1 Safety Management Plan
During construction, erection, testing, commissioning, operation and maintenance, the manpower, materials and machines are the basic inputs. The proposed development of Adakanahalli industrial area generally has problems related to occupational health and safety. Hence management proposes to take steps to minimize the impacts from the proposed industrial area to ensure appropriate occupational health, safety including fire plans by adapting occupational health & safety measures as per standard procedures & local guidelines. All these activities again may be classified based on activities which need attention during construction, erection, operation and maintenance phases.

Over-exertion, ergonomic injuries and illnesses caused due to repetitive motion and manual handling are among the most common during construction. The proper steps for their prevention and control include:

- Training to be given to the workers regarding the lifting of materials & handling, placement of weight limits, planning of work, selection of tools and implementation of administrative controls in the site.
- Implementation of good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in identified areas away from foot paths.
- A fall protection plan will be implemented for the persons who will work in heights and also depending on the nature and aspects of the fall hazard.
- Appropriate techniques and measures will be taken for the prevention and control of hazards caused by the objects and moving machinery in proposed site during constructional phase.
- Suitable dust suppression techniques will be implemented like water spraying to minimize dust from vehicle movements and also proper Personal Protective Equipment (PPE) used at excessive levels.

a) Policy
The employees safety policy includes the following
- Contact their immediate supervisors according to individual department policies. What happened will be sorted out through the accident reporting and investigation process.
- The supervisor or employee should cause the following to be completed
  a. Obtain the names, addresses, and phone numbers (work and home) of any witnesses. Interview the witnesses and prepare a report including statements from the witnesses. The report should include any suggestions to prevent a similar accident or incident from occurring in the future.
b. Take photographs of the property damage or defect. A sufficient number of photos should be taken to fully describe the damage to a person who has not been at the scene.

c. Prepare a report of the incident with all necessary information. The reports should be prepared to reflect the seriousness of the incident.

d. Fill appropriate forms for future use.

e. If individual department procedures include all of the information required by this policy, that document can be utilized to fulfill these requirements.

f. This policy is in addition to a workers’ compensation reporting requirements.

Appropriate risk management strategies will be implemented to protect the community from physical, chemical, or other hazards associated with sites through a combination of institutional and administrative controls by adopting the community Health and Safety measures as per standard procedures & local guidelines provided for community health and safety.

To control communicable and vector-borne diseases attributable in the proposed site are not potentially serious health threat to project personnel and residents of local communities. The investigation facilities are available to monitor all the employees for the occupational health diseases expected due the production activities in the industrial area premises and also maintaining periodical check-up of our all workers from certified industrial & occupational health physician. The industrial area will maintain the first aid box with sufficient medicines to face any emergency in the industrial premises.

The problem of occupational health in the operation and maintenance phase of member industries is due to noise hearing losses. The personal protective equipments are given to all the workers. The working personnel are given the following personnel protective equipments as appropriate to their working environment.

- Safety Helmet
- Face shield with replacement acrylic vision
- Zero power plain goggles with cut type filters on both ends
- Welders equipment for eye and face protection
- Ear muffs
- Canister Gas mask
- Self-contained breathing apparatus
- Leather apron
- Full body Safety harness
- Leather hand gloves
- Acid/Alkali proof rubberized hand gloves
- Electrically tested electrical resistance hand gloves and
- Industrial safety shoes.
Emergency medical facilities are available round the clock for attending emergency arising out of accidents, if any. All working personnel are medically examined at least once in every year and at the end of his term of employment.

b) Safety Plan

Safety of both men and materials during construction and operational phases is of concern. The preparedness in the proposed site for the occurrence of possible disasters is known as emergency plan. The disaster in the proposed site may be possible due to leakage of hazardous fuels like HSD, collapse of structures and fire/explosion etc.

Keeping in view the safety requirement during construction, operation and maintenance phases, developer/common facilitator propose to formulate the safety policy and the same will be further strengthening after establishment of the proposed industrial area.

The safety policy is based on the following regulations:

- To allocate sufficient resources to maintain safe and healthy conditions of work
- To take steps to ensure that all known safety factors are taken into account in the design, construction, operation and maintenance of member industries, machinery and equipment
- To ensure that adequate safety instructions are given to all employees
- To provide wherever necessary protective equipment, safety appliances and clothing and to ensure their proper use
- To inform employees about materials, equipment or processes used in their work which are known to be potentially hazardous to health or safety
- To keep all operations and methods of work under regular review for making necessary changes from the point of view of safety in the light of experience and updated knowledge
- To provide appropriate facilities for first aid and prompt treatment of injuries and illness at work
- To provide appropriate instruction, training, retraining and supervision to employees in health and safety, first aid and to ensure that adequate publicity is given to these matters
- To ensure proper implementation of fire prevention methods and an appropriate firefighting service together with training facilities for personnel involved in this service
- To organize collection, analysis and presentation of data on accident, sickness and incident involving people injury or injury to health with a view to taking corrective, remedial and preventive action
- To promote through the established machinery, joint consultation in health and safety matters to ensure effective participation by all employees
- To publish/notify regulations, instructions and notices in the common language of
employees

➢ To prepare separate safety rules for each type of occupation/processes involved in a proposed industrial area and to ensure regular safety inspection by a competent person at suitable intervals of all buildings, equipments, work places and operations in all member industries.

2 Safety Organization

▪ Construction and Erection Phase

A qualified and experienced safety officer shall be appointed by the member industries and for the entire industrial area. The responsibilities of the safety officers include identification of the hazardous conditions and unsafe acts of workers and advice on corrective actions, conduct safety audit, organize training programs and provide professional expert advice on various issues related to occupational safety and health. He is also responsible to ensure compliance of safety rules/ statutory provisions. In addition to employment of safety officer by industry every contractor, who employs more than 250 workers, in the proposed site for the industrial area/member industry shall also employ one safety officer to ensure safety of the worker, in accordance with the conditions of contract.

▪ Operation and Maintenance Phase

When the construction is completed the posting of safety officers shall be in accordance with the requirement of Factories Act and their duties and responsibilities shall be as defined thereof.

A training center shall be set up at the proposed industrial area. Safety training shall be provided by the Safety Officer with the assistance of External faculty members called from Professional Safety Institutions and Universities. In addition to regular employees, contract labors shall also be provided safety training. To create safety awareness safety films shall be shown to workers and leaflets etc.

3 Risk Assessment Plan

Risk involves the occurrence or potential occurrence of some accident consisting of an event or sequence of events. Risk (R) can be mathematically expressed as R = fD where R is the risk (individual or societal), f is the frequency of occurrence of an undesired event and D is the expected damage distance due to likely occurrence of that unfortunate event. The main objectives of the study are as follows:

i. Identification of hazard prone area and estimation of damage distance for the Maximum Credible Accident (MCA) scenarios visualized for storages.

ii. Computation of frequency of occurrence of hazards and evaluation of risk.

iii. Based on the studies, suggest risk mitigation measures and arrive at guidelines for Disaster Management and Emergency Preparedness Plan (DMP and EPP).
4 Inventory at Site

The inventory at the project site is given in the Table 1.

Table 1

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name of Hazardous Materials &amp; Location</th>
<th>Nature of Hazard</th>
<th>No. of Storage Units</th>
<th>Capacity of storage (Liters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HSD (High Speed Diesel) Stored at Utilities Department</td>
<td>Fire &amp; Explosion</td>
<td>1 No</td>
<td>1000</td>
</tr>
</tbody>
</table>

5 Hazard Identification and Preliminary Hazard Analysis

5.1 Introduction to Hazard Identification

Identification of hazards in proposed site is of primary significance in the analysis, quantification and cost effective control of accidents involving chemicals and process. A classical definition of hazard states that hazard is in fact the characteristic of system/plant/process that presents potential for an accident. Hence, all the components of a system/plant/process need to be thoroughly examined to assess their potential for initiating or propagating an unplanned event/sequence of events, which can be termed as an accident.

5.2 Identification of Major Hazardous Units

Hazardous substances may be combustible/ flammable in nature. The HSD characteristics proposed to be stored at the project site are given in Table 2.

Table 2

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Codes/Label</th>
<th>TLV</th>
<th>FBP</th>
<th>MP</th>
<th>FP</th>
<th>LEL</th>
<th>UEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSD (High Speed Diesel)</td>
<td>Flammable</td>
<td>800 ppm</td>
<td>215 - 376°C</td>
<td>NA</td>
<td>32°C</td>
<td>0.6</td>
<td>6.0</td>
</tr>
</tbody>
</table>

TLV : Threshold Limit Value  
FBP : Final Boiling Point  
MP : Melting Point  
FP : Flash Point  
UEL : Upper Explosive Limit  
LEL : Lower Explosive Limit

5.3 Classification Based On Inventory Rating

In order to ensure a steady supply of raw materials, process chemicals and fuels, adequate inventory of all these materials is maintained. The quantities stored and the degrees of hazard in terms of NFPA ratings are given below. The National Fire Protection Agency, USA (NFPA), on scale 0 to 4 (least to worst), hazard rating is used as a tool to assess the preliminary hazard potential of a material shown in the Table 3.
From the above table it can be inferred that HSD falls under the category of “moderate” category of flammability index with Nf being 2.

5.4 Identification of Major Hazard Installations Based on manufacture, storage and import of hazardous chemical (MSIHC) Rules 1989 and the Amended Rules in October ‘1994

Following accidents in industry in India over the past few decades a specific legislation covering a major hazard activity has been enforced by Govt. of India in 1989 in conjunction with Environment Protection Act, 1986. This is referred here as MSIHC Rules 1989. For the purpose of identifying major hazard installations the rules employ certain criteria based on toxic, flammable and explosive properties of chemicals.

- Besides a list of hazardous substances with their threshold quantities are provided in Part II of Schedule I of the rules
- Schedule II of the rules sets out the threshold quantities for isolated storage units
- Schedule III gives a list of hazardous chemicals with their threshold quantities. In this schedule different chemicals are classified into distinct groups viz. Group 1 - Toxic substances, Group 2 -Toxic substances, Group 3 -Highly reactive substances, Group 4 -Explosive substances and Group 5-Flammable substances.
- Schedule IV of the rules indicate various operations which are hazardous during production, processing or treatment of organic and inorganic chemicals.

Indicative Criteria for Identification of Toxic, Flammable and Explosive Chemicals (MSIHC Rules 1989) is given in Table 4.

### Table 3
Properties of Fuel employed

<table>
<thead>
<tr>
<th>S.No</th>
<th>Raw Material</th>
<th>$N_h$</th>
<th>$N_l$</th>
<th>$N_f$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HSD (High Speed Diesel)</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

### Table 4

<table>
<thead>
<tr>
<th>a. Toxic Chemicals</th>
<th>Chemicals having the following values of acute toxicity and which, owing to their physical and chemical properties, are capable of producing major accident hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. No.</td>
<td>Degree of Toxity</td>
</tr>
<tr>
<td>1.</td>
<td>Extremely toxic</td>
</tr>
</tbody>
</table>
b. Flammable Chemicals

i. Flammable gases: Chemicals which in the gaseous state at normal pressure and when mixed with air become flammable and the boiling point of which at normal pressure is 20°C or below;

ii. Highly flammable liquids: Chemicals, which have a flash point, lower than 23°C and the boiling point of which at normal pressure is above 20°C.

iii. Flammable liquids: Chemicals which have a flash point lower than 65°C and which remain liquids under pressure, where particular processing conditions, such as high pressure and high temperature, may create major accident hazards.

c. Explosives

Chemicals which may explode under the effect of flame, heat or photo-chemical conditions or which are more sensitive to shocks or friction than dinitrobenzene.

Based on the indicative criteria inventory (liquids/fuels) stored in proposed site has been analyzed for applicability of MSIHC Rules 1989 and the results are summarized in Table 5.

### Table 5

**Applicability of MSIHC Rules to Storages**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Chemical/Fuel</th>
<th>Listed in Schedule</th>
<th>*Actual Expected Quantity</th>
<th>Threshold Quantity for Application of Rules 5, 7 – 9 and 13 – 15</th>
<th>Threshold Quantity for Application of Rules 10 - 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HSD</td>
<td>3 (2(e)(iii),5 and 6(1)(a)/)</td>
<td>1 T</td>
<td>2500 T</td>
<td>20,000 T</td>
</tr>
</tbody>
</table>

*Expected Quantity to be Stored for a week

From the above table it can be inferred that HSD tanks do not (with capacity 1 T) attract rules 2(e)(iii), 5 and 6(1)(a) and 7-15, as the stored quantities are less than that of the stipulated threshold quantities.

#### 6 Short Listed Hazards

Based on the preliminary hazard analysis, the following scenarios are short-listed for consequence analysis to quantify the risks involved. The nature of Hazards that could occur in proposed site is presented in the Table 6 along with the sources.

### Table 6

**Short listed Hazards**

<table>
<thead>
<tr>
<th>Nature Of Hazards</th>
<th>Sources &amp; Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Hazards</td>
<td>HSD Storage area. Storage &amp; handling of HSD in DG power house</td>
</tr>
<tr>
<td>Explosion Hazard</td>
<td>HSD</td>
</tr>
<tr>
<td>Fire / explosions due to leakage</td>
<td>Spillage / transfer of HSD cause explosion due to leakage</td>
</tr>
<tr>
<td>Accidents due to leakage</td>
<td>Connected with all material handling activities and equipment</td>
</tr>
</tbody>
</table>
### Nature Of Hazards

<table>
<thead>
<tr>
<th>Material Handling Equipment</th>
<th>Sources &amp; Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust hazard</td>
<td>Storage and handling of product concentrate at production block as well in storage yard</td>
</tr>
<tr>
<td>High voltage electrical hazard</td>
<td>DG power house, switch yard, HT Motors/lines</td>
</tr>
<tr>
<td>Fall from height</td>
<td>Civil construction works, welding and other hot jobs done at height.</td>
</tr>
</tbody>
</table>

### 7 Maximum Credible Accident (MCA) Analysis

Hazardous substances may be released as a result of failures or catastrophes, causing possible damage to the surrounding area. This chapter deals with the question of how the consequences of the release of such substances and the damage to the surrounding area can be determined by means of models. A disastrous situation is generally due to outcome of fire, explosion or toxic hazards in addition to other natural causes, which eventually lead to loss of life, property and ecological imbalance.

Major hazards posed by hazardous chemical storages can be identified taking recourse to MCA Analysis. MCA analysis encompasses certain techniques to identify the hazards and calculate the consequent effects in terms of damage distances of heat radiation, toxic releases, vapor cloud explosion, etc. A host of probable or potential accidents of the major units in the complex 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.

Various models for calculating the physical effects of the incidental release of hazardous substances are detailed subsequently. First, attention is paid to the factors, which are decisive for the selection of the models to be used in a particular situation, after which the various effect models are discussed.

### 8 Injuries Resulting From Flammable Liquids

In the case of flammable liquids such as HSD for immediate ignition of a pool fire will occur. The injuries in this case are mainly caused by heat radiation. Serious injuries as the result of the shock wave generally do not occur outside the fire ball zone. Fragmentation of the storage system can cause damage up to distance of over 50m depending on the capacity of the affected storage tank. If the gas is not ignited immediately, it will disperse into the atmosphere. If the gas cloud ignites it is assumed that everyone present within the gas cloud will die as a result of burns or asphyxiation. Outside the gas cloud the duration of the thermal load will be too brief to cause any injuries. In the event of very rapid combustion of the gas cloud the shock wave may cause damage outside the limits of the cloud. Explosive combustion will only occur if the cloud is enclosed to some extent between buildings and obstacles. The Mathematical models and analytical models for
Hazard Analysis of the flammable liquids in the proposed site are as given in Table 7. Damage criteria in Table 8. Radiation exposure and lethality in Table 9.

Table 7
Mathematical models and analytical models for Hazard Analysis

<table>
<thead>
<tr>
<th>S. No</th>
<th>Explosions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pool fire</td>
</tr>
<tr>
<td></td>
<td>Fire ball</td>
</tr>
</tbody>
</table>

Table 8
Damage criteria

<table>
<thead>
<tr>
<th>Incident Flux (kW/m²)</th>
<th>Damage</th>
<th>Peak overpressure (bar)</th>
<th>Damage</th>
<th>Toxic Gas Dispersion</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.5</td>
<td>100% lethality, Heavy damage to equipment</td>
<td>0.3</td>
<td>Heavy - 90%</td>
<td>The extent of damage depends upon the concentration of the toxic compound in the atmosphere. The relation between percent of injuries and the toxic load is normally given in the form of probity function.</td>
</tr>
<tr>
<td>25.0</td>
<td>50% lethality, non piloted ignition</td>
<td>0.03</td>
<td>Damage of glass</td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>1% lethality, piloted ignition</td>
<td>0.01</td>
<td>Crack of windows</td>
<td></td>
</tr>
<tr>
<td>4.5</td>
<td>Not lethal, 1st degree burns</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6</td>
<td>No discomfort even after long exposure</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 9
Radiation exposure and lethality

<table>
<thead>
<tr>
<th>Radiation (kW/m²)</th>
<th>Intensity</th>
<th>Exposure (seconds)</th>
<th>Time (seconds)</th>
<th>Lethality (%)</th>
<th>Degree of Burns</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.6</td>
<td>--</td>
<td>0</td>
<td>0</td>
<td>No discomfort even after long exposure</td>
<td></td>
</tr>
<tr>
<td>4.5</td>
<td>20</td>
<td>0</td>
<td>1 st</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.5</td>
<td>50</td>
<td>0</td>
<td>1 st</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.0</td>
<td>20</td>
<td>0</td>
<td>1 st</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.0</td>
<td>50</td>
<td>&lt;1</td>
<td>3 rd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.0</td>
<td>60</td>
<td>&lt;1</td>
<td>3 rd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.0</td>
<td>20</td>
<td>&lt;1</td>
<td>2 nd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.0</td>
<td>50</td>
<td>8</td>
<td>3 rd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>--</td>
<td>1</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.0</td>
<td>--</td>
<td>50</td>
<td>--</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37.5</td>
<td>--</td>
<td>100</td>
<td>--</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9 Pool Fire Analysis of HSD Tanks
The detailed computations of FEI (Fire and Explosion Index) for HSD (High Speed Diesel) at proposed site are given in Table 10.
The Health ($N_h$), Flammability ($N_f$), Reactivity ($N_r$), and MF (Material Factor) for all the materials under consideration was derived from NFPA (National Fire Protection Association) codes. The GPH (General Process Hazard Factor) and SPH (Specific Process Hazard Factor) was calculated accordingly. Based on F&EI (Fire and Explosion Index), the HSD fall under light degree of hazard category and nil toxicity. Thus Risk Assessment and Hazard analysis has been carried out due to fire hazard for HSD storage tanks by carrying out MCA (Maximum Credible Accident) analysis.

### Table 10

<table>
<thead>
<tr>
<th>Chemical/Fuel</th>
<th>NFPA Classification</th>
<th>GPH</th>
<th>SPH</th>
<th>F&amp;EI Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSD</td>
<td>$N_h$ = 1, $N_f$ = 2, $N_r$ = 0, $MF$ = 10</td>
<td>1.8</td>
<td>2.83</td>
<td>50.89 Light</td>
</tr>
</tbody>
</table>

*F&EI = MF * (1+GPH) * (1+SPH)*

#### 9.1 Damage Distance Computations for MCA Analysis

The major hazard scenarios identified for the possibility of occurrence are mainly concerned with HSD Storage tanks for both phases.

#### 9.2 Pool Fire of HSD Storage Tanks

A storage tank of HSD with a capacity of 1000 liters is considered for the proposed industrial area. Tank fire would occur if the radiation intensity is high on the peripheral surface of tanks leading to increase in internal tank pressure. Pool fire would occur when fuel oil collected in the dyke due to leakage gets ignited. As the tanks are provided within the dyke the fire will be confined within the dyke wall.

### 1000 Liters

**Source Strength:**

- Leak from hole in horizontal cylindrical tank
- Flammable chemical is burning as it escapes from tank
- Tank Diameter: 1.1 meters
- Tank Length: 1.2 meters
- Tank Volume: 1,140 liters
- Tank contains liquid
- Internal Temperature: 30° C
- Chemical Mass in Tank: 695 kilograms
- Tank is 87% full
- Circular Opening Diameter: 1.7 inches
- Opening is 0.24 meters from tank bottom
- Max Puddle Diameter: Unknown
- Max Flame Length: 10 meters
- Burn Duration: 11 minutes
- Max Burn Rate: 63.8 kilograms/min
- Total Amount Burned: 570 kilograms
- Note: The chemical escaped as a liquid and formed a burning puddle. The puddle spread to a diameter of 4.0 meters.
**Threat Zone:**

Threat Model: Thermal radiation from pool fire
- **Red:** less than 10 meters --- (37.5 kW/(sq m))
- **Orange:** less than 10 meters --- (25 kW/(sq m))
- **Orange:** 10 meters --- (12.5 kW/(sq m))
- **Yellow:** 17 meters --- (4.5 kW/(sq m))
- **Yellow:** 27 meters --- (1.6 kW/(sq m))

The risk contours are shown in **Figure 1** and ALOHA source point on the layout is shown in **Figure 2**.
Figure 7.2
ALOHA Source Point on the Layout

ALOHA Source Point

Time: November 30, 2015 1333 hours ST
Chemical Name: High Speed Diesel
Wind: 2.64 meters/second from SW at 10 meters

THREAT ZONE:
- Red: less than 10 meters — (37.5 kW/(sq m))
- Orange: less than 10 meters — (25 kW/(sq m))
- Orange: 10 meters — (12.5 kW/(sq m))
- Yellow: 17 meters — (4.5 kW/(sq m))
- Yellow: 27 meters — (1.6 kW/(sq m))

Model: ALOHA Thermal radiation from pool fire
10 Disaster Management Plan (DMP)

A disaster is called when following one or the other or more incidents occur:

i) Risk of loss of human lives- ten or more in one single situation

ii) A situation which goes beyond the control of available resource of the plant

iii) Loss of property as a consequence of the incident is over Rs. 1 Crore and/or bears a potential to the above

iv) A situation apparently may not have much loss but its long-term severity can affect loss of life, production, and property.

Disasters occur due to:

i). Emergencies on account of:

- Fire
- Explosion
- Spillage of toxic chemicals
- Electrocution

ii) Natural calamity on account of:

- Flood
- Earthquake / Cyclone / Storm / Cloud burst / Lightning

iii). External factor on account of

- Food poisoning
- Sabotage

The objective of the study is to assess the likely hazards and risk associated with process and preparation of preliminary Disaster Management Plan (DMP). These guidelines would be in addition to the Guidelines issued by the NDMA which are available at http://ndma.gov.in/ndma/guidelines.html. The main objectives of DMP are:-

- To control and contain the incident/accident and if possible, eliminate it
- To minimize the effects of the incident on persons, property and environment

On-site Disaster

If an accident/incident takes place within the industrial area and its effects are confined to the premises, involving only the persons working in the IA and the property inside the IA, it is called as On-site Disaster.

Off-site Disaster

If the accident is such that its effects inside the industrial area are uncontrollable and it may spread outside the premises, it is called as Off-site Disaster.
10.1 On-Site Disaster Management Plan

Main elements of On-site Emergency plans
- Leadership and Administration.
- Role and Responsibilities of Key Personnel.
- Emergency action.
- Light and Power.
- Source of energy control.
- Protective and rescue equipment.
- Communication.
- Medical care.
- Public relation.
- Protection of vital records.
- Training.
- Periodical revision of plan.

Action Plan for On-Site Disaster Management Plan

- Designated Control Centre/Room
- Key Personnel

Control Centre
This is the main center from where the operations to handle the emergency are directed and coordinated. Facilities to be made available in the control centre are:-

i. Internal and external communication.
ii. Computer and other essential records.
iii. Daily attendance of workers employed.
iv. Storage of hazardous material records and manufacturing records.
v. Pollution records.
vi. Walky-talky.
vii. Plan of the plant showing:-
   a. Storage area of hazardous materials.
   b. Storage of safety equipments.
   c. Fire fighting system and additional source of water.
   d. Site entrance, roadway and emergency exist.
   e. Assembly points.
   f. Truck parking area.
   g. Surrounding location.

viii. Note Book, Pad and Pencil.
ix. List of Key Personnel with addresses, telephone number etc.
Assembly Points

A safe place should be pre determined as assembly point where in case of emergency personnel evacuated from the affected areas are to be assembled. The workers, contract workers and visitors should assemble in assembly point in case of emergency and the time office clerk should take their attendance so as to assess the missing persons during emergency.

The Key Personnel for onsite emergency:-

1. Works Main Controller.
2. Works Incident Controller.
3. Other Key Officers
   a. Communication Officer
   b. Security and Fire Officer
   c. Telephone Operators
   d. Medical Officer
   e. Personnel/Administrative Officer
   f. Essential work team leaders

1. Works Main Controller

The general manager of the plant/ industrial area should act as main controller. His duties are to:-

i. Assess the magnitude of the situation and decide whether the evacuation of staff from the plant is needed.

ii. Exercise and direct operational control over areas other than those affected.

iii. Maintain a continuous review of possible development and assess in consultation with work incident controller and other key personnel.

iv. Liaison with police, fire service, medical services, factory inspectorate and other govt. agencies.

v. Direct and control rehabilitation of affected area after emergency.

vi. Intimate off-site emergency controller if the emergency spreads beyond the factory premises and likely to affect the surrounding area.

vii. Ensure that evidence is preserved for enquiries to be conducted by statutory authorities.

The works main controller will declare the emergency and he will instruct gate office to operate the emergency siren after assessing the gravity of the situation.

Work Incident Controller (WIC)

He is the next responsible officer after the Works Main Controller. Generally the Supervisor is designated as Work Incident Controller. In case of emergency he will rush to the place of occurrence and take overall charge and report to the Works Main Controller.
by personnel communication system like cell phones or walky-talky and inform about the magnitude of emergency. He will assess the situation and considering the magnitude of emergency he will take decision and inform Communication Officer to communicate the news of emergency to different agencies. He will give direction to stop all operations within the affected area. He will take the charge of Main Controller till the Main Controller arrives. He will order for shutdown and evacuation of workers and staffs from affected area. He will inform all Key Personnel and all outside agency for help. He will inform security and fire officers and State Fire Services. He will ensure that all non-essential workers/staff are evacuated to assembly point and areas searched for casualties. He will report all significant development to Communication Officer. Moreover he will advise to preserve evidence of emergency into the cause of emergency.

Other Key Personnel and their duties

a. Communication Officer. On hearing the emergency siren/alarm he will proceed to the control center and communicate to Work Incident Controller. He will collect information from the emergency affected area and send correct message to work main controller for declaration of emergency. He will maintain a log book of incident. He will contact all essential departments. He will take stock of the meteorological condition from local meteorological Department. He will communicate all information as directed by Works Main Controller.

b. Security and Fire Officer. The Security or Fire officer will be responsible for the fire fighting. On hearing the emergency alarm/siren, he will reach the incident area with fire and security staff. Immediately after arrival to the emergency area, he will inform through telephone or walky-talky to the communication officer. He will inform to the Work Incident Controller about the situation and requirement of outside help like state fire service and other members. At the site, the entire fire squad member will respond to the advice and information given by the works incident controller. The security will control the visitors and the vehicle entry.

c. Telephone Operator. In case of fire is discovered but no emergency siren is operated, he shall ensure the information about the location of the fire/emergency incident from the persons discovered/notices the above and communicate to different Key Personnel immediately with clear message.

d. Medical Officer. Medical Officer with his team will report to the Works Incident Controller on hearing the fire/emergency siren immediately. The ambulance will be parked nearest to the site of incident. Name of injured and other casualties carried to the Hospital will be recorded and handed over to Works Incident Controller. The ambulance will carry the injured to the nearest hospital for treatment.
e. Personnel/Administrative Officer. He should work as a liaison officer liaising with works main controller and other essential departments such as Police, Press and Statutory authorities. His responsibilities shall include:-

- To ensure that casualties receive adequate attention to arrange additional help if required and inform relatives.
- To control traffic movement into the factory and ensure that alternative transport is available when needed.
- When emergency is prolonged, arrange for the relief of personnel and organize refreshment and catering facilities.
- Arrange for finance for the expenditure to handle the emergency.

Alarm System

Alarm system varies and will depend on the size of the works area - simple fire bell, hand operated siren – break open type, fire alarm etc. Automatic alarm may be needed for highly hazardous nature of industries in the IA.

Communication System

Communication is a key component to control an emergency. The following communication system may be provided in the IA:

- Walky-Talky.
- Telephone (internal & external).
- Cell phone.
- Intercom/paging.
- Runners (verbal or written messages).

Siren for Emergency

Siren for emergency should be different from the normal siren. The emergency siren should be audible to a distance of 5km radius. The emergency siren should be used only in case of emergency.

Escape Route

The escape route from each and every plant should be clearly marked. The escape route is the shortest route to reach out of the plant area to open area, which leads to assembly point. This route should be indicated on the layout plan attached to the On-site Management Plan.

Evacuation

All non-essential staff should be evacuated from the emergency site. As soon as the emergency siren rings the workers have to shut down the IA and move to the assembly
The shutdown procedure in case of emergency should be prepared and kept ready and responsible persons should be nominated for the purpose.

**Counting of Personnel**

All personnel working in the IA should be counted. Time office persons should collect the details of personnel arriving at the assembly point. These should be checked with the attendances of regular workers, contract workers present in the site on the day of emergency. The accident control should be informed and arrangement should be made for searching missing persons in the emergency affected area. The employees’ address, contact number of next to kin should be maintained in the time office so that during emergency relatives of those affected due to emergency may be informed accordingly. Information in respect of emergency should be given to the media and other agency.

**All Clear Signal**

After control of emergency the Work Incident Controller will communicate to the works main controller about the cessation of emergency. The main controller can declare all clear by instructing the time office to sound “All Clear Sirens”.

**Emergency facilities**

The following facilities should be provided to tackle any emergency at any time.

- Fire protection and fire-fighting facilities
- Emergency lighting and standby power
- Emergency equipment and rescue equipment
- Breathing apparatus with compressed air cylinder
- Fire proximity suit
- Resuscitator
- Water gel Blanket
- Low temperature suit
- First aid kit
- Stretchers
- Torches
- Ladders
- Safety Equipment
  - a. Respirators
  - b. Gum boots
  - c. Safety helmets
  - d. Asbestos Rubber hand gloves
  - e. Goggles and face shield
  - f. Toxic gas measuring instruments
  - g. Explosive meter
  - h. Oxygen measuring instruments
  - i. Toxic gas measuring instrument
  - j. Wind direction indicator
On-site Emergency Plan should contain

1. Site plan and topographic plan
2. Plan showing the fire-fighting facilities
3. Plan showing hazardous material storage area
4. Material safety data sheets for hazardous chemicals
5. Facilities available in main control center
6. List of emergency equipment
7. List of safety equipment
8. List of important telephone numbers and addresses
   i. Nearest hospitals and ambulance service center
   ii. Nearest fire station
   iii. Govt. Officials
   iv. Transport provider
9. Names and address & contact telephone number of key personnel

The on-site emergency plan so prepared shall be documented in a printed form in sufficient copies to give all concerned for knowledge, study and easy follow up. The emergency plan shall be rehearsed and practiced at regular intervals to test efficiency of personnel, equipment coordinated efforts and to increase confidence and experience to operate such plan. The plan so prepared should be updated annually and uploaded in the factory website for easy reference.

10.2 Off-site Disaster Management Plan

The main objectives of the off-site emergency plan are:-
   i. To save lives and injuries
   ii. To prevent or reduce property losses and
   iii. To provide for quick resumption of normal situation or operation.

Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 prescribes for the constitution of the State Crisis Group as apex body at the State Level to deal with major chemical accidents and to provide expert guidance for handling major chemical accidents. Schedule 7 and Schedule 8 of the Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 prescribes for the constitution of District and Local Crisis Groups.

The composition of the district crisis group has been prescribed under the chairpersonship of district collector and local crisis group under the chairpersonship of sub-divisional magistrate. The district crisis group shall meet every forty five days and send a report to the state crisis group. The local crisis group shall meet every month and forward a copy of the proceedings to the district crisis group.
A. Functions of the State Crisis Group
i) Review all district off-site emergency plans in the State with a view to examine its adequacy in accordance with the manufacture, storage and import of hazardous chemical, rules and forward a report to the central crisis group once in three months
ii) Assist the state government in managing chemical accidents at a site
iii) Assist the state government in the planning, preparedness and mitigation of major chemical accidents at a site in the State
iv) Continuously monitor the post-accident situation arising out of a major chemical accident in the State and forward a report to the central crisis group
v) Review the progress report submitted by the district crisis group
vi) Respond to queries addressed to it by the district crisis group
vii) Publish a list of experts and officials in the State who are concerned with the management of chemical accidents.

B. Functions of the District Crisis Group
i. Assist the preparation of the district off-site emergency plan
ii. Review all the on-site emergency plans prepared by the occupier of major accident hazards installation for the preparation of the district off-site emergency plan
iii. Assist the district administration in the management of chemical accidents at a site lying within the district
iv. Continuously monitor every chemical accident
v. Ensure continuous information flow from the district to the centre and state crisis group regarding accident situation and mitigation efforts
vi. Forward a report of the chemical accident within fifteen days to the state crisis group
vii. Conduct at least one full scale mock-drill of a chemical accident at a site each year and forward a report of the strength and the weakness of the plan to the state crisis group.

C) Functions of the Local Crisis Group
a) Prepare local emergency plan for the industrial pocket
b) Ensure dovetailing of local emergency plan with the district off-site emergency plan
c) Train personnel involved in chemical accident management
d) Educate the population likely to be affected in a chemical accident about the remedies and existing preparedness in the area
e) Conduct at least one full scale mock-drill of a chemical accident at a site every six months and forward a report to the District Crisis Group and
f) Respond to all public inquiries on the subject.

Central Control Committee
As the offsite plan is to be prepared by the government, a central control committee shall be formed under the chairmanship of the district collector. Other officers from police, fire service, factory inspectorate, medical department shall be incorporated as
members of the central control committee. Under the central control committee the following committees shall be constituted under the control of the district collector.

i. Incident and environment control committee
ii. Fire control committee
iii. Traffic control, law and order, evacuation and rehabilitation committee
iv. Medical help, ambulance and hospital committee
v. Welfare, restoration and resumption committee
vi. Utility and engineering services committee
vii. Press, publicity and public relations committee

The Off-site Emergency Plan shall be prepared by the district magistrate in consultation with the factory management and govt. agencies. The plan contains up-to-date details of outside emergency services and resources such as fire services, hospitals, police etc. with telephone number. The district authorities are to be included in the plan area.

a. Police Department  
b. Revenue Department  
c. Fire Brigade  
d. Medical Department  
e. Municipality  
f. Gram Panchayat  
g. Railway Department  
h. Telephone Department  
i. Factory Department  
j. Electricity Department  
k. Pollution Control Department  
l. Explosive Department  
m. Press and Media

Mock exercises on Off-site plan should be carried out at least once in a year to train the employees, up to date the plan, observe and rectify deficiencies.

Each industrial unit or group of units should prepare separate emergency preparedness and DMP which will be in sync with the main DMP of Industrial area incorporating details of action to be taken in case of any major accident/disaster occurring within the unit. The plan should cover all types of major accident/occurrences and identify the risk involved in the industry. Mock drills on the plan should be carried out periodically to make the plan foolproof and persons are made fully prepared to fight against any incident in the industry. The plan will vary according to the type of industry and emergency.