Chapter 4

Prediction and Assessment of Impacts

4.0 IMPACT IDENTIFICATION

Prediction of impacts is the most important step of environmental impact assessment. Predictions are superimposed over baseline environmental status to derive ultimate environmental scenario. The impact of the proposed incineration plant under construction and operation have been considered and discussed in this chapter. Both beneficial (positive) and adverse (negative) impacts on various components of environment due to proposed incineration plant are identified, based on the nature of the various activities associated with construction and operation of the incineration plants.

Identification of significant impacts from the proposed incinerator project is an eminent step in the process of environmental impact assessment. This provides a way forward to other elements of EIA study such as quantification and evaluation of site specific impacts exclusively from proposed project. As the first step towards the prediction and assessment, the various activities during the construction and operational phase, which are likely to cause an impact on these parameters, have been listed. The next step would be to evaluate quantitatively and qualitatively the impact imposed on the various aspects of the environment.

Many scientific techniques and methodologies are available to predict impacts on physico-ecological and socio-economic environment. Such predictions are superimposed over the baseline (pre-project) status of environmental quality to derive the ultimate (post-project) scenario of environmental conditions. The prediction of impacts helps to identify and implement environmental management plan during and after the execution of the developmental activity to minimize the deterioration of environmental quality.

Environmental impacts of project

The impacts of incinerator project on the environment are influenced by waste handled, processes used and the location characteristics in different ways. Direct impacts resulting from construction and operations include:

- **Land environment**: Surface leveling, over burden soil removal, clearing vegetation activities and Land Degradation – occurs due to alterations of land use. During operation – transportation activity, storage activity, handling of waste and ash generation and its storage will have their own impacts on the land environment

- **Ambient Air Pollution** – particulates, sulphur oxides, nitrous oxides, dioxins, furans, HCl, CO, HF, total organic carbon and other hazardous chemicals
and toxic metals like Hg, As, etc.

- **Noise Pollution** – during operation and cause occupational as well as public health hazards

In incineration project, environmental impacts are likely to comprise the following principal components:

- Storage and transportation activity for the hazardous waste
- Pretreatment activity of hazardous waste
- Emissions due to Incineration activity
- Storage of ash generation due to incinerators
- Fugitive emissions
- Waste Water generation due to venturi scrubber
- Emissions due to use of fuel
- Storage and transportation activity for fuel

### 4.1 AIR ENVIRONMENT

The impact on the air environment due to the upcoming project during the construction phase and operation phase are as mentioned below

#### 4.1.1 Construction Phase

There will be an increase in SPM level along with SOx (from vehicle exhausts) due to transportation of construction material at site. The construction activities will increase the SPM level in the surrounding environment because of the excavation and filling work. During the construction activity the major impact on the air environment will be due to increase in the fugitive emissions.

Even though, most of the activities would exhibit reversible and short term impacts which can be readily controlled and mitigated through robust and scientifically designed construction work-method statements as per the best engineering and management practices.

#### 4.1.2 Operation Phase

The air pollution impacts of an incinerator on neighborhood air quality would depend upon various factors, viz. type of fuel, hazardous waste handled, design capacity, air pollution prevention/control measures, operation and maintenance of incinerator units and air pollution control equipment associated with the individual units.
The severities of impacts on air environment from emissions due to proposed project activity are also governed by terrain features around the project site and the prevailing micro meteorological conditions in the project area. The flue gas emissions through stack are very important for impact assessment, continuous in nature and released at higher elevations. The stack emissions mainly depend on the quality of fuel used for combustion and impacts can extend to far distances depending on prevailing meteorological conditions.

The main concern with air environment due to the proposed project activity is due to the air borne inorganic particles, dust generated due to handling, storage and transport of hazardous waste, ash storage and handling and emissions from stack.

The combustion occurs when fuel, most commonly fossil fuel reacts with oxygen in the air to produce heat. Along with heat, the other major emissions from the burning of hazardous waste are Particulate matter, Nitrogen oxides (NOx), Sulphur Dioxides (SO2), HCl and CO.

**4.2 AIR POLLUTION SOURCE**

The primary emissions shall occur through fugitive emission and point source emission

**4.2.1 Sources of Fugitive emission:**

The major sources of fugitive emissions are as detailed below

i) Loading/ Unloading activity at site.

ii) Transportation activity

iii) Storage activity

iv) Transfer of waste within the plant premises

v) Fugitive emission from ash storage area.

### i. Loading/ Unloading activity:

There won’t be any fugitive emissions due to loading and unloading activities because same activity will be performed in covered shed.

### ii. Transportation System

Vehicular emissions will principally arise out of emissions from the exhausts of vehicles used for the transport of hazardous waste, ash and the movement of personal. All vehicles shall have Pollution Control Certificate (PUC) with regular maintenance check.

However, their effects are highly localized. As proposed development is within GIDC area paved roads are available upto site. Hence no impact is envisaged. Either covered
dumpers shall be used or trucks shall be covered through tarpaulin to prevent fugitive emissions.

Due to the proposed project there would be increase in vehicular movement. NH 8 & Dahej- Bharuch highway with the major district road will be used for the transportation purpose. The detail bifurcation with respect to the numbers of truck is as mentioned in the table below:

<table>
<thead>
<tr>
<th>Material transported</th>
<th>Vehicle used</th>
<th>No. of vehicles per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste containers/trucks</td>
<td>Dumpers/ trucks</td>
<td>10</td>
</tr>
<tr>
<td>Fly ash containers</td>
<td>Dumpers/ trucks</td>
<td>Maximum 3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>13</strong></td>
</tr>
</tbody>
</table>

On an average movement of total 13 trucks/ dumpers (approx) will increase to the existing traffic.

**iii. Storage activity**

It is proposed to construct dedicated covered storage area covered from the side, hence less chances for emission from the storage area. It is also proposed to install defuming system in critical storage area to extract fume generated within storage area

**iv. Transfer of waste within plant premises**

Liquid waste will transfer from storage tank to incineration system through pumping. Semisolid drums shall be transferred through fork lift and solid waste shall be transferred through the covered tractor

**4.2.2 Point source emission**

**Major pollutants from incinerator**

**Dioxins:**

Keeping De novo synthesis in the back drop, steps must be taken to prevent reformation of dioxins by rapidly lowering the flue gas temperatures, particularly from 1200 deg C to less than 625deg C by adopting rapid quench

**Particulate matter**

Fine particulates in the flue gases require specific dust separation technologies and propose to install series of scrubber and cyclones in system.
SO$_2$
Suphur present in feeding waste, upon thermal oxidation forms sulphur dioxide which requires control measures to meet the standard. Conventional method followed is scrubbing by alkali (alkali / wet scrubber with hydrated lime or sodium hydroxide injection)

HCl and HF
In order to control halogen emissions to the desired level, in particular chlorides and fluorides, conventionally water/ alkali scrubbers are in use

Mist
Often there is a need to eliminate the mist in the stack emissions therefore where necessary demister is considered in design

4.3 DETAILS OF AIR DISPERSION MODEL

The air quality impact of a source or group of sources is evaluated by the use of mathematical models. The models simulate the relationships between air pollutant emissions and the resulting impact on air quality. It is most widely accepted for its interpretability. For the present study, this model is used for the prediction of maximum ground level concentration (GLC). Assessment of air pollution is carried out for stack attached to incinerators and forced evaporation system. The ISCST-3 (Industrial Source complex –Short term -3) from lakes and Environment is an hour-by-hour steady state Gaussian Plume Model.

This model is widely recognized as predictive tool in impact assessment for air environment. The ISCST-3 model has been applied with elevated + flat terrain, gradual plume rise and buoyancy induced dispersion options in the present study.

The inputs to the model include data relating to emissions, meteorology and atmospheric details like ambient temperature, wind speed and wind direction, all of which are determined by formulating impact scenarios.

The site specific and monitored details considered for input data for the software “ISCST3” by Lakes Environmental for prediction of impact on air environment are given in the Table 4.2

Point source emission
The major point source emissions are the flue gases stack. Details of all the major stacks stacks are as follows:
<table>
<thead>
<tr>
<th>Stack attached to</th>
<th>Incinerator</th>
<th>Forced evaporation system</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of stacks</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Stack height</td>
<td>32 m</td>
<td>30 m</td>
</tr>
<tr>
<td>Diameter of stack</td>
<td>450 mm</td>
<td>1100 mm</td>
</tr>
<tr>
<td>Exit gas temperature</td>
<td>65 deg C</td>
<td>130 deg C</td>
</tr>
<tr>
<td>Exit gas velocity</td>
<td>12 m/sec</td>
<td>12 m/s</td>
</tr>
</tbody>
</table>

**Pollution load**

<table>
<thead>
<tr>
<th></th>
<th>Incinerator</th>
<th>Forced evaporation system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulate matter</td>
<td>0.095 g/s</td>
<td>1.708 g/s</td>
</tr>
<tr>
<td>SO₂</td>
<td>0.381 g/s</td>
<td>2 g/s</td>
</tr>
<tr>
<td>NOₓ</td>
<td>0.762 g/s</td>
<td>4.556 g/s</td>
</tr>
<tr>
<td>HCl</td>
<td>0.095 g/s</td>
<td>---</td>
</tr>
<tr>
<td>CO</td>
<td>0.190 g/s</td>
<td>---</td>
</tr>
</tbody>
</table>

**Air pollution control measures**

- Cyclone, Multicyclone, ID Fan, 1\(^{st}\) stage scrubbing - Water, 2\(^{nd}\) stage scrubbing - Alkaline, 3\(^{rd}\) stage scrubbing - Sodium hypochlorite, Mist eliminator, ID Fan, Chimney

- Cyclone – 2 nos. Scrubber
Figure 4.1: Isopleths of PM
Figure 4.2: Isopleths of SO2
Figure 4.3: Isopleths of NOx
Figure 4.4: Isopleths of CO
Figure 4.5: Isopleths of HCl
Presentation of Result

The simulations were made to evaluate Particulate Matter, SO\textsubscript{x}, NO\textsubscript{x}, CO and HCl incremental short-term concentrations due to proposed project. These results are based on considering the emission due to proposed installation of incineration and forced evaporation system.

In the short-term simulations, the incremental concentrations were estimated to obtain an optimum description of variations in concentrations within study area of 10 km radius.

Maximum ground level concentration will be observed at different distance for Particulate matter, So\textsubscript{x}, NO\textsubscript{x}, CO and HCl. The maximum ground level concentration for different parameters is given in Table-4.3 for proposed project. Equal concentration contour plots for the PM, SO\textsubscript{x}, NO\textsubscript{x}, CO and HCl are given in Figure- 4.1, 4.2, 4.3, 4.4 and 4.5 for proposed project.

Table 4.3: Resultant Concentrations Due To Incremental GLC*

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Incremental Concentration</th>
<th>Baseline Concentration</th>
<th>Resultant Concentration</th>
<th>Distance w.r.t. centre km</th>
<th>Direction w.r.t. centre</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM(µg/m\textsuperscript{3})</td>
<td>1.995</td>
<td>95</td>
<td>96.995</td>
<td>0.7</td>
<td>SE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.1</td>
<td>NE</td>
</tr>
<tr>
<td>SO\textsubscript{x}(µg/m\textsuperscript{3})</td>
<td>2.973</td>
<td>6.8</td>
<td>9.773</td>
<td>0.7</td>
<td>SE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.1</td>
<td>NE</td>
</tr>
<tr>
<td>NO\textsubscript{x}(µg/m\textsuperscript{3})</td>
<td>6.524</td>
<td>16.6</td>
<td>23.124</td>
<td>0.7</td>
<td>SE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.1</td>
<td>NE</td>
</tr>
<tr>
<td>CO(µg/m\textsuperscript{3})</td>
<td>0.454</td>
<td>523</td>
<td>523.454</td>
<td>0.7</td>
<td>SE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.1</td>
<td>NE</td>
</tr>
<tr>
<td>HCl(ppm)</td>
<td>1.344</td>
<td>ND</td>
<td>1.344</td>
<td>0.7</td>
<td>SE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.1</td>
<td>NE</td>
</tr>
</tbody>
</table>

Incremental concentrations are shown in form of isopleths.

* GLC – Ground Level Concentration

* - Maximum average concentration
The above table reveals that resultant ambient air quality after proposed plant operation will be within the limit specified by CPCB

4.4 WATER ENVIRONMENT

4.4.1 Source of water:

Water shall be obtained from Gujarat Industrial Development Corporation (GIDC). Company has obtained allocation certificate from GIDC and copy of same is attached as annexure 3. Ground water will not be utilized for any construction or industrial purposes.

The quality of raw water from the canal is as given in table below:

**Table 4.4: Raw water analysis**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>8.3</td>
</tr>
<tr>
<td>Conductivity</td>
<td>235 $\mu$hos.cm$^{-1}$</td>
</tr>
<tr>
<td>Turbidity</td>
<td>&lt; 5 mg/l</td>
</tr>
<tr>
<td>Total dissolved solids</td>
<td>150 mg/l</td>
</tr>
<tr>
<td>Total Hardness as Ca CO3</td>
<td>96 mg/l</td>
</tr>
<tr>
<td>Chlorides as Cl-</td>
<td>12 mg/l</td>
</tr>
<tr>
<td>Silica as SiO$_2$</td>
<td>16 mg/l</td>
</tr>
</tbody>
</table>

4.4.2 Water Consumption

The total water consumption for the proposed project will be 50 KL/day. The detail break up for water consumption is as mentioned in the table below:

**Table 4.5: Water consumption details**

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scrubbing</td>
<td>20 KL/day</td>
</tr>
<tr>
<td>Washing/ Drum washing</td>
<td>5 KL/day</td>
</tr>
<tr>
<td>Domestic</td>
<td>5 KL/day</td>
</tr>
<tr>
<td>Others (Gardening/ Plantation)</td>
<td>20 KL/day</td>
</tr>
<tr>
<td>Total</td>
<td>50 KL/day</td>
</tr>
</tbody>
</table>

4.4.3 Waste Water Generation

Water pollution refers to any change in natural waters that may impair further use of water, caused by the introduction of organic or inorganic substances or a change in
temperature of the water.

The characteristics of the wastewaters generated depend on the ways in which the water is used. The wastewater streams in the proposed project include scrubber water, washing and domestic reject.

The total waste water generation from different streams is as mentioned below

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Quantity</th>
<th>Disposal Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scubber bleed</td>
<td>10 KL/day</td>
<td>We propose to Forced evaporate the scrubber bleed and washing water.</td>
</tr>
<tr>
<td>Washing</td>
<td>5 KL/day</td>
<td>However as an additional precaution we propose to have Effluent Treatment Plant</td>
</tr>
<tr>
<td>Domestic</td>
<td>5 KL/Day</td>
<td>Disposed through septic tank/ soak pit</td>
</tr>
<tr>
<td>Total waste water generated</td>
<td>20 KL/day</td>
<td></td>
</tr>
</tbody>
</table>

### 4.5 LAND/ SOIL ENVIRONMENT

In general, one or more of the following activities impart adverse impact on land environment

Activities associated with construction

- Hazardous waste handling and storage
- Handling and disposal of ash, which may deteriorate soil characteristics and change the physical features and drainage, etc.
- Spillage of liquid waste

#### 4.5.1 Construction Phase

Surface leveling, over burden soil removal, clearing shrubs and grasses are envisaged during the construction phases. As far as possible, excavated soils will be used for leveling the grounds and other earthworks. Construction Waste is defined as the waste arising out of project construction related works which include the following

- Soil Overburden
- Concrete Waste
- Welding Rods Pieces (Left over)
- Discarded Chemical Containers/ Oil Barrels/Drum
• Used Oil
• Oil soaked cotton waste
• Damaged Tools & Kits

Improper disposal of construction waste in and outside the project area results in contamination of soil quality. Hence, proper disposal mechanism will be adopted for preventing soil contamination and erosion. The landfill and excavation activities during construction phase will be limited within the project premises resulting minimum impact on topography. Soil over burden and concrete waste will be used for landfill and will have no impact on the land environment.

4.5.2 Operation phase

The proposed project is located in GIDC area and do not involve resettlement and rehabilitation problems.

Proper environment management plan for the disposal of the generated hazardous waste is formulated and described in chapter 5 to avoid impact on land.

4.6 SOLID AND HAZARDOUS WASTE GENERATION

4.6.1 Construction phase

The major solid waste generated during the construction phase will be construction/concrete debris. Also domestic waste shall be generated. The same shall be disposed off through municipality/ GIDC facility.

4.6.2 Operation phase

During operation phase, waste generated can be categorized as hazardous waste and Domestic Solid Waste.

Domestic waste and ash generation due to burning of coal in HAG will be the major solid waste generated.

The major hazardous waste generated will be in form of ash (burnt remain of hazardous waste), discarded containers and salts generated from forced evaporation system. Details of hazardous waste that would be generated from the proposed project are listed in table below.

Table 4.7: Details of Hazardous Wastes generation and Disposal

<table>
<thead>
<tr>
<th>Type of Waste</th>
<th>Quantity</th>
<th>Storage/ Disposal Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incineration Ash</td>
<td>10 Tonnes per day</td>
<td>Stored in covered shed and thereafter sent to Secured landfill site</td>
</tr>
</tbody>
</table>
Containers /barrels | 20 nos/ days | Stored in covered shed and thereafter sent to approved recycler
Salt generated from forced evaporation system | 50 MT/day | Stored in covered shed and thereafter sent to Secured landfill site.

4.7 NOISE POLLUTION

Noise is another pollution and the principal source of noise in a incineration process include the noise generated due to operation of kiln, secondary chamber, motors, ID fans, compressors etc. The noise will be minimal and below the statutory norms.

Several noise suppression and attenuation features shall be designed into the plant for the protection of personnel at all normally accessible locations within the plant boundary, both inside and outside the different buildings, and for the protection of the inhabitants living in the vicinity.

4.7.1 Equipment noise

To achieve the noise limitations around the equipment, the main measures taken shall be as follows:

Each feed water pump sets shall be covered by a separate enclosure, small units like condensate and vacuum pumps, shall be designed so as to limit noise emission, bypass valve, the relevant piping shall be covered with acoustic insulation. To achieve the noise limitations in the control room, the control equipment such as computers and its accessories (printers, etc.) and the air conditioning system shall be designed so as to limit noise emission.

During maintenance/inspection works, the personnel will wear ear protections.

All equipment in the plant would be designed/operated to have a noise level not exceeding 85 to 90 dBA as per the requirement of Occupational Safety and Health Administration Standard (OSHA).

4.8 SOCIOLOGICAL AND CULTURAL IMPACTS

- The major positive impact on the socio economic environment of the study area would be increase in the work opportunity. There would be more employment opportunities generated due to the upcoming project both during the construction phase and operation phase.
- There may be change in the occupational pattern in the study area.

It is anticipated that the impacts on parameters of human interest could be mitigated by proper implementation of the control measures indicated in the Environmental Management Plan for the proposed project.
5.0 INTRODUCTION

An environmental management plan (EMP) is a management framework for reducing environmental impacts and improving organizational performance. EMP provide organizations, a structured approach for managing environmental and regulatory responsibilities to improve overall environmental performance, including areas not subject to regulation such as unregulated risk, resource conservation, and energy efficiency etc.

The project details provided by proponent and the pre-project (baseline) environmental status monitored through field surveys during summer season (March to May 2011) were the basis to evaluate the impacts on all individual components of environment due to the proposed project activities.

In view of the above, project proponent shall maintain the specifications/details/data as provided for preparation of this report or may try to improve further towards betterment of environmental protection during various phases of implementation of proposed project. Proposed development consists of land procurement, construction phase and operation phases. The environmental management plan relevant to these phases is delineated in the following sections:

5.1 CONSTRUCTION PHASE

The construction phase impacts would be mainly due to civil works such as site preparation comprising heavy earthmoving, site grading, RCC foundations; construction material and machinery transportation, fabrication and erection etc.

The construction phase impacts will be temporary and localized phenomenon except the change in the land use pattern. The environment management to be implemented during the construction phase is as delineated below:

The top layer soil which is excavated during site leveling shall be sold to contractor or shall be disposed off in the low lying area instead of accumulating the same on the road or the premises area.

- Temporary huts of the construction labours shall be arranged within the project boundary.
- The site grading, partial level rising as required at project site shall be planned keeping in view the natural drainage around the project site.
The vehicles used for transportation of construction material shall be certified within valid PUC.

The trucks carrying cement and sand should be covered in order to prevent the fugitive emissions due to material handling.

Temporary shed shall be developed in order to store the construction material inside the project premises.

The machinery used for construction purpose shall be properly maintained and serviced.

It should be ensured that diesel powered vehicles and construction machinery are properly maintained to minimize the exhaust emissions as well as noise generation.

The construction debris generated shall be properly stored in the shed and later should be used for leveling of low lying area and road construction.

Regular water sprinkling shall be done in the storage area and within the plant boundary for dust suppression.

Though the effect of noise on the nearby inhabitants due to construction activity will be insignificant as per the proposed plot plan, noise prone activities should be restricted to the extent possible during day time in order to have minimum noise impact during night time.

Onsite workers should be strictly instructed to use noise protection devices like earmuffs in noise prone area.

Hazardous materials such as lubricating oil, compressed gases, paints and varnishes are required during construction phase which should be stored properly as per the safety regulations at isolated places.

Accidental spillages of oil from construction equipment and storage sites should be prevented.

The fuel used for the machines should be of good quality.

Proper arrangement shall be made to prevent to washout of construction material during the monsoon season. Temporary shed of brick should be constructed during the monsoon season for the storage of construction material.

Proper storm water management system shall be integrated in design phase and civil works shall be carried out accordingly at project site.
5.2 OPERATION PHASE

Based on the impacts discussed in the chapter-4 due to the upcoming incineration project on the air environment, water environment, land environment, noise environment, and socio economic environment a detailed environment management plan is proposed in order to mitigate the impacts identified. The general operating standards to be followed during operation phase of incinerator are as mentioned below:

The various types of pollution from the incineration project are categorized under the following types:

- Air pollution.
- Water pollution.
- Solid waste/ hazardous waste generation
- Noise pollution.
- Bio ecological environment / Green belt

The various proposed pollution control systems are described in the following sections.

5.3 AIR ENVIRONMENT

Pollution control devices are required to comply with prescribed standards for particulate matter, HCl, SO2, CO. Total organic carbon, HF, NOx (NO and NO2 expressed as NO2), hydrocarbons, dioxins/ furans, Cd + Th (and its compounds), Hg (and its compounds), Sb + As + Pb + Cr + Co + Cu + Mn + Ni + V (and their compounds). Besides the above, SPCB can prescribe additional parameters as deem fit in consultation with the CPCB.

Incineration facility shall explore ways for heat recovery, to the extent possible.

There are many combinations of treatment units installed for gas cleaning and removal of air pollutants, to comply with the standards. Designed treatment scheme shall comprise of following equipment, in combination, with adequate efficiencies to meet the emission standards

5.3.1 Major pollutants from incinerator

- Dioxins:
- Particulate matter
- SO2
- HCl and HF
- Mercury
- Mist
5.3.2 Emission standard to be maintained

Flue gas emissions standards for common hazardous waste incinerators Treated flue gas emissions discharge through stack to atmosphere shall always be less than or equal to the parameter specific standards. These standards for common hazardous waste incinerator as per Environment (Protection) Act, 1986 are given in the following Table

**Table 5.1: Emission standards**

<table>
<thead>
<tr>
<th>Industry</th>
<th>Parameters</th>
<th>Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common hazardous waste incinerator</td>
<td>A. Emission</td>
<td>Limiting concentration in mg/Nm³</td>
</tr>
<tr>
<td>Particulate matter</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>HCl</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>SO₂</td>
<td>200</td>
<td>30</td>
</tr>
<tr>
<td>CO</td>
<td>100</td>
<td>30</td>
</tr>
<tr>
<td>Total organic carbon</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>HF</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>NOₓ (NO and NO₂ expressed as NO₂)</td>
<td>400</td>
<td>30</td>
</tr>
<tr>
<td>Total dioxins and furans</td>
<td>0.1 ngTEQ/Nm³</td>
<td>8 hours</td>
</tr>
<tr>
<td>Cd + Th + their compounds</td>
<td>0.05</td>
<td>2 hours</td>
</tr>
<tr>
<td>Hg and its compounds</td>
<td>0.05</td>
<td>2 hours</td>
</tr>
<tr>
<td>Sb+As+Pb+Co+Cr+Cu+Mn+Ni+V+ their compounds</td>
<td>0.50</td>
<td>2 hours</td>
</tr>
</tbody>
</table>

**Notes:**

i. All monitored values shall be corrected to 11% oxygen on dry basis.

ii. The CO₂ concentration in tail gas shall not be less than 7%.

iii. In case, halogenated organic waste is less than 1% by weight in input waste, all the facilities in twin chamber incinerators shall be designed to achieve a minimum temperature of 950 deg C in secondary combustion chamber and with a gas residence time in secondary combustion not less than two seconds.

iv. In case halogenated organic waste is more than 1% by weight in input waste, waste shall be incinerated only in twin chamber incinerators and all the facilities shall be designed to achieve a minimum temperature of 1100 deg C in secondary combustion chamber not less than two seconds.
v. Incineration plants shall be operated (combustion chambers) with such temperature, retention time and turbulence, as to achieve Total Organic Carbon (TOC) content in the slag and bottom ashes less than 3%, or their loss on ignition is less than 5% of the dry weight.

### 5.3.3 Air Pollution control devises

In order to control the flue gas emission two stacks with two incinerators has been envisaged with incinerator. Apart from the main stack, total two stacks shall be provided with forced evaporation system.

The flue gases after getting cooled in mixing chamber and waste heat recovery section, it is cooled and scrubbed in two stages

- a. Cyclone,
- b. Multicyclone
- c. ID Fan
- d. 1st stage scrubbing - Water
- e. 2nd stage scrubbing – Alkaline
- f. 3rd stage scrubbing – Sodium Hypochlorite
- g. Mist eliminator,
- h. ID Fan, Chimney

**Quenching system**

Quenching system is placed at the first stage of an APCS to reduce temperature of flue gas after secondary chambers immediately from 1200 deg C to 500deg C. Gas quench system includes use of a cooling blower. Apart from this due to quenching formation of furans and dioxins will be eliminated.

**Cyclone Separator / Multicyclone Separator:**

Flue gas from forced evaporation system is passed through cyclone separator and Multicyclone separator, which are connected in series to remove solid particles up to ~100 micron from flue gas.

**Venturi scrubber/ Water scrubber**

In venturi scrubber the flue gases are coming in close contact of alkaline water which will help in scrubbing of any tiny suspended particles, and acid in the gas will react with alkali in the circulating water. It also helps in cooling of the gas to major extent.
Wet Scrubber/ Alkaline scrubber

Wet scrubber is used to clean acid gas and remove toxic or fine particles. An alkaline solution is injected into the Wet Scrubber or sprayed to scrub all the acidity of gas and smaller particulate matter.

The scrubber solution needs to be removed and replaced frequently, as it becomes contaminated with the particulates and salts from reaction with the acid. The purged stream from scrubber may have to be treated before disposal.

Mist eliminator

After treating in venturi scrubber & wet scrubber, the flue gases are again treated in polishing scrubber – also having packed bed, where it will be treated with Hypochlorite solution to remove odor, if any / and also remaining neutralization of acid, if any. The flue gases leaving the polishing scrubber will be passed through mist eliminator to remove the liquid droplets and solid particles if any.

ID fan

The ID fan is handling all the flue gases coming out of polishing scrubber. It also maintains required /little vacuum(draught) in primary and secondary chambers. It is discharging the gases to chimney.

Chimney /stack

The stack is cylindrical, vertical, self supporting unit designed to discharge flue gases coming from polishing scrubber

5.3.4 Control of Fugitive Emissions

Following area/ operation has been identified from which fugitive emission may occur.

i) Loading/ Unloading activity at site
ii) Transportation activity
iii) Storage activity
iv) Transfer of waste within the plant premises
v) Fugitive emission from ash storage area

Detail of same is discussed in chapter 4, section 4.2.1, page 4.3

5.4 WATER ENVIRONMENT

5.4.1 Water Conservation steps

The first step toward the management of water environment would be conservation of the raw water. Proper step shall be taken to conserve the water from the operation
phase, apart from the reuse and recycle of the wastewater generated. Conservation of raw water will also facilitate the mitigation of wastewater generation.

Conservation of raw water will also facilitate the mitigation of generation.

- Storm water drainage network shall be designed
- Faucets uses are of low water consumption type
- W.C, Flush and Urinal Flush valve are of low water consumption type

### 5.4.2 Rain Water Harvesting

At the periphery, storm water drain will be constructed which leads to common collection pond, where rain water recharge bore shall be constructed. And over flow from pond leads to the GIDC storm water drains

### 5.4.3 Waste water Generated

The total waste water generated from the proposed project is 20 KL/day which includes waste water due to washing and scrubber bleed. The same shall be treated through forced evaporation. However as an additional precaution we also propose to have effluent treatment plant. The domestic waste water shall be disposed through septic tank and soak pit system.

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Quantity</th>
<th>Disposal Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scubber bleed</td>
<td>10 KL/day</td>
<td>We propose to Forced evaporate the scrubber bleed and washing water. However,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>as an additional precaution we propose to have Effluent Treatment Plant and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the treated waste water shall be discharge to GIDC drain.</td>
</tr>
<tr>
<td>Washing</td>
<td>5 KL/day</td>
<td></td>
</tr>
<tr>
<td>Domestic</td>
<td>5 KL/day</td>
<td>Disposed through septic tank/ soak pit</td>
</tr>
<tr>
<td>Total waste water generated</td>
<td>20 KL/day</td>
<td></td>
</tr>
</tbody>
</table>

Water consumption and wastewater generation, treatment and disposal is given in chapter 4, section 4.4.2 and 4.4.3, page no. 4-13.

### 5.5 SOLID/ HAZARD WASTE GENERATION

The hazardous waste generated from the proposed project is as mentioned below
Table 5.3: Hazardous waste generation

<table>
<thead>
<tr>
<th>Type of Waste</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incineration Ash</td>
<td>10 Tonnes per day</td>
</tr>
<tr>
<td>Containers /barrels</td>
<td>20 nos/ days</td>
</tr>
<tr>
<td>Salt generated from forced evaporation system</td>
<td>50 MT/day</td>
</tr>
</tbody>
</table>

The ash generated due to incineration of waste will be send to approved TSDF site.

Salt generated from the forced evaporation system and ash generated due to incineration of waste will be stored in closed containers in covered area and later send to approved landfill site. MoU has been done between the land fill cell of SEPPL, Kutch division and SEPPL, Dahej for the acceptance of the landfill waste. The copy of same is attached herewith as annexure 9.

Discarded container shall be generated as hazardous waste which will be stored in the isolated area and washed into washing area and later sold to approved recyclers.

Direct manual handling of waste will be avoided. The person handling the waste will be equipped with hand gloves resistant to the waste, respiratory mask and goggles.

Record of the hazardous waste generated shall be maintained as per the Hazardous waste rules 2008 in the prescribed format and the same shall be regularly submitted to statutory authority. Prior to dispatch of the waste to the recycler company representative will keep a check on the valid authorization and approval obtained by the recycler from Central Pollution Control board.

5.6 ENVIRONMENT MANAGEMENT PLAN FOR LAND/ SOIL ENVIRONMENT

Proper care shall be taken in order to protect the land from the pollution caused due to spillage of oil and other waste material.

- Proper dyke are provided in order to prevent the spillage of oil directly on ground.
- Waste water generated shall be treated below statutory norms and same shall be discharged through forced evaporation system.
- Domestic waste will disposed through septic tank and soak pit.
- Recyclable solid waste collected in separated bins and sold to authorized recycler.

5.7 NOISE ENVIRONMENT

Manufacturers and suppliers of major equipments like compressors, engines, and motors should be asked to take required measures for minimizing the noise levels generated by
the machines i.e. using noise absorbing material for enclosures or using appropriate
design/technology for fabricating/assembling machines.

The equipment hall is planned to be designed in such a way that the possible leak of
sound from the hall to the outside area is architecturally sealed.

Silencers will be installed at noise generating sources. The operators working in the high-
noise areas shall be strictly instructed to use ear-muffs/ear-plugs and shift timings will
be adjusted as per the Factory Act. Green belt shall be developed to attenuate noise and
the extent of green belt shall be as per requirement. Noise barriers in the form of trees
will be grown around the plant boundary.

Personnel working near the vibrating machinery in different units shall be provided with
well-designed vibration resistant hand gloves/ foot wears and suitable Personal
Protection Equipments (PPEs). Vibration generating sources and their platforms shall be
maintained properly to minimize vibrations and related impacts. Training of personnel is
recommended to create awareness about the damaging effects of vibrations; if PPEs are
not used as regular practice while on duty. Regular noise monitoring will be carried out
at the noise generating sources as well as the entry - exit gates of the plant.

Greenbelt development within and around the plant shall be undertaken through
plantation of appropriate native species. Plantation apart from improving the aesthetics,
would act as sink for gaseous pollutants and masking for noise generated at the project.

5.8 GREEN BELT DEVELOPMENT

In order to reduce the air pollutants concentration and to reduce the windblown dust to
escape from the project premises to the nearby localities and to resist the noise
generated due to plant activity it is recommended to develop green belt around the
periphery of the plant, surrounding the coal storage yard, and along the road side. There
won’t be any relocation of existing trees in the near vicinity of the project site as far as
possible.

The total green belt area of about 2693 sq m has been demarcated for the proposed
project in the layout

5.8.1 Recommended Plants for Green Belt Development

Greenbelts are an effective mode of control of air pollution, where green plants form a
surface capable of absorbing air pollutants and forming a sink of pollutants. Leaves with
their vast area in a tree crown, sorbs pollutants on their surface, thus effectively reduce
pollutant concentration in the ambient air. Often the adsorbed pollutants are
incorporated in the metabolic pathway and the air is purified. Plants grown to function as
pollution sink are collectively referred as greenbelts.
An important aspect of a greenbelt is that the plants are living organisms with their varied tolerance limit towards the air pollutants. A green belt is effective as a pollutant sink only within the tolerance limit of constituent plants.

Apart from function as pollution sink, greenbelt would provide other benefits like aesthetic improvement of the area and providing suitable habitats for birds and animals.

5.8.2 Guidelines for plantation

The plant species identified for greenbelt development shall be planted using pitting technique. The pit size will be either 45 cm x 45 cm x 45 cm or 60 cm x 60 cm x 60 cm. Bigger pit size will be considered at marginal and poor quality soil. Soil used for filling the pit should be mixed with well decomposed farm yard manure or sewage sludge at the rate of 2.5 kg (on dry weight basis) and 3.6 kg (on dry weight basis) for 45 cm x 45 cm x 45 cm and 60 cm x 60 cm x 60 cm size pits respectively. The filling of soil should be completed at least 5-10 days before actual plantation. Healthy sapling of identified species should be planted in each pit with the commencement of monsoon. Provision for regular and liberal watering during the summer period during the commissioning stage of the plant will be arranged from the local available resources.

While making choices of plant species for cultivation in green belts, weightage has been given to the natural native species, bio climatic condition, plants which can be grown as per normal horticultural practices. Plant species identified for greenbelt development, considering the bio-climatic and soil condition are listed in Table 5.2.

5.8.3 Selection of plants for Greenbelts

The main limitation for plants to function as scavenger of pollutants are, plant’s interaction to air pollutants, sensitivity to pollutants, climatic conditions and soil characteristics. While making choice of plants species for cultivation in green belts, due consideration has to be given to the natural factor of bio- climate. Xerophytes plants are not necessarily good for greenbelts; they with their sunken stomata can withstand pollution by avoidance but are poor absorber of pollutants.

Character of plants mainly considered for affecting absorption of pollutant gases and removal of dust particle are as follows.

- For absorption of Gases:
  
  Tolerance towards pollutants in question, at concentration, that is not too high to be instantaneously lethal
  
  Longer duration of foliage
  
  Freely exposed foliage
Adequate height of crown
Openness of foliage in canopy
Big leaves (long and broad laminar surface)
Large number of stomatal apertures

- For Removal of Suspended Particular matter
  1. Height and spread of crown.
  2. Leaves supported on firm petiole
  3. Abundance of surface on bark and foliage
  4. Roughness of bark
  5. Abundance of axillary hairs
  6. Hairs or scales on laminar surface
  7. Protected Stomata

**Table 5.4: Recommended Plant Species for Green Belt Development**

<table>
<thead>
<tr>
<th>PLANT SPECIES</th>
<th>HABIT</th>
<th>TOLERANCE LIMIT</th>
<th>STOMATAL INDEX</th>
<th>MODE OF REGENERATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acacia auriculiformis</td>
<td>Tree</td>
<td>Tolerant</td>
<td>10.9</td>
<td>Seeds</td>
</tr>
<tr>
<td>Acacia leucophloea</td>
<td>Shrub</td>
<td>T</td>
<td>12.01</td>
<td>Seeds</td>
</tr>
<tr>
<td>Ailanthus excels</td>
<td>Tree</td>
<td>T</td>
<td>13.01</td>
<td>Seeds, shoot, root cuttings</td>
</tr>
<tr>
<td>Albizia amara</td>
<td>Tree</td>
<td>T</td>
<td>--</td>
<td>seeds</td>
</tr>
<tr>
<td>Albizia chinensis</td>
<td>Tree</td>
<td>T</td>
<td>--</td>
<td>Seeds</td>
</tr>
<tr>
<td>Albizia lebbeck</td>
<td>Tree</td>
<td>T</td>
<td>19.72</td>
<td>seeds</td>
</tr>
<tr>
<td>Albizia procera</td>
<td>Tree</td>
<td>T</td>
<td>20.21</td>
<td>seeds</td>
</tr>
<tr>
<td>Alstona scholaris</td>
<td>Tree</td>
<td>T</td>
<td>15.23</td>
<td>seeds</td>
</tr>
<tr>
<td>Azadirachta indica</td>
<td>Tree</td>
<td>T</td>
<td>29.2</td>
<td>Seeds</td>
</tr>
<tr>
<td>Bougainvillea spectabilis</td>
<td>Shrub</td>
<td>T</td>
<td>32.53</td>
<td>Cutting</td>
</tr>
<tr>
<td>Caesalpinia pulcherrima</td>
<td>Tree</td>
<td>T</td>
<td>29.09</td>
<td>Seeds and Cuttings</td>
</tr>
<tr>
<td>Species</td>
<td>Category</td>
<td>Type</td>
<td>Quantity</td>
<td>Rate</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------</td>
<td>----------</td>
<td>----------</td>
<td>------</td>
</tr>
<tr>
<td>Callistemon citrinus</td>
<td>Small tree</td>
<td>T</td>
<td>127.49</td>
<td>Seeds</td>
</tr>
<tr>
<td>Cassia javanica</td>
<td>Tree</td>
<td>T</td>
<td></td>
<td>seeds</td>
</tr>
<tr>
<td>Cassia siamea</td>
<td>Tree</td>
<td>T</td>
<td>21.2</td>
<td>Seeds</td>
</tr>
<tr>
<td>Dalbergia sisoo</td>
<td>Tree</td>
<td>T</td>
<td>18.72</td>
<td>Seeds/cuttings</td>
</tr>
<tr>
<td>Dalbergia latifolia</td>
<td>tree</td>
<td>T</td>
<td>10.12</td>
<td>Seeds/cuttings</td>
</tr>
<tr>
<td>Delonix regia (Gulmohur)</td>
<td>Tree</td>
<td>Sensitive</td>
<td>14.38</td>
<td>Seeds/stem cutting</td>
</tr>
<tr>
<td>Hibiscus rosa-sinensis</td>
<td>Small tree</td>
<td>T</td>
<td>23.32</td>
<td>stem cutting</td>
</tr>
<tr>
<td>Ixora arborea</td>
<td>Small tree</td>
<td>T</td>
<td>17.3</td>
<td>stem cutting</td>
</tr>
<tr>
<td>Ixora rosea</td>
<td>Small tree</td>
<td>T</td>
<td>20.30</td>
<td>Stem cutting</td>
</tr>
<tr>
<td>Kegelia Africana</td>
<td>Small tree</td>
<td>T</td>
<td>12.90</td>
<td>Seeds</td>
</tr>
<tr>
<td>Lantana camara</td>
<td>shrub</td>
<td>T</td>
<td>12.13</td>
<td>Seeds/cuttings</td>
</tr>
<tr>
<td>Lowsonia intermis</td>
<td>Shrub</td>
<td>T</td>
<td>17.0</td>
<td>Seeds/cuttings</td>
</tr>
<tr>
<td>Mangifera indica</td>
<td>Tree</td>
<td>S</td>
<td>30.77</td>
<td>Seeds/budding/grafting</td>
</tr>
<tr>
<td>Melia azadirachta</td>
<td>Tree</td>
<td>T</td>
<td></td>
<td>Seeds/stem cutting</td>
</tr>
<tr>
<td>Nerium indicum</td>
<td>Shrub</td>
<td>T</td>
<td>15.7</td>
<td>Cutting</td>
</tr>
<tr>
<td>Peltophorum pterocarpum</td>
<td>Tree</td>
<td>T</td>
<td>16.78</td>
<td>Seeds</td>
</tr>
<tr>
<td>Pithecellobium ducle</td>
<td>Tree</td>
<td>T</td>
<td>11.78</td>
<td>Seeds/cuttings</td>
</tr>
<tr>
<td>Polyalthia longifolia</td>
<td>Tree</td>
<td>Sensitive</td>
<td>22.27</td>
<td>seeds</td>
</tr>
<tr>
<td>Prosopis cineraria</td>
<td>Tree</td>
<td>T</td>
<td>18.1</td>
<td>Seeds/root suckers</td>
</tr>
<tr>
<td>Syzygium cumini</td>
<td>tree</td>
<td>T</td>
<td>20.60</td>
<td>Seeds</td>
</tr>
<tr>
<td>Terminalia catappa</td>
<td>Tree</td>
<td>T</td>
<td>20.9</td>
<td>seeds</td>
</tr>
</tbody>
</table>
**Thespesia populneoides**  Tree  T  29.81  Seeds/ cuttings

**Thevetia peruviana**  Shrub  T  27.8  Seeds

T: Tolerant S- sensitive, (--) =Not available  

The trees and shrubs selected from the above mention list based on its availability shall be, planted. Nearly about 600- 700 trees will be planted in span of two years

### 5.9  ENVIRONMENT MANAGEMENT SYSTEM

- The chief executive officer of the facility is responsible for all the activities at the incineration facility. He can establish an appropriate organizational structure and suitably allocate the responsibilities. This organizational structure shall be made available on site to regulatory officials. A typical organization structure is as mentioned below

![Organization Structure Diagram]

- Proper sign boards shall be placed at all concerned areas
- An emergency protocol shall be established and followed. All operating staff shall be trained, accordingly. Inter locking systems and alarm systems shall be provided at all reasonably possible areas
Abnormal operations and emergency situations should immediately be brought into the notice of the local regulatory board/committee.

While handling odourous wastes care shall be taken (scaled containers, vapour balancing, nitrogen blanketing etc) to avoid smell nuisance.

Efforts must be made to provide diffused emissions collection and control/routing to combustion chambers.

Medical camps/heath check ups of all the workmen of the incineration facility shall be conducted quarterly by registered medical practitioner.

A proper record shall be maintained by the cell for the quantity of fuel and water consumption along with the different types of waste generated.

A regular monitoring program shall be carried out for various environment parameters.

Proper environment & safety policy should be planned.

Environmental Management Cell (EMC) will meet at least once a month to assess the progress and analyze the data collected for the month. Any deviation/variation noticed shall be immediately taken into consideration for improvement of the same. Yearly action plan of EMP will be updated with respect to results achieved and proposed activities for next year.

During operational phase of the proposed project, overall implementation of EMP lies with the project proponent for compliance.

The major duties and responsibilities of Environmental Management Cell shall be as given below:

- To implement the environmental management plan
- To assure regulatory compliance with all relevant rules and regulations
- To ensure regular operation and maintenance of pollution control devices.
- To minimize environmental impacts of operations as by strict adherence to the EMP
- To initiate the environmental monitoring as per approved schedule
- Review and interpretation of monitoring as per approved schedule and corrective measures in case monitoring results are above the specified limits
- Maintain documents of good environmental practices and applicable environmental laws as ready reference
- Maintain environmental related records
Coordination with regulatory agencies, external consultants, monitoring laboratories

Maintain of log of public complain and the action taken

5.10 OCCUPATIONAL HEALTH SURVEILLANCE PROGRAM

5.10.1 Health hazard identification

Allocation of Resources, Responsibility and Authority will results in successful implementation of EMP during construction and operational phase.

The health and hygiene coordinator (Medical officer), with a team of technical personnel will identify and evaluate occupational health and industrial hygiene hazards that exists during operations through a structured approach via systematic inspections. The structured approach can include:

1. Review of work activities for all occupations
2. Review of task analysis and technical surveys
3. Review of hazards identified in planned inspections and reported hazards
4. Applicable regulations, legislation, code and standards
5. Interviews with employees and managers
6. The surveys particularly address the identification and evaluation of the following occupational health and hygiene hazards
   - Chemical hazards
   - Noise hazards
   - Radiation hazards
   - Illumination hazards
   - Vibration hazards
   - Temperature extremes
   - Biological hazards
   - Ergonomic hazards
   - Stress related hazards

5.10.2 Health Hazard Control

The area manager will constitute a team of officers and staff supported by medical officer, which will

- Prioritize the hazards based on their risk potentials
- Identify specific work groups affected by each hazard
- Determine the controls required to manage these identified hazards. The cost of each identified control versus benefits of its implementation may be evaluated

Develop an action plan identifying:
• Work to be done
• Person responsible to complete the work
• Target dates of completion
• Develop a follow up system to ensure the action plan is accomplished

5.10.3 Health Care

The health and hygiene of the personnel working at the site will be monitored through periodic health checks of the persons. All employees will undergo a periodic medical examination once in two years. This medical examination focuses on individual medical surveillance of all types of health hazards covering both occupational and non occupational issues.

The record of the health check up will be maintained centrally off site in confidential file by the safety department. The medical officer will recommend appropriate treatment for the persons found to be having any health problems requiring attentions.

A general analysis of the health records of the employees will also be carried out once in a year by the medical section to identify any trends in health problems related to the occupation and remedial actions as deemed necessary are taken up.

Majority of the employees will be trained in first aid.

5.11 BUDGETARY ALLOCATION FOR ENVIRONMENT MANAGEMENT PLAN

Table 5.5 depicts the resources required during construction and operation stages and the estimated budget against each resource for environment management.

Table 5.5: Estimated Cost for Environmental Management Plan

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Resources</th>
<th>Capital Cost</th>
<th>O &amp; M Cost (annual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Green Belt</td>
<td>10 lakhs</td>
<td>3 Lakhs</td>
</tr>
<tr>
<td>2</td>
<td>Air Pollution Control</td>
<td>1 Crores</td>
<td>175 Lakhs</td>
</tr>
<tr>
<td>3</td>
<td>Waste Water treatment</td>
<td>25 Lakhs</td>
<td>8 Lakhs</td>
</tr>
<tr>
<td>4</td>
<td>Sludge Disposal</td>
<td>17 Lakhs (construction of temporary storage)</td>
<td>150 Lakhs</td>
</tr>
<tr>
<td>5</td>
<td>Environmental Monitoring and management</td>
<td>0.25 Lakhs</td>
<td>20 lakhs annually (third party monitoring)</td>
</tr>
<tr>
<td>6</td>
<td>Occupational Health</td>
<td>---</td>
<td>10 Lakhs annually</td>
</tr>
</tbody>
</table>

5.12 CSR ACTIVITIES

Regular health check up of workers, funding for child education, road side plantation program, group insurance program, fund donation in schools etc shall be done at regular basis. The detail CSR activities are discussed in chapter 7.
Chapter-6
Environmental monitoring program

6.0 POLLUTION MONITORING AND SURVEILLANCE SYSTEM

Regular monitoring of important parameters is of immense importance to assess the status of environment during plant operation. With the knowledge of baseline conditions, a properly planned monitoring program can serve as an indicator for assessment of any deterioration in environmental conditions. This will facilitate undertaking suitable measures to mitigate adverse impacts during the operation of the plant and further help to protect the environment in the area. The main attributes for which monitoring shall be carried out are:

- Ambient air Quality
- Stack Emission
- Wastewater Quality
- Noise Level

For incineration project, the Indian Emission Regulations stipulate the minimum stack heights to be maintained for keeping the Particulate matter, sulphur dioxide, HCl, CO and NOx levels in the ambient within the air quality standards.

The characteristics of the effluent from the plant would be maintained so as to meet the requirements of the State Pollution Control Board and the Minimum National Standards for incineration project.

6.1 AMBIENT AIR QUALITY MONITORING:

The ambient air quality with respect to NOx, SO2, PM10 and PM2.5, CO and HCL shall be monitored at least three locations in the surrounding villages at 120 degree within 3 km radius and one location at project site.

The selected monitoring stations shall be monitored twice in week. The log book shall be maintained at environmental cell for evaluation of impact and to decide required mitigatory measures.
Table 6.1: Ambient monitoring

<table>
<thead>
<tr>
<th>Monitoring</th>
<th>Frequency</th>
<th>Duration</th>
<th>Location</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient</td>
<td>Twice a week</td>
<td>24 hour</td>
<td>3 locations in the surrounding villages at 120 degree from project site</td>
<td>PM$<em>{10}$, PM$</em>{2.5}$, SOx, NOx</td>
</tr>
<tr>
<td></td>
<td>Once in a month</td>
<td>24 hour</td>
<td>Same</td>
<td>HCl, Cl$_2$, hydrocarbons, ammonia, HF, H$_2$S, CS$_2$</td>
</tr>
<tr>
<td></td>
<td>Twice a year (six monthly)</td>
<td>--</td>
<td>Same</td>
<td>VOC, PAH</td>
</tr>
</tbody>
</table>

6.2 STACK MONITORING:

Sampling platform shall be provided as per CPCB norms to collect stack samples from the chimney for monitoring the air pollutants, as and when required. Port Holes need to be provided on chimney as per standard CPCB norms, following diametric calculations.

Frequency of monitoring for various parameters is given in table 6.2:

Table 6.2: Stack monitoring

<table>
<thead>
<tr>
<th>Sr. no</th>
<th>Parameter</th>
<th>Location</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Temperature</td>
<td>Secondary combustion chamber, stack emissions</td>
<td>Continuous monitoring</td>
</tr>
<tr>
<td>2.</td>
<td>Carbon monoxide</td>
<td>Stack emissions</td>
<td>Continuous</td>
</tr>
<tr>
<td>3.</td>
<td>Excess oxygen</td>
<td>Secondary combustion chamber, stack emission</td>
<td>Continuous</td>
</tr>
<tr>
<td>4.</td>
<td>Pressure</td>
<td>Combustion chambers</td>
<td>Continuous</td>
</tr>
</tbody>
</table>
5. Total particulate matter | Stack emission | Continuous
6. HCl | Stack emission | Continuous
7. HF | Stack emission | Once in every month, initially with HCl scrubbing efficiency is established, the frequency may be relaxed by the State Boards/ Pollution Control Committees appropriately
8. SO2 | Stack emission | Continuous
9. NOx | Stack emission | Continuous
10. TOC | Stack emission | Continuous
   | | Residues from the combustion processes (slag/ ash) | Once in every week (pooled sample) initially for the first year. If there is consistency in meeting the standard, may be relaxed to once in a month (pooled sample)
11. Loss on ignition (LOI) | Residues from the combustion processes (slag/ ash) | -do-
12. Mercury | Stack emission | Twice a year, under critical operating conditions
13. Heavy metals | Stack emission | Twice a year, under critical operating condition
14. Dioxins and furans | Stack emissions, ash/dust, scrubber liquors, quench liquor | Twice a year under critical operating conditions

The emission limits should be maintained as per the statutory requirement. For monitoring of dioxins and furans, CPCB has presently approved SGS and Vimta lab. The same lab shall be engaged in monitoring of dioxin and furans.
6.3 NOISE ENVIRONMENT

Monitoring of the noise levels is essential to assess the effectiveness of Environmental Management Plan implemented to reduce noise levels. A good quality sound level meter and noise exposure meter may be procured for the same. Audiometric tests shall be conducted periodically for the employees working close to the high noise sources. The noise levels due to machines/equipments viz. compressors, diesel generator, etc. should be monitored regularly.

6.4 WATER AND WASTE WATER QUALITY MONITORING

Ground water and surface water shall be sampled from the nearby village (3 Km radius) from the project site as well as the project location quarterly.

**Table 6.3: Water monitoring**

<table>
<thead>
<tr>
<th>Locations</th>
<th>Source</th>
<th>Frequency</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project site</td>
<td>Ground water</td>
<td>Quarterly</td>
<td>pH, Temp., Color, EC, Turbidity, SS, TDS, TOC, COD, Zn, Ni, Pb, Cu, Co, Cd, Hg, Cr, Fe, CN, F, As, Mn, Cl, No3, So4, Ca as Ca, Mg as Mg, DO, TKN, Total Alkalinity, Total hardness, Total Pesticides</td>
</tr>
<tr>
<td></td>
<td>Surface water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nearby villages</td>
<td>Ground water</td>
<td>Quarterly</td>
<td>Same as above</td>
</tr>
<tr>
<td></td>
<td>Surface water</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Environmental management cell shall be created and qualified persons would be in charge of monitoring the parameters by using suitable instruments. The detail of same is discussed in chapter 5.

6.5 SOIL QUALITY

The quality of soil in the surrounding area (3 Km radius) and project site shall be accessed every six month. The basic parameters to be analyzed for soil are as mentioned below.

**Table 6.4: Soil Quality**

<table>
<thead>
<tr>
<th>Locations</th>
<th>Frequency</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project site</td>
<td>Once in Six monthly</td>
<td>Bulk density, Specific gravity, Water holding capacity, Particle size distribution, pH, calcium, magnesium, Total hardness, chlorides, alkalinity</td>
</tr>
<tr>
<td>Nearby villages</td>
<td>Once in six month</td>
<td>Same as above</td>
</tr>
</tbody>
</table>
6.6 **FLORA AND FAUNA**

Regular monitoring of flora and fauna shall be done in the nearby area.

6.7 **OCCUPATIONAL HEALTH CHECK UP**

Health check up of the workers at regular intervals shall be done at the project site

**Post project Environment Monitoring Budgetary allocation:**

The total cost allocated for post project monitoring is given in chapter 5, section 5.10, page 5-16.
Chapter-7
Project Benefits

The company is committed for contribution of funds and provides the services for the upliftment of local community in the nearby villages. The different activities to be undertaken by the company are mentioned in this chapter

7.1 CORPORATE SOCIAL RESPONSIBILITY ACTIVITIES

Proposed Project

- Programs for environmental education and public participation shall be developed with the help of audio visual aids to create awareness about the activities.
- Proper awareness campaign shall be organized by the project proponent for water conservation.
- Periodic health check up camps shall be organized by the project authority for workers families.
- Free Medical Facility inside the premises for all employees & tie up with the nearest hospital for further treatment
- Health check up will be provided to the nearby villager at free cost.
- The company shall make collaborative effort with the local authorities of the village for the social welfare activities like:
  - Road side plantation program
  - Improvement in infrastructure facilities like drainage, sanitation etc
  - Funding for education of children
  - Regular Training programs for employment to be conducted
- Apart from the existing drinking water facility additional efforts shall be made to improve the drinking facility
- Group Insurance to all employees over and above the Employees State Insurance Scheme
- Subsidized food in a well equipped and hygienic canteen
- Subsidized Transportation facility for employees
- Annual get-together and rewards for workers/villages kids who have shown brilliance in education, sports, cultural activities
- Free distribution of PPE
- Fire & Safety Training will be imparted to employees.
- Fire fighting and Safety Week will be observed and quiz and essay competitions will be organized to develop awareness in employees on the subject.
- Celebration of International Environment Day every year on 5th June will be marked by plantation of number of trees by employees in order to develop awareness in them about protecting environment from pollution and to save earth.
Community Awareness programme like Aids awareness, Polio camps, Eye camps and blood donation camps will be organized in the company and in its vicinity from time to time for the benefit of employees and their families and people living in the surrounding area.

Regular donations will be made in the nearby schools

**Existing Project**

Saurashtra Enviro Projects Private Limited has developed Integrated Common Hazardous waste Management, Treatment, Storage and Disposal Facility at Kutch. The company has undertaken various corporate social responsibility in the nearby villages

Few of the activities are as listed below

- Generation of direct and indirect employment opportunities for around 100 people
- 100% sponsorship was done for medical camps organized by Chief District Health Officer for near by villages.
- Adoption of kids is done in the nearby village and scholarship is provided at regular basis
- People with less income in the nearby villages are provided with medical assistance of Rs. 2000/-
- Company has ambulance service and the same is provided to the nearby villages free of cost
- Distribution of computers was done in schools of six surrounding villages
- Company contributed funds in the kanya kedavani program of Gujarat Government
- In order to encourage traditional values in the local villages, distribution of prizes to the winners in public social occasions.

**7.2 EMPLOYMENT POTENTIAL:**

There will be increase in the employment facilities due to the upcoming project. The total no. of skilled and unskilled worker to be employed for the proposed project is as given below.

<table>
<thead>
<tr>
<th>Table 7.1: Employment details</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of skilled employees</td>
</tr>
<tr>
<td>No. of unskilled employees</td>
</tr>
<tr>
<td>Total employees for proposed project</td>
</tr>
</tbody>
</table>

**7.3 BUDGETARY ALLOCATION**

Adequate funds as per the statutory requirement will be allotted for various socio economic activities to be undertaken in the villages. The details regarding fund allocation for the socio economic upliftment of the area will be approx 20 lakhs
We will become member of industrial association and shall participate in socio economic development program in the region on prorate basis
8.0 INTRODUCTION

A risk assessment is a careful examination of consequences resulting from the undesired events that could cause harm to people or property, so that sufficient precautions can be taken. Workers and others have a right to be protected from harm caused by a failure to take reasonable control measures.

8.1 OBJECTIVES OF THE RISK ASSESSMENT

As per the requirements stated in the Terms of Reference of the EIA study, the risk assessment study has been undertaken to address the following aspects:

- To identify and assess those fire and explosion hazard arising from the storage and use of the fuel in the project that require management in order to comply with regulatory requirements, company policy and business requirements
- To eliminate or reduce to as low as reasonably practical in terms of risk to human health, risk of injury, risk of damage to plant, equipment and environment, business interruption or loss etc.

8.2 RISK ASSESSMENT PROCESS

Risk assessment involves the identification of the hazards present and an estimate of the extent of the risks involved, taking into account whatever precautions are inherent to the process/activity.

There are more than one approach to risk assessment, for example:

- Look at each activity (not forgetting non-routine activities, e.g., maintenance, breakdowns etc.). That could cause harm or adverse effects;
- Look at hazards and risks in groups e.g. machinery, transport, materials, electrical etc;
- Look at each section e.g. stores, workshop, laboratory, office, etc.

The approach should match the circumstances.

The actions required for an assessment to be suitable and sufficient and compliant with other legal requirements are summarized in the following five steps:

Step 1 - Identify the hazards

Step 2 - Decide who might be harmed and how
Step 3 - Evaluate the risks and decide on precautions

Step 4 - Record your findings and implement them

Step 5 - Review your assessment and update if necessary

Step 1 Identify the hazards

There are a number of simple ways in which hazards can be identified. In order to achieve a suitable and sufficient risk assessment it is essential to identify all the hazards associated with an activity.

Step 2 Decide who might be harmed

Look for who may be harmed by the hazards and how. Include people who may not be in the workplace all the time, e.g. cleaners, visitors, contractors, maintenance personnel, members of the public, etc. If the workplace is shared with others, include them too if there is a chance that they may be harmed in some way by the activities.

Step 3 Evaluate the risks arising from the hazards and decide what should be done to control them

Is there any real chance of harm? Take account of any precautions that are inherent to the process/activity; check against guidelines and consider whether the precautions are adequate and, if not, what further action is needed.

Go through the following questions:

Can the hazard be removed altogether (substitution of the hazard or permanent removal of the hazard)

If not, how can the risks be controlled so that harm is unlikely (control measures taken in order to minimize/remove the risk).

Step 4 Record the findings and put into practice the control measures.

The record can be greatly simplified by referring to other documentation, such as manuals, health and safety procedures. These may well already have listed hazards for equipment or processes and the precautions and arrangements for controlling risk. It is not necessary to repeat all that. Similarly, reference can be made to other assessments where they are relevant. If the required other assessment does not exist then the outcome of this general risk assessment will be to request the appropriate specific assessment.

If a workplace is shared, others must be told about any risks the work could cause them, and what is being done to protect them.
**Step 5 Review the assessment from time to time and revise it if necessary**

Workplace changes, new equipment, substances and procedures could lead to new hazards and risks. If there is any significant change, then the assessment should be revised to take account of the new hazard. In any case, it is good practice for assessments to be reviewed periodically and in some cases, it is a statutory requirement. However, don’t amend assessments for every trivial change, or for every new job that has to be attempted. Walk around the area and look afresh at what can reasonably be foreseen as likely to cause harm. Ask the people who work there what they think. They may come up with hazards which they have noticed in the course of their work and which are not immediately obvious. Accident records, manufacturers’ instructions, or data sheets can also help.

It is required to review the assessment on periodic intervals so that additional risk arises out of the new facilities or modifications carried out in existing facilities can be identified and taken into account.

**8.3 IDENTIFICATION OF HAZARDS BY FIRE AND EXPLOSION INDEX & TOXICITY INDEX**

Fire and Explosion Index (F&EI) is an important technique employed for hazards identification process. Consequence analysis then quantifies the vulnerable zone for a conceived incident. Once vulnerable zone is identified for an incident, measures can be formulated to eliminate or reduce damage to plant and potential injury to personnel.

Rapid ranking of hazard of an entire installation, if it is small, or a portion of it, if it is large, is often done to obtain a quick assessment of degree of the risk involved. The Dow Fire and Explosion Index (F&EI) and Toxicity Index (TI) are the most popular methods for Rapid Hazard Ranking. These are based on a formal systematized approach, mostly independent of judgmental factors, for determining the relative magnitude of the hazards in an installation using hazardous (flammable, explosive and toxic) materials.

The steps involved in the determination of the F & EI and TI are:

- Selection of a pertinent process unit
- Determination of the Material Factor (MF)
- Determination of the Toxicity Factor (Th)
- Determination of the Supplement to Maximum Allowable Concentration (Ts)
- Determination of the General Process Hazard Factor (GPH)
- Determination of the Special Process Hazard Factor (SPH)
8.3.1 HAZARDOUS MATERIAL IDENTIFICATION METHODOLOGY

From the preliminary appraisal of Material Safety Data Sheet, Coal, Furnace oil and natural gas were considered for risk study. F&EI and TI values have been computed for Natural gas supply pipeline, storage of Furnace oil and coal has been conducted.

In general, the higher is the value of material factor (MF), the more inflammable and explosive is the material. Similarly, higher values of toxicity factor (Th) and supplement to maximum allowable concentration (Ts) indicate higher toxicity of the material. The tabulated values of MF, Th and Ts are given in Dows Fire and Explosion Index Hazard Classification Guide. For compounds not listed in Dow reference, MF can be computed from the knowledge of flammability and reactivity classification, Th can be computed from the knowledge of the National Fire Protection Association (NFPA) Index and Ts can be obtained from the knowledge of maximum allowable concentration (MAC) values.

General process hazards (GPH) are computed by adding the penalties applied for the various process factor.

Special process hazards (SPH) are computed by adding the penalties applied for the process and natural factors.

Both General process hazards and Special process hazards corresponding to various process and natural factors are used with MF to compute F&EI value and with Th and Ts to compute TI value.

8.3.2 F&EI Computation

F&EI value computed for TPS and CTT from GPH and SPH values using the following formula

\[
F&EI = MF \times [1 + GPH \text{ (total)}] \times [1 + SPH \text{ (total)}]
\]

8.3.3 Toxicity Index (TI)

Toxicity index (TI) is computed from toxicity factor (Th) and supplement to maximum allowable concentrations (Ts) using the following relationship:

\[
TI = (Th + Ts) \times [1 + GPH \text{ (total)} + SPH \text{ (total)}] / 100
\]

Calculation for F&EI as well as TI is given in table shown below for Natural gas, Coal and Furnace oil.
### Table 8.1: Fire And Explosion Index For Natural Gas

<table>
<thead>
<tr>
<th>Material Factor</th>
<th>Penalty factor range</th>
<th>Penalty factor used</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GPH</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base factor</td>
<td>1.00</td>
<td>1.00</td>
<td>Base factor</td>
</tr>
<tr>
<td>A</td>
<td>Exothermic reaction</td>
<td>0.3-1.25</td>
<td>0.00</td>
</tr>
<tr>
<td>B</td>
<td>Endothermic process</td>
<td>0.2-0.4</td>
<td>0.00</td>
</tr>
<tr>
<td>C</td>
<td>Material handling and transfer</td>
<td>0.2-1.05</td>
<td>0.5</td>
</tr>
<tr>
<td>D</td>
<td>Enclosed or Indoor process unit</td>
<td>0.25-0.9</td>
<td>0.00</td>
</tr>
<tr>
<td>E</td>
<td>Access</td>
<td>0.2-0.35</td>
<td>0.00</td>
</tr>
<tr>
<td>F</td>
<td>Drainage &amp; spill control</td>
<td>0.25-0.5</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>General process Hazard factor F1</strong></td>
<td></td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td><strong>SPH</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base factor</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Toxic material</td>
<td>0.2-0.8</td>
<td>0.20</td>
</tr>
<tr>
<td>B</td>
<td>Sub atmospheric pressure(&lt;500 mmhg)</td>
<td>0.5</td>
<td>0.00</td>
</tr>
<tr>
<td>C</td>
<td>Operation in or near flammable range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Tank farm storage flammable liquid</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Process upset or purge failure</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Always in flammable range</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Value range</td>
<td>Description</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------</td>
<td>-------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>D</td>
<td>Dust Explosion</td>
<td>0.25-2.0</td>
<td>0</td>
</tr>
<tr>
<td>E</td>
<td>pressure</td>
<td>0.86-1.5</td>
<td>0</td>
</tr>
<tr>
<td>F</td>
<td>Low temperature</td>
<td>0.2-0.3</td>
<td>0</td>
</tr>
<tr>
<td>G</td>
<td>Quantity of flammable / unstable material</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Liquid or gases in process</td>
<td>0.2-3</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>2 Liquid or gases in storage</td>
<td></td>
<td>0.1-1.6</td>
</tr>
<tr>
<td></td>
<td>3 Combustible solid in storage, dust in process</td>
<td>0.2-4</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>Corrosion &amp; Erosion</td>
<td>0.1-0.75</td>
<td>0.1</td>
</tr>
<tr>
<td>I</td>
<td>Leakage joint and packing</td>
<td>0.1-1.5</td>
<td>0.1</td>
</tr>
<tr>
<td>J</td>
<td>Use of fired equipment</td>
<td>0.1-1</td>
<td>0</td>
</tr>
<tr>
<td>K</td>
<td>Hot oil heat exchange system</td>
<td>0.15-1.15</td>
<td>0</td>
</tr>
<tr>
<td>L</td>
<td>Rotating equipment</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Special process Hazard F2</strong></td>
<td></td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td>Process unit hazard factor (F1 x F2) = F3</td>
<td></td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td><strong>Fire and Explosion Index (F3 x MF)</strong></td>
<td></td>
<td>75.6</td>
</tr>
<tr>
<td></td>
<td><strong>TOXICITY INDEX</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Toxicity number Th</td>
<td>50</td>
<td>Nh=1</td>
</tr>
<tr>
<td></td>
<td>Penalty factor Ts</td>
<td>50</td>
<td>TLV 0.5 ppm</td>
</tr>
<tr>
<td></td>
<td><strong>Toxicity Index</strong></td>
<td></td>
<td>4.9</td>
</tr>
</tbody>
</table>
### Table 8.2: Fire and Explosion Index for FO

<table>
<thead>
<tr>
<th>Material Factor</th>
<th>Penalty factor range</th>
<th>Penalty factor used</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 GPH</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base factor</td>
<td>1.00</td>
<td>1.00</td>
<td>Base factor</td>
</tr>
<tr>
<td>A Exothermic reaction</td>
<td>0.3-1.25</td>
<td>0.00</td>
<td>No reaction</td>
</tr>
<tr>
<td>B Endothermic process</td>
<td>0.2-0.4</td>
<td>0.00</td>
<td>NA</td>
</tr>
<tr>
<td>C Material handling and transfer</td>
<td>0.2-1.05</td>
<td>0.40</td>
<td>NFPA 2</td>
</tr>
<tr>
<td>D Enclosed or Indoor process unit</td>
<td>0.25-0.9</td>
<td>0.00</td>
<td>Not Enclosed</td>
</tr>
<tr>
<td>E Access</td>
<td>0.2-0.35</td>
<td>0.00</td>
<td>Two side easy access so NA</td>
</tr>
<tr>
<td>F Drainage &amp; spill control</td>
<td>0.25-0.5</td>
<td>0.00</td>
<td>Proper dike design so NA</td>
</tr>
<tr>
<td><strong>General process Hazard factor F1</strong></td>
<td></td>
<td></td>
<td>1.40</td>
</tr>
<tr>
<td><strong>2 SPH</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base factor</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>A Toxic material</td>
<td>0.2-0.8</td>
<td>0.40</td>
<td>0.2×2</td>
</tr>
<tr>
<td>B Sub atmospheric pressure(&lt;500 mmhg)</td>
<td>0.5</td>
<td>0.00</td>
<td>NA</td>
</tr>
<tr>
<td>C Operation in or near flammable range</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Tank farm storage flammable liquid</td>
<td>0.5</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>2 Process upset or purge failure</td>
<td>0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Always in flammable range</td>
<td>0.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D Dust Explosion</td>
<td>0.25-2.0</td>
<td>0</td>
<td>NA</td>
</tr>
<tr>
<td>E pressure</td>
<td>0.86-1.5</td>
<td>0</td>
<td>NA</td>
</tr>
</tbody>
</table>
### Table 8.3: Fire and Explosion Index for Coal

<table>
<thead>
<tr>
<th>Material Factor</th>
<th>16</th>
<th>St-1, Nr-0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GPH</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base factor</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Remark</td>
<td>Base factor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Pen. Factor</td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------------------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>A</td>
<td>Exothermic reaction</td>
<td>0.3-1.25</td>
</tr>
<tr>
<td>B</td>
<td>Endothermic process</td>
<td>0.2-0.4</td>
</tr>
<tr>
<td>C</td>
<td>Material handling and transfer</td>
<td>0.2-1.05</td>
</tr>
<tr>
<td>D</td>
<td>Enclosed or Indoor process unit</td>
<td>0.25-0.9</td>
</tr>
<tr>
<td>E</td>
<td>Access</td>
<td>0.2-0.35</td>
</tr>
<tr>
<td>F</td>
<td>Drainage &amp; spill control</td>
<td>0.25-0.5</td>
</tr>
</tbody>
</table>

**General process Hazard factor F1**

<table>
<thead>
<tr>
<th></th>
<th>Pen. Factor</th>
<th>Gen. Factor</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>SPH</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Base factor</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>A</td>
<td>Toxic material</td>
<td>0.2-0.8</td>
<td>0.40</td>
</tr>
<tr>
<td>B</td>
<td>Sub atmospheric pressure(&lt;500 mmhg)</td>
<td>0.5</td>
<td>0.00</td>
</tr>
<tr>
<td>C</td>
<td>Operation in or near flammable range</td>
<td>0.00</td>
<td>No operation storage</td>
</tr>
<tr>
<td>1</td>
<td>Tank farm storage flammable liquid</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Process upset or purge failure</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Always in flammable range</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Dust Explosion</td>
<td>0.25-2.0</td>
<td>0.5</td>
</tr>
<tr>
<td>E</td>
<td>pressure</td>
<td>0.86-1.5</td>
<td>0</td>
</tr>
<tr>
<td>F</td>
<td>Low temperature</td>
<td>0.2-0.3</td>
<td>0</td>
</tr>
<tr>
<td>G</td>
<td>Quantity of flammable / unstable material</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Liquid or gases in process</td>
<td>0.2-3</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Liquid or gases in storage</td>
<td>0.1-1.6</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Combustible solid in storage, dust in process</td>
<td>0.2-4</td>
<td>0.2</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------</td>
<td>-------</td>
<td>-----</td>
</tr>
<tr>
<td>H</td>
<td>Corrosion &amp; Erosion</td>
<td>0.1-0.75</td>
<td>0</td>
</tr>
<tr>
<td>I</td>
<td>Leakage joint and packing</td>
<td>0.1-1.5</td>
<td>0</td>
</tr>
<tr>
<td>J</td>
<td>Use of fired equipment</td>
<td>0.1-1</td>
<td>0</td>
</tr>
<tr>
<td>K</td>
<td>Hot oil heat exchange system</td>
<td>0.15-1.15</td>
<td>0</td>
</tr>
<tr>
<td>L</td>
<td>Rotating equipment</td>
<td>0.5</td>
<td>0</td>
</tr>
</tbody>
</table>

**Special process Hazard F2**

| Process unit hazard factor ($F_1 \times F_2$) = $F_3$ | 2.10 |

**Fire and Explosion Index ($F_3 \times MF$)**

<table>
<thead>
<tr>
<th>Toxicity number $Th$</th>
<th>50</th>
<th>$Nh=1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penalty factor $Ts$</td>
<td>50</td>
<td>TLV 0.5 ppm</td>
</tr>
</tbody>
</table>

**Toxicity Index**

| 5.0 |

**Table 8.4: Conclusion for Fire, Explosion & toxicity Index**

<table>
<thead>
<tr>
<th>Applicable Fire and Explosion index range</th>
<th>1-60</th>
<th>Light</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>61-96</td>
<td>Moderate</td>
</tr>
<tr>
<td></td>
<td>97-127</td>
<td>Intermediate</td>
</tr>
<tr>
<td></td>
<td>128-158</td>
<td>Heavy</td>
</tr>
<tr>
<td></td>
<td>&gt;159</td>
<td>Sever</td>
</tr>
</tbody>
</table>

**CONCLUSION FOR TOXICITY INDEX**

<table>
<thead>
<tr>
<th>Applicable Toxicity index range</th>
<th>1-5</th>
<th>Light</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6-9</td>
<td>Moderate</td>
</tr>
<tr>
<td>above 10</td>
<td></td>
<td>High</td>
</tr>
</tbody>
</table>
8.3.4 Hazards Ranking

<table>
<thead>
<tr>
<th>Substance</th>
<th>F&amp;EI value</th>
<th>TI value</th>
<th>F&amp;EI range</th>
<th>TI range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas</td>
<td>75.6</td>
<td>4.9</td>
<td>Moderate</td>
<td>Light</td>
</tr>
<tr>
<td>FO</td>
<td>36</td>
<td>8.75</td>
<td>Light</td>
<td>Moderate</td>
</tr>
<tr>
<td>Coal</td>
<td>64</td>
<td>5</td>
<td>Moderate</td>
<td>Light</td>
</tr>
</tbody>
</table>

From the above various hazards identified from the proposed project activities are as under:

- Fire and explosion hazard due to use of natural gas
- Fire hazard due to handling and storage of Combustible Coal.
- Light fire hazard due to Storage of MEG

Other hazards are:

- Occupational health hazards
- Other hazards

Consequences of hazards also depend on prevailing meteorological conditions and density of population in surrounding areas.

8.4 CONSEQUENCE ANALYSIS

Consequence analysis quantifies vulnerable zone for a conceived incident and once the vulnerable zone is identified for an incident, measures can be proposed to eliminate damage to plant and potential injury to personnel. For consequence analysis both units chosen for hazards analysis are considered. The following likely maximum credible scenarios (Primary) considered for hazard analysis

- Catastrophic failure of Natural gas pipeline
- Catastrophic failure of Furnace oil storage tank.

Damage area from the above scenarios is presented in the model developed with HAMS-GPS software and presented as below.

a) Full bore failure of Natural gas pipeline:

From the primary scenario of full bore failure of natural gas pipeline two secondary scenarios are considered based on the time taken for ignition.

1) Immediate ignition will lead to jet fire
2) Delayed ignition will lead to Vapor cloud explosion.
1) Immediate ignition will lead to jet fire

**Scenario:** Gas pipe Plume immediate ignition leading to Jet fire (SMOD-5 Fire module)

**Results:**
- Maximum HR at Flame Centre Height (Kw/m²): 159.47
- Maximum HR at height of simulation (Kw/m²): 159.47
  - 37.9
  - 29
  - 12.9
  - 6
  - 1.6
- Damage to process equipment: 100% fail in 1 min. 1% fail in 12 Sec.
- M10 steel (without flame contact): 100% fail in 1 min. Standard varnish in 12 Sec.
- Paint ignites wood (with flame contact): 1% fail in 1 min. First degree burn in 15 Sec.
- Paint after 25 Sec. Blistering unlikely.
- No skin irritation even on long exposure.

**Data Entered:**
- Reference No.: Natural gas
- Name of Chemical: Methane
- Scenario: Gas pipe Plume immediate ignition leading to Jet fire (SMOD-5 Fire module)
- Jet height from ground (m): 1.00
- Atmospheric stability class: D
- Terrain Level: 1
- Rate of Released (g/Sec): 8.700
2) Delayed ignition will lead to Vapor cloud explosion.
HAMS-GPS : Explosion Module

Date : Monday, January 30, 2012

Reference No. : natural gas
Name of Chemical : Methane
Scenario : 1. Gas Puff Delayed inside ignition leading to Explosion (UCE module)
Cloud height at Pool/Dyka Depth from ground (m) : 1.00
TNT Equivalent of the chemical : 0.5
Explosion Mass (lbm) : 0.5

Results

Un-Confined Explosion Summary at Height of simulation (m) 1.00

1. Cloud Radius (m) : 0.44
2. Explosion Yield Factor : 0.02

1. Storage tank/Non-closed structure damage limit (m) : 0.41
2. 50% BrickWall damage distance limit (m) : 1.22
3. Sheet/Panels damage limit (m) : 3.96
4. Safe distance/Missile limit (m) : 17.0/
5. 100% Fatal distance (m) : 0.00
6. 50% Fatal distance (m) : 6.30
7. Fatal distance limit (m) : 0.61
8. 100% Structural damage limit (m) : 0.00
9. 50% Structural damage limit (m) : 2.13
10. Structural damage limit (m) : 3.79
11. Far drum damage limit (m) : 6.40
12. 100% Glass break limit (m) : 2.74
13. 50% Glass break limit (m) : 10.36
14. Glass break limit (m) : 49.38
15. Loud noise (m) : 52.43
b) Catastrophic failure of Furnace oil storage tank.

Date: Monday, January 30, 2012

Scenario: 1. Tank-Fixed roof

Data Entered

Reference No.: Furnace oil
Name of Chemical: Furnace oil SEPPL
Scenario: 1. Tank-Fixed roof No roof catastrophic failure liquid dyke pool fire (SMOD-7 Fire module)
Pool/Dyke Depth from ground (m): 1
Atmospheric stability class: D
Terrain: Level
Rate of Released (g/Sec): 306670

Results

<table>
<thead>
<tr>
<th>Maximum IHR at Flame Centre Height (KW/m2)</th>
<th>Distance(m) Radial From Flame</th>
<th>Distance(m) along Ht simulation</th>
<th>Effect of IHR</th>
</tr>
</thead>
<tbody>
<tr>
<td>43.14</td>
<td>7.78</td>
<td>3.38</td>
<td>Damage to process equipment. 100% fatal in 1 min. 1% fatal in 10 Sec.</td>
</tr>
<tr>
<td>37.5</td>
<td>7.78</td>
<td>3.38</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>7.78</td>
<td>4.38</td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>9.19</td>
<td>4.38</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>14.25</td>
<td>12.98</td>
<td></td>
</tr>
<tr>
<td>1.6</td>
<td>21.34</td>
<td>20.48</td>
<td></td>
</tr>
</tbody>
</table>

Fire & Burnout Time (hrs) 2.11
Heat Flux (KW/m2) 63.45
Flame width (m): 5.97
Flame Height: 12.94
Flame centre height (m): 7.67
Flame Tip Angle due to wind (deg): 43.27°
8.5 RISKS AND FAILURE PROBABILITY

The term Risk involves the quantitative evaluation of likelihood of any undesirable event as well as likelihood of harm of damage being caused to life, property and environment. This harm or damage may only occur due to sudden/accidental release of any hazardous material from the containment. This sudden/accidental release of hazardous material can occur due to failure of component systems. It is difficult to ascertain the failure probability of any system because it will depend on the components of the system. Even if failure occurs, the probability of fire and the extent of damage will depend on many factors like:

- Quantity and physical properties of material released.
- Source of ignition.
- Wind velocity and direction
- Presence of population, properties etc. nearby.

Frequencies of Loss Of Containment (LOCs) for atmospheric tanks as per CPR 18E guidelines are as under:

<table>
<thead>
<tr>
<th>Installation (part)</th>
<th>G.1a</th>
<th>G.1b</th>
<th>G.2a</th>
<th>G.2b</th>
<th>G.3a</th>
<th>G.3b</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>release to atmosphere</td>
<td>release to secondary container</td>
<td>release to atmosphere</td>
<td>release to secondary container</td>
<td>release to atmosphere</td>
<td>release to secondary container</td>
</tr>
<tr>
<td>Single containment tank</td>
<td>$5 \times 10^8 \text{ y}^{-1}$</td>
<td>$5 \times 10^7 \text{ y}^{-1}$</td>
<td>$5 \times 10^8 \text{ y}^{-1}$</td>
<td>$5 \times 10^7 \text{ y}^{-1}$</td>
<td>$1 \times 10^4 \text{ y}^{-1}$</td>
<td></td>
</tr>
<tr>
<td>Tank with a protective outer shell</td>
<td>$5 \times 10^5 \text{ y}^{-1}$</td>
<td>$5 \times 10^5 \text{ y}^{-1}$</td>
<td>$5 \times 10^7 \text{ y}^{-1}$</td>
<td>$5 \times 10^7 \text{ y}^{-1}$</td>
<td>$1 \times 10^4 \text{ y}^{-1}$</td>
<td></td>
</tr>
<tr>
<td>Double containment tank</td>
<td>$1.25 \times 10^4 \text{ y}^{-1}$</td>
<td>$5 \times 10^4 \text{ y}^{-1}$</td>
<td>$1.25 \times 10^4 \text{ y}^{-1}$</td>
<td>$5 \times 10^4 \text{ y}^{-1}$</td>
<td>$1 \times 10^4 \text{ y}^{-1}$</td>
<td></td>
</tr>
<tr>
<td>Full containment tank</td>
<td>$1 \times 10^6 \text{ y}^{-1}$</td>
<td>see note 7</td>
<td>$1 \times 10^6 \text{ y}^{-1}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Membrane tank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-ground tank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mounded tank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Frequencies for Loss Of Contentment for pipes as per CPR 18E guidelines are as under:

<table>
<thead>
<tr>
<th>Installation (part)</th>
<th>G.1</th>
<th>G.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>pipeline, nominal diameter &lt; 75 mm</td>
<td>$1 \times 10^{-6}$ m$^{-1}$ y$^{-1}$</td>
<td>$5 \times 10^{-6}$ m$^{-1}$ y$^{-1}$</td>
</tr>
<tr>
<td>pipeline, 75 mm ≤ nominal diameter ≤ 150 mm</td>
<td>$3 \times 10^{-7}$ m$^{-1}$ y$^{-1}$</td>
<td>$2 \times 10^{-6}$ m$^{-1}$ y$^{-1}$</td>
</tr>
<tr>
<td>pipeline, nominal diameter &gt; 150 mm</td>
<td>$1 \times 10^{-7}$ m$^{-1}$ y$^{-1}$</td>
<td>$5 \times 10^{-7}$ m$^{-1}$ y$^{-1}$</td>
</tr>
</tbody>
</table>

### 8.6 HAZARD INVOLVED IN HANDLING OF NATURAL GAS

#### Gas Requirement

Total gas requirement for the proposed plant: 1219.5 kg/hr

#### Risk due to handling/ Receipt of gas

The gas will be received through pipeline from GSPC.

#### Hazards in Gas Handling

- Fire hazard
- Explosion Hazard

#### Control Measures/ Safety precautions to be adopted during handling of gas

Following safe operating work procedure & precautionary measures will be adopted.

- Only seamless pipe will be utilized
- MOC of pipe is schedule 40
- Welded joins will be done
- Provision of movable gas leakage detector to identify any gas leakage
- Interlocking valve arrangement
- Gas venting system in case of emergency.
- Work permit system will be followed strictly.
The supervisor & the workers will be trained for the work to be carried out. They will be made aware of the hazards involved in particular work & remedial measures to be observed.

Required P.P.E. as per job requirement will be issued & their use be ensured while working.

It would be ensured that the contractor would deploy well trained physically fit workers for the work.

Adequate lighting arrangement will be ensured in the plant.

The workers will be using nose mask, safety shoes, gum boots & helmet while working in plant to ensure their safety.

8.7 HAZARD INVOLVED IN HANDLING OF FURNACE OIL

Chemical emergency may arise when the person comes in direct contact with the material.

**Furnace oil Requirement and storage**

Total Furnace oil requirement for the proposed plant: 952.3 kg/hr

Storage of Furnace oil: 20 m3

**Transportation of Furnace oil**

Furnace oil will be transported through tankers and will be used with pumps and piping in close system.

**Route of Entry and symptoms:**

**Inhalation:** If heated or misted, the product may cause dizziness, headaches, light headedness and nausea. FO has a low vapor pressure and inhalation is unlikely (below 38oC).

**Ingestion:** The product is mildly toxic when ingested. Vomiting, stomach irritation and central nervous system depression may occur. If the product is aspirated, (enters the lungs) serious damage may occur.

**Skin absorption:** Mildly irritating or dermal disorder

**Eye:** May irritate the eyes, permanent damage is not suspected.

**Acute exposure:** Headache and giddiness following inhalation. Aspiration into the lungs can cause severe pneumonitis (serious lung irritation), with coughing, gagging, shortness of breath, chest pain, and/or pulmonary edema (fluid accumulation in the lungs). Ingestion may produce nausea, vomiting, and cramping. Kidney effects have been reported.
**Chronic exposure:** Kidney, liver, lung, blood, and skin disorders.

**Control Measures/ Safety precautions to be adopted for handling of FO**

- Furnace oil should be used in closed system. Employee handled FO during unloading of the tankers should be trained for standard operating procedures.
- FO should be stored as per supplier's instruction and MSDS should be made available at site.
- Safety shower and Eye wash fountains should be made available near by the area for flushing in case of exposure.
- Personal Protective Equipments like apron, gloves, safety goggles, etc. should be provided and ensured to be worn during working. Use of PPE is enforced 100%.
- Typical label, Warning and safety phrases such as 'flammable', poison', etc should be marked where applicable.
- Movement in FO storage area should be restricted and smoking should be strictly prohibited.
- Good Housekeeping is maintained at the facility.
- Furnace Oil should be stored in a suitable steel tank designed, constructed, and operated according to standards for the prevention and control of fire and explosion hazards.
- The storage tanks should be secured in the open air, and sited at a distance of 5m from adjacent building and the facility. Furnace Oil tanks are located away from other storages.
- All measures should taken to prevent potential heat and ignition sources reaching the storage area. Typical label, Warning and safety phrases such as 'flammable', poison', etc are marked where applicable.
- To avoid static electricity buildup proper grounding and bonding (including formal procedures for the use and maintenance of grounding connections) should be provided and other safety procedures for loading and unloading of product to transport systems
- Facilities are properly equipped with fire suppression equipment that meets recognized technical specifications for the type and amount of flammable and combustible materials stored at the facility. Portable fire extinguishers are maintained and readily available at the storage site. Fire buckets filled with dry
sand are provided for fire controls. Fire hydrants systems are also installed at the facility. Fires are handled by trained firefighters.

- Personal Protective Equipments like Respirators, gloves, safety goggles, etc. are provided and ensured to be worn during working.
- Special trainings are given to the employees regarding fire fighting through demonstration and mock drills and in case of emergency only trained person are permitted to handle the fire.
- Emergency telephone numbers are posted in a permanent place.

### 8.8 HAZARD INVOLVED IN HANDLING OF COAL

#### Coal Requirement

Total coal requirement for the proposed plant: 48 MT/day

#### Risk due to storage and handling

- Fire due to Spontaneous Combustion of coal dust.
- Coal dust when dispersed in air and ignited would explode. Crusher Houses and conveyor Systems are most susceptible to this hazard. To be explosive, the dust mixture should have:
  - Particles dispersed in the air with minimum size.
  - Dust concentrations must be reasonably uniform.
  - Minimum explosive concentration for coal dust (33% volatile) is 50 grams/m3.
- Failure of dust extraction and suppression systems may lead to abnormal conditions and increasing the concentration of coal dust to the explosive limits.
- Sources of ignition present are electric equipment and cables, friction, spontaneous combustion in accumulated dust.
- Dust explosions may occur without any warning. Another dangerous characteristic of dust explosions is that it sets off secondary explosions after the occurrence of the initial dust explosion. Many a time, the secondary explosions are more damaging than primary ones.
- The dust explosions are powerful enough to destroy structures, kill or injure people and set dangerous fires likely to damage a large portion of the Coal/lignite Handling Plant including the structural damages. Hence stockpile areas shall be provided with automatic sprinklers for dust suppression.
Following process safety features will be installed / implemented.

- Moisture content maintained up to silo process by water sprinkling to prevent dusting in crushing plant and conveyer belt area.
- Static earthling provision made on all powder handling equipments.
- Emergency stop pull stop wire provided on belt.
- Safe guardings are provided on moving part of the machines.
- Proper ventilation and air draft available at all site of the plant.
- No high temperature exposure to workers near owns due to charging and discharge work carried out by machines.
- Air circulating within a coal pile should be restricted as it contributes to heating; compacting helps seal air out.
- Moisture in coal contributes to spontaneous heating because it assists the oxidation process and should be limited to 3%.
- Coal having high moisture content should be segregated and used as quickly as possible. Efforts should be made to keep stored coal from being exposed to moisture.
- Dry coal shall be kept dry and shall be not exposed to any rain during storage period. This concerns what is known as the heat-of-wetting;
- Drying coal is an endothermic process [heat is absorbed] and lowers the temperature of the coal. Wetting (or gaining moisture) is an exothermic process and the liberated heat can accelerate the spontaneous heating of the coal.
- Following the "first in, first out" rule of using stock reduces the chance for hot spots by helping preclude heat buildup for portions of stock which remain undisturbed for a long term. The design of coal storage bins is important in this regard.
- A high ambient temperature aids the spontaneous heating process.
- Use coal as quickly as practicable. The longer large coal piles are allowed to sit, the more time the spontaneous process has to work.
- The shape and composition of open stockpiles can help prevent fires. Dumping coal into a big pile with a trestle or grab bucket can lead to problems. Rather, coal should be packed in horizontal layers, which are then leveled by scraping and compacted by rolling. This method helps distribute the coal evenly and thus avoids breakage and segregation of fine coal. Segregation of coal particles by size should be strenuously
avoided, as it may allow more air to enter the pile and subsequent heating of finer sizes.

- Properly inspect, test and maintain installed fire protection equipment.
- Maintain an update pre-fire plan and encourage regular visits to coal facilities by the site or local emergency response force.

### 8.9 STORAGE AND HANDLING OF INCINERABLE HAZARDOUS WASTE

The incinerable hazardous waste should be handled and storage as per the guidelines of CPCB and the same is as follows:

**Storage Area (Storage Shed):**

- Flammable, ignitable, reactive and non-compatible wastes should be store separately and never should be stored in the same storage shed.
- Storage area may consist of different sheds for storing different kinds of incinerable hazardous wastes and sheds should be provided with suitable openings.
- Adequate storage capacity (i.e. 50% of the annual capacity of the hazardous waste incinerator) should be provided in the premises.
- Storage area should be designed to withstand the load of material stocked and any damage from the material spillage.
- Storage area should be provided with the flameproof electrical fittings and it should be strictly adhered to.
- Automatic smoke, heat detection system should be provided in the sheds.
- Adequate fire fighting systems should be provided for the storage area, along with the areas in the facility.
- There should be at least 15 m distance between the storage sheds.
- Loading and unloading of wastes in storage sheds should only be done under the supervision of the well trained and experienced staff.
- Fire break of at least 04 meter between two blocks of stacked drums should be provided in the storage shed. One block of drum should not exceed 300 MT of waste.
- Minimum of 1 meter clear space should be left between two adjacent rows of drums in pair for inspection.
- The storage and handling should have at least two routes to escape in the event of any fire in the area.
Doors and approaches of the storage area should be of suitable sizes for entry of forklift and fire fighting equipment;

The exhaust of the vehicles used for the purpose of handling, lifting and transportation within the facility such as forklifts or trucks should be fitted with the approved type of spark arrester.

In order to have appropriate measures to prevent percolation of spills, leaks etc. to the soil and ground water, the storage area should be provided with concrete floor or steel sheet depending on the characteristics of waste handled and the floor must be structurally sound and chemically compatible with wastes.

Measures should be taken to prevent entry of runoff into the storage area.

The Storage area shall be designed in such a way that the floor level is at least 150 mm above the maximum flood level.

The storage area floor should be provided with secondary containment such as proper slopes as well as collection pit so as to collect wash water and the leakages/spills etc.

All the storage yards should be provided with proper peripheral drainage system connected with the sump so as to collect any accidental spills in roads or within the storage yards as well as accidental flow due to fire fighting.

**Storage Drums/Containers:**

The container shall be made or lined with the suitable material, which will not react with, or in other words compatible with the hazardous wastes proposed to be stored.

The stacking of drums in the storage area should be restricted to three high on pallets (wooden frames). Necessary precautionary measures should be taken so as to avoid stack collapse. However, for waste having flash point less than 65.5 C, the drums should not be stacked more than one height.

No drums should be opened in the storage sheds for sampling etc. and such activity should be done in designated places out side the storage areas;

Drums containing wastes stored in the storage area should be labeled properly indicating mainly type, quantity, characteristics, source and date of storing etc.
Spillage/leakage control measures:

- The storage areas should be inspected daily for detecting any signs of leaks or deterioration if any. Leaking or deteriorated containers should be removed and ensured that such contents are transferred to a sound container.
- Incase of spills / leaks/dry adsorbents/cotton should be used for cleaning instead of water.
- Proper slope with collection pits be provided in the storage area so as to collect the spills/leakages.
- Storage areas should be provided with adequate number of spill kits at suitable locations. The spill kits should be provided with compatible sorbent material in adequate quantity.

Normal storage of incinerable hazardous wastes at the incinerator site should be restricted to maximum of six months

8.10 OCCUPATIONAL HEALTH AND SAFETY

During the project work lot of activities will be involved such as construction, erection, testing, commissioning, operation and maintenance, the men, materials and machines are the basic inputs. Along with the boons, the industrialization generally brings several problems like occupational health and safety.

The following occupational health and safety issues are specific to proposed plant activities will arise during project work as well as regular operation of plant:

- Physical hazards
- Respiratory hazards
- Electrical hazards
- Noise
- Entrapment hazards
- Fire and explosions

8.10.1 Physical Hazards

Industry specific physical hazards are discussed below.

Potential physical hazards in proposed plant are related to handling heavy mechanical transport (e.g. trucks) and work at heights (e.g. platforms, ladders, and stairs).
Heavy Loads / Rolling during construction phase

Lifting and moving heavy loads at elevated heights using hydraulic platforms and cranes presents a significant occupational safety hazard. Recommended measures to prevent and control potential worker injury include the following;

- Clear signage in all transport corridors and working areas;
- Appropriate design and layout of facilities to avoid crossover of different activities and flow of processes;
- Implementation of specific load handling and lifting procedures, including:
  - Description of load to be lifted (dimensions, weight, position of center of gravity)
  - Specifications of the lifting crane to be used (maximum lifted load, dimensions)
  - Train staff in the handling of lifting equipments and driving mechanical transport devices
- The area of operation of fixed handling equipment (e.g. cranes, elevated platforms) should not cross above worker and pre-assembly areas;
- Material and product handling should remain within restricted zones under supervision;
- Regular maintenance and repair of lifting, electrical, and transport equipment should be conducted.
- Use appropriate PPE (e.g. insulated gloves and shoes, goggles to protect against radiation, and clothing to protect against heat radiation and liquid metal splashes);
- Install cooling ventilation to control extreme temperatures;
- Implement work rotations providing regular work breaks, access to a cool rest area, and drinking water.

8.10.2 Respiratory Hazards

Insulation Materials

Recommended management practices include:

- Damaged or friable material should be repaired or removed while other materials may be monitored and managed insitu. Any handling of insulation materials deemed to contain asbestos or any other hazardous material should only be
performed by properly trained and certified contractors and personnel following internationally accepted procedures for their repair or removal;

- Use of asbestos must be avoided in new installations or upgrades;
- LDPE sheet should be placed under the item to be insulated (e.g. tube or vessel) and under the stock of insulation material to be layered, to prevent surface contamination with fibers.

**Gas**

During transfer of gas workers may be exposed to gas inhalation hazards.

Recommendations to prevent exposure to gas are as follows:

- Design facility ventilation to maximize air circulation. Outlet air shall be filtered before discharge to the atmosphere;
- Exhaust ventilation should be installed at the significant point sources of gas emissions;
- Provide a sealed cabin with filtered air conditioning if an operator is needed in a contaminated area;
- Provide separated eating facilities that allow for washing before eating;
- Provide facilities that allow work clothes to be separated from personal clothes, and for washing / showering after work;
- Implement a policy for periodic health checks.

Recommendations for respiratory protection include the following:

- Use of filter respirators when exposed to dust;
- For light, metallic dust and gases, fresh-air supplied respirators should be used. Alternatively, a complete facial gas mask (or an “overpressure” helmet) may be used, equipped with electrical ventilation;

**8.10.3 Electrical Hazards**

Workers may be exposed to electrical hazards due to the presence of heavy-duty electrical equipment in plant.

**8.10.4 Noise**

Noise level will be high at gas compressors and gas engine. Proper environment management plan has been formulated to control the same
8.10.5 Explosion and Fire Hazards

Fire fighting system to control the hazard is discussed in previous sections.

8.11 OTHER HAZARDS AND ITS CONTROLS

The other hazards possible at site are as given below:

Table 8.6: Other Hazards and Its Controls

<table>
<thead>
<tr>
<th>Name of possible hazard or emergency</th>
<th>Its source &amp; reason</th>
<th>Its effects on person, property &amp; environment</th>
<th>Place of effect</th>
<th>Control measures provided</th>
</tr>
</thead>
</table>
| Building collapse                     | • Any natural Calamities
  • Week structure
  • Over loading                       | • Injuries & Fatalities
  • Building damage.                   | • All building & sheds of the company as given in the Fac. layout | • Structure stability is by competent person for all structure.
  • No overloading of structures and building. |
| Earthquake                            |                    |                                             |                |                          |
| Electrical Installation failure like Transformer, PCC etc. | • Overload Loose contacts
  • Short circuit                       | • Fire
  • Suffocation of persons inside the plant | • Electrical transformer switch yard
  • Electrical MCC rooms
  • Power plant                         | • Installation as per electricity rules.
                                          |                    |                                             |                |                          |

8.12 AUTOMATIC FIRE DETECTION AND CONTROL MEASURES

8.12.1 General

The fire fighting system shall be designed as per TAC (Tariff Advisory Committee) guidelines. The plant's fire protection shall consist of structural solutions, fire extinguishing systems and fire alarm systems. The fire extinguishing system shall consist of the fire water system with fire pumps distribution pipelines, hydrant valves and fire hoses and the portable extinguishers.
The fire alarm system is a part of the primary systems and shall take care of the places which are unmanned or do not have any fixed fire extinguishing system.

### 8.12.2 Fire Water Reservoir

Separate fire water reservoir is proposed for firefighting system. Water will be taken from GIDC water supply for firefighting system.

Details of fire water reservoir are as under:

<table>
<thead>
<tr>
<th>Sr no</th>
<th>Proposed</th>
<th>Volume m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fire hydrant reservoir</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>200</td>
</tr>
</tbody>
</table>

### 8.12.3 Fire Water / Hydrant System

**Fire pumps**

There shall be two fire pumps, one electric and one diesel engine driven. The pumps supply water for the fire line and the fixed fire extinguishing systems. Either of these centrifugal pumps can alone deliver the required amount of water. At the rated flow, the pressure produced by the pumps shall be adequate, at least 6 bar by the rated flow, and at a zero flow not exceed 10 bar.

**Jockey Pumps**

An electric motor driven jockey pump will maintain automatically system pressure in the fire line. In case of emergency main pump will be turned on manually.

Pressure switches located in the fire water main shall sense sudden drop of pressure below set point, due to opening of any hydrant valves, which shall provide the starting signal to the jockey pumps. For stopping of the pumps only manual arrangement shall be provided.

The run and fault alarms from the fire pumps are led to the control room. The pumps will be located in pump house which shall be constructed by purchaser based on input from supplier.

Details of fire fighting main pumps and jokey pump for fire hydrant and sprinkler system are as under:
### Table 8.8: Control logic of system in kg/cm²

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>Pumpset</th>
<th>Start</th>
<th>Stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYDRANT</td>
<td>Jockey pump</td>
<td>6.00</td>
<td>7.00</td>
</tr>
<tr>
<td></td>
<td>Main pump</td>
<td>5.00</td>
<td>Manual</td>
</tr>
<tr>
<td></td>
<td>Stand by pump</td>
<td>4.00</td>
<td>manual</td>
</tr>
</tbody>
</table>

**Diesel Engine**

Diesel engine shall be equipped with an approved automatic auxiliary starting device having a sufficient capacity for at least six starts of fire pump. The diesel pump shall have a fuel tank containing sufficient fuel to enable the pump to run on full load for at least three hours.

**Gas Detector**

Gas leakage detectors will be installed at different locations in the premises.

**Water distribution system**

Fire piping shall be of MS Class “C” with supports for above ground lines. For underground piping GI class “C” pipes with necessary fittings will be used. The piping will be externally painted. The codes IS1239/IS 3589 will be followed. All underground pipes shall have cathodic protection. Sufficient no of isolation valve shall be provided to Isolate the area in case of maintenance. The diameter of the fire pipes shall be sufficient for the effective use of at least two fire hoses. The pipes and hydrants will be so placed that the fire hoses may be easily coupled to them.

**Hydrants**

Hydrant type Fire Protection System essentially shall consist of a network of piping and hydrant valves- both indoor & outdoor. The distance between any two hydrants shall not be more than 45 meters. Each hydrant shall be provided with a hose cabinet (mounted along side the hydrant on a steel column, lockable type) containing two nos. of 15 M long hoses and branch pipes/nozzles. For multi-stored office building located alongside engine hall, a wet riser tapped off from the hydrant main, shall be provided for each stair case inside the stair case and on this riser hydrant outlet with first aid hose reel connection shall be provided on each floor. Each hydrant shall be provided with a wall/column mounted on hose cabinet containing two nos. of hose and branch pipe/nozzle.

The number and position of the hydrants shall be such that spray from at least two hoses with combined jet and water fog nozzles may reach any part of the engine hall or auxiliary
room and spray from one combined jet and water fog nozzles may reach any part of other places. A hydrant unit inside the power house shall consist of two hose couplings of size DN50, both equipped with a shutoff valve. There will be two couplings beside each other to make it possible to use the water hose and mobile foam unit simultaneously. Some hydrants shall also to be installed on an external wall, to allow the use of hoses outside a building.

Following fire hydrant accessories will be installed:

**Table 8.9: Hydrant Accessories proposed**

<table>
<thead>
<tr>
<th>SL. No.</th>
<th>DESCRIPTION</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>O1</td>
<td>SINGLE HEADED HYDRANT VALVES</td>
<td>20</td>
</tr>
<tr>
<td>O2</td>
<td>FIRE ESCAPE HYDRANT VALVES</td>
<td>20</td>
</tr>
<tr>
<td>O3</td>
<td>WATER MONITOR</td>
<td>(32 NB) O2</td>
</tr>
</tbody>
</table>

Fire hoses shall be cotton and nylon jacket seamless woven and rot proofed material equipped with quick couplings and adjustable water fog nozzles. Hose couplings and nozzles throughout the fire line shall be completely interchangeable. Hose couplings shall be made of a copper alloy or other approved material.

- Hose length : 15 m
- Hose diameter : 63 mm
- Busting pressure test : 32 kg/cm²

**Fire department connections**

The fire water line will be provided with a fire department connection to allow additional water supply from fire department. It consist of a check valve, a pipe between the fire water line after the fire pump and outside wall and 3 inches hose connections on the outside wall.

**8.12.4 Fire Alarm And Detection System**

The fire alarm and detection centre shall be located in the control room. Manual call points shall be installed at critical points and escape routes. Manual alarms shall set off by breaking a glass disk and pressing a button.

The fire detection system shall comprise of smoke and heat detectors. The fire detection system shall be installed through out the power plant and shall at least cover the following
areas: Operating area, drum storage area, control room, office etc. The preferable choice of type of indicators shall be as mentioned below.

**Process, Engine hall and auxiliary area**

Following extinguishing and protection system shall be provided all over the engine hall and auxiliary area. Fixed heat or flame detectors used in power plants shall be differential maximum heat detectors with the following activation criteria:

- Limit temperature : 58 deg C
- Maximum temperature rise : 100°C per minute

**Siren**

A siren with minimum range of 300 m in addition to flashing lights & alarm bells shall be provided.

**8.12.5 Fire Extinguishing Equipment**

Extinguisher, preferably wall mounted type, shall be located such that they are not far from each other at max distance of 15 m but shall be provided near the exit.

**CO₂ extinguishers**

Fire extinguisher contains extinguishing carbon dioxide which under expected conditions of use gives off to prevent fire to get oxygen. CO₂ extinguishers are meant to extinguish mainly fire caused by electric devices. Capacity of extinguisher shall be Min. 4.5 kg

**Dry powder extinguishers**

Dry powder extinguisher contains extinguishing medium which either by itself or under expected conditions of use gives off fine powder to prevent fire to get oxygen. Dry powder extinguishers are suitable for all kinds of fires.

- Capacity of one extinguisher : Min. 5 kg
- Dry powder type : ABIII-E

**Mobile foam units**

A mobile foam unit shall consist of a low expansion foam branch pipe, inductor, foam tank and two fire hoses with couplings suitable to connected to the fire main hydrants.

- Foam tank capacity : 100 litres
- Fire hose diameter : 45 mm
- Fire hose length : 15 m
Foam production capacity : 1.5 m³/min

**Process area, Engine hall and auxiliary area**

- Mobile foam units
- Portable CO₂ extinguishers on the generator-end and
- Dry powder extinguishers elsewhere in the hall

**Note:** Gas fire is not allowed to extinguish with water, because it may cause a gas explosion when the out flowing gas makes contact with flowing residues. Gas fires should be extinguished by closing the main gas valve. Water could be used only for cooling after gas fire.

### 8.13 GAS DETECTION SYSTEM

Gas detection system shall be provided gas receiving area. In addition one hand held gas detector (portable type) shall also be supplied. Gas detection system shall be also provided in the area of reactive material storage.

### 8.14 SAFETY ORGANIZATION AND ITS ACTIVITIES

#### 8.14.1 Construction and Erection Phase

A qualified and experienced safety officer will be appointed. The responsibilities of the safety officer includes identification of the hazardous conditions and unsafe acts of workers and advise 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 Plant, every contractor, who employs more than 250 workers, will also employ one safety officer to ensure safety of the worker, in accordance with the conditions of contract.

#### 8.14.2 Operation and Maintenance Phase

On completion of construction phase, the posting of safety officers would be in accordance with the requirement of Factories Act and their duties and responsibilities would be as defined thereof.

#### 8.14.3 Strengthening of HSE and Meeting by Safety and quality circle

In order to fully develop the capabilities of the employees in identification of hazardous processes and improving safety and health, safety and quality circles would be constituted in area of work. The circle normally will meet for about an hour fortnight.
8.14.4 Safety Training

Safety training would be provided by the Safety Officers with the assistance of faculty members called from Corporate Center, Professional Safety Institutions and Universities. In addition to regular employees, limited contractor labors would also be provided safety training. To create safety awareness safety films would be shown to workers and leaflets would be distributed. Some precautions and remedial measures proposed to be adopted to prevent fires are:

- Compartmentation of cable galleries, use of proper sealing techniques of cable passages and crevices in all directions would help in localizing and identifying the area of occurrence of fire as well as ensure effective automatic and manual fire fighting operations;

- Reliable and dependable type of fire detection system with proper zoning and interlocks for alarms are effective protection methods for conveyor galleries;

- Housekeeping of high standard helps in eliminating the causes of fire and regular fire watching system strengthens fire prevention and fire fighting; and Proper fire watching by all concerned would be ensured.

- Tie up will be made with emergency services like local fire station, hospitals, emergency van etc during operation phase. The emergency telephone numbers will be displayed at different points within the plant premises and at the entry exit gates.

- The same shall be displayed at the factory premises.
Chapter 9

Disaster Management Plan

9.1 GENERAL

Disaster is an undesirable happening of such magnitude and nature, which can adversely affect man, material and environment. Risk assessment forms an integral part of "Disaster Management". Any major or a number of minor failures could lead to an accident taking a heavy toll of human life and affecting the production target considerably.

Disasters are major accidents, which cause widespread disruption of human and commercial activities. Disaster can be defined as a sudden occurrence of impacts of greater magnitude to affect normal pattern of life in the plant and/or vicinity, causing extensive damage to life and property. Normally, the community absorbs common accidents, but disasters are major accidents and community cannot absorb within its own resources. Most of the disasters, natural or technological (man-made) have sudden onset and give very short notice or no time to prevent the occurrence.

Disaster has the potential to cause serious injury or loss of life, both inside and outside the works. It would normally require the assistance of outside emergency services to handle it effectively. Although the emergency may be caused by a number of different factors, e.g. plant failure, human error, earthquake, vehicle crash or sabotage etc., it will normally manifest itself in power plant operation as three basic forms: fire, explosion or toxic release.

It is therefore, necessary to ensure safety and reliability of any new plant, through a systematic study of industrial installations to identify possible failures and prevent their occurrence before the disasters.

9.2 PURPOSE AND SCOPE OF DMP

In carrying out the preliminary Risk Analysis, the stress is given to Maximum Credible Accident (MCA) analysis and the resulting DMP include the following:

- On-Site Emergency Plan
- Off-site Emergency Plan
- Safety Review Check Plan
- Accident Reporting
9.3 CAUSES OF DISASTER

Disastrous incident could be a local one causing damage to plant, equipment and material only or additionally affecting the persons working in the plant/industry or if more serious, affecting the neighboring environment including human population. The first two categories can be termed as “On-site Emergency” and the last one as an “Off-site Emergency”. There are number of factors that can be considered as causes for disastrous situation or emergencies.

A good process technology has to be engineered properly by following accepted standards in design, if the hazards are to be minimized. Improper sizing of plant and equipment, inadequate schemes, faulty choice of material of construction may lead to unsafe conditions. Risk evaluation, Hazard analysis and Hazard & operability will be emphasized made mandatory when engineering the proposed project.

9.4 DISASTER CONTROL PHILOSOPHY

The principal strategy of Disaster Management Plan of proposed project is prevention of the identified major hazards. And since these hazards can occur only in the event of loss of containment, one of the key objectives of technology selection, project engineering, construction, commissioning and operation is Total and Consistent Quality assurance. It is committed to this philosophy right from the conceptual stage of the proposed project. The second control strategy adopted for potential emergencies is minimization of operation inventories of hazardous substances both in process plants as well as in storage limits of viability of continuous operation. In the proposed plant there is no storage of natural gas. The gas will be procured through pipeline from the nearest GSPC source.

And another control measure that will be adopted is early detection of any accidental leak and activation of as well structured, resourced and rehearsed Off-Site Emergency Plan to intercept the incident with speed and ensure safety to employees, operating plants, public and environment as a matter of priority.

9.5 DISASTER CONTROL PLAN

Design stage considerations:

For the proposed power plant major emergency situation can arise mainly from fire in Furnace oil storage area, coal storage area and leakage from natural gas pipe line resulted in to fire. From the analysis of the vulnerable zones the will be taken during design stage are mention in chapter 8 for storage of Furnace oil, pipe line carrying natural gas and storage & consumption pattern of coal.(section 8.5, 8.6 & 8.7)
9.6 FIRE FIGHTING ARRANGEMENT

Fire detection and fire fighting systems were discussed in detail in chapter 8 in section 8.10.

Fire Services Personnel

Fire service shall be manned by trained fire safety personnel. Fire services department shall have adequate number of safety equipment for use during emergency. The list of safety appliances is as follows:

- Gas Mask
- Canisters Alkali Suit
- Asbestos Suit
- Fire Proximity Suit
- BA Set
- Electric Gloves (for 15000 volts)
- Hydraulic Tool
- Telephone
- Emergency Ladder, etc.

9.7 SAFETY AND PERSONAL PROTECTIVE APPLIANCES

Safety and personal protective appliances shall be provided in adequate numbers and shall be distributed in different sections according to requirement. A list of such appliances available in the plant is given in the Table 9.1.

Table 9.1: List of Proposed Safety Equipment

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Equipment</th>
<th>Nos.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>GAS MASK</strong></td>
<td></td>
</tr>
<tr>
<td>01.</td>
<td>Carbon Monoxide</td>
<td>Adequate Nos.</td>
</tr>
<tr>
<td>02.</td>
<td><em>Gas mask suitable to acidic fumes</em></td>
<td>- do -</td>
</tr>
<tr>
<td></td>
<td><strong>BREATHING APPARATUS</strong></td>
<td></td>
</tr>
<tr>
<td>01.</td>
<td>Compressed Air</td>
<td>- do -</td>
</tr>
<tr>
<td>02.</td>
<td>Airline respirator</td>
<td>- do -</td>
</tr>
<tr>
<td></td>
<td><strong>OTHERS</strong></td>
<td></td>
</tr>
<tr>
<td>01.</td>
<td>Pneupac Resuscitator</td>
<td>- do -</td>
</tr>
<tr>
<td>02.</td>
<td>Combustible gas indicator/explosimeter</td>
<td>- do -</td>
</tr>
<tr>
<td>03.</td>
<td>Gas Detector (Dragger Pump)</td>
<td>- do -</td>
</tr>
<tr>
<td>04.</td>
<td>Safety Belts</td>
<td>- do -</td>
</tr>
<tr>
<td>05.</td>
<td>Alkali/ Acid Suit</td>
<td>- do -</td>
</tr>
<tr>
<td>06.</td>
<td>Asbestos Suit</td>
<td>- do -</td>
</tr>
<tr>
<td>07.</td>
<td>Hand Gloves etc.</td>
<td>- do -</td>
</tr>
<tr>
<td>08.</td>
<td>Gum Boots</td>
<td>- do -</td>
</tr>
<tr>
<td>09.</td>
<td>Safety Shoes</td>
<td>- do -</td>
</tr>
<tr>
<td>10.</td>
<td>Eye Goggles</td>
<td>- do -</td>
</tr>
</tbody>
</table>
9.8 EMERGENCY ACTION PLAN

The emergency action plan consists of:

- First information;
- Responsibilities of Work Incident Controller;
- Responsibilities of Chief Incident Controller;
- Responsibilities for Declaration of Emergency;
- Responsibilities for Emergency Communication Officer;
- Responsibilities of key personnel;
- Responsibilities and action to be taken by essential staff and various teams during emergency; and
- Responsibilities for All Clear Signal.

9.8.1 First Information

The first person who observes/identifies the emergencies will inform by shouting and by telephone to the Shift Engineer and Fire Station about the hazard. The Shift Engineer will inform to Works Incident Controller, Chief Incident Controller and also telephone operator, who shall communicate it to all key personnel.

9.8.2 Responsibilities of Work Incident Controller (WIC)

The Work Incident Controller on knowing about an emergency immediately will rush to the incident site and take overall charge and inform the same to Chief Incident Controller (Chief Executive). On arrival, he will assess the extent of emergency and decide if major emergency exists and inform the communication officer accordingly. His responsibilities will be to ensure compliance to the duties listed below.

9.8.3 Responsibilities of Chief Incident Controller (CIC)

The Chief Executive, who is also the Chief Incident Controller, will assume overall responsibilities for the factory/storage site and its personnel in case of any emergency. His responsibilities are to:

1. Assess the magnitude of the situation and decide if staff needs to be evacuated from their assembly point to identified safer places. Declare on-site/off-site emergency.
2. Exercise direct operational control over areas other than those affected.
3. Undertake a continuous review of possible developments and assess in consultation with key personnel as to whether shutting down of the plant or any section of the plant and evacuation of personnel are required.

4. Liaison with senior officials of Police, Fire Brigade, Medical and Factories Inspectorate and provide advice on possible effects on areas outside the factory premises.

5. Look after rehabilitation of affected persons on discontinuation of emergency.

6. Issue authorized statements to news media, and ensures that evidence is preserved for inquiries to be conducted by the statutory authorities.

9.8.4 Responsibilities For Declaration Of Major Emergency

- Making the emergency known inside the plant

The major emergency will be made known to everyone inside the plant by blowing the alarm. Separate alarms to warn different types of major emergencies such as fire and explosion or toxic gas escape are provided. Public address system is also available throughout the plant.

Announcement will be made by the concerned official/interpreter in local language. Similarly announcement for termination of the emergency will also be announced.

9.8.5 Responsibilities of Emergency Communication Officer (ECO)

On hearing the emergency alarm he will proceed to Emergency Control Center. He will:

- Report to Chief Incident Controller and Work Incident Controller and maintain contact with them.
- On information received from the WIC of the situation, recommending if necessary, evacuate the staff from the assembly points.
- Identify suitable staff to act as runner or messenger who is listed in the Essential staff, between him and the Works Incident Controller if the telephone and other system of communication fail due to any reason.
- Maintain inventory of items in the emergency control center.
- Contact local meteorological office to receive early notification of changes in weather condition in case of gas leak and prolonged action.
- Maintain a log of incidents.
- Keep in constant touch with happenings at the emergency site and with WIC
9.8.6 Key Personnel

Apart from Works Incident Controller and Chief Incident Controller, other works personnel will have key role to play in providing advice and in implementing the decisions made by the Chief Incident Controller. The key personnel include:

A. Sr. Supdts./Engineer-in-charge responsible for
   - Operation
   - Electrical Maintenance
   - Mechanical maintenance
   - C&I
   - Chemical

B. Head of Personnel and Officers connected with IR and Labour Welfare

C. Head (Technical Service)

9.8.7 Responsibilities of Key Personnel

- **Department Heads**

  The departmental heads will provide assistance as required. They will decide which members of their departments are required at the incident site.

- **Chief Personnel Manager**

  He will:

  a) Report to Work Incident Controller;

  b) Ensure that all non-essential workers in the affected areas are evacuated to assembly points in consultation with the Chief Incident Controller;

  c) Receive reports from nominated persons from assembly points, and pass on the absence information services;

  d) Keep liaison with other coordinators to meet the requirements of services such as materials, security management, transportation, medical, canteen facilities etc. as required during emergency;

  e) Be in constant touch with the Chief Incident Controller and feed him correct information of the situation;

  f) Give information to press, public and authorities concerned on instructions from the CIC/WIC;
g) Ensure that casualties receive adequate attention at medical center and arrange required additional help and inform relatives of the injured;

h) Arrange to inform public on Radio and TV about evacuation etc.; and

i) Arrange TV coverage on handling emergency.

• **In-Charge**

On knowing about an emergency, he will report to CIC and assist him in all activities. He will also liaison with all teams.

• **Medical Officer**

Medical Officer will render medical treatment to the injured and if necessary will shift the injured to nearby Hospitals. He will mobilize extra medical help from outside if necessary.

• **Safety Officer**

On hearing the Emergency alarm he will proceed to main entrance/main gate. He will:

a. Make sure that all safety equipment are made available to the emergency teams;

b. Arrange to control the traffic at the gate and the incident area;

c. Direct the security staff to the incident site to take part in emergency operations under his guidance and supervision;

d. Evacuate the persons in the plant or in the nearby areas as advised by WIC after arranging the transport through the Transport in-charge;

e. Allow only those people who are associated with handling emergency;

f. Maintain law and order in the area, if necessary seek the help of police; and

g. Maintain communication with CIC/WIC and ECO.

• **Fire Officer**

On hearing the emergency, he will reach the fire station and arrange to sound the alarm as per the type of emergency in consultation with WIC, He will:

a. Guide the fire fighting crew i.e. firemen and trained plant personnel and shift the fire fighting facilities to the emergency site. Adequate facilities will be made available;

b. Take guidance of the WIC for fire fighting as well as assessing the requirement of outside help;

c. Maintain communication with WIC, CIC and ECO.
• **Transport-in-Charge**

On hearing the emergency alarm he will immediately report to WIC. He will:

a. Ensure availability of auto base vehicles for evacuation or other duties, when asked for; and

b. Make all arrangements regarding transportation.

### 9.8.8 Emergency Plan For Handling Accidents During Hazardous Waste Transportation

The need for safety during transport of hazardous waste is well recognized. In addition to the rigorous safety practices followed, all necessary safety measures as per international norms and standards will also be implemented during transport to the land fill site.

In the event of an accident and discharge of hazardous waste during transportation, the Transporter should take immediate action to protect human health and the environment, (e.g. notify to SPCBs/PCCs, local police and district administration, build a dyke to contain the discharge area) and should clean up the discharge as required and approved by the State Board.

A transporter should engage drivers, provided with special training for handling and transport of hazardous wastes. Driver training shall, at the minimum, include:

- use of the manifest system
- use of emergency equipment, such as fire extinguisher, gas mask, first aid etc.
- procedure to be followed in case of an emergency during transit
- use of TREM card

The safety precautions and practices relate to designing upkeep of container, loading and unloading of waste in containers etc. will be taken.

In spite of the best safety measures, accidents may occur though the possibility is remote. However, an emergency plan to deal with accidents is essential to minimize the ill effect of such accidents. The objectives of the emergency plan are:

a. To localize the emergency and if possible eliminate; and

b. To minimize the effects on people and property

Whereas localizing the emergency will involve prompt action at the loading, unloading areas and during transport through use of fire fighting equipment, water spray,
operation of emergency shut of valves etc. minimizing the impact would involve, rescue, first aid, evacuation, relaying information etc. A Transport Monitoring Cell (TMC) would be constituted which will monitor:

a. Loading and unloading operations;

b. Transportation; and

c. Maintenance of vehicles.

● Operational Plan

The TMC will also function as an Integrated Disaster Management Center (IDMC) to coordinate and handle any emergency. The IDMC is headed by a senior level officer, supported by transportation/logistics engineer, a senior police officer and a fire service expert. The IDMC will be equipped with the following:

a. Adequate number of telephones;

b. Radio Equipment;

c. Layout plan of the transport corridor to the plant site:

• Population density in different colour codes;

• Topographic features;

• Location of industries/depots especially related to chemical oil, petrol, explosive and other sensitive area;

• Land Use Plan;

• Major Structures;

• Fire stations with telephone nos. and wireless codes;

• Police Stations, Central Reserve Police battalions, civil defense positions with telephone nos. and wireless code;

• Emergency local hospitals, general hospitals with telephone nos. and wireless codes;

• Meteorological information; and

• Map of approach road network.

The information will be available in the form of maps and charts. In case of an accident, the IDMC will co-ordinate with all concerned agencies in rescue operations. The nearest fire fighting unit, police and Government officials will be mobilized to accident site for fire fighting and rescue operation to minimize damage to life and property.
9.9 EMERGENCY CONTROL CENTRE

An emergency control centre shall be provided at a safe place from where Chief Emergency Co-ordinator shall function for ON-SITE emergency. The Emergency Control Centre (ECC) shall be provided with following;

- Adequate number personal protective equipment,
- Alarm and communication network (Siren, local as well as P&T Telephone, Public Address system etc.),
- Route map,
- Map of the factory & surrounding areas, evacuation routes, fire hydrant network and other important information
- Details of fire hydrant system
- Copy of detailed Disaster Management Plan, where names, telephone numbers of the response team members and their responsibilities are clearly written as well as names and telephone numbers of key personnel from outside agencies and district authorities, Fire Station, nearby Hospitals and doctors should be made available.
- First aid kit,
- Material safety data sheets of chemicals

Assembly Point

Assembly points shall be set up near to the likely hazardous event sites where pre-designated persons from the disaster response team should assemble and meet the Site Incident controller. This may be regarded as Site Incident Control Room where Incident Controller will receive instruction and furnish information to the Chief Emergency coordinator. The site incident control room shall be provided with efficient communication system, adequate personal protective equipment, copy of Disaster Management Manual etc.

Emergency Shelter

Emergency shelter places shall be chosen sufficiently away from likely affected site. Employees who are not in the emergency management team shall be asked to take shelter. The place is chosen such that the employees taking shelter are not affected by fire, explosion and release of toxic gases. More than one emergency shelter shall be designated so that proper shelter point can be chosen depending on wind direction and other factors.
Wind Socks

Windsocks shall be provided on the top of tall buildings to indicate the wind direction.

Fire Station

A fire station with fire water tender shall be provided.

The onsite emergency plan structure is shown below:

Figure 9.1: On-site Emergency Plan

9.10 OFF-SITE EMERGENCY PREPAREDNESS PLAN

The task of preparing the Off-Site Emergency Plan lies with the district collector; however, the off-site plan will be prepared with the help of the local district authorities. The off-site emergency preparedness plan should be based on the following guidelines. Off-site emergency plan follows the on-site emergency plan. When the consequences of an emergency situation go beyond the plant boundaries, it becomes an off-site emergency. Off-site emergency is essentially the responsibility of the public administration. However,
the factory management will provide the public administration with the technical information relating to the nature, quantum and probable consequences on the neighboring population.

The off-site plan in detail will be based on those events, which are most likely to occur, but other less likely events, which have severe consequence, will also be considered. Incidents which have very severe consequences yet have a small probability of occurrence should also be considered during the preparation of the plan. However, the key feature of a good off-site emergency plan is flexibility in its application to emergencies other than those specifically included in the formation of the plan.

The roles of the various parties who will be involved in the implementation of an off-site plan are described below. Depending on local arrangements, the responsibility for the off-site plan should be either rest with the works management or, with the local authority. Either way, the plan should identify an emergency co-ordinating officer, who would take the overall command of the off-site activities. As with the on-site plan, an emergency control center should be setup within which the emergency co-ordinating officer can operate.

An early decision will be required in many cases on the advice to be given to people living "within range" of the accident - in particular whether they should be evacuated or told to go indoors. In the latter case, the decision can regularly be reviewed in the event of an escalation of the incident. Consideration of evacuation may include the following factors:

a. In the case of a major fire but without explosion risk only houses close to the fire are likely to need evacuation, although a severe smoke hazard may require this to be reviewed periodically;

b. If a fire is escalating and in turn threatening a store of hazardous material, it might be necessary to evacuate people nearby, but only if there is time; if insufficient time exists, people will be advised to stay indoors and shield themselves from the fire;

c. For release or potential release of toxic materials, limited evacuation may be appropriate down wind if there is time. The decision would depend partly on the type of housing "at risk". Conventional housing of solid construction with windows closed offers substantial protection from the effects of a toxic cloud, while shanty house, which can exist close to factories, offer little or no protection.

The major difference between releases of toxic and flammable materials is that toxic clouds are generally hazardous down to much lower concentrations and therefore hazardous over greater distances. Also, a toxic cloud drifting at, say 300 m per minute covers a large area of land very quickly. Any consideration of evacuation should take this into account.
Although the plan will have sufficient flexibility built in to cover the consequences of the range of accidents identified for the on-site plan, it will cover in some detail the handling of the emergency to a particular distance from each major hazard works.

9.10.1 Aspects proposed to be considered in the Off-Site Emergency Plan

The main aspects, which will be included in the emergency plan, are:

- **Organization**
  Details of command structure, warning systems, implementation procedures, emergency control centers. Names and appointments of incident controller, site main controller, their deputies and other key personnel.

- **Communications**
  Identification of personnel involved, communication center, call signs, network, and lists of telephone numbers.

- **Specialized knowledge**
  Details of specialist bodies, firms and people upon whom it may be necessary to call e.g. those with specialized chemical knowledge, laboratories.

- **Voluntary organizations**
  Details of organizers, telephone numbers, resources etc.

- **Chemical information**
  Details of the hazardous substances stored or procedure on each site and a summary of the risk associated with them.

- **Meteorological information**
  Arrangements for obtaining details of whether conditions prevailing at the time and whether forecasts.

- **Humanitarian arrangements**
  Transport, evacuation centers, emergency feeding treatment of injured, first aid, ambulances and temporary mortuaries.

- **Public information**
  Arrangements for (a) dealing with the media press office; (b) informing relatives, etc.

- **Assessment of emergency plan**
  Arrangements for: (a) collecting information on the causes of the emergency; (b) reviewing the efficiency and effectiveness of all aspects of the emergency plan.
9.10.2 **Role of the Emergency Co-ordinating Officer**

The various emergency services should be coordinated by an emergency coordinating officer (ECO), who will be designated by the district collector. The ECO should liaise closely with the site main controller. Again depending on local arrangements, for very severe incidents with major or prolonged off-site consequences, the external control should be passed to a senior local authority administrator or even an administrator appointed by the central or state government.

9.10.3 **Role of the Local Authority**

The duty to prepare the off-site plan lies with the local authorities. The emergency planning officer (EPO) appointed should carry out his duty in preparing for a whole range of different emergencies within the local authority area. The EPO should liaise with the works, to obtain the information to provide the basis for the plan. This liaison should ensure that the plan is continually kept up to date.

It will be the responsibility of the EPO to ensure that all those organizations which will be involved off site in handling the emergency, know of their role and are able to accept it by having for example, sufficient staff and appropriate equipment to cover their particular responsibilities. Rehearsals for off-site plans should be organized by the EPO.

9.10.4 **Role of Police**

Formal duties of the police during an emergency include protecting life and property and controlling traffic movements.

Their functions should include controlling bystander evacuating the public, identifying the dead and dealing with casualties and informing relatives of death or injury.

9.10.5 **Role of Fire Authorities**

The control of a fire should be normally the responsibility of the senior fire brigade officer who would take over the handling of the fire from the site incident controller on arrival at the site. The senior fire brigade officer should also have a similar responsibility for other events, such as explosions and toxic release. Fire authorities in the region should be appraised about the location of all stores of flammable materials, water and foam supply points and fire-fighting equipment. They should be involved in on-site emergency rehearsals both as participants and, on occasion, as observers of exercises involving only site personnel.

9.10.6 **Role of Health Authorities**

Health authorities, including doctors, surgeons, hospitals, ambulances and so on, will have a vital part to play following a major accident and they will form an integral part of the
emergency plan. For major fires, injuries should be the result of the effects of thermal radiation to a varying degree and the knowledge and experience to handle this in all but extreme cases may be generally available in most hospitals. For major toxic releases, the effects vary according to the chemical in question, and the health authorities should be apprised about the likely toxic releases from the plant which will unable then in dealing with the aftermath of a toxic release with treatment appropriate to such casualties.

Major off-site incidents are likely to require medical equipment and facilities additional to those available locally and a medical “mutual aid” scheme should exist to enable the assistance of neighboring authorities to be obtained in the event of an emergency.

9.10.7 Role of Government Safety Authority

This will be the factory Inspectorate available in the region. Inspectors are likely to want to satisfy themselves that the organization responsible for producing the off-site plan has made adequate arrangements for handling emergencies of all types including major emergencies. They may wish to see well documented procedures and evidence of exercise undertaken to test the plan.

In the event of an accident, local arrangements regarding the role of the factory inspector will apply. These may vary from keeping a watching brief to a close involvement in advising on operations in case involvement in advising on operations. In cases where toxic gases may have been released, the factory inspectorate may be the only external agency with equipment and resources to carry out tests. The off-site emergency organization chart for major disaster is shown below:
9.11 DISASTER FOR NATURAL CALAMITY I.E. EARTHQUAKE

The proposed site falls in the region of Seismic Zone No. III i.e. moderate risk zone. Government of Gujarat has already formulated DMP to deal with earthquake. However,
on site operating measures in designing of structures, land fill cell etc. to seismically safe construction and implementation of BIS norms is already been considered.

9.12 SAFETY & EMERGENCY PLAN

Safety of both men and material during construction and operation stages is of concern to industries. The preparedness of an industry for the occurrence of possible disasters is known as emergency plan. The disaster in Hazardous waste incineration plant may occur due to leakage of hazardous chemicals, collapse of structures and fire/explosion etc. Keeping in view the safety requirements during construction, operation and maintenance phases, and the plant would formulate safety policy with respect to the following requirements:

- To allocate sufficient resources to maintain safe and healthy conditions at work.
- To take steps to ensure that all known safety factors are taken into account in the design, construction, operation and maintenance of plants, 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 up to date knowledge.
- To provide appropriate instruction, training, retraining and supervision in health and safety, first aid and to ensure that adequate awareness is given to these matters.
- To ensure proper implementation of fire prevention and an appropriate firefighting service together with training facilities for personnel involved in this service.
- To ensure that professional advice is made available wherever potentially hazardous situations exist or might arise.
- To organize collection, analysis and presentation of data on accident, sickness and incident involving personal injury or cause of sickness with a view to taking corrective, remedial and preventive action.
• To promote through the established machinery, joint consultation in health and safety matters to ensue 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/process involved in a plant.

• To ensure regular safety inspection by a competent person at suitable intervals of all buildings, equipment, work places and operation

9.13 PRE-EMERGENCY ACTIONS

The proposed preventive and pre-emptive measures are as follows:-

• Ensure implementation of Disaster Planning.

• Ensure that all drafted for emergency undergo regular training and are prepared for tackling emergency/disaster.

• Ensure that Mock Drills are performed under simulated emergency condition at regular intervals to assess the strength and weaknesses of the response team/plan.

• Ensure awareness among employees through regular training.

• Ensure good liaison with all agencies and industries in the neighborhood for getting help if situation arises.

• Ensure adequate stock of safety, personal protective appliances in good working condition.

• Ensure awareness amongst public in the neighboring areas.

• Medical Services

The doctors in the nearby hospitals should be trained for treatment of personnel affected. Necessary apparatus and drugs should also be available in first aid post and in State Hospitals and also other Nursing Homes nearby. Manager (HR-Welfare) should have good liaison with authorities of nearby hospitals and Nursing Homes as well as doctors outside so that help may be available when required. Qualified safety officer and medical officer will be appointed.

9.14 TRANSPORT AND COMMUNICATION

The disaster management cell will have the contact number of nearby hospitals or nursing home with Ambulance facility to call them in case of emergency.
Chapter-10

Summary & Conclusion

10.0 INTRODUCTION

SAURASHTRA ENVIRO PROJECTS PRIVATE LIMITED (SEPPL), is the sister concern of Detox Group of Companies. Saurashtra Enviro Projects Private Limited has developed Integrated Common Hazardous waste Management, Treatment, Storage and Disposal Facility at Kutch.

The company now proposes incineration project located at D2/ CH/ 135, Dahej II Industrial Estate, Notified GIDC Bharuch Gujarat. The site is approachable by the site is well connected through an existing village road to the state Highway.

10.1 SALIENT FEATURES OF SITE

Table 10.1: Salient Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plot no.</td>
<td>D2/ CH/ 135 GIDC Dahej II Industrial Estate, Notified Gujarat PCPIR Bharuch Gujarat</td>
</tr>
<tr>
<td>District</td>
<td></td>
</tr>
<tr>
<td>State</td>
<td></td>
</tr>
<tr>
<td>Total area required</td>
<td>13922.06 sq. mtr</td>
</tr>
<tr>
<td>Type of Land</td>
<td>Notified Industrial Estate</td>
</tr>
<tr>
<td>Nearest Highway</td>
<td>NH 8: approx 38 Km</td>
</tr>
<tr>
<td>Nearest Railway station</td>
<td>Bharuch: approx 35 km</td>
</tr>
<tr>
<td>Nearest city</td>
<td>Bharuch: approx 35 km</td>
</tr>
<tr>
<td>Nearest town</td>
<td>Dahej: approx 8 km</td>
</tr>
<tr>
<td>Nearest village</td>
<td>Vdadala: approx 1.2 Km</td>
</tr>
<tr>
<td>Water availability</td>
<td>GIDC water</td>
</tr>
<tr>
<td>Nearest port</td>
<td>Dahej: approx 11 km</td>
</tr>
<tr>
<td>National park/ sanctuary/ reserve forest</td>
<td>None within 10 Km radius</td>
</tr>
<tr>
<td>Heritage site</td>
<td>None within 10 Km radius</td>
</tr>
</tbody>
</table>
10.2 LAND AVAILABILITY AND REQUIREMENT

The project is proposed to be located in about 13922.06 sq. mtr of land located at D2/ CH/ 135, Dahej II Industrial Estate, Notified GIDC Bharuch Gujarat.

10.3 FUEL REQUIREMENT, STORAGE & HANDLING SYSTEM

Quantity of waste to be charged along with fuel in form of natural gas/ furnace oil is as mentioned below along with the source and mode of transportation

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Calorific value</th>
<th>Quantity</th>
<th>Source</th>
<th>Transportation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas (incineration)</td>
<td>8200 kcal/kg</td>
<td>1219.5 Kg/hr</td>
<td>GSPC</td>
<td>Through pipeline</td>
</tr>
<tr>
<td>Furnace oil</td>
<td>10500 kcal/kg</td>
<td>952.3 kg/hr</td>
<td>Authorized</td>
<td>By tankers</td>
</tr>
<tr>
<td>Coal (HAG)</td>
<td>3600 – 4000 kcal/kg</td>
<td>Upto 4 MT/hour</td>
<td>Imported coal</td>
<td>By truck/dumpers</td>
</tr>
</tbody>
</table>

10.4 WATER AVAILABILITY AND REQUIREMENT

Water shall be obtained from Gujarat Industrial Development Corporation (GIDC). The total waster consumption for the proposed project will be 50 KL/day.

10.5 BASELINE STUDY

In order to identify the impacts due to construction and operation of incinerator project and draw an Environmental Management Plan, a detailed Environmental Impact Assessment (EIA) Study has been undertaken. The environmental disciplines studied include meteorology, air quality, water quality and water use, soils, land-use, demography and socio-economics, and noise. The study was conducted during summer season (March 2011 to May 2011).

The major parameters considered for air quality are PM$_{10}$, PM$_{2.5}$, SO$_2$, NO$_x$, CO and HCl. The level of PM$_{10}$ varies between 39.93 µg/m$^3$ to 112 µg/m$^3$. The minimum and maximum value for PM$_{2.5}$ was found to be between 18.99 µg/m$^3$ to 35.5 µg/m$^3$. The minimum and maximum value for SO2 ranges between 2.94 µg/m$^3$ to 10.88 µg/m$^3$. The nitrogen dioxide
concentration in the study area varied between 9.27 µg/m³ to 23.8 µg/m³. Ambient air quality was found below the prescribed statutory norms.

10.6 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

10.6.1 Land Use:

The proposed site, comprising of 13922.06 sq. mtr of land and is without any human settlement. The proposed site where the plant is to be located has been presented in the Google earth map in chapter 1 of the report.

10.6.2 Water Use and Hydrology:

Project proponent will draw its entire water requirement for the project from GIDC.

10.6.3 Demography and Socio-economics:

The proposed site is located in rural area without any human settlement. There will be no displacements and no problems related to Rehabilitation and Resettlement. However project would create the employment opportunity for the local community which inturn lead to socio-economic development of the region.

10.6.4 Air Quality

The maximum predicted incremental ground level concentrations (GLCs) for particulate matter, SOx and NOx will be 1.995 µg/m³, 2.973 µg/m³ and 6.524 µg/m³ respectively in North East and South East direction.

The incremental concentration for PM, NOx and SOx will be at distance of 0.7 Km in South East and 1.1 Km in North East direction.

10.6.5 Water Quality

While developing the water system for the project, utmost care has been taken to maximize the recycle/ reuse of effluents and minimize effluent quantity. Waste water shall be generated from washing and as scrubber bleed. The same shall be treated in force evaporation system. As an additional precaution measure ETP shall be installed at project site.

10.6.6 Noise:

The major noise generating sources during the construction phase are vehicular traffic, construction equipment like, dozer, scrapers, concrete mixers, cranes, generators, pumps, compressors, rock drills, pneumatic tools, vibrators etc. The operation of these equipments will generate noise ranging between 75 - 90 dB (A).
However, workers within the construction area and plant area may be affected due to high noise levels. Adequate protective measures in the form of ear-muffs / ear plugs/ masks shall be provided to such persons, which will minimise / eliminate such adverse impacts. In addition, reduction in noise levels shall also be achieved through built-in design requirements to produce minimum noise, proper lay out design, adding the sound barriers, use of enclosures with suitable absorption material etc. Provision of green belt and afforestation will further help in reducing the noise levels.

10.7 DISASTER MANAGEMENT PLAN

The EIA Report includes a Disaster Management Plan covering elements of emergency planning like organization, communication, coordination, procedure, accident reporting, safety review checklist, on-site emergency plan and off-site emergency plan. A Disaster Management Plan (DMP) for the project has already been prepared and to be implemented for the proposed project, specifying responsibilities at various levels to be discharged in case of an emergency. The DMP at site shall be strengthened suitably based on recommendation of DMP included in EIA Report.

10.8 PROJECT BENEFITS

The major project benefits are as mentioned below:

- Increase in employment opportunity in skilled, semi-skilled and un-skilled categories.
- Increase in employment/ self employment avenues in service sector.
- Development of support infrastructure such schools, roads improve the livelihood and social status of the local peoples

For the proposed project, the project proponent is committed to implement social welfare measures as part of Corporate Social Responsibility plan as the part of the proposed project and has proposed to implement various community development programs.

10.9 ENVIRONMENT MANAGEMENT PLAN

An Environment Management Plan for Construction and operation phases of the project has been prepared. An Environment Management cell shall be created to strengthen and monitoring of the implementation of the environmental management plan for the project.
Table 10.3: Environment impact and management plan

<table>
<thead>
<tr>
<th>Impact</th>
<th>Management plan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air environment</strong></td>
<td></td>
</tr>
<tr>
<td>Point source emission from stack of incinerator and forced evaporation system</td>
<td>Adequate stack height&lt;br&gt;Air pollution control equipments - Cyclone, Multicycle, 1st stage scrubbing – Water, 2nd stage scrubbing – Alkaline, 3rd stage scrubbing – Sodium hypochlorite, Mist eliminator with incineration stack and cyclone, scrubber with forced evaporation stack</td>
</tr>
<tr>
<td><strong>Water Environment</strong></td>
<td></td>
</tr>
<tr>
<td>Waste water generated from the project activity in the form of scrubber bleed and washing will be treated through forced evaporation system. However as additional precaution we also propose to install Effluent treatment plant.&lt;br&gt;Domestic waste water shall be disposed through septic tank/soak pit</td>
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</tr>
<tr>
<td><strong>Hazardous waste</strong></td>
<td></td>
</tr>
<tr>
<td>The major hazardous waste generated will be incineration ash and salts generated from forced evaporation system, which shall be send to approved TSDF site.&lt;br&gt;Discarded containers shall be send to approved recyclers.</td>
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</tr>
</tbody>
</table>

10.10 ENVIRONMENT MONITORING PLAN

The main attributes for which monitoring shall be carried out are as below:

1. Ambient air Quality
2. Stack Emission
3. Wastewater Quality

4. Noise Level

**Conclusions:**

Based on the above, it has been concluded that by adopting a robust environmental management plan and risk mitigation measures as presented in the EIA report, the proposed project would exhibit very insignificant environmental impacts. However, the implementation of proposed massive plantation, green belt area and community development programs under CSR activities would bring significant positive impacts to the entire region.

Hence it is being requested to Expert Appraisal Committee, for considerations of awarding Environmental Clearance for the project as per the provisions of EIA Notification and its amendments there on.
NAME OF THE CONSULTANTS

Mahabal Enviro Engineer Pvt Ltd
Plot No F-7, Road No-21,
Wagle Estate, Thane West-400 604,
Maharashtra.
Telephone No: 90-22-2582 3154/3139/0658
Fax: 91-22-2582 3543
Email: thane@mahabal.com, mahabal_thane@yahoo.com
Web site: www.mahabalenviro.com

Mahabal Enviro Engineers Pvt. Ltd. (MEEPL) incorporated on 19th Oct., 1984 is a company engaged in providing environmental consultancy services. It has a laboratory established under the Environment (Protection) Act and is located at its Head Office at F-7, Road No. 21, Wagle Estate, Thane- 400 604. Although the jurisdiction of the Head Office extends all over the country, it is assisted by the branches located at Nashik, Pune, Delhi, Aurangabad, Jalgaon and Nagpur (all in Maharashtra), Chhindwara in Madhya Pradesh, and Bharuch in Gujarat. The Branches do also have laboratories established either in the office or at the client’s site for analysis of general parameters in Air, Water and Waste Water samples.

Mahabal Enviro Engineers Pvt. Ltd. is an ISO 9001-2000 Certified Company and laboratory is accredited by:

- Ministry of Environment and Forest (MoEF), Govt. of India, New Delhi.
- NABL
- IMS 18001

The firm has been engaged in the jobs of preparation of Environmental Impact Assessment (EIA) & Environmental Management Plan (EMP) for more than 15 years for the purpose of obtaining clearance from Ministry of Environment & Forest.

They have major experience in operation and maintenance of STP in Pune, Nagur, Nashik and Shimla.

Some of the other Services Offered by them are given below.

- Environmental Clearance From MoEF and SEIAA
- CRZ Clearances from MoEF
- Environmental Quality Monitoring
- Noise Mapping and Design of Noise Barriers
- Stack & Work place Monitoring
- Environmental Due Diligence study
- Plant Ventilation Study
- Consent to Operate/Establish/Renewal
- Design of STP and ETP
- Supply of Noise Meter, Weather Stations, RDS machines etc.
- Legal guidance to industry

**QCI NABET ACCREDITATION**


**EIA TEAM MEMBERS**

<table>
<thead>
<tr>
<th>EIA CORDINATOR</th>
<th></th>
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<tbody>
<tr>
<td>1. MR. Raghunath Mahabal</td>
<td>32 (A)</td>
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<th>FUNCTIONAL AREA EXPERT</th>
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<tr>
<td>2. MR. Raghunath Mahabal</td>
<td>WP (A), AP (A)</td>
</tr>
<tr>
<td>3. Dr. D. A. Patil</td>
<td>AP (A), WP (B)</td>
</tr>
<tr>
<td>4. Mr. Pravin Latwade</td>
<td>AQ (A)</td>
</tr>
<tr>
<td>5. Ms. Jaya Pande</td>
<td>LU (B)</td>
</tr>
<tr>
<td>6. Mr. Chetan Contractor</td>
<td>Team Leader</td>
</tr>
<tr>
<td>7. Mr. Pushpak Shah</td>
<td>Reviewer/ Coordinator/ air quality monitoring and prediction</td>
</tr>
<tr>
<td>8. Dr. Manoj Eledath</td>
<td>Ecologist</td>
</tr>
<tr>
<td>9. Dr. Lole</td>
<td>RS-GIS Specialist</td>
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<td>Soil specialist</td>
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<tr>
<td>10. Mr.N.B.Kelvanikar</td>
<td>Geo hydrology</td>
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<tr>
<td>11. Dr. Bhavna Mehra</td>
<td>Ecologist and laboratory support</td>
</tr>
<tr>
<td>12. Mr. Jitendra Khasakia</td>
<td>Laboratory analysis-Water</td>
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<tr>
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<tr>
<td>13.</td>
<td>Mr. Amit Renose</td>
</tr>
<tr>
<td>14.</td>
<td>Mr. D. H Patel</td>
</tr>
<tr>
<td>15.</td>
<td>Mr. Mitesh Desai</td>
</tr>
<tr>
<td>16.</td>
<td>Ms. Ankita Bhairaviya</td>
</tr>
<tr>
<td>17.</td>
<td>Ms. Maitri Contractor</td>
</tr>
</tbody>
</table>
Annexure 1

Layout map
Annexure 2

Land documents
Pursuant to the allotment of Ind. Plot No. D-2/CH-135, measuring 13922.06 sq.mt (Tentative) situated in the Housing - Industrial Phase Dahej - II. As is Where is the basis of the survey No.878/P, 839/P, 840/P & 1138/P within the village limit of Vadodara at GIDC Industrial Estate Dahej, Ta. Vagra, Dist. Bharuch, the said premises are bounded as follows:

<table>
<thead>
<tr>
<th>Direction</th>
<th>Boundary Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>North By</td>
<td>30.00mt wide road</td>
</tr>
<tr>
<td>South By</td>
<td>Plot No D-2 / CH / 134</td>
</tr>
<tr>
<td>East By</td>
<td>20.00mt Road</td>
</tr>
<tr>
<td>West By</td>
<td>Plot No D-2 / CH / 136</td>
</tr>
</tbody>
</table>

Possession Taken Over By: Shri Chetan Desai
FOR SAURASHTRA ENVIR PROJECTS PRIVATE LIMITED
Place: GIDC / BRH

Date: 11/11/2011

Possession Handed Over By: Shri K S Ghatn
Place: GIDC / BRH

Signatures:
1. Shri Chetan Desai
   DIRECTOR
2. Shri K S Ghatn
   AAE

Copy to:
1. Shri M/s Saurashtra Enviro Projects Pvt. Ltd, 2nd Floor K G Chamber, Udha Darwaja, Ring road, Surat
2. R M GIDC / Ankleshwar
3. A O GIDC / Ankleshwar
4. The Executive Engineer GIDC Bharuch
5. The Dy Ex Engineer (W/s), GIDC Bharuch
6. The Dy Ex Engineer (Drg), GIDC Bharuch

Sign Of Party: Shri Chetan Desai
FOR SAURASHTRA ENVIR PROJECTS PRIVATE LIMITED
DIRECTOR
Annexure 3

Water allocation
GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION  
(A GOVT. OF GUJARAT UNDERTAKING)  
Administrative Office Building,  
Plot No.624/B, GIDC, Ankleshwar, Dist. Bharuch  
Phone: 02646-221351, 221451, 221403

No: GIDC/RM/ANK/ Date: / / 2011

By R.P.A.D.

To,

M/s. Saurashtra Enviro Projects Pvt Ltd
2nd floor, K G Chambers
Udhna Darwaja
Ring road, Surat

Sub: Offer-cum-Allowment of Plot No.D-2/CH/135 in Dahej-II Industrial Estate
Ref: Your application dated 11-2-2011.

Dear Sir,

Gujarat Industrial Development Corporation (GIDC) would like to welcome M/s. Saurashtra Enviro Projects Pvt Ltd an enterprise consisting of directors/partners as under with their respective percentage of profit sharing/shareholding, in its Dahej-II Industrial Estate.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the Director/Partner/Prop.</th>
<th>Percentage of shareholding/profit-sharing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chetan Chandrakant Contractor</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Shaila Chetan Contractor</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Varoon Chetan Contractor</td>
<td></td>
</tr>
</tbody>
</table>

Accordingly, we are sending this Offer-cum-Allowment (OCA) letter to you. Please find enclosed the form of agreement in triplicate, which is to be duly executed and returned within 30 days from the date of receipt of this OCA letter. It is not necessary to execute this agreement in our presence; the same can be executed at your end and can be sent by post.

A | Plot Details | Plot No.D-2/CH/135
---|--------------|-------------------
1 | Plot Number  | 13922.06 sq.mtrs |
2 | Area of Plot in square meters (tentative) | 13922.06 sq.mtrs |
<table>
<thead>
<tr>
<th></th>
<th>Price of Land</th>
<th>(in Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Allotment Price @ Rs.715 per sq.mtr</td>
<td>Rs. 71,50,000/-</td>
</tr>
<tr>
<td>2</td>
<td>Additional area 3922.06 sq.mtrs x Rs.715/- per sq.mtr</td>
<td>Rs. 28,04,273/-</td>
</tr>
<tr>
<td>3</td>
<td>Frontage Charges (@ 5% of Allotment Price i.e. Rs.35.75 for 13922.06 sq.mtrs</td>
<td>Rs. 4,97,714/-</td>
</tr>
<tr>
<td>4</td>
<td>Capital Cost of water supply @ Rs.____ per square meter</td>
<td>--</td>
</tr>
<tr>
<td>5</td>
<td>Adjoining Charge @ ____% of Allotment Price</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td><strong>Total Allotment Price</strong></td>
<td>Rs.1,04,51,987/-</td>
</tr>
<tr>
<td>6</td>
<td>Less Concession 50% as per circular dated 31-1-1998</td>
<td>Rs. 35,75,000/-</td>
</tr>
<tr>
<td>7</td>
<td><strong>Net Allotment Price</strong></td>
<td>Rs. 68,76,987/-</td>
</tr>
<tr>
<td>8</td>
<td>PCPIR charges Rs.15.00 per sq.mtr on 13922.06 sq.mtrs (tentative)</td>
<td>Rs. 2,08,831/-</td>
</tr>
</tbody>
</table>

**Procedure for obtaining possession:**

**A. Mode of Payment:**

a) The payment can be made through two options, as below:-

i. **Upfront Payment**
   The allottee can make an upfront payment of the full **Net Allotment Price**.

ii. **Installment Payment**
   The allottee can make payment of **15%** of the net allotment price, i.e. **Rs.10,31,548/-**. The balance amount of **85%** amounting **Rs.58,45,439/-** (Rupees fifty eight lakhs forty five thousand four hundred thirty nine only), being 'balance capital', shall be payable in **20(PDC)** equal quarterly installments with **13.5%** rate of interest by post dated cheques (PDCs). You shall have to pay **1%** administrative charges **58,454/-** & Service tax @ **10.00%** **Rs.6,021/-** & Education cess **Rs.18/-** Total **Rs.13,04,872/-** in form of DD in favour of GIDC payable at Ankleshwar.

   ► **Rate of Interest:** The rate of interest mentioned above is subject to revision from time to time at the discretion of the Corporation and the interest would be payable at such revised rates and from such dates as may be specified by the Corporation from time to time.

   ► **Rate of interest on delayed payment:** In case of default in payment of scheduled installments, the Corporation levies penal interest at the rate of **3%** p.a. over and above the normal interest.

   ► **Administrative Charges:** Corporation levies **1%** administrative charge on the 'balance capital'.

b) Revenue Charges/Contribution towards Infrastructure Development Fund, as applicable, will be charged separately every year.

c) Allottee shall have to pay the development charges, if applicable.
Prior permission of the Corporation is required to be taken by the allottee, bank, financial institution or any other person for creating a lien on the property. If prior permission of the Corporation is not obtained, the concerned person/institution will not have any kind of lien on the property allotted.

B. Conditions for Utilization of Property:

a) **In case of Shed**: Allottee shall put the shed to industrial use for manufacturing the products mentioned in the application within a period of 6 months from the date of possession, failing which Corporation is entitled to take back the possession.

b) **In case of other built-up properties**: Allottee shall put to use the shops/ godown/ canteen/ housing quarter etc., as per application, within a period of 6 months from the date of possession, failing which Corporation is entitled to take back the possession.

c) **In case of plot**: Allottee is required to get the building plans approved from GIDC/ Competent Authority within a period of 3 months from the date of the possession letter and inform GIDC with copy of approved plan. In case of delay / late approval, fee @ Rs. 0.50 per square meter per month shall be levied till the approval is obtained.

- Allottee is required to start construction within 6 months from the date of possession letter and inform GIDC. Delay will result in levy of late construction charges @ Rs. 0.50 per square meter per month till the construction starts.
- Allottee is required to construct minimum 20% of the plot area on ground floor for considering utilization of plot.
- Allottee shall commence commercial production within 2 years from the date of possession letter, where the plot size is less than 10,000 sq. mt. and within 3 years where the plot size is more than 10,000 sq. mt. Allottee is required to intimate the date of production to the Corporation, failing which the Corporation is entitled to take back the possession of the plot, unless extension is given by the Corporation.

C. General Conditions:

a) Allottee is required to produce registered Partnership Deed/ Memorandum and Articles of Association/ Certificate of Incorporation, whichever is applicable.

b) The plot is offered on as-is-where-is basis for the purpose of **Collection Treatment and disposal industrial hazardous waste for Energy generation**. The allottee shall inspect the property and execute undertaking in the enclosed Performa.
c) The agreement forms are required to be signed by all the partners of partnership firm on each page. In case of Private/Public Limited Company, it is necessary to attach a copy of the Board Resolution authorizing the Director/Officer who is to sign the agreement.

d) On receipt of agreement duly executed, Corporation will issue a possession advice. Possession is required to be taken from Deputy Executive Engineer, GIDC.

e) Allottee is required to fill up at least 85% of posts in the unit built on this land by local persons. For managerial and supervisory cadres, at least 65% posts shall have to be filled by the local persons; however, the total posts of the unit filled by local persons shall not be less than 85%. Preference shall have to be given in employment to land losers of Dahej industrial estate. ‘Local Person’ means a person domiciled in Gujarat State for the last 15 years.

f) Allottee is required to produce SSI certificate/ IEM Registration, project report, certificate indicating authorized, subscribed and paid up capital of the company, name of directors / shareholders and their holding in the Company, as applicable.

g) Allottee shall grow at least one tree per 100 sq. mtrs. in the allotted plot.

h) Transfer of non-utilized plot is prohibited.

i) Change of use of the plot is prohibited.

If 1) Offer Amount 2) Form of Agreement 3) PDC; 4) Acceptance–cum–Undertaking of this OCA letter are not received by Corporation within a period of 30 days from the receipt of this letter, the offer will stand automatically cancelled, the allottee will not be entitled to get the land at the offered price, he will also lose priority, and the application shall be automatically treated as closed.

D. **Water supply**

1. The water supply connection shall be given considering lowest of the following:
   (a) The calculation of water quantity as per the design norms of water supply distribution line (for chemical units 55 KLS per hectare and for engineering units 33 KLD per hectare)
   (b) The quantity of water consumption approved by GPCB.
   (c) Water quantity demanded by the allottee.

2. The water quantity beyond minimum quantity shall be provided to the allottee at his own cost subject to (a) capacity of water supply distribution line, (b) availability of water quantity.

3. The expenditure incurred by GIDC beyond provision of allotment price for water supply scheme and its related works, the pro-rata cost shall be recovered alongwith interest from the allottee at the time of release of water supply connection.

4. The pro-rata cost shall be recovered alongwith interest from the allottee for the actual expenditure incurred by GIDC for completion and commission of water supply scheme based on Narmada river/Canal/Dam or the applicable source of the water supply scheme, at the time of release of water supply connection.
5 The water supply connection shall be released by GIDC to allottee as per the provision of Water Supply Rules 1991 and Amendment-2010.

6. The unit whose water requirement is 1 MGD or above shall have compulsory facility in its premises for recycle & reuse of water for their water requirement as per below norms.
   (a) For 1st five years – at least 30% water demand shall be met through recycle and re-use of water.
   (b) For next five years – at least 40% water demand shall be met through recycle & re-use of water.
   (c) Thereafter – at least 50% water demand shall be met through recycle and reuse of water.

E UNDERGROUND DRAINAGE SYSTEM

1. The drainage connection shall be given considering lower of the following:
   (a) The quantity as per the design norms of underground drainage collection line (for chemical units 44 KLD per hectare).
   (b) The quantity for disposal of effluent approved by GPCB.

2. The drainage connection of quantity for disposal of effluent beyond minimum quantity shall be provided to the allottee at his own cost subject to (a) capacity of underground drainage collection line.

3. For the expenditure incurred by GIDC over and above the provision in allotment price for collection and disposal pipeline and its related works, the pro-rata cost shall be recovered along with interest from the allottee at the time of release of underground drainage connection.

4. The pro-rata cost shall be recovered along with the interest from the allottee for the actual expenditure incurred by GIDC for effluent treatment and final disposal pipeline works at the time of release of underground drainage connection.

5. The underground drainage connection shall be released by GIDC to allottee as per the provision of Drainage Regulation 1990.

F Power Supply:

i) Location of 220 KV sub station and probable power corridor are provided. The final width/lay meter of the 220 KV sub station and corridor shall be finalized only after actual power requirement and its source from the applicant by DM(CG) GIDC and in consultation with GETCO/DGVCL/Power supply authority.

ii) 220 KV sub station shall be established by GETCO/Power supply at their cost after recovery on pro-rata cost on the land earmarked by GIDC and in consultation with prospective applicant. The allottee shall obtain power at their cost as per the norms of GETCO/Power supply authority.

G You shall have to make the payment of down payment @ 15% and remaining balance capital @ 85% in 20 Nos PDC cheques.

H. The plot allotted to you i.e. upto 10,000 sq.mtrs on 50% concession of the allotment price and remaining area i.e. 9222.06 at the rate of normal prevailing price i.e. Rs.715/- per sq.mtrs.
1) You shall have to furnish the No Objection Certificate from Gujarat Pollution Control Board, Gandhinagar & also give an undertaking on stamp paper of Rs.100/- for GPCB NOC.

2) You shall have to follow the rules and regulations as prescribed by Gujarat Pollution Control Board and have the sole responsibilities for the same.

<table>
<thead>
<tr>
<th>Name of Director/Partner/Prop.</th>
<th>Photograph of Director/Partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chetan Chandrakant Contractor</td>
<td></td>
</tr>
<tr>
<td>Shalla Chetan Contractor</td>
<td></td>
</tr>
<tr>
<td>Varoon Chetan Contractor</td>
<td></td>
</tr>
</tbody>
</table>

Thanking you

Yours faithfully,

Encl: 1. Agreement Forms (in triplicate)
   2. Acceptance of OCA in the form of undertaking

Copy to:
   1. Executive Engineer, GIDC, Bharuch
   2. Executive Engineer (Elect./Mech.), GIDC, Bharuch
   3. Dy. Ex. Engineer, GIDC, Bharuch
   4. Dy Chief Accounts Officer GIDC Ankleshwar

Regional Manager,
GIDC, Ankleshwar
Annexure 4

Toposheet