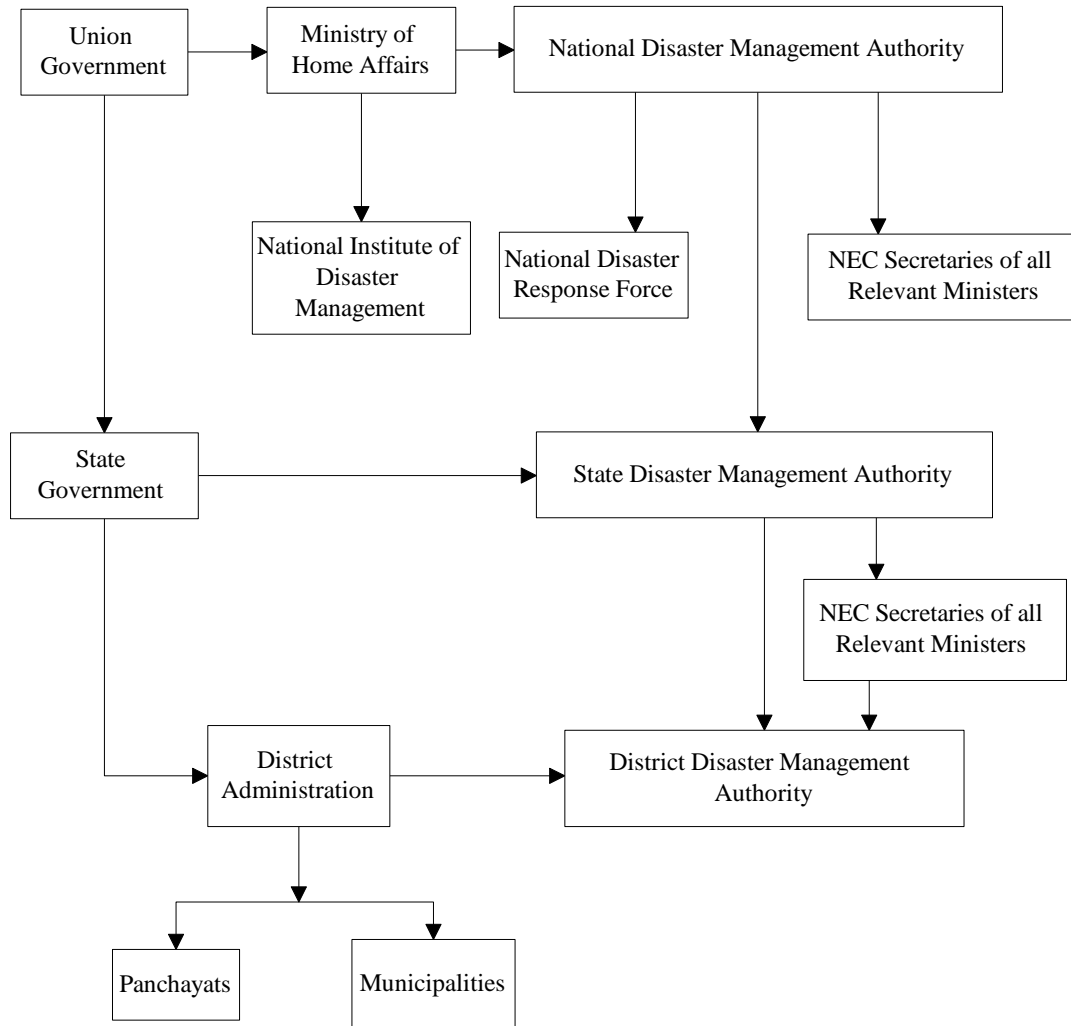


- ◆ Land use management should provide protection from wind and storm surge.
- ◆ Building should be constructed with higher wind-resistant capacity.
- ◆ Securing of elements such as metal sheeting, roofing, and fences should be done to avoid severe damages.
- ◆ Cyclone and severe weather warning systems should be installed.
- ◆ Community awareness regarding cyclone risk and evacuation plan should be properly addressed.
- ◆ Drainage: Storm water drainage should be provided through providing chambers, side drains and culverts for settlements in low-lying areas to ensure flow of water during periods of inundation and cyclones.
- ◆ Ensuring appropriate strengthening and construction of resistant features in housing and buildings in cyclone prone areas keeping in mind the type of vulnerability i.e., tidal inundation and high- winds.
- ◆ There are three kinds of shelter options
  - Building new shelters with specific cyclone resistant design standards and construction methods
  - Progressively upgrading already constructed shelters/buildings into cyclone resistant shelters as and when feasible by reinforcements / retrofitting
  - Converting a part of the shelter to be cyclone resistant either by making a new addition adhering to cyclone resistant design standards and construction methods or reinforcing an existing room which can be used as a shelter during cyclones

## **7.7.9 Technological Hazards**

### **7.7.9.1 Train Accidents Related Disaster**

Disaster in the Railway context was traditionally a serious train accident, caused by Human/equipment failure, which may affect normal movement of train services with loss of human life or property or both. This is now extended to include natural and other manmade disasters. These types of disasters are described below:



### **Quick Response Team for Prevention of Rail Accident**

Collisions (with a huge number of casualties), Train marooned (flash floods), derailments at a bridge over a river, and coaches falling down; train washed away in cyclone, derailment of a train carrying explosives or highly inflammable material, tunnel collapse on a train, fire or Explosion in trains, and other miscellaneous cases etc.

Following are the mitigation measures to be adopted to prevent train accidents

- ◆ Regular inspection of railway tracks and trains
- ◆ Modernisation of signal and traffic management systems
- ◆ Strict adherence to prescribed safety standards
- ◆ Proper manning of level crossings



### **7.7.9.2 Road Accidents**

The followings are certain remedial measures for enhance road safety that would minimize accidents

- ◆ Roads should be constructed according to Indian Roads Congress (IRC) standards to ensure that the prescribed quality standards are maintained
- ◆ Road signs, speed limit posts and other traffic control devices including delineators should be installed.
- ◆ Checking of vehicles should preferably be conducted at spacious places so that minimum disturbance is caused to the flow of traffic.
- ◆ At each 15-20 Km of the N.H. and S.H., there should be provisions for first aid and ambulance for treatment of the accident victims and also there should be cranes to clear the roads.
- ◆ The roads having curves should be properly banked.
- ◆ The road shall have the same level, at the junctions as well as on the approaches of the culverts & bridges.
- ◆ There should be well-maintained proper conventional signboards and road furniture. These shall be insured against theft and damage.
- ◆ Guard posts should be provided at closer intervals on high banking roads with reflecting point on top.
- ◆ Offloading excess goods from the goods carriages and impose penalty for the offence
- ◆ The SP, Traffic will be the overall in charge of traffic management who is assisted by Dy. SP, Traffic in case of emergency Mobilize necessary police personnel/vehicles to man and control traffic on various roads identified as safe routes and also take measures to divert normal traffic away from the emergency routes identified
- ◆ Ensure available of adequate number of vehicles fitted with public address system/wireless etc. and directly supervise manning of routes and parking yards

### **7.7.9.3 Industrial Disasters**

Factory Inspectorate plays an important role during any industrial and transportation disaster in which there is large-scale release of hazardous chemicals. In case of such disaster, the Dy. Chief Inspector of Factories or Sr. Inspector of Factories would help the District Administration by providing expert advice for minimizing the effect of such a disaster.

#### **Main functions of Inspector of Factories:**

- ◆ Ensure the on-site emergency management plan of the affected industry (in case of an industrial disaster) has been activated and the mitigative measures are taken to safeguard the people present in the premises.



- ◆ Visit the site of accident to ensure proper measures are taken to control the situation.
- ◆ Speed up help from mutual aid members, if required to contain the emergency. Mobilize the technical experts for advice if required.
- ◆ Inspect the area along with the tech. Co-coordinators and report to Deputy Commissioner for giving all clear signals.

Accidents involving transportation of hazardous chemicals and possibility of accidents/disasters shall be mitigated through the following measures

- ◆ Awareness of the industry and community regarding safety measures and identification of hazards
- ◆ Awareness and training of drivers, operators, consignors regarding safety measures
- ◆ Awareness and training of regulatory bodies regarding regulatory provisions and development of a methodology for compliance of the same.
- ◆ Hospitals located near the hazardous industries should have facility for de-toxication
- ◆ The concerned regulatory organizations shall be strengthened for better enforcement of the acts and rules related to safe handling of hazardous chemicals and chemical accident response.

The other points that should be known to drivers having additional permits required for carrying hazardous materials are

- ◆ Carrying Transport Emergency Card
- ◆ Correct technical information about the hazardous substances
- ◆ Fixing of labels on the vehicle
- ◆ Details of dangerous goods

#### **7.7.9.4 Biological Disasters and Epidemics**

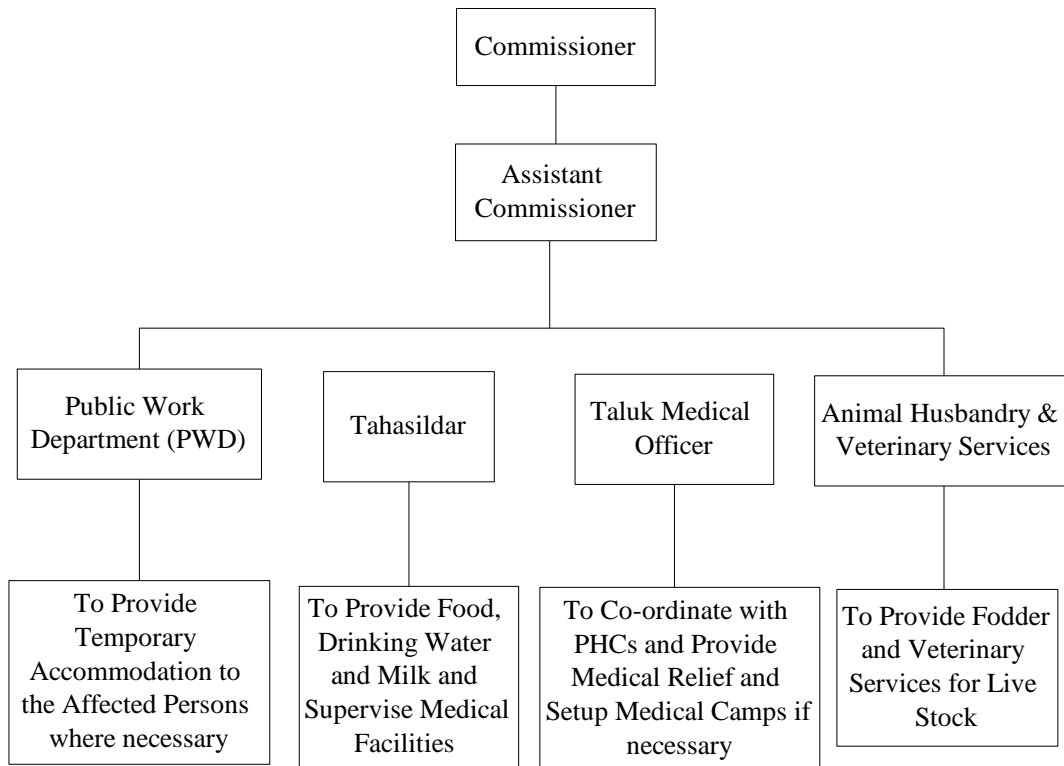
Disasters caused by living organisms such as bacteria, virus, fungus, etc. are termed as biological disasters. These organisms may cause epidemics. Since, epidemics are major health hazards, it is necessary to have trained persons to handle disasters of such nature. Proper training in first aid, hygiene and treatment is essential to deal with biological disasters.

To effectively treat cases of epidemics, public awareness and education, before and after the epidemic, is vital. Studies have related that the following are major problems faced before and during the outbreak of epidemics.

- ◆ Inadequate medical and health facilities.
- ◆ Inadequate supply of pure water.
- ◆ Lack of medical and health assistance.

- ◆ Absence of effective control of common diseases.
- ◆ Unsanitary conditions.
- ◆ Malnutrition.

Following is the quick response team to tackle biological disasters



### **Quick Response Team to Tackle Biological Disasters**

The Public Health Department is the nodal agency responsible for monitoring and control of epidemics. Mitigation efforts for control of epidemics would include

- ◆ Ensuring efficient functioning of surveillance machinery
- ◆ Surveillance requires adequate infrastructure, including trained personnel, within the district and timely communications among health departments, public and private laboratories and health care providers
- ◆ Laboratory capabilities to identify and characterize pathogens should be improved.
- ◆ Ensure timely development, appropriate use, and availability of diagnostic tests and reagents.
- ◆ New diagnostic tools for emerging infections should be developed and evaluated and diagnostic and reference reagents for the identification of emerging pathogens should be maintained.



- ◆ In order to mitigate the possibilities of the outbreak of epidemics, the Public Health Department should encourage the local authorities and the communities to undertake certain preventive and promotive measures including
  - Supply of safe drinking water and water quality monitoring
  - Promotion of personal and community latrines
  - Improvement in sewage and drainage systems
  - Solid waste management system
  - Surveillance of water bodies and canal distribution network for control of malaria

#### **7.7.9.5 Major Building Collapse and Fire hazards in Multi-storied Buildings**

- ◆ With the increase in the number of high-rise buildings, fire services should be equipped to handle building collapse and fire hazards in high rises. Snorkel ladders that can reach the highest floor should be positioned at district headquarters Chhindwara to handle building collapse/ fire hazards. Municipalities / Development Authorities should strictly enforce the latest building codes to prevent future collapses and ensure that fire escapes are a part of the construction design in all buildings.
- ◆ For each ward, the fire services should have contingency plans ready for rescue and treatment including location of routes, nearest hospitals and other material needs during such emergencies.
- ◆ The district fire services and all their district branches should organize regular drills and train their personnel in this respect. Their efforts should be augmented with the assistance of Civil Defence Personnel. The occupants of high-rise buildings should be encouraged to participate in such drills.
- ◆ For ensuring better coordination and proper discharge of all functions, all related agencies like police, hospitals, fire services, home guards, civil defence and local bodies should hold annual joint rehearsals and update Disaster Management Plan.
- ◆ Awareness on the Dos and Don'ts to prevent fire accidents should be increased
- ◆ Regular maintenance & replacement of old equipments and check against overloads should be done periodically

#### **7.7.10 Roles of Various Government Departments**

Each department and Government agency involved in disaster management and mitigation will designate a nodal officer for emergency response and will act as the contact person for that department / agency. The failsafe two-way communication with the State, district and other emergency control rooms and within the organization

should be established. Emphasis should be given on communication systems used regularly during normal times with more focus on the use of VHF's with automatic repeaters, mobile phones with publicised numbers, HF radio sets etc. It should be remembered that SAT phones fail during prolonged emergencies and electric failure if the phones cannot be re-charged. Following are the roles of different Government departments in minimizing the effects of any kind of emergency

### **7.7.10.1 Agriculture**

#### **Prevention Activities:**

- ◆ Awareness generation regarding various plant diseases, alternate cropping practices in disaster-prone areas, Crop Insurance, provision of credit facilities and proper storage of seeds
- ◆ Hazard area mapping (identification of areas endemic to pest infections, drought, flood, and other hazards)
- ◆ Develop database village-wise, crop-wise, irrigation source wise, insurance details and credit facilities
- ◆ Detail response manuals to be drawn up for advising the farmers for different types of disasters, e.g., rain failure in July or September & development of a dynamic response plan taking into account weekly rainfall patterns.
- ◆ Improving irrigation facilities, watershed management, soil conservation and other soil, water and fertility management measures keeping in mind the local agro-climatic conditions and the proneness of the area to specific hazards

#### **Preparedness Activities before Disaster Seasons:**

- ◆ Review and update precautionary measures and procedures and especially ascertain that adequate stock of seeds and other agro inputs are available in areas prone to natural calamities
- ◆ Review the proper functioning of rain gauge stations, have stock for immediate replacement of broken / non-functioning gadgets/equipments, record on a daily basis rainfall data, evaluate the variation from the average rainfall and match it with the rainfall needs of existing crops to ensure early prediction of droughts

#### **Response Activities:**

- ◆ Management of control activities following crop damage, pest infestation and crop disease to minimise losses
- ◆ Collection, laboratory testing and analysis of viruses to ensure their control and eradication
- ◆ Pre-positioning of seeds and other agro inputs in strategic points so that stocks are readily available to replace damage caused by natural calamities

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- ◆ Rapid assessment of the extent of damage to soil, crop, plantation, irrigation systems, drainage, embankment, other water bodies and storage facilities
- ◆ Establishment of public information centres to assist farmers in providing information regarding insurance, compensation and repair of agro equipments

#### **Recovery Activities:**

- ◆ Arrange for early payment of compensation and crop insurance dues
- ◆ Facilitate provision of seeds and other agro inputs
- ◆ Promotion of drought and flood tolerant seed varieties
- ◆ Review with the community, the identified vulnerabilities and risks for crops, specific species, areas, which are vulnerable to repetitive floods, droughts and other natural hazards
- ◆ Facilitate sanctioning of soft loans for farm implements
- ◆ Establishment of a larger network of soil and water testing laboratories
- ◆ Establishment of pests and disease monitoring system
- ◆ Training in alternative cropping techniques, mixed cropping and other agricultural practices which will minimise crop losses during future disasters

#### **7.7.10.2 Health Department**

##### **Prevention Activities:**

- ◆ Assess preparedness levels at District and Block levels
- ◆ Identification of areas endemic to epidemics and natural disasters
- ◆ Identification of appropriate locations for testing laboratories
- ◆ Listing and networking with private health facilities
- ◆ Developing a network of volunteers for blood donation with blood grouping data
- ◆ Formation of adequate number of mobile units with trained personnel, testing facilities, communication systems and emergency treatment facilities
- ◆ Identification of locations in probable disaster sites for emergency operation camps
- ◆ Awareness generation about various infectious diseases and their prevention
- ◆ Arrangement of standby generators for every hospitals



### **Preparedness Activities before Disaster Seasons:**

- ◆ **For Heat Wave:** distribution of life-saving drugs, training of field personnel on measures to be taken for management of patients suspected to be suffering from heatstroke;
- ◆ **For Flood and Cyclone:** Assessment and stock piling of essential medicines, anti snake venom, halogen tablets, bleaching powders, ORS tablets, Pre-positioning of mobile units at vulnerable & strategic points

### **Response Activities:**

- ◆ Stock piling of life-saving drugs, de-toxicants, anesthesia, Halogen tablets in vulnerable areas
- ◆ Strengthening of drug supply system with bestowing powers to local purchase committee
- ◆ Situational assessment and reviewing the status of response mechanisms in known vulnerable pockets
- ◆ Ensure adequate availability of personnel in disaster sites
- ◆ Review and update precautionary measures and procedures, and apprise the personnel who will be implementing those.
- ◆ Disinfections of water bodies and drinking water sources.
- ◆ Immunization against infectious diseases

### **Recovery Activities:**

- ◆ Continuation of disease surveillance and monitoring
- ◆ Continuation of treatment, monitoring and other epidemic control activities till the situation is brought under control and the epidemic eradicated
- ◆ Trauma counselling
- ◆ Treatment and socio-medical rehabilitation of injured or disabled persons
- ◆ Immunisation and nutritional surveillance
- ◆ Long term plans to progressively reduce various factors that contribute to high level of vulnerability to diseases of population affected by disasters

### **7.2.10.3 Water Supplies and Sanitation**

#### **Prevention Activities:**

- ◆ Provision of safe water to all habitats
- ◆ Clearance of drains and sewerage systems, particularly in the urban areas



### **Preparedness Activities for Disaster Seasons:**

- ◆ Prior arrangement of water tankers and other means of distribution and storage of water
- ◆ Prior arrangement of stand by generators
- ◆ Adequate prior arrangements to provide water and halogen tablets at identified sites to used as relief camps or in areas with high probability to be affected by natural calamities
- ◆ Raising of tube-well platforms, improvement in sanitation structures and other infrastructural measures to ensure least damages during future disasters

### **Response Activities:**

- ◆ Disinfections and continuous monitoring of water bodies
- ◆ Ensuring provision of water to hospitals and other vital installations
- ◆ Provision to acquire tankers and establish other temporary means of distributing water on an emergency basis
- ◆ Arrangement and distribution of emergency tool kits for equipments required for dismantling and assembling tube wells, etc.
- ◆ Carrying out emergency repairs of damaged water supply systems
- ◆ Disinfection of hand pumps to be done by the communities through prior awareness activities & supply of inputs

### **Recovery Activities:**

- ◆ Strengthening of infrastructure
- ◆ Review and documentation
- ◆ Sharing of experiences and lessons learnt
- ◆ Training to staff
- ◆ Development of checklists and contingency plans

#### **7.7.10.4 Police**

### **Prevention Activities:**

- ◆ Procurement and deployment of modern emergency equipments while modernising existing infrastructure and equipments for disaster response
- ◆ Ensure that all communication equipments including wireless are regularly functioning and deployment of extra wireless units in vulnerable pockets
- ◆ Keeping close contact with the District Administration & Emergency Officer

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- ◆ Superintendent of Police be made Vice Chairperson of District Natural Calamity Committee
- ◆ Involvement of the local army units in response planning activities and during the preparation of the annual contingency plans to ensure logistics and other support to armed forces during emergencies

#### **Response Plan:**

- ◆ Security arrangements for relief materials in transit and in camps etc.
- ◆ Senior police officers to be deployed in control rooms
- ◆ Deploy personnel to guard vulnerable embankments and at other risk points
- ◆ Arrangement for the safety
- ◆ Coordinate search, rescue and evacuation operations in coordination with the administration
- ◆ Emergency traffic management
- ◆ Maintenance of law and order in the affected areas

#### **7.7.10.5 Civil Defence**

##### **Prevention Activities:**

- ◆ Organise training programmes on first aid, search, rescue and evacuation
- ◆ Preparation and implementation of first aid, search and rescue service plans for major public events in the district
- ◆ Remain fit and prepared through regular drills and exercises at all times.

##### **Response Activities:**

- ◆ Act as support agency for provision of first aid, search and rescue services to other emergency service agencies and the public
- ◆ Act as support agency for movement of relief
- ◆ Triage of casualties and provision of first aid and treatment
- ◆ Work in coordination with medical assistance team
- ◆ Help the Police for traffic management and law and order

#### **7.7.10.6 Fire Services**

##### **Prevention Activities:**

- ◆ Development /enforcement of relevant legislations and regulations to enhance adoption of fire safety measures
- ◆ Modernisation of fire-fighting equipments and strengthening infrastructure



- ◆ Identification of pockets, industry, etc. which highly susceptible to fire accidents
- ◆ Building awareness in use of various fire protection and preventive systems
- ◆ Training the communities to handle fire emergencies more effectively
- ◆ VHF network for fire services linked with revenue & police networks
- ◆ Making clearance of building plans by fire services mandatory

**Response Activities:**

- ◆ Rescue of persons trapped in burning, collapsed or damaged buildings, damaged vehicles, including motor vehicles, trains and aircrafts, industries, boilers and pressure vessels, trenches and tunnels
- ◆ Control of fires and minimising damages due to explosions
- ◆ Control of other dangerous or hazardous situations such as oil, gas and hazardous materials spill
- ◆ Protection of property and the environment from fire damage
- ◆ Investigation into the causes of fire and assist in damage assessment

**7.7.10.7 Civil Supplies**

**Preventive Activities:**

- ◆ Construction and maintenance of storage go downs at strategic locations
- ◆ Stock piling of food and essential commodities in anticipation of disaster Take appropriate preservative methods to ensure that food and other relief stock are not damaged during storage, especially precautions against moisture, rodents and fungus infestation.

**Response Activities:**

- ◆ Management of procurement
- ◆ Management of material movement
- ◆ Inventory management

**Recovery Activities:**

- ◆ Conversion of stored, unutilised relief stocks automatically into other schemes like Food for Work. Wherever, it is not done leading to damage of stock, it should be viewed seriously



#### **7.7.10.8 Works/ Rural Development Departments**

##### **Prevention Activities:**

- ◆ Keep a list of earth moving and clearing vehicles / equipments (available with Govt. Departments, PSUs, and private contractors, etc.) and formulate a plan to mobilize those at the earliest.
- ◆ Inspection and emergency repair of roads/ bridges, public utilities and buildings

##### **Response Activities:**

- ◆ Clearing of roads and establish connectivity. Restore roads, bridges and where necessary make alternate arrangements to open the roads to traffic at the earliest.
- ◆ Mobilization of community assistance for clearing blocked roads
- ◆ Facilitate movement of heavy vehicles carrying equipments and materials
- ◆ Identification and notification of alternative routes to strategic locations
- ◆ Filling of ditches, disposal of debris, and cutting of uprooted trees along the road

##### **Recovery Activities:**

- ◆ Strengthening and restoration of infrastructure with an objective to eliminate the factor(s) which caused the damage
- ◆ Sharing of experiences and lessons learnt
- ◆ Development of checklists and contingency plans

#### **7.7.10.9 Forest Department**

##### **Prevention Activities:**

- ◆ Promotion of shelter belt plantation
- ◆ Publishing for public knowledge details of forest cover, use of land under the forest department, the rate of depletion and its causes
- ◆ Keep saws (both power and manual) in working conditions
- ◆ Provision of seedling to the community and encouraging plantation activities, promoting nurseries for providing seedlings in case of destruction of trees during natural disasters
- ◆ Increasing involvement of the community and NGOs in plantation, protection and other forest protection, rejuvenation and restoration activities.
- ◆ Plan for reducing the incidence, and minimise the impact of forest fire





- Non-governmental organizations (NGO)
- NGO's could provide a valuable source of expertise and information to support emergency response efforts. Members of NGOs could assist response personnel by performing specified tasks, as planned during the emergency planning process. Such tasks could include providing humanitarian, psychological & social assistance to members of community and response personnel.
- ◆ Duties of NGO are listed below:
  - Evacuation of personnel from the affected area
  - Arrangements at rallying posts and parking yards
  - Rehabilitation of evacuated persons
  - Co-ordination with other agencies such as police, medical, animal husbandry, agriculture, electricity board, fire services, home guards and civil defence.
  - Establishing shelters for rescue, medical, fire fighting personnel.

#### **7.7.11 Capacity Analysis**

The following steps have been taken to combat any eventualities during and after the disaster situations

- ◆ DC will be overall in charge of the disaster management in the district and could delegate any of the powers to other officers in the district.
- ◆ Control Room will be functioning round the clock in the DC office, SP's office, Tahsildar's office with adequate facilities staff exclusive members assigned with the job.
- ◆ The respective Taluka Tahsildars are working as taluka level incident commanders for managing the disasters.
- ◆ Superintending Engineer of Irrigation department will be assigned the overall responsibility of flood management and rainfall data management.
- ◆ PWD has been assigned the overall responsibility of setting up of site operations centre during the disaster situation and provide all the necessary facilities.
- ◆ Transport Department is in charge of providing the vehicles necessary for managing the response activities.
- ◆ DHO is in charge of providing the necessary medical facilities such as Medicine, Ambulances, Statures at medical relief camps, mobile medical teams ready for the purpose.



- ◆ Flood and Civil supplies officers have been directed by the DC to store adequate foodstuff at vulnerable areas and strategic points.
- ◆ SP has been directed by the DC to set up and monitor the wireless stations and make arrangements to seek army assistance if required.
- ◆ The SE/PWD; SE, Irrigation have been instructed to carry out the repair works of dams, canals, river embankments, bridges, old and unsafe buildings immediately and before the rainy season ever year.
- ◆ Some NGOs in the district working at the levels of talukas and villages are asked to collaborate with local administrations to carry out the relief, rescue operations and rehabilitation activities.
- ◆ Review of pre-disaster arrangements has been carried out and contingency plan for the district has been provided to all the heads of the departments in the district.

### **7.7.12 Recovery and Rehabilitation**

The objective of the recovery and rehabilitation plan will be to reduce vulnerability of the people and infrastructure. In the rehabilitation plan, the special needs of the vulnerable groups and areas prone to repeated disasters will be given priority.

#### **7.2.12.1 Recovery**

The restoration programme may involve two stages of works. In the first stage some repairs are immediately necessary to avoid further deterioration for making the works worthy for immediate use. Restoration of communication power supply, hospital facilities, water and sanitary arrangements are some of the programme, which may come under this category. The concerned departments of government may lay down priorities in the restoration programme having regard to the necessary and availability of funds.

The overall objectives of a recovery framework are:

- ◆ To organize the country's response and approach
- ◆ To review and stock-take regarding the recovery needs to get the community/country back on track towards sustainable development;
- ◆ To secure wide support, including financial and technical resources;
- ◆ To develop a partnership strategy for implementation with participation of multiple stakeholders, including the affected communities

#### **7.7.12.2 Rehabilitation**

House damage in the wake of major disaster in the rural areas presents a serious problem. As these houses are generally mud built with thatched roof, the worst sufferers are the economically backward people who normally reside in vulnerable prone areas of these villages. Rehabilitations schemes are undertaken to provide housing to as many people as possible after a devastating disasters. Such



houses are either to be located on the land allotted by the government or in their own safe land.

Some typically addressed step in a recovery and rehabilitation are:

- ◆ Rehabilitation of damaged infrastructure should be seen as an opportunity to reduce the development deficit, to fulfill unmet needs and development objectives and to reduce disaster risk. Recovery activities may include focus on:

**Employment and Livelihoods:**

- ◆ Agriculture and livestock production, through the provision of seeds, tools, micro- credits, and other means
- ◆ Small business through the provision of credits or other means
- ◆ Recovery of and improvement of productive social infrastructure such as roads, markets, etc. which will support the economic activities
- ◆ The reconstruction of the housing sector using local technologies, construction materials, local know-how, to ensure that construction activities will have a direct positive impact upon the local economy.
- ◆ Consideration of short-term gender sensitive alternative employment generation to compensate lost livelihoods in the immediate post-disaster period.

The rapid rehabilitation of primary infrastructure such as primary roads, bridges, water supply and sanitation systems, primary power generation and distribution facilities, irrigation and agricultural facilities, health, education and other social facilities, can contribute to a swift restoration and development of the affected region.

Environmental and water resources recovery should be used as an opportunity to enhance the management of water and environmental resources in order to reduce one of the major causes of future disasters. Several environmental restoration activities are, by their nature, significant contributors to reducing disaster risk and must be seriously taken into consideration in recovery planning. Some of these include cleaning of watersheds and reforestation programmes.

Often, in the aftermath of a disaster, there is a growing concern among experts and government officials to promote a safer location for settlement of people at risk. Experience shows, however, that resettlement of population on new sites is a complex issue and presents major challenges.

**7.8 Social Impact Assessment / Rehabilitation & Resettlement**

100% land is in possession of the project proponent. The process of land acquisition was started in 2007 and made completed in May 2015. Since then there is no habitation or any kind of activity pertaining to any outside person or agent.

The land has been in possession of the project proponent for more than 10 years and there is no habitation within the land premises. Socio-Economic evaluation study has been done for the surrounding arrears upto 10 km and appropriate budget to

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the tune of 20.25 Cr. has been earmarked towards CER based on the requirement of the people in the region.

The land has been in possession for more than ten years without encroachment. The R & R proposed and approved by the state government have been implemented. R&R has been implemented as per the acquisition of government land policy of resettlement and rehabilitation approved by divisional commissioner Jabalpur (order dated 24/06/2015) as per the right to fair compensation and transparency and land acquisition , rehabilitation and resettlement act 2013. An amount of Rs. 2.89 crores has been paid by project proponent on 06/10/2016 and has been settled and completed (The R&R certificate to this effect from district collector is enclosed here below).

It would be value to add here that the area acquired on the foot hills. The land earmarked as negative growth area. For every cropping cycle the losses have been estimated at around 2.5 %. The soil lacks in Nitrogen and Phosphate most of the farmers are caught in the vicious cycle of poverty.

The land was valued land at Rs.1,05,000/ Per Hectare (Non-Irrigated) as per Government guidelines rates in the year 2008- 09. The Government Guidelines rates increased to Rs.10,60,000/- Per Hectare (Non-Irrigated) in the year 2012-13. Government Guidelines Rates for the year 2008-09 and Year 2012-13 is enclosed.

Copy of award for acquisition land of one of the village - Dudhalakhurd passed by District Collector Chhindwara dated 12/12/2014 showing land valued at double of the cost of the land is enclosed.

Thus benefitting the land owners and giving them an opportunity to shift to fertile areas where agriculture returns are good.

No irrigation land has been acquired nor any inhabited land has been acquired for the project.

Certificate from District Collector

ANNEXURE - 1



कार्यालय - ☎ (07162) 242302  
निवास - ☎ (07162) 242303  
फैक्स - ☎ (07162) 244467  
e-mail : dmchhindwara@gmp.gov.in

## कार्यालय कलेक्टर, छिन्दवाड़ा

Date: 03/12/2019

### TO WHOMSOEVER IT MAY CONCERN

M/A Chhindwaraplus Developers Limited (CPDL), Nagpur had got In-principal approval vide letter dated 30.07.2007 from Ministry of Commerce and Industry, Government of India, New Delhi for setting up of Multi-Product Special Economic Zone (SEZ) / Industrial Park at Villages: Khapakarimwar, Kodadongri B1, Kodadongri B2, Kodadongri Dawami, Kodadongri Malgajari, Dudhalakhurd, Satnoor, Sawanga, Gondiwadhona, Gowariwadhona of Tehsil Sausar, and District Chhindwara in Madhya Pradesh.

About 1208 hectare Land is in possession of M/s Chhindwaraplus Developers Limited, Nagpur at the various villages mentioned as above. Land in possession of CPDL is been acquired through Private Negotiations, Government Acquisition, and Government Allotment and involves Revenue Forest Land.

Further, for acquisition of government land, Policy for resettlement and rehabilitation (R & R) has been approved from Divisional Commissioner, Jabalpur vide its order dated 24.06.2015 as per The Right to fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (No. 30 of 2013). The amount for R & R has been paid by CPDL on 06/10/2016 and has been settled and completed.

Further to certify that No settlements/villages fall within the land boundaries of CPDL and now the said project does not require any further implementation of Rehabilitation and Resettlement (R & R).

(Note for land in possession along with relevant document). - Enclosed

  
( Dr. Shrinivas Sharma )  
Collector  
Chhindwara



कार्यालय - ☎(07162) 242302  
निवास - ☎(07162) 242303  
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e-mail : dmchhindwara@mp.gov.in

## कार्यालय कलेक्टर, छिन्दवाड़ा

### NOTE ON LAND IN POSSESSION

M/s Chhindwaraplus Developers Limited, Nagpur had got In-principal approval vide letter dated 30.07.2007 from Ministry of Commerce and Industry, Government of India, New Delhi for setting up of Multi-Product Special Economic Zone (SEZ) /Industrial Park at Villages: Khapakarimwar, Kodadongri B1, Kodadongri B2, Kodadongri Dawami, Kodadongri Malgajari, Dudhalakhurd, Satnoor, Sawanga, Gondiwadhona, Gowariwadhona of Tehsil Sausar, and District Chhindwara in Madhya Pradesh.

About 1208 hectare of Land is in possession. Land in possession of CPDL is been acquired through Private Negotiations, Government Allotment and Government Acquisition. The details of land in possession is as below :

Sr.	Particular	Remark
1.	Private Negotiation Land	Near about 574 Hectare of land is been acquired through private negotiations since CPDL got in-principal approval i.e. land acquired through private negotiations from year 2007 to 2015.
2.	Government Acquisition Land	Government of Madhya Pradesh, Revenue Department, Bhopal had acquired private land of 386 Hectare under under the provisions of land acquisition act 1894 which was completed in May 2015.
3.	Government Allotment Land	Government of Madhya Pradesh, Revenue Department, Bhopal vide its order dated 12/07/2010 had allotted 242.019 hectare of government land of which CPDL got possession on 30/05/2015.
4.	Government Allotment Land	Government of Madhya Pradesh, Revenue Department, Bhopal vide its order dated 06/11/2017 had allotted 54.354 hectare of government land for cart roads and water bodies within project area.
5.	Revenue forest Land	80.737 Hectare involves revenue forest land.

  
( Dr. Shrinivas Sharma )  
Collector  
Chhindwara

मध्यप्रदेश शासन  
राजस्व विभाग  
मंत्रालय  
बल्लभ भवन, मोपाल-462004

क्रमांक एफ 16-60/2009/सात/2ए

मोपाल, दिनांक 12 जुलाई, 2010

प्रति,

कलेक्टर,  
जिला-छिन्दवाड़ा,  
मध्यप्रदेश।

विषय- मेसर्स छिन्दवाड़ा प्लस डेव्हलपर्स द्वारा छिन्दवाड़ा जिले की साँसर तहसील में मल्टी प्रोडक्ट एस.ई.जेड. की स्थापना हेतु शासकीय भूमि का आगंतन।

संदर्भ- आपका प्रस्ताव 89/आरएडो(एन)/2010, दिनांक 04.2.2010.

राज्य शासन एतद्वारा द्वारा मेसर्स छिन्दवाड़ा प्लस डेव्हलपर्स द्वारा छिन्दवाड़ा जिले की साँसर तहसील में मल्टी प्रोडक्ट एस.ई.जेड. की स्थापना हेतु तहसील साँसर के ग्राम मोडीवाड़ीना, कोदाईगरी, भालगुजारी, खापरलीमगार, कोदाईगरी देवापी, कोदाईगरी डी-1, कोदाईगरी डी-2 एवं गाँव नागाणा की साँसर तहसील में कुल रकबा 282.04 हेक्टर का आगंतन वर्ष 2010-2011 की मई में जारी अधिसूचना संख्या 10/2010 द्वारा की जा चुकी है। के आगंतन पर प्रयोग होने वाले भूमि का मूल्य आ-वाक पर तथा भूमि पर खड़े हुए वृक्षों का मूल्य जेम्स गिन्स विधि का उपयोग करके जिला द्वारा जारी की जा चुकी है। अधिसूचना संख्या 10/2010 के अंतर्गत आगंतन पर लागू होने वाले करों को पर्याप्त रूप से वास्तु प्रकल्प में अधिसूचना संख्या 10/2010 में उल्लिखित किया है।

- 1) पट्टों का मूल्य का अनिवार्य रूप से उच्च श्रेणी/मजबूत वर्गीकरण में वर्गीकरण कराया जाये, तत्पश्चात् ग्राम सचिवी भू-अभिलेख में सहायक प्रविष्टि सुनिश्चित की जाये। पट्टों के परीक्षण एवं भू-अभिलेख में प्रविष्टि के अभाव में भूमि का अधिपत्य सीमा नहीं होगी।
- 2) आगंतन भूमि का आगंतन प्रयोग के अलावा अन्य उपयोग नहीं होगा। यदि कोई भूमि कमी भी प्राप्त प्रकल्प के अंतर्गत नहीं होती है तो वह भूमि को खरीद दिया जाता है तो भूमि तथा इस पर निर्मित इमारतों एवं सामग्री के साथ साँसर में निहित ही आगे, और आगंतनी को उचित मुआवजा देय नहीं होगा।
- 3) भूमि के किसी भी उपयोग या इस पर किसी भी निर्माण के पूर्व सभी आवश्यक अनुमति प्राप्त करनी होंगी एवं तत्पश्चात् आगंतनी द्वारा संस्थाओं के लिए निर्माण, कार्य तथा तारीफ निवेश आदि से आगंतनी को लेना होगी तथा साँसर प्लान में पर्यावरण संरक्षण अधिनियम संघी

5) प्रावधानों, अन्य विधिक अनुमतियों जो आवश्यक हों आदि को प्राप्त करना होगा व इनकी शर्तों का पूर्ण पालन करना होगा।  
शासन के प्रतिनिधि, अधिकृत व्यक्ति तथा जिला कलेक्टर या उसके अधिकृत प्रतिनिधियों को भूमि के सही उपयोग तथा शर्तों के पालन का पर्यवेक्षण करने के लिये कमी भी भूमि तथा उस पर निर्मित ऋरिसर के निरीक्षण का अधिकार होगा।

6) भूमि एवं भूमि पर बनी आस्तियाँ एवं सेवाएँ न तो बंधक रखी जावेंगी और न ही उस पर कोई ऋण लिया जावेगा। राज्य शासन इस हेतु कोई अनुमति भी नहीं देगा।

2/- आदेश जारी होने की तिथि से आवेदक / संस्था से प्रव्याजि की संपूर्ण राशि व भू-भाटक की राशि तीन माह के अन्दर जमा करावें, यदि वे निर्धारित अवधि तक प्रव्याजि व भू-भाटक खाना नहीं करते हैं, तो आवेदन आदेश स्वयं निरस्त माना जावेगा।

3/- यह स्वीकृति वित्त विभाग के ज्ञाप क्रमांक 2/2/02/नियम-4 दिनांक 30.9.2002 द्वारा प्रदत्त अधिकारों के अधीन महालेखाकार मध्यप्रदेश ग्वालियर को पृष्ठांकित की गई है।

संलग्न-मूल राजस्व प्रकरण

- 05/आ-19(2)/09-10
- 06/आ-19(2)/09-10
- 07/आ-19(2)/09-10
- 08/आ-19(2)/09-10
- 09/आ-19(2)/09-10
- 10/आ-19(2)/09-10(11/आ-19(2)/09-10)

मध्यप्रदेश के राज्यपाल के नाम से  
तथा आदेशानुसार

  
(एस.के.राजेक)  
अधिर सचिव

मध्यप्रदेश शासन, राजस्व विभाग  
ग्वालियर, दिनांक 12 जुलाई, 2010

पुस्तकांक 0एफ 16-80/2009/शास/2ए  
प्रतिनिधि-

1. सचिव, मध्यप्रदेश शासन, वित्त विभाग, महाराज ग्वालियर।
  2. महालेखाकार मध्यप्रदेश ग्वालियर।
  3. जागृदा, पालसपुर संभाग, जगतपुर की और एल क्रमांक 08/एक-2/10, दिनांक 17 फरवरी, 2010 के संदर्भ में।
  4. मुख्य कार्यालय अधिकारी मेहसी सिविल लाइन्स डेवलपर्स लिमिटेड नागपुर
- की और सूचनाएँ एवं आवश्यक कार्यवाही हेतु अधिसूचित।

  
अधिर सचिव

मध्यप्रदेश शासन, राजस्व विभाग

मध्यप्रदेश शासन,  
राजस्व विभाग,  
मंत्रालय, वल्लभ भवन, भोपाल।

// आदेश //

भोपाल, दिनांक 6/11/2017

क्रमांक एफ 16-30/2016सात-2ए राज्य शासन द्वारा मेसर्स छिन्दवाड़ा प्लस डेव्हलपर्स लिमिटेड को जिला छिन्दवाड़ा तहसील सासर में एस.ई.जेड (विशेष आर्थिक क्षेत्र) परियोजना की स्थापना हेतु भूमि रकबा 54.354 हेक्टेयर सलगन परिशिष्ट-अ अनुसार वर्ष 2017-18 की प्रचलित कलेक्टर गाइड लाइन के आधार पर सगणित प्रीमियम राशि तथा उस पर 7.5 प्रतिशत की दर से वार्षिक भू-भाटक लेकर भूमि आवंटन निम्न शर्तों के आधार पर किया जाता है :-

1. आदेश जारी होने की स्थिति से आवेदक/संस्था से प्रव्याजि एवं वार्षिक भू-भाटक की राशि 1 अप्रैल, 2019 को देय होगी, जिस पर इस अवधि का कोई ब्याज देय नहीं होगा। यदि ये निर्धारित अवधि तक भू-भाटक जमा नहीं करते हैं तो आवंटन आदेश स्वमेव निरस्त माना जावेगा। इस हेतु पृथक से कोई नोटिस नहीं दिया जावेगा।
2. भूमि का उपयोग जिस प्रयोजन के लिये आवंटित की जा रही है उससे भिन्न प्रयोजन के लिए उपयोग नहीं होगा अन्यथा अनाधिकृत कब्जेदार मानकर भूमि शासन में निहित कर ली जावेगी तथा उस पर निर्मित भवनों एवं सन्पत्तियों के साथ शासन में निहित हो जावेगी और आवंटितों को उसका मुआवजा देय नहीं होगा।
3. भूमि के किसी उपयोग या इस पर किसी भी निर्माण के पूर्व सभी आवश्यक अनुमतियां अनुमोदन एवं अनापत्तियां संबंधित स्थानीय संस्थाओं नगर निगम, नगर तथा ग्रामीण निवेश आदि से आवंटितों को लेना होगी तथा मास्टर प्लान व पर्यावरण संरक्षण अधिनियम संबंधी प्रावधानों आदि का पूर्ण पालन किया जावेगा।
4. शासन के प्रतिनिधि अधिकृत व्यक्ति तथा जिला कलेक्टर या उसके अधिकृत प्रतिनिधियों को भूमि के सही उपयोग तथा शर्तों के पालन का परीक्षण करने के लिये कभी भी भूमि तथा उस पर निर्मित परिसर के निरीक्षण का अधिकार होगा।
5. भूमि एवं भूमि पर बनी अस्तित्वा एवं सेवाएँ न तो बंधक रखी जाएगी और न ही उस पर कोई ऋण लिया जायेगा। राज्य शासन इस हेतु कोई अनुमति भी नहीं देगा।
6. यह आदेश मंत्रि-परिषद की बैठक दिनांक 03 अक्टूबर, 2017 के आयटन क्र.04 में लिये गये निर्णय के परिप्रेक्ष्य में जारी किया जाता है।

मध्यप्रदेश के राज्यपाल के नाम से  
तथा आदेशानुसार

  
( आर.एस.शर्मा )  
अवर सचिव

मध्यप्रदेश शासन, राजस्व विभाग

**Chapter 7: Additional Studies**

Environmental Impact Assessment (EIA) Study for Development of Multi-Product Special Economic Zone (SEZ)/Industrial Park at Tehsil Sausar, District Chhindwara, Madhya Pradesh  
**Final Report, October 2020**

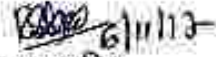


— 2 —

पृ०क० एफ 16-30/2016/साज-2ए  
प्रतिलिपि-

भोपाल, दिनांक 6/11/2020

1. निज सचिव, मान.मंत्रीजी, राजस्व विभाग।
  2. निज सहायक, प्रमुख सचिव/सचिव, मध्यप्रदेश शासन, राजस्व विभाग।
  3. सचिव, मध्यप्रदेश शासन, वित्त विभाग, मंत्रालय, भोपाल।
  4. महालेखाकार, मध्यप्रदेश ग्वालियर।
  5. आयुक्त जबलपुर संभाग, जबलपुर।
  6. मेसर्स छिंदवाडा प्लस डेवलपर्स लिमिटेड, तहसील सौसर जिला छिंदवाडा।
  4. कलेक्टर जिला छिंदवाडा मध्यप्रदेश।
  8. फोल्डर प्रति।
- की ओर सूचनार्थ एव आवश्यक कार्यवाही हेतु अग्रेषित।

  
अवर सचिव  
मध्यप्रदेश शासन राजस्व विभाग

**Agenda No. 7**

**File No. 8-16/2019-FC**

**Sub: Proposal for diversion of 80.737 ha of forest land (8.33 ha. Forest land & 72.407 Revenue Forest land) for establishment of Special Economic Zone (SEZ) in Chhindwara Dist. of MP State in favour of M/s Chhindwara Plus Developers Ltd, reg.**

1. The above stated agenda item was considered in FAC meeting on 26.09.2019. The corresponding agenda note may be seen at [parivesh.nic.in](http://parivesh.nic.in).
2. The FAC observed that there are 89 patches of forest land totalling 80.737ha, which are interspersed in the whole project area of the SEZ having total area of 1320.065 (including 1239.328 ha non-forestland).
3. FAC after through deliberation & discussion with Nodal Officer (FCA) of the State, **recommended for In-principle approval** for diversion of 80,737 hectares of forest land (8.33 ha. Forest land & 72,407 Revenue Forest land) for use within the Special Economic Zone (SEZ) in Chhindwara District of Madhya Pradesh in favour of M/s Chhindwara Plus Developers Ltd. with General, standard and following specific conditions:
  - a. Norms and guidelines followed in similar proposals, shall be applicable in the instant case.

\*\*\*\*\*

**Agenda No. 8**

**File No. 8-53/2009-FC (Vol.)**

**Sub: Proposal for diversion of 2.7675 ha of forest land in favour of M/s Executive Engineer EHT Construction Division MPPTCL Bhopal for 132 KV Interconnector-II Line from 220 KV S/S Mandi Deep to 132 KV S/S Mandi Deep in Raisen District Madhya Pradesh-regarding.**

1. The above stated agenda item was considered in FAC meeting on 26.09.2019. The corresponding agenda note may be seen at [parivesh.nic.in](http://parivesh.nic.in).
2. The FAC observed following:
  - a. This proposal is part of the 197.855 ha forest land for which In-principle approval was already accorded by the Ministry (HQ) on 20.12.2017 for Mandi Deep Industrial Area in Raisen District of MP State.
  - b. As per the Guidelines, the proposal even though involves forest land of less than 40ha, will be dealt in MoEF&CC(HQ), since the original proposal related to this, as mentioned at para.2(i) above, was dealt in MoEF&CC (HQ) itself.
  - c. Instant proposal is for diversion of 2.7675 ha forest land for Transmission.

**Decision of FAC:**

FAC after through deliberation & discussion with Nodal Officer (FCA) of the State and DDG (RO, Bhopal), **recommended to accord In-principle approval** for the instant proposal with general and standard conditions.

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**Chapter 7: Additional Studies**

Environmental Impact Assessment (EIA) Study for Development of Multi-Product Special Economic Zone (SEZ)/Industrial Park at Tehsil Sausar, District Chhindwara, Madhya Pradesh  
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3. It was also noted that in the same order dt 12.12.1996, it was directed that the States would constitute respective expert committees which would identify all 'forests', irrespective of whether they are notified, recognised or classified under any law, and irrespective of the ownership of the land of such forest, in a time bound manner.
4. To comply with the order, States formed 'Expert Committees'. Many States developed their respective criteria for considering 'deemed forest' and accordingly have submitted their affidavits in the Hon'ble Court. However, no document could be brought to the notice of the FAC, based on which it could be said that the Hon'ble Court has ever directed the MoEF&CC to develop or frame criteria, state-wise or for the country, for identifying lands to be identified as 'deemed forest'.
5. FAC also noted that a matter in this subject is *sub-judice* in the Hon'ble Supreme Court, in which the state Government of Uttarakhand is a respondent. The state has submitted before the court that, a draft set of criteria has been referred to MoEF&CC for the latter's approval, based on which 'deemed forest' can be identified for Uttarakhand.
6. To have due deliberation and appropriate view, this has been brought before the FAC.
7. FAC deliberated over the issue in presence of ODGs of Regional Offices present in the meeting and was of the view that:
  - a. India is a vast country with varied geo-physical units and soil-climatic conditions, that has given rise to a number of forest types. There are variations even within the forest types.
  - b. As far as developing criteria for 'deemed forests' is concerned, there cannot be any uniform criteria applicable to all forest types or all states. There has to be different criteria for different forest types or states.
  - c. It is not only that Hon'ble Supreme Court had directed states to identify their own forests, in fact the states, having well established forest departments, are in a better position, rather than MoEF&CC, to understand their own forests and needs, and should frame criteria for their forests.
  - d. While framing criteria, due diligence should be exercised taking into account spirit of order of Supreme court, National Forest Policy, the rationale of having adequate forests, site quality of naturally occurring forest species etc for supporting a healthy environment.
  - e. The criteria so finalised by a state, need not be subject to approval of MoEF&CC.

Confirmed by mail  
(S. D. Vora)  
Member

  
(A. K. Mohapatra)  
Inspector General of Forests (FC)

Confirmed by mail  
(Dr Sanjay Deshmukh)  
Member

Confirmed by mail  
(Sh Anmol Kumar)  
Member

Confirmed telephonically  
(Saibal Duggupta)  
Addl. Director General of Forests (FC)

not-present  
Additional Commissioner (Soil Conservation)  
Ministry of Agriculture (Member)

Confirmed  
(Siddhanta Das)  
Director General of Forests & Special Secretary

**Chapter 7: Additional Studies**

Environmental Impact Assessment (EIA) Study for Development of Multi-Product Special Economic Zone (SEZ)/Industrial Park at Tehsil Sausar, District Chhindwara, Madhya Pradesh  
**Final Report, October 2020**



**Government Guidelines Rates of the year 2008-09 and year 2012-13**

**GOVERNMENT GUIDELINE RATES**

सूचि नार्डब लाईन कर्ब 2008-2009 की प्रचलित दरे ग्रामवार निम्नानुसार हे ।

क्र.	ग्राम	प.ड.नं.	ब.क्र.	प्रति हेक्टर मूल्य रूपमा मे	
				असिचित	सिचित
1	गोडीवाडोना	22	101	121000	208000
2	खापाकरीमवार	23	74	101000	
3	कोदाडोगरी बी-1	23	58	90000	153000
4	कोदाडोगरी बी-2	23	60	90000	153000
5	कोदाडोगरी दवाची	23	59	90000	153000
6	कोदाडोगरी नात	23	57	90000	153000
7	सातनूर	23	376	178000	303000
8	दुधाला खुर्द	23	189	104500	178000
9	दुधाला कता	24	188	108000	180500
10	सावगा	24	381	186500	317500
11	पारखसिंगा	23	237	221000	376300
12	कबर चिन्ता	25	34	192000	328500
13	पालोरा	26	241	158000	270500
14	ब्राम्हा पिपला	25	265	185500	317500
15	सगम	26	410	158500	268500



Chapter 7: Additional Studies

Environmental Impact Assessment (EIA) Study for Development of Multi-Product Special Economic Zone (SEZ)/Industrial Park at Tehsil Sausar, District Chhindwara, Madhya Pradesh  
Final Report, October 2020



GOVERNMENT CUM LEASE RAFFS 2012-13

क्र.सं.	विकास क्षेत्र का नाम	उपखिला - सीसर		खण्ड - 3		निहित सम्पत्तियों का सूचना सहित कार्यालय से गार्डरॉक सिटिंग वर्ष 2012-13 (रु.करी)				
		प्रति हेक्टेयर सूचना का संख्या	प्रति हेक्टेयर सूचना का मूल्य (रु.करी)	5	6	7	8	9	10	11
1	पुसापुर	420000	840000	500	6000	3000	5000	4100	5000	10000
2	बागवतपुर	130000	455000	500	6000	3000	5000	4100	5000	9500
3	गोविंदपुर	510000	1530000	500	6000	3000	5000	4100	5000	10000
4	गोविंदपुर	400000	1200000	500	6000	3000	5000	4100	5000	10000
5	गोविंदपुर	130000	390000	500	6000	3000	5000	4100	5000	10000
6	गोविंदपुर	150000	450000	500	6000	3000	5000	4100	5000	10000
7	गोविंदपुर	120000	360000	500	6000	3000	5000	4100	5000	10000
8	गोविंदपुर	140000	420000	500	6000	3000	5000	4100	5000	10000
9	गोविंदपुर	110000	330000	500	6000	3000	5000	4100	5000	10000
10	गोविंदपुर	100000	300000	500	6000	3000	5000	4100	5000	10000
11	गोविंदपुर	180000	540000	500	6000	3000	5000	4100	5000	10000
12	गोविंदपुर	160000	480000	500	6000	3000	5000	4100	5000	10000
13	गोविंदपुर	140000	420000	500	6000	3000	5000	4100	5000	10000
14	गोविंदपुर	120000	360000	500	6000	3000	5000	4100	5000	10000
15	गोविंदपुर	100000	300000	500	6000	3000	5000	4100	5000	10000
16	गोविंदपुर	180000	540000	500	6000	3000	5000	4100	5000	10000
17	गोविंदपुर	160000	480000	500	6000	3000	5000	4100	5000	10000
18	गोविंदपुर	140000	420000	500	6000	3000	5000	4100	5000	10000
19	गोविंदपुर	120000	360000	500	6000	3000	5000	4100	5000	10000
20	गोविंदपुर	100000	300000	500	6000	3000	5000	4100	5000	10000



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10/11/2020

## Award of Acquisition of Land

वाहक द्वारा

कार्यालय कमिश्नर जबलपुर संभाग जबलपुर  
ज्ञापन

क्रमांक-31

/एच-1/64/2014

जबलपुर दिनांक 09/01/2015

धति

कलेक्टर

छिन्दवाड़ा

विषय-

एस ई जेड (स्पेशल एकोनॉमिक जोन) की स्थापना के लिये ग्राम  
पुष्पासाहूई बन्दोबरत क्रमांक 189 पटवारी हल्का क्रमांक 61/24  
तहसील -सौसार जिला छिन्दवाड़ा का रकबा 98.900 हेक्टेयर को  
अधिग्रहण किये जाने हेतु मेसर्स छिन्दवाड़ा प्लस डेवलपर्स लिमिटेड  
नागपुर (महाराष्ट्र)के द्वारा प्रस्तुत प्रस्ताव प्रकरण।

सन्दर्भ-

कलेक्टर छिन्दवाड़ा का पत्र क्रमांक 10044/प्रस्तु./मू-अर्जन/2014  
छिन्दवाड़ा दिनांक 12/12/2014

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कृपया विधायतगत रुदभित पत्र का अवलोकन करने का फाट करें।  
कलेक्टर छिन्दवाड़ा का पत्र क्रमांक 10044/प्रस्तु./मू-अर्जन/2014 छिन्दवाड़ा दिनांक  
12/12/2014 के द्वारा मेसर्स छिन्दवाड़ा प्लस डेवलपर्स लिमिटेड नागपुर (महाराष्ट्र)  
का प्रस्ताव के तहत तहसील सौसार में अर्जागत एस ई एम जेड (स्पेशल एकोनॉमिक जोन)  
की स्थापना का लिये ग्राम -पुष्पासाहूई बन्दोबरत क्रमांक 189 पटवारी हल्का क्रमांक  
61/24 तहसील सौसार जिला छिन्दवाड़ा रकबा 98.900 हेक्टेयर को अधिग्रहण हेतु प्रस्ताव  
प्रस्तुत किये गये है। उपरोक्त प्रस्ताव प्रकरण सामान्य योजना की श्रेणी के अन्तर्गत  
प्रस्तावित है। प्रकरण में प्रस्तावित भूमि के अधिग्रहण हेतु मू-अर्जन अधिनियम 1894 की  
धारा 4 एवं धारा 6 की अधिसूचना प्रकाशन कराया जाकर धारा-9 में विहित प्रावधानों के  
तहत व्यक्तिगत सुनवाई की कार्यवाही की गई तथा मू-अर्जन अधिकारी तहसील सौसार  
जिला छिन्दवाड़ा द्वारा धारा 6 के लिये प्रस्तावित रकबा 98.900 हेक्टेयर निजी भूमि की  
मूल्यांकित राशि 25,46,53,388.00/- (रुपये पच्चीस करोड़ छियालिस लाख तिरपन हजार  
तीन सौ अड़सठ मात्र) का अनुमोदन किये जाने प्राप्त हुआ है।

अतः आप से प्राप्त प्रस्ताव अनुसार मध्यप्रदेश शासन नोपाल की अधिसूचना  
क्रमांक-12-84-90-7/9 भोपाल दिनांक 28 मार्च 2002 के अनुसार प्रदत्त अधिकारों का  
उपयोग करते हुए प्रकरण में प्रस्तावित अपाई राशि 25,46,53,388.00/- (रुपये पच्चीस  
करोड़ छियालिस लाख तिरपन हजार तीन सौ अड़सठ मात्र) का अनुमोदन निम्नलिखित  
शर्तों पर किया जाता है-

- 1- धारा 4 एवं 6 में प्रकाशित रकबा एवं उस पर विहित परिसम्पत्तियों का ही  
मुआवजा भुगतान किया जावे।
- 2- भूमि के मुआवजा गणना पत्रक अपाई में किसी प्रकार की त्रुटि की पूर्ण जिम्मेदार  
मू-अर्जन अधिकारी की होगी।
- 3- अपाई पत्रक में की गई गणना एवं भूमि के स्वामित्व का एक बार पुनः परीक्षण  
कर लिया जावे।

**Chapter 7: Additional Studies**

Environmental Impact Assessment (EIA) Study for Development of Multi-Product Special Economic Zone (SEZ)/Industrial Park at Tehsil Sausar, District Chhindwara, Madhya Pradesh  
**Final Report, October 2020**



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- 4- भूमि अर्जन का विवाद होने की स्थिति में किसी को भुगतान न किया जाये। विवाद का निराकरण होने पर ही मुआवजा का भुगतान किया जाये।
- 5- किसी भूमि अर्जन के मामले में न्यायालय से स्वगत होने पर उसका मुआवजा भुगतान 10% तक न किया जाये जब तक कि उसका निराकरण नहीं हो जाये।
- 6- अर्जित की जा रही भूमि के संबंध में कलेक्टर यह सुनिश्चित कर ले कि वन भूमि तो नहीं है तथा शासन के निर्देशानुसार सर्विस चार्ज जमा किया जा चुका है।
- 7- सिंचित/असिंचित भूमि होने की जिम्मेदारी भू-अर्जन अधिकारी की होगी।
- 8- मध्य प्रदेश शासन राजस्व विभाग के पत्र क्रमांक एफ 12-5/2014/सात/सा-2 ए/भोपाल दिनांक 28/01/2014 (अधिनियम 2013) के प्रावधान अनुसार कार्रवाई करना सुनिश्चित करें।
- 9- भू-अर्जन अधिनियम 1894 की धारा 23 (1-क) के अनुसार ब्याज की गणना का सही होना सुनिश्चित करें।
- 10- समस्त वैधानिक प्रावधानों का पालन सुनिश्चित हो।

अतः आप से प्राप्त प्रस्ताव में शासन द्वारा दिये गये निर्देशों का पालन कर मुआवजा राशि का वितरण नये सिटीजन चार्टर में निर्धारित समय-सीमा में किया जाना सुनिश्चित करें।

(कमिश्नर द्वारा आदेशित)  
संख्या: पत्र क्रमांक 10044/2014 छिन्दवाड़ा  
दिनांक 12/12/2014 द्वितीय प्रति मूलतः  
वापिस

(सभाजीत सादत)  
उप आयुक्त (राजस्व)  
जबलपुर संभाग

वित्तीय प्रति



**॥ कार्यालय कलेक्टर, जिला-छिन्दवाडा (म०प्र०) ॥**

**प्रस्ताव पत्र**

क्रमांक / 1004 / प्रस्तुत / मू-अर्जन / 2014 छिन्दवाडा, दिनांक 12/12/2014  
प्रति

कमिश्नर,  
जबलपुर सभाग,  
जबलपुर (म.प्र.)

विषय- एस.ई.जेड (स्पेशल एकोनॉमिक झोन) की स्थापना के लिये ग्राम-दुवालाखुर्द इन्डोबस्त क्रमांक-189, पटवारी हत्या क्रमांक-61/24 तहसील-सौसर जिला-छिन्दवाडा का रकबा 98,900 हेक्टेयर के अधिग्रहण किये जाने हेतु मेसर्स छिन्दवाडा प्लस डेवलपर्स लिमिटेड नागपुर (महाराष्ट्र) के द्वारा प्रस्तुत प्रस्ताव प्रकरण।

संदर्भ - मेसर्स छिन्दवाडा प्लस डेवलपर्स लिमिटेड नागपुर (महाराष्ट्र) का प्रस्ताव पत्र क्र. / सी०पी०डी०एल० / 618 / एस.ई.जेड / मू-अर्जन / 2011-12 / छिन्दवाडा दिनांक 22.03.2013.

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उपरोक्त विद्यार्थी के संबंध में नियेदन है, कि मेसर्स छिन्दवाडा प्लस डेवलपर्स लिमिटेड नागपुर (महाराष्ट्र) द्वारा संदर्भित पत्र-प्रस्ताव के तहत तहसील-सौसर के अंतर्गत एस.ई.जेड (स्पेशल एकोनॉमिक झोन) की स्थापना के लिये ग्राम-दुवालाखुर्द इन्डोबस्त क्रमांक-189, पटवारी हत्या क्रमांक-61/24 तहसील-सौसर जिला-छिन्दवाडा का रकबा 98,900 हेक्टेयर के अधिग्रहण हेतु प्रस्ताव प्रस्तुत किए गए हैं। उपरोक्त प्रस्ताव प्रकरण सामान्य योजना की श्रेणी के अन्तर्गत प्रस्तावित है।

2. प्रकरण में प्रस्तावित भूमि के अधिग्रहण हेतु मू-अर्जन अधिनियम 1894 की धारा-4 एवं धारा-6 की अधिसूचनाओं का प्रकाशन कराया जाकर धारा-9 में वर्णित प्रावधानों के तहत व्यक्तिगत सुनवाई की कार्यवाही की गई तथा मू-अर्जन अधिकारी तहसील-सौसर, जिला-छिन्दवाडा द्वारा धारा 8 के लिये प्रस्तावित रकबा 98,900 हेक्टेयर निजी भूमि की मूल्यांकित राशि रुपये 25,46,53,388.00 (रुपये पच्चीस करोड़ पचास लाख तिरपन हजार तीन सौ अड़सठ मात्र) आकलित किया जाकर अगार्ड पारित किया गया है।

3. प्रकरण में प्रस्तावित भूमि का स्थल निरीक्षण किये जाने पर प्लॉटों की अर्जनीय निजी भूमि पर स्थित परिसंपत्तियों में जैसे 06 नकान का मूल्य रुपये-27,37,538.00 एवं 14 फुजों का मूल्य रुपये 12,89,100.00 एवं 884 विभिन्न प्रजातियों के वृक्ष अधिग्रहण स्थल में आना पाये गये हैं, जिसका बाजार मूल्य रुपये 27,82,305.00 निर्धारित किया गया है।

4. मू-अर्जन पुनर्वासन और पुनर्व्यवस्थापन में समित प्रतिकर और पारदर्शिता का अधिकार अधिनियम, 2013 की धारा- 24 (1) (क) के अनुसार 01 जनवरी, 2014 की स्थिति में अधिनियम 1894 के अंतर्गत की गयी कार्यवाही के मामलों में यदि अधिनियम 1894 की धारा 11 के अधीन अगार्ड पारित नहीं किया गया है तो ऐसे मामलों में प्रतिकर (मुआवजा) का निर्धारण

1/2/1

अधिनियम 2013 के प्रतिकर निर्धारण संबंधी प्रावधानों के अंतर्गत किया जाएगा। प्रकरण में अर्जित की जा रही भूमि को बाजार मूल्य पर धारा-4(1) की अधिसूचना प्रकाशन दिनांक से अर्वाह आदेश दिनांक तक के लिए 18 माह 22 दिनों की गणना राशि रुपये 02,08,49,908.00 तथा भूमि को निर्वाचित बाजार मूल्य पर 100 प्रतिशत सात्वना राशि रुपये 11,70,01,730.00 निर्धारित की जाकर अर्वाह आदेश पारित कर प्रतिकर राशि निर्धारित की गई है।

5. उपरोक्त प्रकरण में पारित किये गए अर्वाह की राशि रुपये 25,46,53,368.00 (रुपये पच्चीस करोड़ छियालिस लाख तिरपन हजार तीन सौ अठसठ मात्र) का अनुमोदन कमिश्नर, जबलपुर संभाग, जबलपुर द्वारा किया जाना आवश्यक है।

6. प्रकरण में पारित अर्वाह आदेश, बाजार मूल्य गणना पत्रक, प्रतिकर निर्धारण पत्रक, अर्वाह संक्षेपिका प्रपत्र अ. ब. स. ट के मूल्यांकन प्रपत्र आदि के सहित माग्यप्रतिवा दो-दो प्रतियों में नीचे दर्शाये अनुसार सलग्न कर आपकी ओर सादर सम्प्रेषित की जा रही है। उपरोक्त प्रेषित प्रस्ताव के संबंध में अनुरोध है कि अर्वाह राशि रुपये 25,46,53,368.00 (रुपये पच्चीस करोड़ छियालिस लाख तिरपन हजार तीन सौ अठसठ मात्र) का अनुमोदन किये जाने के बारे में अग्रतः कार्यवाही हेतु सादर सम्प्रेषित है।

सहपत्र :- उपरोक्तानुसार  
प्रस्ताव दो प्रतियों में।

( महेशचन्द्र चौधरी )  
कलेक्टर  
जिला-छिन्दवाड़ा (MP)