जहाँ है हरियाली ।
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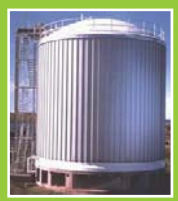
IL&FS | Environment

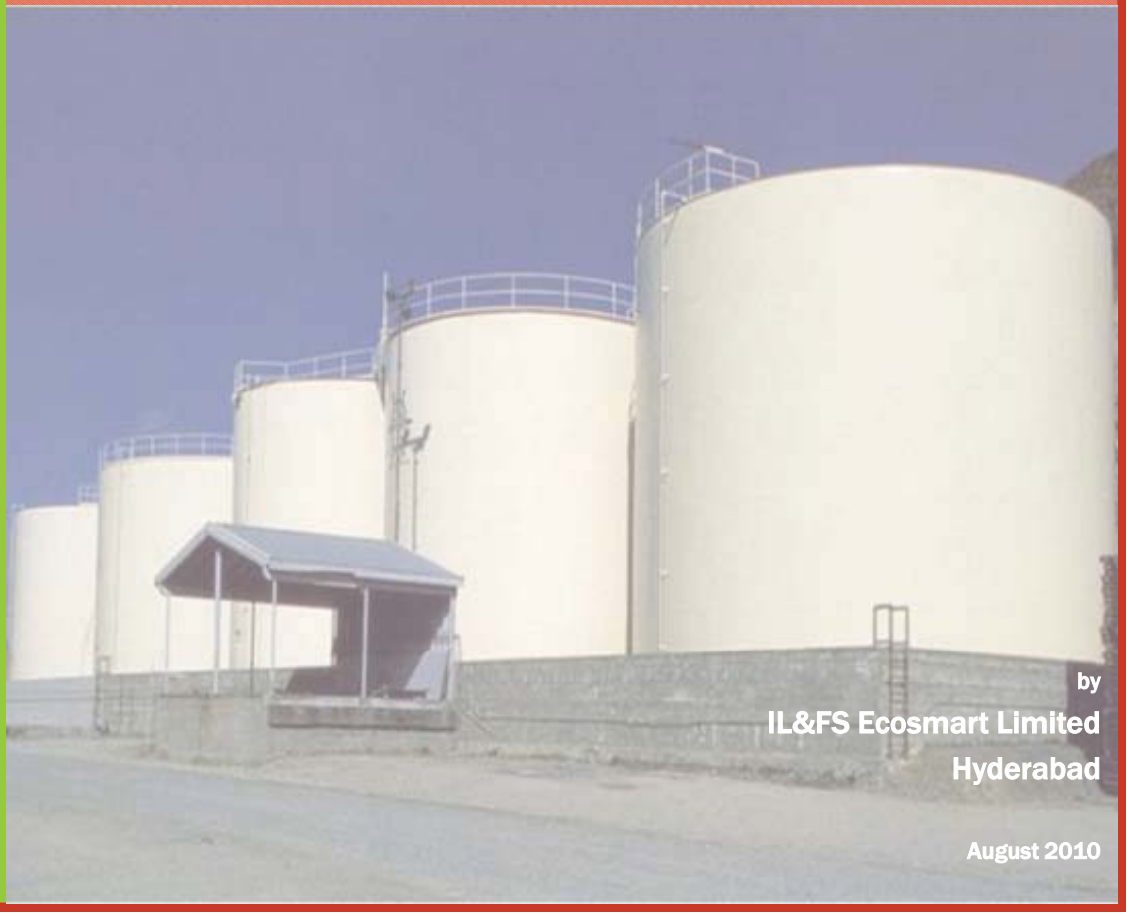
# TECHNICAL EIA GUIDANCE MANUAL FOR ISOLATED STORAGES HANDLING HAZARDOUS CHEMICALS

Prepared for

**The Ministry of Environment and Forests**
Government of India



by
**IL&FS Ecosmart Limited**
**Hyderabad**

August 2010

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# ACRONYMS

| | |
|---|---|
| AAQ | Ambient Air Quality |
| ATF | Aviation Turbine Fuel |
| B/C | Benefits Cost Ratio |
| BAT | Best Available Technology |
| BOD | Biological Oxygen Demand |
| BOQ | Bill of Quantities |
| BOT | Build Operate Transfer |
| CCA | Conventional Cost Accounting |
| CCoE | Chief Controller of Explosives |
| CCR | Calcium Carbide Rule |
| CER | Corporate Environmental Reports |
| CEAA | Canadian Environmental Assessment Agency |
| CFE | Consent for Establishment |
| CPCB | Central Pollution Control Board |
| CREP | Corporate Responsibility for Environmental Protection |
| CRZ | Coastal Regulatory Zone |
| DfE | Design for Environment |
| DMP | Disaster Management Plan |
| EAC | Expert Appraisal Committee |
| ECC | Emergency Control Centre |
| EcE | Economic-cum-Environmental |
| ECI | Environmental Condition Indicators |
| ECM | Emission Control Measures |
| EFRT | External Floating Roof Tank |
| EcE | Economic-cum-Environmental |
| EIA | Environmental Impact Assessment |
| EIS | Environmental Information System |
| EMA | Environmental Management Accounting |

| | |
|---|---|
| EMP | Environmental Management Plan |
| EMS | Environmental Management System |
| EPI | Environmental Performance indicators |
| ER | Explosive Rules |
| ES | Environmental Statements |
| FCA | Full Cost Assessment |
| FRT | Fixed Roof Tanks |
| GCR | Gas Cylinder Rules |
| HAZOP | Hazard and Operability Studies |
| HSD | High Speed Diesel |
| HTL | High Tide Level |
| IFR | Internal Floating Roof |
| IFRT | Internal Floating Roof Tank |
| IL&FS | Infrastructure Leasing & Financial Services Limited |
| IVI | Importance Value Index |
| ISO | International Standard Organization |
| LCA | Life Cycle Assessment |
| LDAR | Leak Detection and Repair |
| LDO | Light Diesel Oil |
| LEL | Lower Explosive Limit |
| LFL | Lower Flammability Limit |
| LPG | Liquefied Petroleum Gas |
| LTL | Low Tide Level |
| MAH | Major Accident Hazard |
| MAPP | Major Accident Prevention Policy |
| MCA | Maximum Credible Accident |
| MoEF | Ministry of Environment & Forests |
| MS | Motor Spirit |
| MSDS | Material Safety Data Sheet |
| MSIHC | Manufacture, Storage and Import of Hazardous Chemicals |
| NAQM | National Air Quality Monitoring |
| NGO | Non-Government Organizations |
| O&M | Operation and Maintenance |
| OECD | Organization for Economic Co-operation and Development |
| OSHA | Occupational Safety and Health Administration |
| PA | Petroleum Act |
| PM | Particulate Matter |
| PR | Petroleum Rules |
| PPA | Participatory Poverty Assessment |

| | |
|---|---|
| PRA | Participatory Rural Appraisal |
| PSTs | Primary Settling Tankers |
| PVRVs | Pressure/Vacuum Relief Valves |
| QA/QC | Quality Assurance/Quality Control |
| QRA | Quantitative Risk Assessment |
| SEA | Strategic Environmental Assessment |
| SEAC | State Level Expert Appraisal Committee |
| SEIAA | State Level Environment Impact Assessment Authority |
| SEZ | Special Economic Zone |
| SIA | Social Impact Assessment |
| SKO | Superior Kerosene Oil |
| SMPV | Static and Mobile Pressure Vessel |
| SPCB | State Pollution Control Board |
| SPM | Suspended Particulate Matter |
| TA | Technology Assessment |
| TCA | Total Cost Assessment |
| TEQM | Total Environmental Quality Movement |
| TGM | Technical EIA Guidance Manual |
| ToR | Terms of Reference |
| UFL | Upper Flammability Limit |
| UT | Union Territory |
| UTEIAA | Union Territory Level Environment Impact Assessment Authority |
| UTPCC | Union Territory Pollution Control Committee |
| VHTs | Vapour Holders or Holding Tanks |
| VRU | Vapour Recovery Unit |

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## Acknowledgement

The Notification issued on the prior environmental clearance process by the Ministry of Environment and Forests (MoEF) on September 14, 2006 delegated substantial powers to the State Level Environment Impact Assessment Authorities (SEIAA) to grant environmental clearance for certain categories of developmental activities/projects. It was felt that proper guidance to the stakeholders would enhance appreciation of environmental impacts of proposed projects and possible mitigation measures. Further, such a guidance would also help ensure that decision making authorities across different States and Union Territories could adopt similar considerations and norms with due weightage for site-specific considerations.

We feel privileged to be part of the interventions being spearheaded by Sh. Jairam Ramesh, Hon'ble Minister, MoEF, Government of India, to mainstream environmental considerations in the decision making process. IL&FS Ecosmart as part of this important initiative, prepared Technical EIA Guidance Manuals for 27 identified development activities. In view of the diversity of 27 developmental activities entrusted to IL&FS Ecosmart Ltd., in consultation with the MoEF, an expert Peer and Core Committee was constituted to review and finalize each of the draft Manuals. The Manuals prepared by IL&FS were technically reviewed and up-dated by the respective sector-specific expert resource persons.

The Manuals designed by the Expert Committee have benefitted from the advise and feedback received from MoEF. The Manuals are designed to provide readers with an in-depth understanding of the environmental clearance mechanism, developmental activity specific environmental impacts with possible mitigation measures, environmentally compliant manufacturing/ production processes and pollution control technologies, etc.

IL&FS Ecosmart hopes that these Manuals are a step forward to realize the MoEF's desired objective of enhancing functional efficiency and effectiveness in the environmental clearance process. We hope the stakeholders will find the Manuals useful.

We take this opportunity to convey our appreciation to the MoEF team under the leadership of Mr. J.M. Mauskar, Additional Secretary, for the technical inputs, guidance and support extended throughout the project period for successful completion of the project. The technical guidance and support extended by the Expert Peer and Core Committee under the Chairmanship of Dr. V. Rajagopalan, former Chairman, Central Pollution Control Board and inputs of the sector-specific resource persons are gratefully acknowledged.

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15th November 2010

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## FOREWORD

The Ministry of Environment & Forests (MOEF) introduced the Environmental Impact Assessment (EIA) Notification 2006 on 14th September 2006, which not only reengineered the entire environment clearance (EC) process specified under the EIA Notification 1994, but also introduced a number of new developmental sectors which would require prior environmental clearance. The EIA Notification 2006 has notified a list of 39 developmental sectors which have been further categorised as A or B based on their capacity and likely environmental impacts. Category B projects have been further categorised as B1 and B2. The EIA Notification 2006 has further introduced a system of screening, scoping and appraisal and for the setting up of Environment Impact Assessment Authority (EIAA) at the Central level and State Level Environment Impact Assessment Authorities (SEIAAs) to grant environmental clearances at the Central and State level respectively. The Ministry of Environment & Forests is the Environment Impact Assessment Authority at the Central level and 25 State Level Environment Impact Assessment Authorities (SEIAAS) have been set up in the various States/UTs. The EIA Notification 2006 also stipulates the constitution of a multi-disciplinary Expert Appraisal Committee (EAC) at the Centre and State level Expert Appraisal Committees (SEACs) at State/UT Level for appraisal of Category A or B projects respectively and to recommend grant/rejection of environmental clearance to each project/activities falling under the various sectors to the EIAA/SEIAAs respectively.

Although the process of obtaining environmental clearance consisting of Screening, Scoping and Appraisal and for undertaking public consultation including the process of conduct of Public Hearing has been elaborated under the EIA Notification 2006, the Notification itself provides for bringing out guidelines from time to time on the EIA Notification 2006 and the EC process with a view to bringing clarity on the EC process for expediting environmental clearance. This need was further reinforced after the constitution of SEIAAs and SEACs in various States, who were assigned the task for the first time and for addressing the concerns of standardization of the quality of appraisal and in reducing inconsistencies between SEACs/SEIAAs in granting ECs for similar projects in different States.

The Technical Guidance Manual of **"Isolated Storages Handling Hazardous Chemicals"** sector describes types of process and pollution control technologies, operational aspects of EIA with model TOR of that Sector, technological options with cleaner production and waste minimization techniques, monitoring of environmental quality, post clearance

monitoring protocol, related regulations, and procedure of obtaining EC if linked to other clearances for e.g., CRZ, etc.

The isolated storage of hazardous chemicals calls for items to be isolated and stored according to guidelines specified on its container or packaging. Vapour recovery units should be installed to recover vapours. It is necessary to adopt safety norms while handling, storing and transporting hazardous materials. Risk assessment, on-site, off-site emergency plans and disaster management plans are necessary. Moreover, materials or items should not be used without guidance on usage. Containers and packages should always be stored and kept closed. To improve guidelines, industry and educational institutions should join hands for the better and safer future.

India's industrial competitiveness and environmental future depends on Industries such as Isolated Storages Handling Hazardous Chemicals adopting energy and resource efficient technologies. Recycling and reuse of materials is critical. To keep pace with changing technologies and needs of sustainable development, the manual would require regular updating in the future. The manual will be available on the MoEF website and we would appreciate receiving responses from stakeholders for further improvements.

I congratulate the entire team of IL&FS Ecosmart Ltd., experts from the sector who were involved in the preparation of the Manuals, Chairman and members of the Core and Peer Committees of various sectors and various Resource Persons whose inputs were indeed valuable in the preparation and finalization of the Manuals.

Jairam Ramesh

(Jairam Ramesh)

# 1. INTRODUCTION TO THE TECHNICAL EIA GUIDANCE MANUALS PROJECT

Environmental Impact Assessment (EIA) is a process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made. These studies integrate the environmental concerns of developmental activities into the process of decision-making.

EIA has emerged as one of the successful policy innovations of the 20th Century in the process of ensuring sustained development. Today, EIA is formalized as a regulatory tool in more than 100 countries for effective integration of environmental concerns in the economic development process. The EIA process in India was made mandatory and was also given a legislative status through a Notification issued by the ministry of Environmental and Forests (MoEFS) in January 1994. The Notification, however, covered only a few selected industrial developmental activities. While there are subsequent amendments, the Notification issued on September 14, 2006 supersedes all the earlier Notifications, and has brought out structural changes in the clearance mechanism.

The basic tenets of this EIA Notification could be summarized into the following:

- Pollution potential as the basis for prior environmental clearance instead of investment criteria; and
- Decentralization of clearing powers to the State/Union Territory (UT) level Authorities for certain developmental activities to make the prior environmental clearance process quicker, transparent and effective.

Devolution of the power to grant clearances at the state level for certain category of the developmental activities / projects is a step forward to fulfill the basic tenets of the re-engineering *i.e.*, quicker, transparent and effective process but many issues impede/hinder its functional efficiency. These issues could be in technical and operational domains as listed below:

## Technical issues

- Ensuring level playing ground to avoid arbitrariness in the decision-making process
- Classification of projects which do not require public hearing and detailed EIA (Category B2)
- Variations in drawing Terms of Reference (ToR) of EIA studies for a given developmental activity across the States/UTs
- Varying developmental-activity-specific expertise requirement for conducting EIA studies and their appraisal
- Availability of adequate sectoral experts and variations in competency levels
- Inadequate data verification, cross checking tools and supporting institutional framework

- Meeting time targets without compromising with the quality of assessments/ reviews
- Varying knowledge and skill levels of regulators, consultants and experts
- Newly added developmental activities for prior environmental clearance, *etc*.

### Operational issues

- State level /UT level EIA Authorities (SEIAA/UTEIAA) are formulated for the first time and many are functioning
- Varying roles and responsibilities of involved organizations
- Varying supporting institutional strengths across the States/UTs
- Varying manpower availability, *etc*.

## 1.1 Purpose

The purpose of developing the sector-specific technical EIA guidance manuals (TGM) is to provide clear and concise information on EIA to all the stakeholders i.e., the project proponent, the consultant, the reviewer, and the public. The TGMs are organized to cover following:

**Chapter 1 (Introduction):** This chapter provides a brief introduction on the EIA, basic tenets of EIA Notification, technical & operational issues in the process of clearance, purpose of the TGMs, project implementation process and additional information.

**Chapter 2 (Conceptual facets of an EIA):** Provides an overall understanding to the conceptual aspects of control of pollution and EIA for the developmental projects. This basic understanding would set the readers at same level of understanding for proper interpretations and boundaries for identifying the environmental interactions of the developmental projects and their significance for taking measures of mitigation. This chapter covers the discussion on environment in EIA context *i.e* sustainable development, pollution control strategies, preventive environmental management tools, Objectives of EIA, types and basic principles of EIA, project cycle for isolated storage and handling of hazardous chemicals industry, understanding on type of environmental impacts and the criteria for the significance analysis.

**Chapter 3 (Isolated storage and handling of hazardous chemicals):** The purpose of this chapter is to provide the reader precise information on all the relevant aspects of the industry, which is essential to realize the likely interaction of such developmental activities on the receiving environment. Besides, this Chapter gives a holistic understanding on the sources of pollution and the opportunities of the source control.

The specific coverage which provides precise information on the industry include (i) introduction to industry, (ii) scientific aspects - categories of tanks, types of storages based on type of chemicals, storage and handling in environmental context, (iii) typical checklist for isolated storages, (iv) technological aspects – emission control measures and (vi) the summary of applicable national regulation for this developmental activity.

**Chapter 4 (Operational aspects):** The purpose of this chapter is to facilitate the stakeholders to extend clear guidance on coverage of legislative requirements, sequence of procedures for obtaining the EIA clearance and each step-wise provisions and considerations.

The coverage of the Chapter include provisions in the EIA Notification regarding isolated storage and handling of hazardous chemicals industry, screening (criteria for categorization of B1 and B2, siting guidelines, *etc*.), scoping (pre-feasibility report, guidance for filling Form 1, identification of valued environmental components, identification of impacts, *etc*.), arriving at terms of reference for EIA studies, impact assessment studies (EIA team, assessment of baseline quality of environment, impact prediction tools, significance of impacts), social impact assessment, risk assessment considerations, typical mitigation measures, designing considerations for environmental management plan, structure of EIA report for incorporation of study findings, process of public consultation, project appraisal, decision making process and post-clearance monitoring protocol.

**Chapter 5 (Roles and responsibilities of various organizations involved in the process of prior environmental clearance):** The purpose of this Chapter is to brief the stakeholders on the institutional mechanism and roles & responsibilities of the stakeholders involved in the process of prior environmental clearance. The Coverage of the Chapter include (i) roles and responsibilities of the stakeholders, (ii) organization specific functions, (iii) constitution, composition and decision making process of SEIAA and (iv) EAC & SEAC and (v) other conditions which may be considered.

- Conceptual facets of an EIA
- Details on the developmental activity including environmental concerns and control technologies *etc*.
- Operational aspects; and
- Roles and responsibilities of various organizations involved in the process of prior environmental clearance

For any given industry, each topic listed above could alone be the subject of a lengthy volume. However, in order to produce a manageable document, this project focuses on providing summary information for each topic. This format provides the reader with a synopsis of each issue. Text within each section was researched from many sources, and was condensed from more detailed sources pertaining to specific topics.

The contents of the document are designed with a view to facilitate addressing of the relevant technical and operational issues as mentioned in the earlier section. Besides, facilitates various stakeholders involved in the EIA clearance process *i.e,*

- Project proponents will be fully aware of the procedures, common ToR for EIA studies, timelines, monitoring needs, *etc*., in order to plan the projects/studies appropriately.
- Consultants across India will gain similar understanding about a given sector, and also the procedure for EIA studies, so that the quality of the EIA reports gets improved and streamlined
- Reviewers across the states/UTs will have the same understanding about an industry sector and would able to draw a benchmark in establishing the significant impacts for the purpose of prescribing the ToR for EIA studies and also in the process of review and appraisal.
- Public who are concerned about new or expansion projects, can use this manual to get a basic idea about manufacturing/production details, rejects/wastes from the operations, choice of cleaner/control technologies, regulatory requirements, likely environmental and social concerns, mitigation measures, *etc*., in order to seek

clarifications appropriately in the process of public consultation. The procedural clarity in the document will further strengthen them to understand the stages involved in clearance and roles and responsibilities of various organizations.

- In addition, these manuals would substantially ease the pressure on reviewers at the scoping stage and would bring in functional efficiency at the central and state levels.

## 1.2 Project Implementation

The Ministry of Environment & Forests (MoEF), Government of India took up the task of developing sector-specific technical EIA guidance manuals for all the developmental activities listed in the re-engineered EIA Notification. The Infrastructure Leasing and Financial Services Ecosmart Limited (IL&FS Ecosmart), has been entrusted with the task of developing these manuals for 27 industrial and related sectors. Isolated storage and handling of hazardous chemicals is one of these sectors, for which this manual is prepared.

The ability to design comprehensive EIA studies for specific industries depends on the knowledge of several interrelated topics. Therefore, it requires expert inputs from multiple dimensions *i.e.*, administrative, project management, technical, scientific, social, economic, risk *etc*., in order to comprehensively analyze the issues of concern and to draw logical interpretations. Thus, Ecosmart has designed a well-composed implementation framework to factor inputs of the experts and stakeholders in the process of finalization of these manuals.

The process of manual preparation involved collection & collation of the secondary available information, technical review by sectoral resource persons and critical review & finalization by a competent Expert Committee composed of core and sectoral peer members.

The MoEF appreciates the efforts of Ecosmart, Expert Core and Peer Committee, resource persons and all those who have directly and indirectly contributed to this Manual.

## 1.3 Additional Information

This TGM is brought out by the MoEF to provide clarity to all the stakeholders involved in the 'Prior Environmental Clearance' process. As such, the contents and clarifications given in this document do not withstand in case of a conflict with the statutory provisions of the Notifications and Executive Orders issued by the MoEF from time-to-time.

TGMs are not regulatory documents. Instead, these are the tools designed to assist in successful completion of an EIA.

For the purpose of this project, the key elements considered under TGMs are: conceptual aspects of EIA; developmental activity-specific information; operational aspects; and roles and responsibilities of involved stakeholders.

This manual is prepared considering the Notification issued on 14$^{th}$ September, 2006 and latest amendment as on 1$^{st}$ December 2009. For recent updates, if any, may please refer the website of the MoEF, Government of India *i.e.,* http://moef.nic.in/index.php.

# 2. CONCEPTUAL FACETS OF EIA

It is an imperative requirement to understand the basic concepts concerned to the pollution control and the environmental impact assessment in an overall objective of the sustainable development. This Chapter highlights the pollution control strategies and their tools besides the objectives, types & principles of EIA, type of impacts their significance analysis, in order to provide consistent understanding to the reader before assessing the development of activity-specific environmental concerns in Chapter 3 and identification & prediction of significant impacts in order to design mitigation measures as detailed in Chapter 4.

## 2.1 Environment in EIA Context

"Environment" in EIA context mainly focuses, but is not limited to physical, chemical, biological, geological, social, economical, and aesthetic dimensions along with their complex interactions, which affect individuals, communities and ultimately determines their forms, character, relationship, and survival. In EIA context, 'effect' and 'impact' can often be used interchangeably. However, 'impact' is considered as a value judgment of the significance of an effect.

Sustainable development is built on three basic premises *i.e.*, economic growth, ecological balance and social progress. Economic growth achieved in a way that does not consider the environmental concerns, will not be sustainable in the long run. Therefore, sustainable development needs careful integration of environmental, economic, and social needs in order to achieve both an increased standard of living in short term, and a net gain or equilibrium among human, natural, and economic resources to support future generations in the long term.

"It is necessary to understand the links between environment and development in order to make choices for development that will be economically efficient, socially equitable and responsible, as well as environmentally sound." Agenda 21

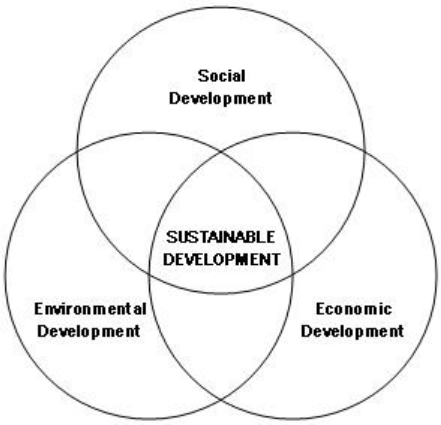


**Figure 2-1 Inclusive Components of Sustainable Development**

## 2.2 Pollution Control Strategies

Pollution control strategies can be broadly categorized in to preventive and reactive. The reactive strategy refers to the steps that may be applied once the wastes are generated or contamination of the receiving environment takes place. The control technology or a combination of technologies to minimize the impact due to the process rejects/wastes varies with quantity and characteristics, desired control efficiency and economics.

Many combinations of techniques could be adopted for treatment of a specific waste or the contaminated receiving environment, but are often judged based on techno-economic feasibility. Therefore, the best alternative is to take all possible steps to avoid pollution it self. This preventive approach refers to a hierarchy that involves i) prevention & reduction; ii) recycling and re-use; iii) treatment; and iv) disposal, respectively.

Therefore, there is a need to shift the emphasis from the reactive to preventive strategy *i.e.,* to promote preventive environmental management.

## 2.3 Tools for Preventive Environmental Management

The tools for preventive environmental management can be broadly classified into following three groups.

- Tools for assessment and analysis - risk assessment, environmental audit/statement, environmental benchmarking, environmental indicators
- Tools for action - environmental policy, innovative funding mechanism, EMS and ISO certification, total environmental quality movement, industrial ecosystem or metabolism, voluntary agreements
- Tools for communication - state of environment, corporate environmental reporting

Specific tools under each group are discussed precisely in next sections.

### 2.3.1 Tools for assessment and analysis

#### 2.3.1.1 Risk assessment

Risk is associated with the frequency of failure and consequence effect. Predicting such situations and evaluation of risk is essential to take appropriate preventive measures. The major concern of the assessment is to identify the activities falling in a matrix of high & low frequencies at which the failures occur and the degree of its impact. The high frequency, low impact activities can be managed by regular maintenance *i.e*, LDAR (Leak detection and repair) programmes. Whereas, the low frequency, high impact activities are of major concern (accidents) in terms of risk assessment. As the frequency is low, often the required precautions are not realized or maintained. However, the risk assessment identifies the areas of major concerns, which require additional preventive measures; likely consequence distances considering domino effects, which will give the possible casualties and ecological loss in case of accidents. These magnitudes demand the attention for preventive and disaster management plans (DMP). Thus is an essential tool to ensure safety of operations.

### 2.3.1.2 Environmental audit/statement

Key objectives of an environmental audit includes compliance verification, problem identification, environmental impact measurement, environmental performance measurement, conforming effectiveness of EMS, providing a database for corrective actions and future actions, developing company's environmental strategy, communication and formulating environmental policy.

The MoEF, Government of India issued Notification on '*Environmental Statements*' (ES) in April, 1992 and further amended in April 1993 – As per the Notification, the industries are required to submit environmental statements to the respective State Pollution Control Board (SPCB). ES is a proactive tool for self-examination of the industry itself to reduce/minimize pollution by adopting process modifications, recycling and reusing of the resources. The regular submission of ES will indicate the systematic improvement in environmental pollution control being achieved by the industry. In other way, specific points in ES may be used as environmental performance indicators for relative comparison, implementation and to promote better practices.

### 2.3.1.3 Environmental benchmarking

Environmental performance and operational indicators could be used to navigate, manage and communicate the significant aspects and give enough evidence of good environmental house keeping. Besides the existing prescribed standards, an insight to identify the performance indicators and prescribing schedule for systematic improvement in performance of these indicators will yield better results.

Relative indicators may be identified for different industrial sectors and be integrated in the companies and organizations to monitor and manage the different environmental aspects of the company, to benchmark and compare two or more storages from the same sector. These could cover the product losses, frequencies of clearing, safety ratings, equipments, *etc*. Once these benchmarks are developed, the industries which are below them may be guided and enforced to reach them while those which are better than the benchmark may be encouraged further by giving incentives *etc*.

### 2.3.1.4 Environmental indicators

Indicators can be classified in to environmental performance indicators (EPI) and environmental condition indicators (ECI). The EPIs can be further divided into two categories *i.e.,* operational performance indicators and management performance indicators.

Management performance indicators are related to the management efforts to influence the environmental performance of the organizational operations.

The environmental condition indicators provide information about the environment. These indicators provide information about the local, regional, national or global condition of the environment. This information helps the organization to understand the environmental impacts of its activities and thus helps in taking decisions to improve the environmental performance.

Indicators basically used to evaluate environmental performance against the set standards and thus indicate the direction in which to proceed. Selection of type of indicators for a

firm or project depends upon its relevance, clarity and realistic cost of collection and its development.

### 2.3.2 Tools for action

#### 2.3.2.1 Environmental policy

An environmental policy is a statement of an organization's overall aim and principles of action w.r.t the environment, including compliance with all relevant regulatory requirements. It is a key tool in communicating the environmental priorities of the organization to all its employees. To ensure organization's commitment towards a formulated environmental policy, it is essential for the top management to be involved in the process of formulating the policy and setting priorities. Therefore, the first step is to get the commitment from the higher levels of management. The organization should then conduct an initial environmental review and draft an environmental policy. This draft should be discussed and approved by the board of directors. The approved environmental policy statement should then be communicated internally among all its employees and must also be made available to the public.

#### 2.3.2.2 Innovative funding mechanism

There are many forums under which the fund is made available for the issues which are of global/regional concern *i.e.,* climate change, basal convention and further fund sources are being explored for the Persistent Organic Pollutants Convention. Besides the global funding mechanism, there needs to be localized alternative mechanisms for boosting the investment in environmental pollution control. For example, in India the Government has established mechanism to fund the common effluent treatment plants, which are specifically serving the small and medium scale enterprises *i.e.,* 25% share by the State Government, matching grants from the Central Government and surety for 25% soft loan. It means that the industries need to invest only 25% initially, thus encouraging voluntary compliance.

There are some more options *i.e.,* if the pollution tax/charge is imposed on the residual pollution being caused by the industries, municipalities *etc*., fund will automatically be generated, which in turn, can be utilized for funding the environmental improvement programmes. The emerging concept of build-operate-transfer (BOT) is an encouraging development, where there is a possibility to generate revenue by application of advanced technologies. There are many opportunities which can be explored. However, what is required is the paradigm shift and focused efforts.

#### 2.3.2.3 EMS and ISO certification

EMS is that part of the overall management system, which includes the organizational structure, responsibilities, practices, procedures, process and resources for determining and implementing the forms of overall aims, principles of action w.r.t the environment. It encompasses the totality of organizational, administrative and policy provisions to be taken by a firm to control its environmental influences. Common elements of an EMS are the identification of the environmental impacts and legal obligations, the development of a plan for management & improvement, the assignment of the responsibilities and monitoring of the performance.

### 2.3.2.4 Total environmental quality movement

Quality is regarded as

- A product attribute that had to be set at an acceptable level and balanced against the cost
- Something delivered by technical systems engineered by experts rather than the organization as a whole
- Assured primarily through the findings and correction of mistakes at the end of the production process

One expression of the total environment quality movement (TEQM) is a system of control called Kaizen. The principles of Kaizen are:

- Goal must be continuous improvement of quality instead of acceptable quality
- Responsibility of the quality shall be shared by all members of an organization
- Efforts should be focused on improving the whole process and design of the products

With some modifications, TEQM approach can be applied in the improvement of corporate environmental performance in both process and product areas.

### 2.3.2.5 Voluntary agreements

Voluntary environmental agreements among the industries, government, public representatives, NGOs and other concerned towards attaining certain future demands of the environment are reported to be successful. Such agreements may be used as a tool where Government would like to make the standards stringent in future (phase-wise-stringent). These may be used when conditions are temporary and requires timely replacement. Also these may be used as supplementary/complimentary in implementation of the regulation. The agreements may include:

- Target objectives (emission limit values/standards)
- Performance objectives (operating procedures)
- R&D activities – Government and industry may have agreement to establish better control technologies.
- Monitoring & reporting of the agreement conditions by other agents (NGOs, public participants, civil authority *etc*.)

In India, the MoEF has organized such programme, popularly known as the corporate responsibility for environment protection (CREP) considering identified 17 categories of high pollution potential industrial sectors. Publication in this regard, is available with Central Pollution Control Board (CPCB).

## 2.3.3 Tools for communication

### 2.3.3.1 State of environment

The Government of India has brought out the state of environment report for entire country and similar reports available for many of the states. These reports are published at regular intervals to record trends and to identify the required interventions at various

levels. These reports consider the internationally accepted DPSIR framework for the presentation of the information. DPSIR refers to

- D – Driving forces – causes of concern *i.e.* industries, transportation *etc*.
- P – Pressures – pollutants emanating from driving forces *i.e.* emission
- S – State – quality of environment *i.e.* air, water & soil quality
- I – Impact – Impact on health, eco-system, materials, biodiversity, economic damage *etc*.
- R – Responses – action for cleaner production, policies (including standards/ guidelines), targets *etc*.

Environment reports including the above elements gives a comprehensive picture of specific target area in order to take appropriate measures for improvement. Such reports capture the concerns, which could be considered in EIAs.

#### 2.3.3.2 Corporate environmental reporting

Corporate environmental reports (CERs) are only one form of environmental reporting defined as publicly available, stand alone reports, issued voluntarily by the industries on their environmental activities. CER is just a means of environmental improvement and greater accountability, not an end in itself.

Three categories of environmental disclosure are:

- Involuntary disclosure: Without its permission and against its will (env. Campaign, press *etc*.)
- Mandatory disclosure: As required by law
- Voluntary disclosure: The disclosure of information on a voluntary basis

## 2.4 Objectives of EIA

Objectives of EIA include the following:

- To ensure environmental considerations are explicitly addressed and incorporated into the development decision-making process;
- To anticipate and avoid, minimize or offset the adverse significant biophysical, social and other relevant effects of development proposals;
- To protect the productivity and capacity of natural systems and the ecological processes which maintain their functions; and
- To promote development that is sustainable and optimizes resource use as well as management opportunities.

## 2.5 Types of EIA

Environmental assessments could be classified into four types *i.e.* strategic environmental assessment, regional EIA, sectoral EIA and project level EIA. These are precisely discussed below:

### Strategic environmental assessment

Strategic Environmental Assessment (SEA) refers to systematic analysis of the environmental effects of development policies, plans, programmes and other proposed strategic actions. SEA represents a proactive approach to integrate environmental considerations into the higher levels of decision-making – beyond the project level, when major alternatives are still open.

### Regional EIA

EIA in the context of regional planning integrates environmental concerns into development planning for a geographic region, normally at the sub-country level. Such an approach is referred to as the economic-cum-environmental (EcE) development planning. This approach facilitates adequate integration of economic development with management of renewable natural resources within the carrying capacity limitation to achieve sustainable development. It fulfils the need for macro-level environmental integration, which the project-oriented EIA is unable to address effectively. Regional EIA addresses the environmental impacts of regional development plans and thus, the context for project-level EIA of the subsequent projects, within the region. In addition, if environmental effects are considered at regional level, then cumulative environmental effects of all the projects within the region can be accounted.

### Sectoral EIA

Instead of project-level-EIA, an EIA should take place in the context of regional and sectoral level planning. Once sectoral level development plans have the integrated sectoral environmental concerns addressed, the scope of project-level EIA will be quite minimal. Sectoral EIA will help in addressing specific environmental problems that may be encountered in planning and implementing sectoral development projects.

### Project level EIA

Project level EIA refers to the developmental activity in isolation and the impacts that it exerts on the receiving environment. Thus, it may not effectively integrate the cumulative effects of the development in a region.

From the above discussion, it is clear that EIA shall be integrated at all the levels *i.e.* strategic, regional, sectoral and the project level. Whereas, the strategic EIA is a structural change in the way the things are evaluated for decision-making, the regional EIA refers to substantial information processing and drawing complex inferences. The project-level EIA is relatively simple and reaches to meaningful conclusions. Therefore in India, project-level EIA studies takes place on a large scale and are being considered. However, in the re-engineered Notification, provisions have been incorporated for giving a single clearance for the entire industrial estate for e.g., Leather parks, pharma cities *etc*., which is a step towards the regional approach.

As we progress and the resource planning concepts emerge in our decision-making process, the integration of overall regional issues will become part of the impact assessment studies.

## 2.6 Basic EIA Principles

By integrating the environmental impacts of the development activities and their mitigation early in the project planning cycle, the benefits of EIA could be realized in all stages of a project, from exploration and planning, through construction, operations, decommissioning, and beyond site closure.

A properly-conducted-EIA also lessens conflicts by promoting community participation, informing decision makers, and also helps in laying the base for environmentally sound projects. An EIA should meet at least three core values:

- Integrity: The EIA process should be fair, objective, unbiased and balanced
- Utility: The EIA process should provide balanced, credible information for decision-making
- Sustainability: The EIA process should result in environmental safeguards

Ideally, an EIA process should be:

- Purposive - should inform decision makers and result in appropriate levels of environmental protection and community well-being.
- Rigorous - should apply 'best practicable' science, employing methodologies and techniques appropriate to address the problems being investigated.
- Practical - should result in providing information and acceptable and implementable solutions for problems faced by proponents.
- Relevant - should provide sufficient, reliable and usable information for development planning and decision making.
- Cost-effective - should impose minimum cost burdens in terms of time and finance on proponents and participants consistent with meeting accepted requirements and objectives of EIA.
- Efficient - should achieve the objectives of EIA within the limits of available information, time, resources and methodology.
- Focused - should concentrate on significant environmental effects and key issues; *i.e.,* the matters that need to be taken into account in making decisions.
- Adaptive - should be adjusted to the realities, issues and circumstances of the proposals under review without compromising the integrity of the process, and be iterative, incorporating lessons learned throughout the project life cycle.
- Participative - should provide appropriate opportunities to inform and involve the interested and affected publics, and their inputs and concerns should be addressed explicitly in the documentation and decision making.
- Inter-disciplinary - should ensure that the appropriate techniques and experts in the relevant bio-physical and socio-economic disciplines are employed, including use of traditional knowledge as relevant.
- Credible - should be carried out with professionalism, rigor, fairness, objectivity, impartiality and balance, and be subject to independent checks and verification.
- Integrated - should address the interrelationships of social, economic and biophysical aspects.

- Transparent - should have clear, easily understood requirements for EIA content; ensure public access to information; identify the factors that are to be taken into account in decision making; and acknowledge limitations and difficulties.
- Systematic - should result in full consideration of all relevant information on the affected environment, of proposed alternatives and their impacts, and of the measures necessary to monitor and investigate residual effects.

## 2.7 Project Cycle

The generic project cycle including that of isolated storage and handling of hazardous chemicals plant has six main stages:

1. Project concept
2. Pre-feasibility
3. Feasibility
4. Design and engineering
5. Implementation
6. Monitoring and evaluation

It is important to consider the environmental factors on an equal basis with technical and economic factors throughout the project planning, assessment and implementation phases. Environmental considerations should be introduced at the earliest in the project cycle and must be an integral part of the project pre-feasibility and feasibility stage. If the environmental considerations are given due respect in the site selection process by the project proponent, the subsequent stages of the environmental clearance process would get simplified and would also facilitate easy compliance to the mitigation measures throughout the project life cycle.

A project's feasibility study should include a detailed assessment of significant impacts and the EIA include a detailed prediction and quantification of impacts and delineation of Environmental Management Plan (EMP). Findings of the EIA study should preferably be incorporated in the project design stage so that the project site, as well as site alternatives are studied and necessary changes, if required, are incorporated in the project design stage. This practice will also help the management in assessing the negative impacts and in designing cost-effective remedial measures. In general, EIA enhances the project quality and improves the project planning process.

## 2.8 Environmental Impacts

Environmental impacts resulting from proposed actions can be grouped into following categories:

- Beneficial or detrimental
- Naturally reversible or irreversible
- Repairable via management practices or irreparable
- Short term or long term
- Temporary or continuous
- Occurring during construction phase or operational phase
- Local, regional, national or global
- Accidental or planned (recognized before hand)

- Direct (primary) or Indirect (secondary)
- Cumulative or single

The category of impact as stated above, and the significance will facilitate the Expert Appraisal Committee (EAC)/State Level EAC (SEAC) to take a look at the ToR for EIA studies, as well as, in decision making process about the developmental activity.

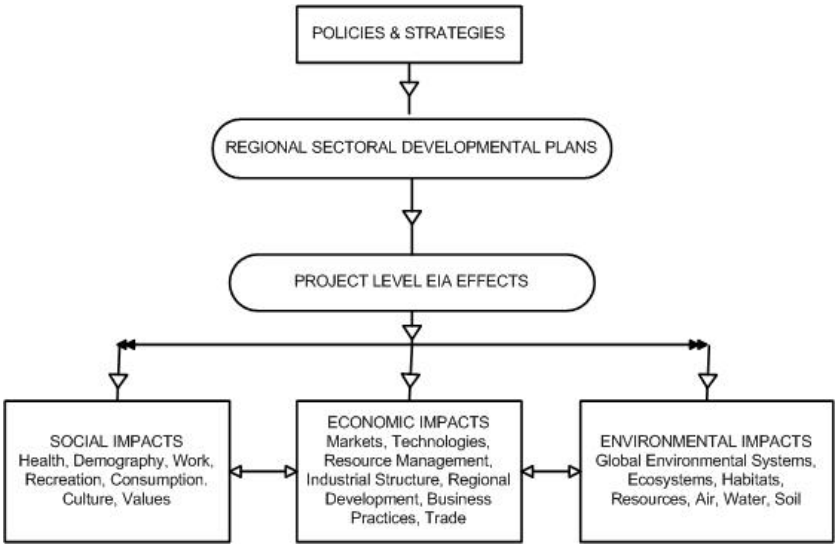


**Figure 2-2 Types of Impacts**

The nature of impacts could fall within three broad classifications *i.e.*, direct, indirect and cumulative, based on the characteristics of impacts. The assessment of direct, indirect and cumulative impacts should not be considered in isolation or considered as separate stages in the EIA. Ideally, the assessment of such impacts should form an integral part of all stages of the EIA. The TGM does not recommend a single method to assess the types of impacts, but suggests a practical framework/approach that can be adapted and combined to suit a particular project and the nature of impacts.

## 2.8.1 Direct impacts

Direct impacts occur through direct interaction of an activity with an environmental, social, or economic component. For example, release of VOCs and hazardous air pollutants, *etc*.

## 2.8.2 Indirect impacts

Indirect impacts on the environment are those which are not a direct result of the project, often produced away from or as a result of a complex impact pathway. The indirect impacts are also known as secondary or even tertiary level impacts. The indirect impacts may also include growth-inducing impacts and other effects related to induced changes to the pattern of land use or additional road network, population density or growth of industries in the region. In the process, air, water and other natural systems including the ecosystem may also be affected.

### 2.8.3 Cumulative impacts

Cumulative impact consists of an impact that is created as a result of combination of the project evaluated in the EIA, together with other projects in the same vicinity, causing related impacts. These impacts occur when the incremental impact of the project is combined with the cumulative effects of other past, present and reasonably foreseeable future projects. Figure 2-3 depicts the same. Respective EAC may exercise their discretion on a case-by-case basis for considering the cumulative impacts.

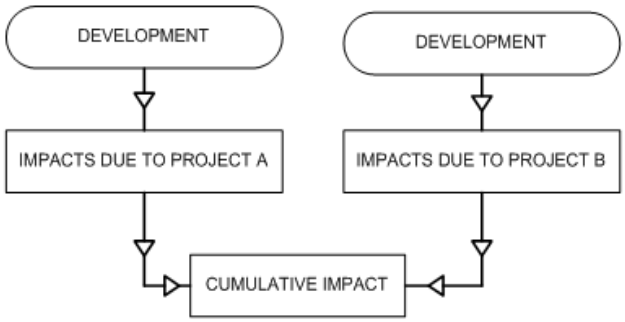


**Figure 2-3 Cumulative Impact**

### 2.8.4 Induced impacts

The cumulative impacts can be due to induced actions of projects and activities that may occur if the action under assessment is implemented such as growth-inducing impacts and other effects related to induced changes to the pattern of future land use or additional road network, population density or growth rate (*e.g.,* excess growth may be induced in the zone of influence around a the storage facility, and in the process causing additional effects on air, water and other natural ecosystems). Induced actions may not be officially announced or be part of any official announcement/plan. Increase in workforce and nearby communities contributes to this effect.

They usually have no direct relationship with the action under assessment, and represent the growth-inducing potential of an action. New roads leading from those constructed for a project, increased recreational activities (*e.g*., hunting, fishing), and construction of new service facilities are examples of induced actions.

However, the cumulative impacts due to induced development or third level or even secondary indirect impacts are difficult to be quantified. Because of higher levels of uncertainties, these impacts cannot normally be assessed over a long time horizon. An EIA practitioner usually can only guess as to what such induced impacts may be and the possible extent of their implications on the environmental factors. Respective EAC may exercise their discretion on a case-by-case basis for considering the induced impacts.

## 2.9 Significance of Impacts

This TGM establishes the significance of impacts first and proceeds to delineate the associated mitigation measures. So the significance here reflects the "worst-case scenario" before mitigation is applied, and therefore provides an understanding of what may happen if mitigation fails or is not as effective as predicted. For establishing significance of different impacts, understanding the responses and interaction of the environmental system is essential. Hence, the impact interactions and pathways are to be

understood and established first. Such an understanding will help in the assessment process to quantify the impact as accurately as possible. Complex interactions, particularly in the case of certain indirect or cumulative impacts, may give rise to non-linear responses, which are often difficult to understand and therefore their significance is difficult to assess. It is hence understood that indirect or cumulative impacts are more complex than the direct impacts. Currently, the impact assessments are limited to direct impacts. In case mitigation measures are delineated before determining significance of the effect, the significance represents the residual effects.

However, the ultimate objective of an EIA is to achieve sustainable development. The development process shall invariably cause some residual impacts even after implementing an EMP effectively. Environmentalists today are faced with a vital, not-easy-to-answer question—"What is the tolerable level of environmental impact within the sustainable development framework?" As such, it has been recognized that every ecosystem has a threshold for absorbing deterioration and a certain capacity for self-regeneration. These thresholds based on concept of carrying capacity are as follows:

- Waste emissions from a project should be within the assimilative capacity of the local environment to absorb without unacceptable degradation of its future waste absorptive capacity or other important services.
- Harvest rates of renewable resource inputs should be within the regenerative capacity of the natural system that generates them; depletion rates of non-renewable inputs should be equal to the rate at which renewable substitutes are developed by human invention and investment.

The aim of this model is to curb over-consumption and unacceptable environmental degradation. But because of limitation in available scientific basis, this definition provides only general guidelines for determining the sustainable use of inputs and outputs. To establish the level of significance for each identified impact, a three-stage analysis may be referred:

- First, an impact is qualified as being either negative or positive.
- Second, the nature of impacts such as direct, indirect, or cumulative is determined using the impact network
- Third, a scale is used to determine the severity of the effect; for example, an impact is of low, medium, or high significance.

It is not sufficient to simply state the significance of the effect. This determination must be justified, coherent and documented, notably by a determination methodology, which must be described in the methodology section of the report. There are many recognized methodologies to determine the significance of effects.

### 2.9.1 Criteria/methodology to determine the significance of the identified impacts

The criteria can be determined by answering some questions regarding the factors affecting the significance. This will help the EIA stake-holders, the practitioner in particular, to determine the significance of the identified impacts eventually. Typical examples of such factors include the following:

- Exceeding threshold Limit: Significance may increase if a threshold is exceeded. e.g., VOC emissions exceed the permissible threshold.

- Effectiveness of mitigation: Significance may increase as the effectiveness of mitigation measures decreases. e.g., control technologies, which may not assure consistent compliance to the requirements.
- Size of study area: Significance may increase as the zone of effects increases.
- Incremental contribution of effects from action under review: Significance may increase as the relative contribution of an action increases.
- Relative contribution of effects of other actions: Significance may decrease as the significance of nearby larger actions increase.
- Relative rarity of species: Significance may increase as species becomes increasingly rare or threatened.
- Significance of local effects: Significance may increase as the significance of local effects is high.
- Magnitude of change relative to natural background variability: Significance may decrease if effects are within natural assimilative capacity or variability.
- Creation of induced actions: Significance may increase as induced activities also highly significant.
- Degree of existing disturbance: Significance may increase if the surrounding environment is pristine.

For determining significance of impacts, it is important to remember that secondary and higher order effects can also occur as a result of a primary interaction between a project activity and the local environment. Wherever a primary effect is identified, the practitioner should always think if secondary or tertiary effects on other aspects of the environment could also arise.

The EIA should also consider the effects that could arise from the project due to induced developments, which take place as a consequence of the project. Ex. Population density and associated infrastructure and jobs for people attracted to the area by the project. It also requires consideration of cumulative effects that could arise from a combination of the effects due to other projects with those of other existing or planned developments in the surrounding area. So the necessity to formulate a qualitative checklist is suggested to test significance, in general.

# 3. ABOUT ISOLATED STORAGES AND HANDLING OF HAZARDOUS CHEMICALS INCLUDING TYPES OF STORAGES, RISK AND POLLUTION CONTROL MEASURES

## 3.1 Introduction

The Occupational Safety and Health Administration (OSHA) define a hazardous chemical as any chemical which is a physical hazard or a health hazard.

- Physical hazard means a chemical for which there is evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive), or water-reactive.

- Health hazard means a chemical for which there is evidence that acute (immediate) or chronic (delayed) health effects may occur in over-exposed people. Exposure being related to the dose (how much), the duration and frequency of exposure (how long and how often), and the route of exposure (how and where the material gets in or on the body), whether it be absorption through: the respiratory tract (inhalation); the skin; the digestive tract (ingestion), and/or percutaneous injection through the skin (e.g. accidental needle stick). These health effects can be: transient, persistent, or cumulative, local (at the sight of initial contact with the substance) and/or systemic (after absorption, distribution, and possible biotransformation, at a site distant from initial contact with the substance). The term health hazard includes chemicals which are carcinogens, toxic or highly toxic, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which can act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes (see detailed descriptions of the individual physical and health hazards).

Considering the risk associated with hazardous chemicals, their manufacture and/or storage in large quantities at one place definitely needs attention. After considerable amount of deliberations with experts, various Ministries and State Governments, the Ministry of Environment & Forests (MoEF), Government of India has formulated the Manufacture, Storage and Import of Hazardous Chemicals Rules (MSIHC Rules), in the year 1989 under the Environmental Protection Act, 1986. MSIHC regulation was amended once in 1994 and again in 2000. According to the MSIHC, 'isolated storages' are defined as storages of specific chemicals in specified quantities, which are not associated with specified manufacturing process *i.e.* the storage of hazardous chemicals, other than the storage associated with an installation on the same site specified in the schedule 4, where the storage involves at least the quantities of that chemicals set out in schedule 2 as given in **Annexure I**.

Thus, this storage of chemicals in transit or for warehousing, are subsequently released to consumers for use. Such storages sprung-up in large numbers in locations suitable for import-export and warehousing purposes near the production and usage sites of such chemicals.

The MSIHC rules are the first major legislative effort to address the issue of handling of hazardous chemicals specifically in their state of "isolated" storage or warehousing.

The quantity of the hazardous chemical is the operative criteria to decide upon applicability of the rules.

The principal objectives of the MSIHC regulation are:

- prevention of major accidents arising from industrial activities
- limitation of the effects of such accidents both on man and on the environment
- harmonisation of the various control measures and the agencies to prevent and limit major accidents

### 3.1.1 Threshold quantities

- The threshold quantities set out in the schedule 2 of MSIHC rules relate to each installation or group of installations belonging to the same occupier, where the distance between the installations is not sufficient to avoid, in foreseeable circumstances, any aggravation of major accidents hazards. These threshold quantities apply in any case to a group of installation belonging to the same occupier, where the distance between the installations is less than 500 meters (m).

- For the purpose of determining the threshold quantity of a hazardous chemical at an isolated storage, account shall also be taken of any hazardous chemical, which is:

  – in that part of any pipeline under the control of the site, which is within 500 m of that site and connected to it
  – at any other site under the control of the same occupier, any part of the boundary of which is within 500 m of the said site
  – in any vehicle, vessel, aircraft, hovercraft under the control of the same occupier which is used for storage purpose either at the site or within 500 m of it

But no account will be taken of any hazardous chemical which is in a vehicle, vessel, aircraft or hovercraft used for transporting it.

The list of the groups of threshold quantity (from MSIHC rules) is given in **Annexure II**.

There are number of isolated storages spread across the country. The district wise list of the isolated storages with its location; category, storage capacity, threshold quantity, and chemical name, *etc*., are given in **Annexure III**.

### 3.1.2 Warehouses

Storage of hazardous chemicals in warehouses is a well-known practice. These warehouses as such do not come under the definition of "Processes", "Factories", thus do not require applying for consent under Air Act and Water Act. Hence storage of chemicals at warehouses is strictly not under the regulatory control of any Authority empowered under the MSIHC rules.

The Central Warehousing Corporation which has over a hundred warehouses in all major cities of the country has a Central Guideline Code, which enlists the Do's and Don'ts on the storage of chemicals and a list of chemicals not to be accepted for general storage in the warehouses.

The guideline code mentions the following on the storage of chemicals. "Many chemicals require specialized facility for their safe storage, which are normally not available at our warehouses. Therefore, it would be dangerous to accept such chemicals in warehouses unless specialized storage facilities are provided.

## 3.2 Storage Facilities and their Handling Techniques

### 3.2.1 Categories of storage tanks

Storage tanks could be categorized in to three types based on their design pressure *i.e.*,

- 0 to 2.5 psig, 'atmospheric tanks' - welded steel tanks for oil storage
- up to 15 psig, 'low-pressure tanks' - large, welded, low-pressure storage tanks *e.g.* spheroids
- above 15 psig, 'pressure vessels' - Boiler and pressure vessels -spheres

### 3.2.2 Types of liquid and liquefied gas storage tanks

#### Open top tanks

Open top tanks are used for the storage of water and other non-flammable liquids (*e.g.* manure slurry in agricultural premises) or non-volatile liquids in industrial facilities.

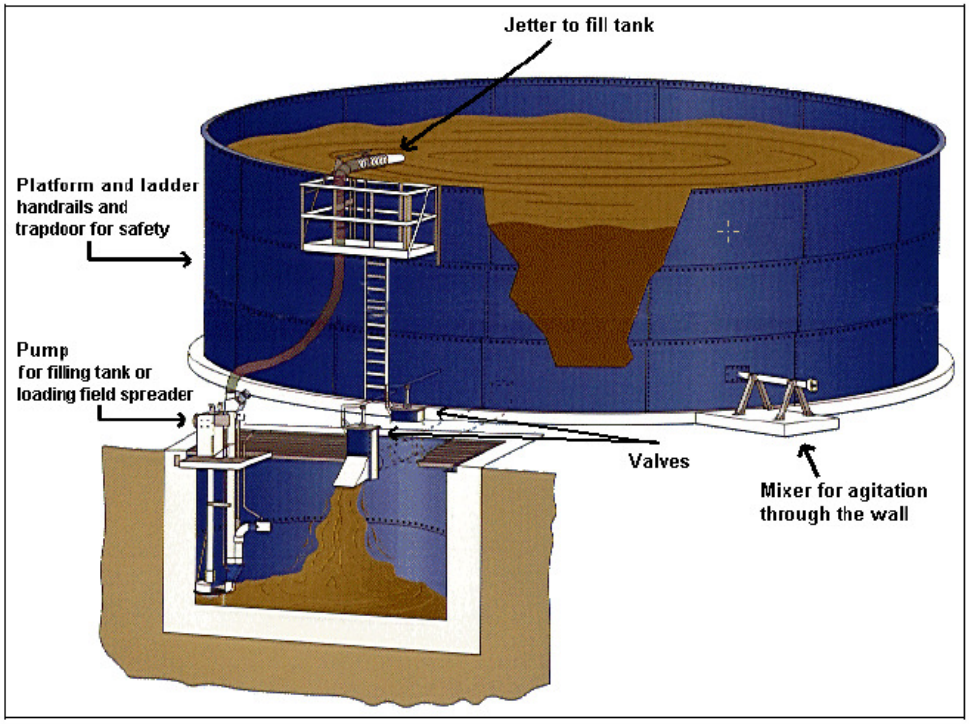


**Figure 3-1: Typical Open top tank**

## Fixed roof tanks

Fixed roof tanks are used for the storage of flammable and other liquids, such as oil products and chemicals with all levels of toxicity. Fixed roof tanks are designed as atmospheric tanks (free vented), low pressure tanks, and high pressure tanks. Non-pressure fixed roof tanks are suitable for storage at atmospheric pressure and therefore have open vents. Both low pressure and high pressure fixed roof tanks are provided with pressure/vacuum relief valves (PVRVs), which are fully open at the design pressure/vacuum. All of these tank types must also meet additional requirements such as stability. Anchor systems may be necessary to prevent uplifting of the tank near the periphery due to the combined load of internal pressure and wind loads.

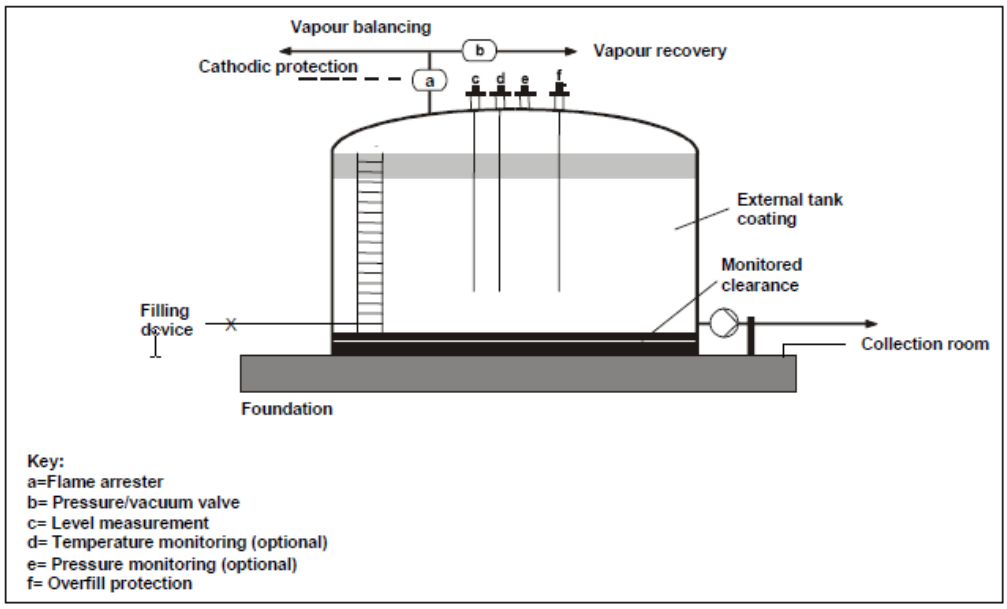


**Figure 3-2: Vertical fixed roof tank with some emission control equipments**

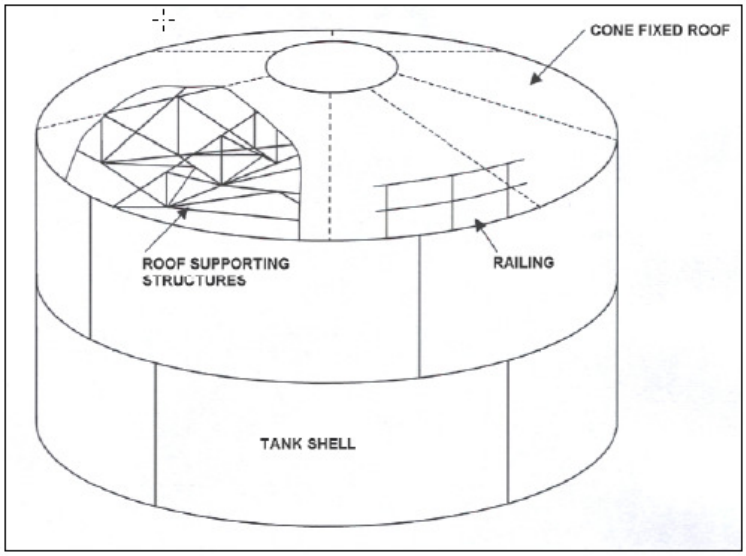


**Figure 3-3: Typical fixed roof tank**

### External floating roof tank (EFRT)

EFRTs are used for the storage of liquids *e.g.* crude oil. A typical EFRT consists of an open-topped cylindrical steel shell equipped with a roof that floats on the surface of the stored liquid. The floating roof consists of a deck, fittings, and a rim seal system. With all types of EFRT, the roof rises and falls with the rise and fall of the liquid level in the tank. External floating decks are equipped with a rim seal system, which is attached to the deck perimeter and contacts the tank wall. The purpose of the floating deck and rim seal system is to reduce emissions (and loss of product) of the stored liquid. The seal system slides against the tank wall as the roof is raised and lowered. The floating deck is also equipped with fittings that penetrate the deck and serve operational functions. The external floating roof design is such that evapourative losses from the stored liquid are limited to losses from the rim seal system and deck fittings (standing storage loss) and from any liquid left on the inner tank shell as the roof falls (withdrawal loss).

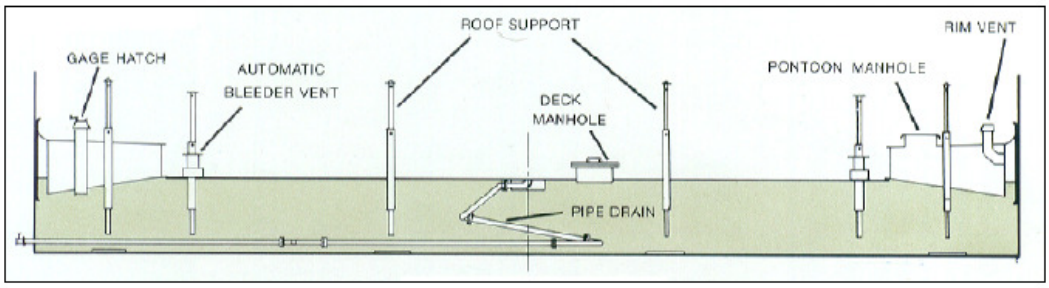


**Figure 3-4: Typical floating roof tank with pontoon floating roof**

### Fixed roof tanks

Fixed roof tanks are used for the storage of flammable and other liquids, such as oil products and chemicals with all levels of toxicity. Fixed roof tanks are designed as atmospheric tanks (free vented), low pressure tanks, high pressure tanks. Non-pressure

fixed roof tanks are suitable for storage at atmospheric pressure and therefore have open vents. Both low pressure and high pressure fixed roof tanks are provided with pressure/vacuum relief valves (PVRVs), which are fully open at the design pressure/vacuum. All of these tank types must also meet additional requirements such as stability. Anchor systems may be necessary to prevent uplifting of the tank near the periphery due to the combined load of internal pressure and wind loads.

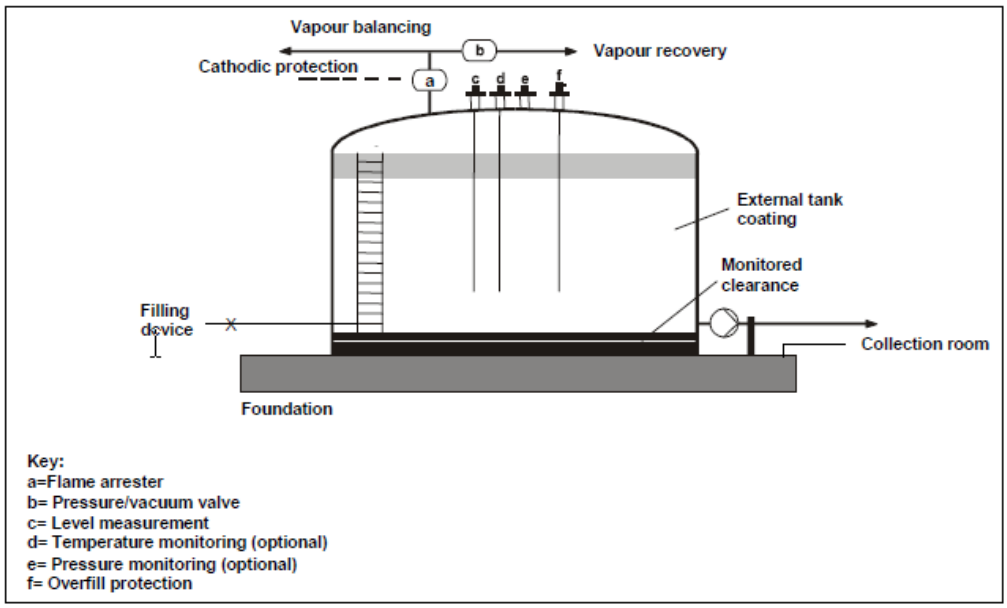


**Figure 3-5: Vertical fixed roof tank with some emission control equipments**

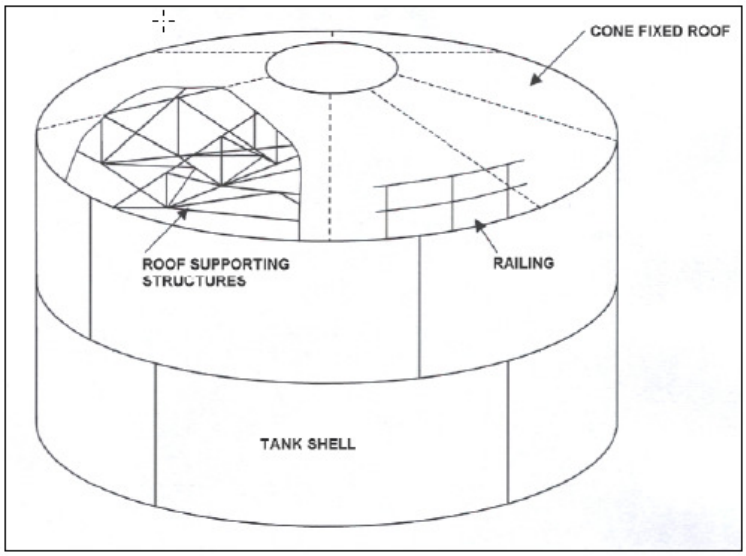


**Figure 3-6: Typical fixed roof tank**

### Atmospheric horizontal tanks

Atmospheric horizontal tanks are used for the storage of flammable liquids and also other liquids such as oil products and chemicals in all levels of flammability and toxicity. Horizontal fixed roof tanks are constructed for both aboveground and underground service and generally have a capacity of less than 150m$^3$. Horizontal tanks are usually equipped with pressure/vacuum relief vents (PVRVs), gauge hatches, sample wells and manholes to provide access. The maximum diameter is usually determined by factors such as design pressure, fabrication possibilities, post-weld heat treatment requirements, transport limitations, foundation criteria and economy of the design. The maximum allowable length is usually determined by the support structure, foundation criteria, size of available site and the economics of the design.

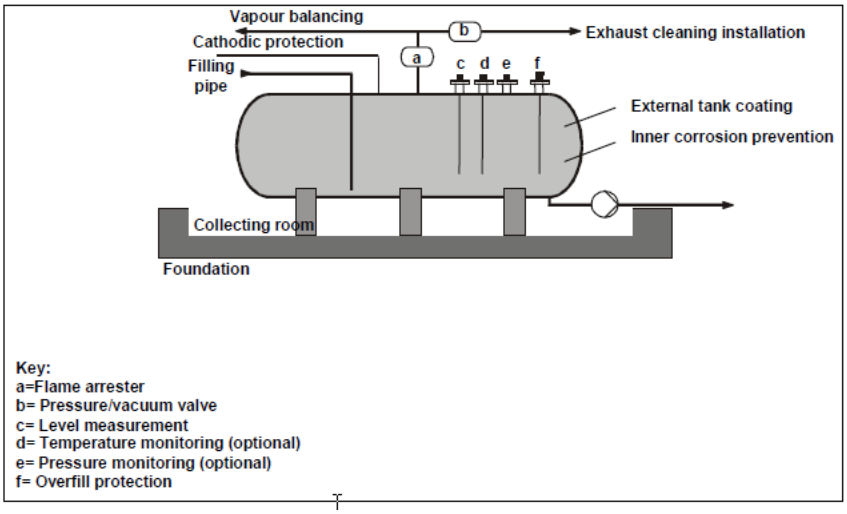


**Figure 3-7: Above ground Horizontal tank with emission control equipment**

### Lifter roof tanks

Lifter roof tanks are used to store a product whereas flexible diaphragm tanks are only used to store vapour at, or very close to atmospheric pressure. Lifter roof tanks have a telescoping roof that fits loosely around the outer main tank wall. The space between the roof and the wall is closed by either a wet seal, which is a trough filled with liquid, or a dry seal, which uses a flexible coated fabric. The use of a water seal necessitates manual checking or automatic control of the seal level. Usage during cold weather requires protection against freezing. Fabric seals have to be checked regularly for wear or damage which will result in vapour loss.

### Refrigerated tanks

There are three types of refrigerated storage systems:

- Single containment
- Double containment
- Full containment

The selection of the type of storage system will be considerably influenced by the location, the operational conditions, the adjacent installations, loadings and environmental

considerations. From an external safety point of view, refrigerated storage could be considered for large-scale storage of liquefied gases such as ammonia, chlorine, liquefied petroleum gas, *etc*.

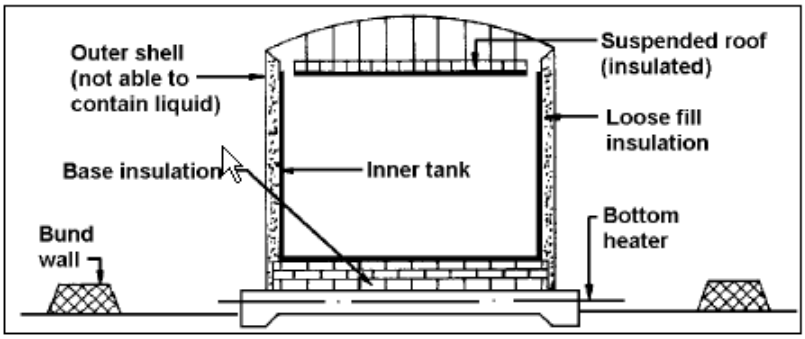


**Figure 3-8: Typical example of a single containment refrigerated tank**

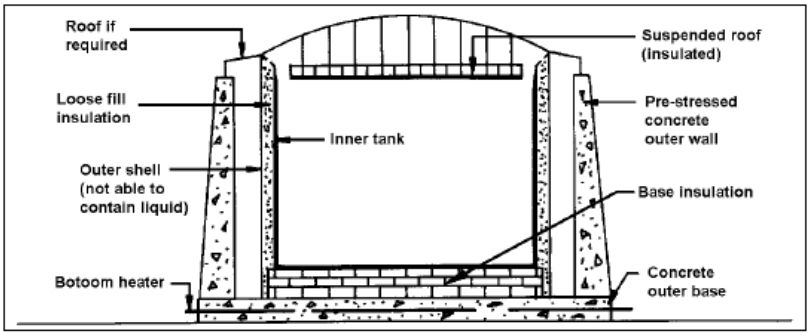


**Figure 3-9: Typical example of a double containment refrigerated tank**

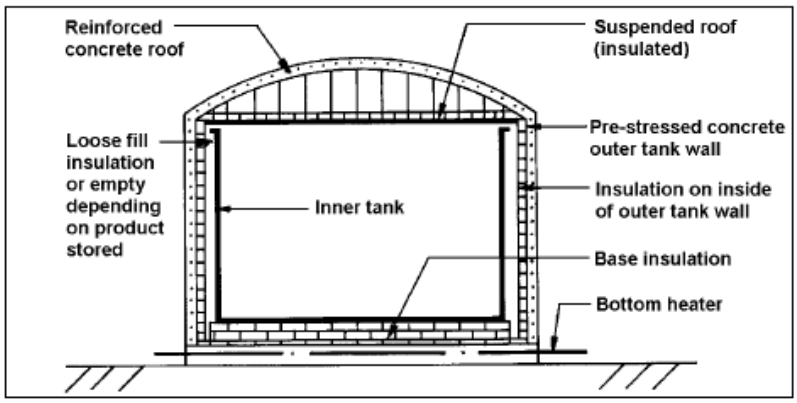


**Figure 3-10: Typical example of a full containment refrigerated tank**

## Underground and mounded tanks

Underground (buried) storage tanks are often used especially for flammable products — like the storage of gasoline, diesel and other fuels and typically have a capacity of less than 50m$^3$. They can be made of steel or fiberglass reinforced polymers. Underground tanks are protected from corrosion on the outside, for *e.g*., with cathodic corrosion protection or by insulation (*e.g*. bitumen). The tanks can be double-walled and equipped

with a leakage detector, but can also be single-walled in combination with containment. The level of emission control equipment is of course dependent on the substance that is stored.

For underground tanks, it is important that the construction proceeds in such a way so as to prevent damage from aboveground activities. When containing combustible substances, the tank is normally completely surrounded by a layer of non-combustible substance that cannot damage the insulating layer, *e.g.* sand.

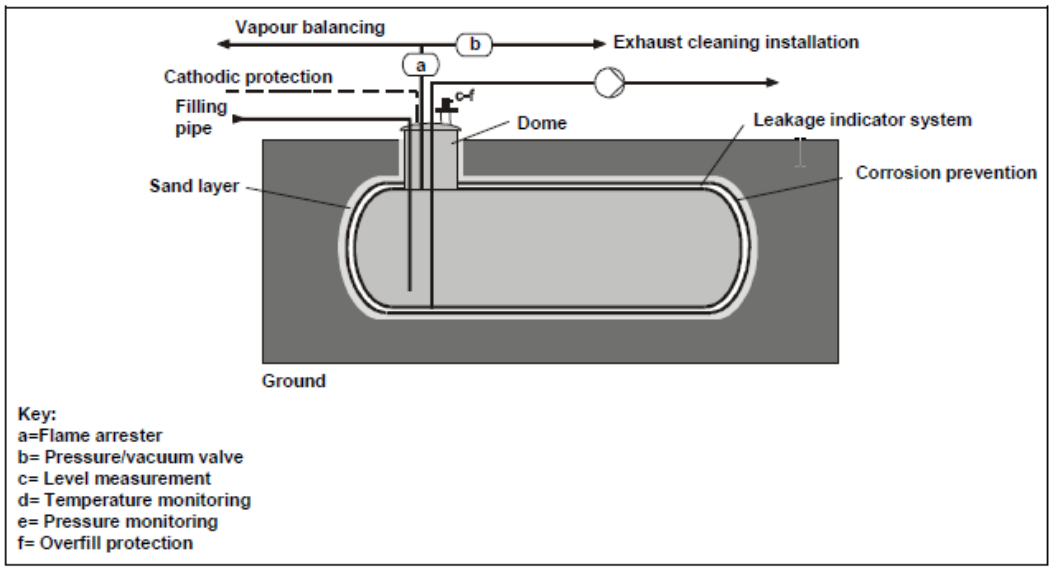


**Figure 3-11: Underground double wall tank with some emission control equipment**

### 3.2.2.1 Handling techniques of liquid and liquefied gas

Considerable handling techniques and related issues are:

i. Gravity flow
ii. Pumps
iii. Compressors
iv. Inert gases
v. Flanges and gaskets
vi. Valves and fittings

#### i) Gravity flow

Gravity flow is only applicable under atmospheric conditions or between pressurized vessels with either common vapour space, or when operating at the saturated vapour pressure of the stored liquid.

### ii) Pumps

Pumps are used to displace all types of products under atmospheric, pressurised or refrigerated conditions. Two types of pumps are generally used: positive displacement pumps or centrifugal pumps.

For handling oil products, centrifugal pumps are commonly applied, although in special situations displacement pumps may be used. Centrifugal pumps with magnetic transmission are commonly applied for handling chlorinated solvents.

### iii) Compressors

Compressors have many similar features to pumps and are used to displace gases or refrigerated products. Two types of rotodynamic compressor are there. The first grouping has lower velocity, positive displacement designs, operating typically at 50/60 cycle synchronous speeds. They are used with many different types of gases, but are commonly used in smaller refrigeration cycle services. The same technology is applied on some process gases.

The shaft bearing assemblies are at either end of the shaft and mounted inboard of the seal assembly. Equipment leakage losses occur mainly where the rotating shaft penetrates

### iv) Inert gases

Inert gases may be used to displace a product, either because of quality or safety issues. This system is generally used only for small product volumes.

### v) Flanges and gaskets

A gasket is used to create and retain a static seal between two stationary flanges, which may connect a series of mechanical assemblies in an operating plant, including the storage area. These static seals aim to provide a complete physical barrier against the fluid contained within, and so block any potential leakage path. To achieve this, the gasket must be able to flow into (and fill) any irregularities in the mating surfaces being sealed, while at the same time be sufficiently resilient to resist extrusion and creep under operating conditions.

### vi) Valves and fittings

Leaking losses are generally higher from dynamic equipment (compared to static equipment) and from older equipment. Valves are considered to account for approximately 50 – 60 % of fugitive emissions in the chemical and petrochemical industries. Furthermore, the major proportion of fugitive emissions comes from only a small fraction of sources (*e.g.* less than 1 % of valves in gas/vapour service can account for more than 70 % of the fugitive emissions in a refinery).

## 3.2.3 Types of solid storage tanks

The different modes of storing solids are:

- Open storage section
- Sacks and bulk bags section
- Silos and bunkers section
- Packaged dangerous solids

### i) Open storage

Open storage can be used for short-term or long-term storage and, in general, the heaps are longitudinal or ring-shaped. Depending on the requirements (*e.g.* if different materials have to be stocked in one place), storage can be up against one or several walls. For instance, fertiliser is stockpiled against three walls, also called an open bay, or in dedicated sheds.

### ii) Sacks and bulk bags

Storage in sacks and bulk bags has no relevance to dust emissions. However, empty bulk bags and sacks that cannot be reused are waste. It is used especially for quality reasons and in cases where very dusty goods are handled. In most cases, the opening of sacks and bulk bags containing dusty materials is carried out in specialised installations with suitable suction installations within the production sheds. The type of bags used, their size and construction, will depend on the frequency and method of handling climatic conditions and market requirements. For fertilisers polythene bags are often used because these are resistant to water and oil.

### iii) Silos and bunkers

In some industrial branches silos are also called bunkers. Silos are normally used for the storage of dry and/or fine materials such as cement and grain. Bunkers are normally used for the storage of material composed of larger particles. The top of bunkers and silos can be opened or closed. The open ones are relevant for emissions by wind erosion: emissions from closed ones only appear during loading and unloading.

Silos can be made of concrete, metal or plastic. The capacity of concrete silos can range up to tens of thousands of tonnes, the metal and plastic silos are of a more moderate size. Depending on the product (*e.g.* clinker or cement), silos are equipped with a fabric filter, sometimes with fabric sleeves that can withstand temperatures of up to 150 – 160 °C. For *e.g.,* fertiliser is stored in closed plastic silos or in open bunkers.

### iv) Packaged dangerous solids

In practice packaged solids and liquids are often stored together in warehouses.

## 3.2.3.1 Handling of solids

The different techniques for the transfer and handling of solids are:

### Construction and reclaiming of heaps

There are several techniques to construct and reclaim a heap. These are given below;

- Cone-shell
- Strata
- Chevron
- Windrow

- Chevcon

### Grabs

Grabs are technical installations with two or more controlled shells which penetrate the bulk material in an open condition, pick up the material by closing and discharge it by opening. In general, the capacity of grabs – dependent on the type of grab, its weight and size – is limited to 2000 to 2500 t/h. Grabs are normally used to pick up the material from a place and for further transport belt conveyors are used.

### Discharge hoppers

Discharge hoppers are devices which take the discharged product (from grabs or from belts) and deliver it in a jet onto the load area of a vehicle (truck or wagon), onto another conveyor system or into the storage system. Discharge hoppers are often fitted with gratings or lamellae in order to ensure an even flow of material and to prevent larger pieces of material blocking the flow; the lamellae require the bulk material to be fairly fluid. Feeders are used for delivery to the next conveying device. Hoppers can be equipped with a height adjustable fill tube and with a dust apron when they are used, *e.g.* for loading vehicles.

### Tubs

Tubs are used to load as well as to transport. Tubs are transportable vessels with at least one gate. They cannot pick up the material but are normally filled from the top. In order to empty the tubs a bottom plate is swung aside (bottom emptying tub), the tub is tilted (tilting tub) or gates are opened (a gate tub similar to the grab).

### Suction air conveyors

Suction air conveyors may be installed as mobile or stationary installations. Mobile systems are suitable if different port activities take place at the same point or if the installation is only needed from time to time. Stationary installations are growing in number because the transport of goods is steadily increasing together with the number of suitable specialised terminal.

### Mobile loading devices

Mobile loading devices are excavators and front loaders. They are used:

- to work on small heaps
- to load vehicles
- to bring the material to bins or boxes
- to feed hoppers
- to trim the material in ships.

### Wagon and truck emptying

Wagons and trucks are used to transport grain, fertiliser, coal, sand or ores. The emptying of wagons/trucks is either carried out *via* lateral discharge openings or at the bottom of the wagon/truck. With lateral emptying, the material is led *via* special gutters to the next handling device or directly onto belts/bands.

### Dump pits

Dump pits are ground excavations covered with a grid into which the material is tipped at high velocity. Dump pits are normally used to unload tipper wagons (*e.g.* with grain). Dump pits can be equipped with so-called dust barriers. These lamellae open when the material is fed in. The dust that comes up is held back either by the following material or, when the mass flow stops, by the closing dust barriers. Dump pits can also be equipped with a suction system. Apart from dust barriers or a suction system, the reception area can be housed. Another possibility is the housing of the vehicle and pit area by a movable curtain system.

### Fill pipes

Fill pipes are available as a rigid pipe or as a vertical and/or horizontal movable pipe. The mobility is achieved by lifting devices with ropes, telescopic booms and kick-in/kick-out installations. With a movable fill pipe the fall height can be (automatically) regulated and loading heads can be installed at the end of the pipe to regulate the output volume. A movable fill pipe can also be composed of an upper pipe and a lower pipe; they are joined with a seal and the lower one is telescoped by sliding pieces or pulleys. In very long pipes, baffles are installed to reduce the fall velocity.

### Fill tubes

Fill tubes (also called loading tubes) can be used for closed and open loading. For open loading of bulk materials onto open trucks, ships or heaps, covers or aprons are fixed at the end of the tube to minimize the spreading of dust. For closed loading in silo trucks or containers, a cone with a fill alarm is fixed at the end of the tube so that dust cannot be emitted. The tube is composed of an inner and an outer tube and is made of plastic or of a tough woven plastic textile.

### Cascade tubes

Cascade tubes are used to load containers, silos, trucks, wagons and ships, and for transfer between conveyor belts. Suitable bulk materials are: powdered to coarse flowing bulk materials, *e.g.* potash, phosphate, grain, coal, coke, heavy sodium, aluminium oxide, cement, sodium phosphate, maize and animal feed. The technique has a relatively simple construction and only needs simple maintenance and cleaning.

### Chutes

Chutes are bulk material conveyors where the material slides downwards in an open or closed sloping groove. Chutes are used as loading tools or as transfer devices between two conveyors. There are rigid and movable chutes. Movable chutes can be vertical and horizontal slewable or drivable either backwards and forward or diagonally.

### Thrower belts

Thrower belts are short rubber belt conveyors which reach very high conveyor velocities of 10 to 20 m/s. They are used as the last part of a loading chain if, for local reasons, the conveyor or loading system cannot be installed near enough to the discharge point.

### Belt conveyors

Belt conveyors are the most used and the best-known continuous conveyor systems. On belt conveyors the conveyed material is transported on an endless belt on support pulleys, slide strips or on an air film, made of rubber or plastic

### Bucket elevators

Bucket elevators are conveyors where the buckets that pick up the material are fixed to a drive mechanism such as a chain or a conveyor belt. The shape and material of the buckets depend on the material that is to be conveyed. Bucket elevators are used for vertical transport, as they can lift to great heights, but are also used as continuous ship unloaders to convey the material horizontally and vertically in one device. In these cases, the conveyor foot is L-shaped. The advantage of the L-shaped foot is that the bulk material can be picked up fairly close to floor level and out of the corners of the ship's hold, which reduces the need for trimming. The flexible conveyor shoe can be adapted by hydraulic systems to the geometry of the hold, enabling optimum filling of the buckets

### Trough chain conveyors

Trough chain conveyors are typically used in bunkers and silos for loading and unloading powdered and moderately lumpy materials that have no caking-on properties. Because the trough chain conveyor is a closed system, it is used especially for grain, oil seeds, food and feed, coal, cement, chemical products and minerals.

### Scraper conveyors

A scraper conveyor is similar to a trough chain conveyor, but without a trough. The conveying is carried out by collectors attached to chains. The collectors push the material. The pick-up and discharge of the material can be made at any chosen point on the conveyor.

### Screw conveyors

Screw conveyors are bulk material conveyors in which the material is driven along a stationary trough or pipe by a rotary conveyor worm, whether horizontal or sloping. Vertical movement is also possible, but requires a totally different construction of the conveyor. With horizontal movement, the material is pushed forward along the bottom of the trough; with vertical movement, the material runs with the worm around the pipe.

### Pressure air conveyors

Pressure air conveyors are suitable for fine particle crystalline bulk materials like cement, lime or gypsum and are applied, *e.g.* for unloading silo trucks.

### Feeders

The feed and discharge points are the most significant for the formation of dust from continuous conveyor systems. Some typical feeders are:

- Belt feeders
- Roll feeders
- Screw feeders

- Rotating wheel disclaimers
- Rotating feeders

## 3.2.4 Possible sources of emissions during storage and handling

### Liquid and liquefied gas storage & handling process

Possible emissions to air from 'operational sources' while handling the liquid and liquefied gas storage and handling are:

- Filling
- Cleaning
- Pigging
- Purging
- Sampling
- (Dis)connecting
- Opening
- Pressure relief
- Fugitive
- Emptying/draining

**Table 3-1: Types of Storages and the Operational Causes for Emissions to Air and Water**

| S. No. | Type of Storage | Operational Sources that cause Possible Emissions to Air | Operational Sources that cause Possible Emissions to Water |
|---|---|---|---|
| 1 | Open top storage tanks | filling, standing, emptying, cleaning, blanketing, manual gauging, sampling, fugitive, draining and draining, cleaning, | draining, cleaning, sampling |
| 2 | Internal / external floating roof tanks (EFRT) | filling (until roof floats on liquid), standing, emptying (shell film), emptying (roof landing), blanketing, cleaning, manual gauging, sampling, fugitive, fugitive | draining, roof draining, cleaning, sampling |
| 3 | Fixed roof tanks (FRT) - (Vertical) | filling, breathing, emptying, cleaning, blanketing, manual gauging, sampling, fugitive, draining | draining, cleaning, sampling |
| 4 | Above ground horizontal storage tanks (atmospheric) | | |
| 5 | Horizontal storage tanks (pressurised) | | |
| 6 | Vertical storage tanks (pressurised) | | |
| 7 | Spheres (pressurised) | | |
| 8 | Mounded storage (pressurised) | | |

| S. No. | Type of Storage | Operational Sources that cause Possible Emissions to Air | Operational Sources that cause Possible Emissions to Water |
|---|---|---|---|
| 9 | Variable vapour space tanks | | |
| 10 | Refrigerated storage tanks | | |
| 11 | Underground horizontal storage tanks | | |
| Apart from operational losses, infrequent emissions also occur from incidents and (major) accidents such as overfill and leakages. | | | |

### General emission sources from handling of solids

Transfer and handling comprises three types of operations, the dust relevance of which is determined by the material itself and the techniques used. The techniques of material pick-up and discharge can be classified as continuous and batch processes.

## 3.3 Emission Control Measures

### 3.3.1 General emission control measures

#### A) Tank design

A proper design must take many factors into account including:

- Physico-chemical properties of the substance being stored
- Operation of the storage
- Level of instrumentation is needed
- Number of operators required
- Workload of the operators
- Process of informing the operators about the deviations from normal process conditions (alarms)
- Methods of protecting the storage against deviations from normal process conditions (safety instructions, interlock systems, pressure relief devices, leak detection and containment, *etc*.)
- Type of equipment to be installed, largely taking account of past experience of the product (construction materials, quality of valves, types of pumps, *etc*.)
- Type of maintenance and inspection plan to be implemented; methods/ways to ease the maintenance and inspection work (access, layout, *etc*.)
- Available options to deal with emergency situations (distance to other tanks, facilities and to the boundary, fire protection, access for emergency services such as the fire brigade, *etc*.).

#### B) Inspection, maintenance and monitoring

The different approaches to perform inspection work are:

- Official surveillance
- Surveillance by experts

- Internal company control (control by the operator)

## 3.3.2 Emission control measures for liquid and liquefied storages

### 3.3.2.1 Gaseous emission control measures

#### (i) Tanks

The principle of 'minimisation of emissions in tank storage' is, within a certain time frame all emissions from the tank storage, transfer and handling will be abated before they are emitted. This includes the following emissions arising from normal operational activities and from incidents:

- emissions to air
- emissions to soil
- emissions to water
- energy consumption
- waste

**Floating covers**

Floating covers are applied to open top tanks, basins and lagoons to prevent vapours and particularly odours being emitted to the atmosphere. The types of covers normally fitted into vertical fixed roof tanks. For open top tanks, different types of floating covers are available, such as:

- light gravel
- straw
- peat
- rapeseed oil
- plastic pellets
- blankets and foil.

**Flexible covers or tent covers**

Open top tanks can be covered with flexible covers or tent covers which have a central supporting pole with spokes radiating from the top. A fabric membrane is spread over the spokes and is tied to a rim-bracing. This is a circular pipe that is located on the outside around the circumference just below the top of the store. By evenly spaced vertical straps between rim-bracing and the tent-rim, the cover is tightened over the store. Pole and spokes are designed to withstand wind. Vents are applied to release gases that build up under the cover and the cover is further applied with an opening for an inlet pipe and a hatch that can be opened for inspecting the store's contents.

**Fixed/rigid covers**

Rigid covers are tight concrete covers or fibre glass panels with a flat deck or conical shape. They fully cover the product surface, to prevent rain from entering. If the cover is made of lighter material, the span can be larger than for concrete covers exceeding 25 m and can have a central support. The use of rigid covers permits emissions to be collected and treated.

### Domes

Retrofitting an EFRT with a fixed or domed roof will reduce the emissions to air. The typical aluminum (geodesic) dome roof structures, introduced in the mid 1970s as weather covers over water treatment facilities, are now also used for some storage tanks in the petrochemical industry. Dome roofs are advantageous in the prevention of rainwater accumulation. The elimination of wind on top of the floating roof is another important feature.

### Tank colour

The tank colour influences the amount of thermal or light radiation absorbed by aboveground tanks and, therefore, the temperature of the liquid and vapour contents inside. This measure is applicable for all types of aboveground tanks. The impact of the tank colour is limited if the tank is already fitted with a floating roof. For storage tanks in a ship (floating storage) painting the ship deck, which is the tank top, in a light colour also reduces the amount of absorption of thermal or light radiation.

### Solar shields

A rather new development is the application of sunscreens or sunshields around vertical storage tanks. This technique has been used on horizontal liquefied gas tanks. This approach focuses mainly on the idea that one will reduce/prevent an increase in temperature of the vapour/product within the tank and this in turn will lead to the potential for lower emissions. The shields are positioned to minimise the solar impact onto the roof and shell of the tank. There is some space left between the shield and tank.

### Natural tank cooling

To run a storage tank with low liquid temperatures is an important measure of emission prevention, especially when storing mixtures of hydrocarbon liquids with high portions of lightweight molecules, such as gasoline, naphtha or crude oil. In order to keep the storage temperature under a certain limit, also during summer conditions, it is an advantage to use all natural possibilities for cooling the tank. Floating roof tanks do have the best chance of keeping the liquid temperature at a low level, as there is no heated-up air volume between a tank roof and the stored liquid. Furthermore, it is beneficial to keep a certain quantity of rainwater on top of the floating roof during the summer period. Evapouration of this water will result in lower storage temperatures and lower emissions.

## (ii) Roof seals for external and internal floating roofs

### Rim seals

The rim seal system is designed to fill the gap between the outer pontoon of the floating roof and the tank shell (rim space) and, therefore, minimise emissions to air. All EFRs, as part of their construction have such a seal to prevent vapour egress to the atmosphere and this is called the primary seal. To reduce emissions even further, a secondary seal can be mounted above the primary seal. New seal designs are available with integrated primary and secondary seals. Here, the working elements of independent primary and secondary seals are integrated into one construction, with one or two sealing curtains connected to the floating roof.

### Still wells and guide poles

Emissions can occur through fittings on both floating and fixed roof tanks where there are pathways for vapours to escape. Such fittings are slotted still wells and roof legs on EFRTs. The emission controls for these fittings are

- Slotted still wells
- Roof support legs

### Internal floating roof tank (IFRT)

An IFRT has both a permanent fixed roof and a floating roof (or deck) inside. The deck in an IFRT rises and falls with the liquid level and either floats directly on the liquid surface (contact deck) or rests on pontoons several centimetres above the liquid surface (non-contact deck). Contact floating roofs can be:

- aluminum sandwich panels that are bolted together, with a honeycomb aluminum core
- pan steel decks with or without pontoons
- Resin-coated, fiberglass reinforced polyester (FRP), buoyant panels.

### Pressure and vacuum relief valves (PVRV)

The valves, installed as a safety device to fixed roof tanks, prevent either overpressure or the pulling of a vacuum, also provide a useful function in limiting vapour emissions to atmosphere. They are useful in limiting filling losses and, particularly, breathing losses. When a blanketing gas is used, it has to be ensured that the pressure inside the tank does not counter the settings of the PVRV.

### Closed drain systems

For atmospheric vessels, drains can be routed to a recovery vessel from which the material is usually recovered and recycled, otherwise treated as a waste. For pressurized storage, drains can be routed through a local pressure vessel to a compressor system for reliquifying (*e.g*. ammonia storage) or to a vapour treatment (usually thermal oxidation).

### Vapour balancing

Vapour balancing consists of collecting vapours which are displaced during a liquid transfer from the 'receiving tank' and returning them to the tank from which the product is delivered, *i.e.,* the 'delivery tank'. Such balancing systems require the receiving and delivery tanks to be of the fixed roof type to permit vapour collection and transfer.

The objective of the balancing system is to reduce emissions to the atmosphere from liquid displacement operations by transferring the vapours from the receiving tank to the delivery tank. The volume of product removed from the delivery tank is replaced by vapours instead of by air drawn into the tank through the vents from the atmosphere. Evapouration is thus reduced, depending on the level of saturation of the returned vapours. The maximum achievable efficiency is thus limited to approximately 80% for such applications, depending on the number of tank turnovers, *etc*.

The balancing principle requires vapour tight pipework between the vapour spaces of the receiving and delivery tanks. The connection pipe for gas balancing is not shut during filling to prevent undue overpressure in the tank. The system is designed in such a way that at maximum vapour flow rate (*i.e.* at maximum liquid fill and breathing rates) the increase in pressure in the delivery tank does not result in an emission from the tank pressure relief valves. The vapour balancing system must be safeguarded against the hazards of handling potentially explosive air/hydrocarbon mixtures, mixing of incompatible components, and excessive differential pressures between the receiving and delivery tanks.

### Vapour holders – flexible diaphragm tanks

Vapour holders or holding tanks (VHTs) are used in a tank vapour balanced system to store the vapours produced by storage tank 'out-breathing' due to a rise in the temperature of the tank vapour space. These vapours are then released back to the storage tank when the temperature reduces again. Majority of VHTs are aboveground vertical tanks. It is also possible to retrofit spherical tanks or horizontal tanks, either above or below the ground, for vapour holding duty. In a VHT, a flexible diaphragm is installed, fixed at its periphery around the tank shell at the mid-height of the tank. The diaphragm is weighed to provide stability as it moves within the tank shell.

The diaphragm material should be sufficiently conductive to prevent generation of static electricity as the material rubs against the tank shell. Normally it has a permeation rate as low as is cost-effective for the installation. An aboveground vertical tank, used as a VHT is normally constructed to API 650 or equivalent, for vapour – and not liquid –with a weak seam between roof and shell. A VHT should be treated as a normal storage tank when considering safety distances to other tanks and other potential sources of ignition. A VHT does not need to be located in a bund as it does not contain any liquid.

Roof vents are provided in accordance with recognised standards *e.g.* API 2000, (see International Codes) assuming the vapour flow is equivalent to the liquid product flow into a normal tank. Roof access should be provided to permit manual inspection and maintenance. A pressure/vacuum valve (P/V valve) should be installed, connected to the vapour space beneath the diaphragm to prevent overpressure when the tank is full. The pressure valve venting capacity must cope with the maximum design vapour flow rate into the tank plus thermal expansion.

### Vapour treatment

The costs for conventional condensation and absorption systems are given in table.

**Table 3-2: Costs for Conventional Condensation and Absorption Systems**

| Recovery operation and processes for VOCs | Range of VOC stream concentration considered applicable by volume | Range of VOC stream concentration considered applicable by mass | Range of VOC stream flow considered applicable by $Nm^3/h$ | Investment Cost EUR/$m^3/h$ |
|---|---|---|---|---|
| Selective Membrane Separation | Up to 90% | Up to 2700 g/$m^3$ 1) | Dependent on membrane area, but up to 3000 reported | 300 (for 200 $m^3/h$ system) |

| | | | | |
|---|---|---|---|---|
| Conventional Condensation | More of less saturated | ± 1200 g/m3 | 100 to 100000 | 5 |
| Cryogenic Condensation | Not given | Not given | Up to 5000 | 500 |
| Adsorption | Up to 25% Lower explosive limit (LEL) | Up to 2700 g/m$^3$ 1) | 100 to 100000 | 240 (including regeneration system) |
| Adsorption (Scrubbing) | Not given | Not given | 50 to 500000 | 7 to 37 for packed bed (highest cost system) |
| Straight Thermal Oxidation | Up to 25% Lower explosive limit (LEL) | Up to 2700 g/m$^3$ 1) | 900 to 86000 | 3-65 |
| Flare | 0 to100 % LEL with safety engineering | Up to 2700 g/m$^3$ 1) | Up to 1800000 | 9 to 625 for elevated flare |
| Note: Data in italics is derived from the figures in the CWW BREF using a value for gasoline vapour density of 3 kg/m$^3$ | | | | |

*Source: Integrated Pollution Prevention and Control Reference Document on Best Available Techniques on Emissions from Storage July 2006.*

Description: End-of-line vapour treatment systems require the vapours to be collected and are fed to a thermal oxidiser or vapour recovery unit (VRU) *via* pipework. Vapour treatment is only applicable where emissions can be collected and routed to the treatment system, *e.g.* from fixed roof tank vents. This pipework requires the same consideration as for vapour balancing systems. Vapour treatment is also applicable to floating storage.

If the tank on the ship is connected to a shore-side vapour treatment system, the vapour pipework must incorporate flexible sections to take account of wave and tidal motion. Technologies for the abatement of VOC emissions to atmosphere from storage operations are:

- oxidation of the vented vapours in process heaters, specially designed incinerators, gas engines or flares
- hydrocarbon recovery of the vented vapour in VRU utilizing technologies such as adsorption, absorption, membrane separation and condensation.

With application of vapour recovery, the hydrocarbons in the air/hydrocarbon vapour mixture displaced during loading operations are recovered for subsequent reuse. The technologies of vapour recovery involve two processes:

- separation of the hydrocarbons from air
- liquefaction of the separated hydrocarbon vapours

The separation processes that may be used to separate hydrocarbon vapours from the air are:

- pressure swing adsorption on activated carbon
- absorption by washing in a low volatility absorbent fluid
- selective membrane separation
- condensation by cooling or compression (this is a special case because separation and liquefaction are combined in a single process).

The liquefaction processes applicable for separated hydrocarbon vapours are:

- reabsorption, normally into their own product
- condensation on a cold surface
- compression

The following are the most commonly used VRU systems:

- adsorption in twin bed pressure swing operation
- cold liquid absorption in a lean oil stream
- indirect liquid condensing in a refrigerant heat exchanger
- membrane separation by passage through a hydrocarbon selective surface

The technologies used for vapour treatment are:

- Thermal oxidation
- Adsorption
- Absorption (washing)
- Condensation
- Membrane separation

### (iii) For aboveground closed piping

The emission control measures that may be considered are:

- Reduction in number of flanges and connectors
- Selection and maintenance of gaskets
- Improved flanges
- Vapour collection

### (iv) For aboveground open piping

The emission control measures that may be considered are:

- Replacement with closed piping systems
- Reduced length

### (v) For the loading and unloading of transporters

Vapours displaced during the loading of road tankers, rail tankers and ships may be freely vented to atmosphere, or as an alternative for products where the vapours have a significant negative environmental effect, may be 'balanced' back to the tank from which the product is being delivered, or treated in a vapour treatment system. Control measures are:

- Vapour balancing for the loading and unloading of transporters
- Vapour treatment for the loading of transporters

### (vi) For product handling systems

The main sources of fugitive emissions in a storage transfer and handling system are valve stems, flanges, connections and open ends, sampling points and pump seals.

ECM for each of these potentials are:

- High quality equipment
- Elimination of open-ended lines and valves
- Bellows valves
- Valves with a diaphragm
- Rotating control valves
- Variable speed pumps
- Double walled valve
- Pressure and thermal relief valves
- Seal-less pumps
- Improved single seals for pumps
- Dual unpressurised seals for pumps
- Dual pressurised seals for pumps
- Seals for compressors
- Improved sampling connections

### (vii) For mined caverns (atmospheric)

#### Vapour balancing

Vapour balancing is used on atmospheric mined cavern sites with a fixed waterbed when storing liquid hydrocarbons. These sites contain number of caverns which are connected to each other. As one cavern is filled, the displaced vapour is transferred to other caverns in order to avoid rapid pressure rise in the cavern being filled. Rigorous stock control planning is required in order to ensure that caverns are always available to receive displaced vapour.

### (viii) For basins and lagoons

#### Floating covers

Floating covers are applied to tanks, basins and lagoons to prevent vapours and particularly odours being emitted to the atmosphere.

#### Plastic or rigid covers

Covers for lagoons are based on flexible impermeable UV-stabilised plastic sheets that are secured at the bank tops and supported on floats. Plastic covers could effectively increase the capacity of a lagoon by a possible 30 % by keeping rainwater out.

## 3.3.2.2 Liquid emission control measures

### (i) Tanks

Liquid emission control measures are divided into two main groups: ECM for potential releases to soil from planned activities and those for unplanned releases. The regular operations having potential for liquid emissions are draining and cleaning like:

- Manual draining
- Semi-automatic tank drain valves

- Fully automatic tank drain valves
- Dedicated systems

### (ii) Basins and lagoons – emissions to soil and water

#### Impervious barriers

Where groundwater pollution is seen to be a risk, the lagoon should be made substantially impermeable. The choice lies between either a clay or a synthetic membrane liner.

If clay is used, it should contain at least 20 – 30 % clay in order to make it sufficiently impermeable.

The clay needs to be compacted to a minimum of one metre thickness and a maximum permeability of $1*10^{-9}$ m/s. Liners need to be applied by a specialist contractor to ensure no damage during installation. Concrete basins are also an option.

### (iii) Floating storage – operational – emissions to water

Cleaning of the tanks is the most important source of emissions to water. Normally residues from tank cleaning are piped ashore and treated in the same manner as those from tanks on shore.

### (iv) Waste emission control measures for tanks

### Tank mixing

Sludge is a loose term for a semi-solid mixture of product, water and solids such as sand, scale and rust particles. Crude sludge can contain all of the above, including wax crystals, in varying quantities.

Sludge deposition in storage tanks occurs by the mechanisms of molecular diffusion, gravity, chemical reactivity and depends on operating conditions. Sludge deposition is not usually even and does not necessarily build at the same rate.

The amount of sludge depends on some or all of the following factors:

- temperature
- product type
- standing time
- mixer capacity
- type of tank bottom
- method of receipt (tanker, pipeline)

Mixing offers the best technology for reducing sludge. Turbulent mixing occurs when fluid particles move past each other at different speeds setting up shear stresses forming eddies. The speed at which this occurs determines the mixing rate.

### Sludge removal

When sludge depth in tanks become unacceptably high and cannot be reduced by mixing technologies, tank cleaning will be necessary. A number of methods have been developed which eliminate the need to open the tank and will re-suspend deposits, and thus minimise losses. Chemical additives, centrifuging or product circulation form the basis for these methods.

Current practice for the removal of sludge build up in crude oil storage tanks involves withdrawal from operational service and after the discharging of stored stock, purging the interior of any hazardous atmosphere. The sludge bottom is then removed manually and disposed off in a safe manner (*e.g.* incineration).

## 3.3.2.3 Emission control measures for solid storage tanks

The approaches and techniques to minimize dust from storage (Table 3-3) are:

- Pre-primary approaches start with the production or extraction process and reduce the material's tendency to make dust before it leaves the production plant.
- Primary approaches are all the ways of reducing emissions during storage and can be divided into:
  - organizational primary approaches: behaviour of the operators
  - constructional primary approaches: constructions which prevent dust formation
  - technical primary approaches: techniques which prevent dust formation
- Secondary approaches are abatement techniques to limit the distribution of dust.

**Table 3-3: Approaches and Techniques to Reduce Dust Emission from Storage**

| | | |
|---|---|---|
| Primary | Organisational | Monitoring |
| | | Layout and operation of storage places (by planning and operating personnel) |
| | | Maintenance (of prevention/reduction techniques) |
| | | Reduction of wind attack areas |
| | Constructional | Large volume silos |
| | | Sheds or roofs |
| | | Domes |
| | | Self-erecting covers |
| | | Silos and hoppers |
| | | Wind protection mounds, fences and/or plantings |
| | Technical | Use of wind protection |
| | | Covering of open storage |
| | | Moistening of open storage |
| Secondary | Water spraying/water curtains and jet spraying | |

| | |
|---|---|
| | Extraction of storage sheds and silos |

*Note: The boundary between primary and secondary approaches is not always clear; e.g. a water curtain limits the spread of dust emissions and is – at the same time – a means of dust binding*

### 3.3.3 Incidental and accidental emission control measures

#### 3.3.3.1 For tanks

##### (i) Safety and risk management

The safety management system gives shape to the major accident prevention policy (MAPP). A safety management system includes:

- a statement of tasks and responsibilities
- an assessment of the risks of major accidents
- a statement of procedures and work instructions
- plans for responding to emergencies
- monitoring of the safety management system
- periodical evaluation of the policy adopted

##### (ii) Fire protection, firefighting equipment, and containment

It may be necessary to provide fire protection measures where the storage conditions are less than ideal, such as where it is difficult to achieve adequate separation distances. Fire protection measures can be provided by:

- fire resistant claddings or coatings
- firewalls (only for smaller tanks)
- water cooling systems

To prevent a tank from collapsing it is important to prevent the overheating of tank supports, *e.g*. by insulating and/or equipping them with water deluge facilities.

#### 3.3.3.2 For underground closed piping

External corrosion – underground piping: It is a commonly applied technique to protect underground piping systems by a combination of external coating and cathodic protection.

#### 3.3.3.3 For basins and lagoons

As basins and lagoons are not used for storing hazardous substances major accidents are not expected. A possible incident or accident is overfilling due to rainfall in situations where the basin or lagoon is not covered. Measures should be taken to prevent overfill due to rainfall.

#### 3.3.3.4 For storing containers

Possible ECM not only includes building and engineering design and installation standards, but also good management practices and operational procedures like;

- Safety and risk management
- Construction and ventilation
- Separation policy
- Segregation and separation policy for incompatible materials
- Containment of leakage and contaminated extinguisher
- Fire protection and firefighting equipment
- Preventing ignition
- Firefighting systems

## 3.4 Safety Management Plan

Safety of plant, personnel and environment in any industry is generally taken care of in following stages

- Conceptual stage
- Design stage
- Engineering stage
- Construction stage
- Commissioning and operation stage

Safety is incorporated by way of

- Proper site selection
- Safe, maintainable and operable plant layout
- Input of National and International Codes and Safe Engineering practices during plant design and engineering
- HAZOP and Risk Analysis input during the engineering stage
- Proper implementation of safety and firefighting requirements during construction
- Preparation and application of safe operating procedures for the start-up and operation of the plant
- Regular monitoring of the safety status by Audits, HAZOP studies for modifications and risk analysis

A typical checklist to ensure for compliance to the safety requirements of isolated storages is given in Table 3-4. Based on the attributes listed in check list safety management plan may be prepared.

**Table 3-4: Criteria-specific Typical Checklist for Isolated storages**

| S. No. | Criteria | Checklist Points |
|---|---|---|
| 1. | **Process** | |
| | **a) Type Of Chemical** | ▪ Definition of materials handled i.e. Hazardous or non-hazardous<br>▪ Hazardous property<br>▪ Health hazard<br>▪ Fire hazard<br>▪ Chemical reactivity<br>▪ Hazard ratings (NFPA or NAS)<br>▪ Pollution hazard |
| | **b) Quantity Of Chemical Stored** | ▪ Amount of materials stored (as against threshold limits)<br>▪ Inventory in the plant<br>▪ Intermediate Storages |
| | **c) Variety Of** | ▪ Number of hazardous chemicals handled |

| S. No. | Criteria | Checklist Points |
|---|---|---|
| | **Chemicals** | ▪ Relative quantities |
| | **d) Process Severity** | ▪ Operating pressure<br>▪ Operating temperature<br>▪ Storage pressure<br>▪ Storage temperature<br>▪ Process reactivity<br>▪ Runaway reaction potential<br>▪ Corrosion products |
| **2.** | **Plant** | |
| | **a) Plant Design Parameters** | ▪ Proven design<br>▪ Proven equipment<br>▪ Metallurgy<br>▪ Quality of engineering<br>▪ Design documents<br>▪ Piping layout<br>▪ Fire protection<br>▪ Design to cover natural extremes |
| | **b) Monitoring and Controls** | ▪ Measurement instruments<br>▪ Control instruments<br>▪ Detection instruments<br>▪ Alarm instruments<br>▪ Trips instruments<br>▪ Redundancy<br>▪ Reliability<br>▪ Emergency power |
| | **c) Relief Systems** | ▪ Normal relief<br>▪ Emergency relief<br>▪ Containment<br>▪ Venting<br>▪ Vacuum breaks<br>▪ Fire arrestors |
| | **d) Age** | ▪ Date of commissioning and relative age of plant<br>▪ Obsolence of process & equipment.<br>▪ Physical condition |
| | **e) Plant Layout** | Maintainability<br>▪ Obsolence of process & equipment<br>▪ Operational convenience<br>▪ Confinement of released material |
| | | Containment of released material<br>▪ Escalation of emergency<br>▪ Inter distances of storage<br>▪ Inter distance of storage w.r.t process, administration, public road & buildings |
| **3.** | **Operation** | |
| | **a) Procedures/ Manuals/ Documentation** | ▪ Availability of standard operating<br>▪ procedures/manual<br>▪ Updating system of such documents |
| | **b) Personnel** | ▪ Manning philosophy/adequacy<br>▪ Training in operation/safety |

| S. No. | Criteria | Checklist Points |
|---|---|---|
| | | ▪ Knowledge/skill/attitude to safety<br>▪ Experience |
| | **c) Maintenance** | ▪ Breakdown or Preventive maintenance<br>▪ Record upkeep<br>▪ Instrumentation maintenance<br>▪ Work permit system/handling over, taking over procedures/hot work permits |
| | **d) House Keeping** | ▪ Waste/scrap disposal<br>▪ General attitude<br>▪ Upkeep of panels, instruments, spares, tools *etc*. |
| **4.** | **Emergency Plans** | |
| | **a) Procedures** | ▪ Availability and quality of Safety Procedures |
| | **b) Training** | ▪ Training in Safety Procedurs<br>▪ Training to handle emergency<br>▪ Training in fire fighting<br>▪ Attitude towards safety<br>▪ Skill.knowledge/to use emergency repair kits<br>▪ Upkeep of repair kits |
| | **c) DMPs** | ▪ Availability & Quality of ONSITE plans<br>▪ Preparedness for handling natural disaster like Earth Quake, Lightning strikes, flood etc. (Proper thought out procedures to be evolved and written down as a part of ONSITE plans to handle such unexpected natural disasters. Modes of obtaining outside help, internal organization to deal with such emergencies, anticipation of consequences and methods to mitigate them and safe shut down of the plant are to be thought out in detail and procedures to be laid down)<br>▪ Preparedness to handle / prevent sabotage/ terrorist activities (Adequate & efficient security system, regular checking of personnel like Frisking, checking of vehicles, checking of entry permits , regular inspections of all areas within the plant, proper communication, well thought out procedure to handle & obtain outside help from police , fire stations, bomb disposal squads *etc.,* & regular training & vigilance). |
| | **d) Personnel Protection Equipment** | ▪ Availability of gas mask, breathing<br>▪ Appartments, fire proof suit, helmets,<br>▪ gloves, safety shoes, safety showers, eye wash<br>▪ Upkeep of P.P.E and their proximity to<br>▪ hazard chemical handling areas<br>▪ Training, knowledge & skill to use these<br>▪ apparatus |
| | **e) Fire Fighting / Toxic Release Handling** | Fire water storage tanks and adequacy of quantity (capacity)<br>▪ Fire water loop and pressure<br>▪ Fire water Pumps (Motor & Diesel) and<br>▪ and Jockey Pumps<br>▪ Number and adequacy of fire hydrants, monitors<br>▪ Fire stations & Fire Tender<br>▪ Foam Tenders |

| S. No. | Criteria | Checklist Points |
|---|---|---|
| | | ▪ Fire Staff & Organisation<br>▪ Fire Extinguishers<br>▪ Deluge/water spray system<br>▪ Dikes and Drains<br>▪ Fire Proofing requirement<br>▪ Inter distances of storage tanks<br>▪ Fire Alarms<br>▪ Mutual Aid programmes<br>▪ Any other emergency handling systems for Toxic release like Neutralisation pits, scrubbers etc. Availability, Maintenance & Proximity & Training |
| | **f) Medical Aids** | ▪ First aid booth<br>▪ Local dispensary<br>▪ Availability of company doctor<br>▪ Antidotes availability at site<br>▪ Knowledge of first-aid application (Trained nurses or operating staff)<br>▪ Nearby hospitals<br>▪ Availability of beds during emergency<br>▪ Panel of doctors |
| | **g) Environment Protection** | ▪ Solid/liquid/gaseous waste disposal system<br>▪ Oily water sewer and oil removal<br>▪ Storm water sewer & discharge<br>▪ Maintenance of these systems<br>▪ Greenbelt |
| | **h) Safety Controls** | ▪ Safety committees & reviews<br>▪ Safety staff & organisation<br>▪ Safety policy & implementation<br>▪ Safety studies like Safety audits (internal), safety audits (external), HAZOP study, risk analysis study<br>▪ Accident records and dissemination of lessons |
| | **i) Communication** | ▪ Telephones, mobile phones, intercom<br>▪ Public address system<br>▪ Wind socks<br>▪ Pamphlets to public<br>▪ Education of public, doctors & hospital, fire stations |

## 3.5 Disaster Management Plan

### 3.5.1 Objectives

Objectives of the DMP are:

- Tackle emergencies instantly and effectively
- Have a proper plan and procedure to execute the plan systematically
- Mitigate the effect of accidents to minimum
- Minimise the damage to the reputation of the company by executing the plan smoothly and reduce the impact on the public to the minimum

### 3.5.2 Approach of managing disasters/emergencies

In spite of all the safety considerations there could be instances of emergencies, which can affect not only the plant and the operators but also the public outside. These incidents or accidents have very low frequencies of occurrence but the damage effect could be large and can extend beyond the battery limits of the plants. It may not be possible or feasible financially to engineer the plants and make them 100% safe. In case of such emergencies the only course of action is to take steps to mitigate the effects of such disasters as practicable as possible.

A comprehensive approach of managing such disasters/emergencies is prevention, preparedness, response, recovery.

- Prevention includes:
  - Improving the safety awareness and house keeping
  - Sound fire prevention policy and executing methodology
  - Safety and health reviews like safety audits, HAZOP and risk analysis
  - Implementation of the recommendations and elimination of unsafe practices
- Preparedness includes:
  - Proper planning for emergency
  - Emergency procedures to tackle the identified risks/accident scenarios
  - Establishment of organization structure and involvement of management.
  - Availability of resources like communication facility, transport, medical facilities, *etc*.
  - Contacts and coordination procedures with public, civic authorities, police, fire stations and hospitals
  - Coordination procedures for getting mutual aid from adjacent industries
  - Training programs, mock drills to test and improve the adequacy of plan provisions and the skill of the staff
- Response includes the assessment of:
  - Firefighting facilities
  - Fire alarm, gas alarm and other warning facilities
  - Emergency exits and facility for immediate isolation, repair, *etc*., to minimise the effects
  - Communication and other requirements to handle the public or evacuate them
- Recovery provides for an effective means of
  - Re-establishing the plant to normal conditions and resume operations/production
  - Conduct objective inquiry to assess the needs for prevention of such accidents
  - Handle public relations and press diplomatically to minimise unwanted publicity and criticism

### 3.5.3 Typical structure of an on-site emergency plan

The following sub-sections briefly indicate the typical structure of an on-site emergency plan report, which can be followed by the plant handling/storing hazardous chemicals.

Apart from the indicated information given below, any other relevant specific information required to handle safety of the plant, personal, property and public shall also be included. All the information may be reviewed and updated annually.

### Aims and Objectives of the Emergency Plan

- Name and address of the occupier
- Objectives of the plant
- Location
- Process description (with PFD and block diagrams)
- Plant description
- Manpower
- Shift details
- Working hours
- Chemicals handled and stored
- Equipment layout (with drawings)

### Key personnel and their functions – organizational chart

- List of key personnel, address, and contact numbers
- Emergency actuation plan (concept)
- Action plan
- Duties and functions of key personnel
- Duties and functions of task force
- Site facilities (communication, fire fighting, security, medical and administration)
- Offsite areas that may be affected (details of colonies, township, villages, population, distances *etc*.)
- Declaration of emergency and notification list (authorities and institutions)

### Mutual aid and external coordination

- Mutual aid plan
- List of mutual aid members and their addresses
- List of other external agencies and their addresses (District administrator, fire services, police, NGOs, railways, Vidyut board, Director of Factories, hospitals, Regional Transport Officer, Pollution Control Board Members, Controller Civil Defense, Station Commander Army)
- Organization structure for onsite and offsite coordination
- Duties and responsibilities

### Hazard assessment

- Identification of possible hazards
- Consequence analysis of failure cases
- Hazard zones in offsite and onsite
- Site specific responses for each failure case to mitigate the consequences
- Emergency action plan in detail for each scenario

### Site and neighbourhood details

- Plant site location (with maps and proximity to neighbourhood and drawings)
- Plant description
- Storage facilities and logistics of import and export

- Emergency control centre (ECC) and its facilities
- List of chemicals stored
- Material safety data sheets (MSDS)

### Safety features

- Safety features of layout
- Safety features of operations
- Hazard prevention features
- Alarms, trips and communication systems (internal and external)
- Security systems
- Housekeeping
- Maintenance systems
- Safety monitoring (safety audits, HAZOP, risk analysis)
- Safety organization
- Safety training and mock drills (type and frequency)
- Fire fighting facilities (fire water storage pumps, foam generation, dispensing, hydrants, monitors, mobile units, sprinkler's deluge, gas detection, fire control panel)

### Details of facilities during emergencies

- Onsite emergency facilities (communication, fire warning, sirens, first aids, medical, transport, and emergency exits)
- Offsite emergency facilities (Notification procedure, communication facilities, public warning system, evacuation procedures, medical help, transport, handling press and accident investigation and reporting)

### Evaluation and updating plan – policies and procedures

- Training and mock drill evaluation reports
- Accident investigation reports
- Presentation and seminars to civic authorities and feedback report
- List of documents to be updated

### Offsite Emergency Plan

The plan addresses the wide range of issues that need to be dealt with, in order to ensure effective chemical safety, i.e., the actions that should be taken by industry (including labour), public authorities, communities and other stakeholders to:

- Minimize the likelihood that an accident will occur (prevention);
- Mitigate the consequences of accidents through emergency planning, land-use planning and risk communication (preparedness/ mitigation); and
- Limit the adverse consequences to health, the environment and property in the event of an accident (response).

It also includes actions that need to be learnt from the experiences of past accidents and other unexpected events (follow-up) in order to reduce future incidents (prevention). It is often difficult to clearly delineate which issues and actions fall within each of these stages, and there is significant overlap among them. Therefore, the entire process is sometimes described as a "Safety Continuum" or "Emergency Management Cycle". OECD has suggested this cycle in its "guiding principles for chemical accident prevention, preparedness and response", 2003. These address the three stages and the roles and responsibilities of different stakeholders in each stage. Responsibility of

identifying and including these areas in the emergency management plan lies with the Directorate of Factories.

The aim of the off-site emergency management plan for District is to analyze the hazards associated with MAH industrial units in the District with a view to identifying comprehensive measures for effective chemical accident prevention, preparedness and response, including reporting and follow-up activities. For purposes of this plan, a chemical accident is defined as any unplanned event involving hazardous substances that causes or is liable to cause, harm to health, the environment or property. Examples include loss of containment of hazardous substances, explosions and fires. These events are generally the result of unintended technological failures and/or human errors (or a combination of these). Dealing with long-term events, such as chronic pollution from hazardous substances is outside the scope of this plan.

### Legal provisions

For preparation of off-site emergency management plans, Rule 14 of MS&IHC Rules, 1989 as amended in 2000, states that:

- It shall be the duty of the concerned authority as identified in Column 2 of Schedule 5 i.e. Chief Inspector of Factories, in consultation with District Collector to prepare and keep up-to-date an adequate off-site emergency management plan detailing how emergencies relating to a possible major accident on that site will be dealt with and in preparing that plan the concerned authority shall consult the occupier and such other persons as it may deem\ necessary.
- For the purpose of enabling the concerned authority to prepare the off-site emergency plan required under sub-rule (1), the occupier shall provide the concerned authority such information relating to the industrial activity under his control as the concerned authority may require, including the nature, extent and likely effects off-site of possible major accidents and the authority shall provide the occupier with any information from the off-site emergency management plan which relates to his duties under rule 13.
- The concerned authority shall prepare its emergency plan required under sub-rule (1):
  - In case of a new industrial activity, before that activity is commenced
  - In case of an existing industrial activity, within six months of coming into operation of these rules

### Concept of off-site emergency plan

Chemical Emergency is usually managed at the State, District and Local levels. However, if it is assessed that the consequences of crisis exceed the capacity of the State Government, and then Ministries at Central level are activated for prompt response by mobilizing support in terms of emergency relief teams, support personnel, specialized equipments and other facilities depending upon the scale of crisis.

An effective emergency plan must strive to achieve the following:

- Identification of hazards
- Risk Analysis and its assessment.
- Reduction of the assessed risk at source
- Ensure the protection of the community.

- Have ready information of the available resources for emergency response in terms of Manpower and material.
- Ensure education and awareness of the community and workers.
- Effective coordination of Govt. responding agencies
- Reduce the environmental impact.

**Parties addressed**

The plan should contain guidelines for the range of individuals, groups or organizations that are involved or interested in, or potentially affected by, chemical accident prevention, preparedness or response (collectively known as stakeholders). The stakeholders involved into emergency preparedness include industries, public authorities, NGOs and communities.

## 3.6 Risk Potential & Quantitative Risk Assessment

A hazard is a danger, peril, source of harm, or an adverse impact on people or property. Risk is an expression of chance, a function of the likelihood of an adverse impact and the magnitude of its consequences.

Environmental risk assessment is the process of evaluating the likelihood of adverse effects in, or transmitted by, the natural environment from hazards that accompany human activities. The effects from hazards may be on human health, economic welfare, quality of life, and VECs. Under QRA the severity, or distribution of the range of magnitude of the adverse effect (damage), is evaluated.

As far as history of QRA is concerned 'technological risks' began to be specifically analysed during World War II in military operations research and thereafter in the nuclear energy and space exploration fields. The concern was mainly with infrequent but catastrophic events. Since then, there has been an increase in the number of severe pipeline leak accidents. At the same time, environmental concerns have also become a central theme in public policy discussions. Pipeline explosions, oil tanker spills, chemical tank car derailments, and petroleum product fires have generated a public demand for prevention and a profound concern for victims and damage to the natural environment. In 1980, the Scientific Committee on Problems of the Environment (SCOPE) of the International Congress of Scientific Unions published the landmark report "Environmental Risk Assessment". The World Bank, after the Bhopal- methyl isocyanate disaster- issued guidelines and a manual to help control major hazard accidents. Another important development is OECD compilation of a report on risk assessment in the OECD countries with sections on the nuclear industry, chemicals, petroleum processing, transportation of hazardous materials, and dam-reservoir projects.

### 3.6.1 Quantitative Risk Analysis (QRA) – methodology

**A) Release scenarios**

**Enumeration**

Effective management of a QRA study requires enumeration and selection of incidents, and a formal means for tracking the incidents and incident outcomes. Enumeration attempts to ensure that no significant incidents are overlooked; selection tries to reduce the incident outcome cases studied to a manageable number; and tracking ensures that no selected incident and incident outcome is lost in the calculation procedure. The starting

point of the analysis is to identify all the incident scenarios (due to "loss of containment" that needs to be addressed). Unfortunately, there are infinite number of ways (incidents) by which loss of containment can occur in either category. For example, leaks of materials can be of any size, from a pinhole leak up to a severed pipeline.

A technique commonly used to generate an incident list is to consider potential leaks and major releases from fractures of all pipeline sections and components. This compilation should include all pipeline sections.

### Selection

The goal of selection is to limit the total number of incident outcome cases to be studied to a manageable size, without introducing bias or losing resolution through overlooking significant incidents or incident outcomes. The purpose of incident selection is to construct an appropriate set of incidents for the study from the initial list that has been generated by the enumeration process.

### B) QRA study

Accidental release of natural gas can result in possible damage. Immediate ignition could lead to jet fires and delayed ignition of flammable vapours could result in flash fires with damage confined to within the cloud dimensions or unconfined vapour cloud explosions with blast overpressures covering significant areas. In contrast, fires generally have localised consequences. Fires can be put out or contained in most cases; there are a few mitigating actions one can take once a flammable gas or a vapour cloud gets released. The most extensive incidents generally arise consequent upon the release of flammable gases or vapour clouds. In this study, the following incident outcome cases were considered as and when applicable:

- Release of gas at high pressures from the pipeline for different leak sizes
- Immediate ignition leading to jet fires
- Delayed ignition leading to flash fires and vapour cloud explosions
- For liquids, pool formation and pool fires and flash fires

The pipeline should be divided into different sections or "nodes" and it is assumed that, in case of a loss of containment situation from a point (major leak *etc*.), the sectionalizing valves shall be closed to divide the line into different sections and thereby limit the inventory.

### C) Consequence calculations

In consequence analysis, a number of calculation models are used to estimate the physical effects of an accidental release and to predict the damage (lethality, injury, material destruction) of the effects. The calculations can roughly be divided in three major groups:

- Determination of the source strength parameters
- Determination of the consequential effects
- Determination of the damage or damage distances

The basic physical effect models consist of the following.

### Source strength parameters

Calculation of the gas outflow rate for the different hole sizes (this outflow rate determines the jet dynamics or the source strength for the flash fire or explosion scenarios).

### Consequential effects

- Dispersion of gaseous material/vapours in the atmosphere as a function of source strength, relative density of the gas/vapour, weather conditions and topographical situation of the surrounding area
- Intensity of heat radiation [in kW/ $m^2$] due to a jet fire or pool fire as a function of the distance to the source
- Concentration of gaseous material in the atmosphere, due to the dispersion of gas for the case of a flash fire
- Energy of vapour cloud explosions [in $N/m^2$], as a function of the distance to the distance of the exploding cloud

### Selection of damage criteria

The damage criteria gives the relation between extent of the physical effects (exposure) and the percentage of people killed or injured due to those effects. The knowledge about these relations depends strongly on the nature of the exposure. In the next two paragraphs, the chosen damage criteria are given and explained for heat radiation and vapour cloud explosion.

### Jet fires/ pool fires- heat radiation

The consequences caused by exposure to heat radiation are a function of:

- radiation energy onto the human body [$kW/m^2$]
- exposure duration [sec]
- protection of the skin tissue (clothed or naked body)

The limits for 1% of the exposed people to be killed due to heat radiation, and for second-degree burns are given in the Table below:

**Table 3-5: Damages to Human Life Due to Heat Radiation**

| Exposure Duration | Radiation energy (1% lethality, kW/m2 | Radiation energy for 2nd degree burns, kW/m2 | Radiation energy for first degree burns, kW/m2 |
|---|---|---|---|
| 10 Sec | 21.2 | 16 | 12.5 |
| 30 Sec | 9.3 | 7.0 | 4.0 |

100% lethality may be assumed for all people suffering from direct contact with flames. For ease of understanding and comparison with understood values, the next chart is self-explanatory.

**Table 3-6: Effects Due to Incident Radiation Intensity**

| Incident Radiation – $kW/m^2$ | Type of Damage |
|---|---|
| 0.7 | Equivalent to Solar Radiation |
| 1.6 | No discomfort for long exposure |
| 4.0 | Sufficient to cause pain within 20 sec. Blistering of skin (first degree burns are likely) |
| 9.5 | Pain threshold reached after 8 sec. second degree burns after 20 sec. |
| 12.5 | Minimum energy required for piloted ignition of wood, melting plastic tubing etc. |

### Unconfined Vapour Cloud Explosions

In case of vapour cloud explosion, two physical effects may occur:

- a flash fire over the whole length of the explosive gas cloud
- a blast wave, with typical peak overpressures circular around ignition source

100% lethality is assumed for all people who are present within the cloud proper for the flash fire scenario. For the blast wave, the lethality criterion is based on:

**Table 3-7: Damage Due to Overpressures**

| Peak Overpressure | Damage Type |
|---|---|
| 0.83 bar | Total Destruction |
| 0.30 bar | Heavy Damage |
| 0.10 bar | Moderate Damage |
| 0.03 bar | Significant Damage |
| 0.01 bar | Minor Damage |

### D) Probabilities

### Population Probabilities

It is necessary to know the population exposure in order to estimate the consequences and the risk resulting from an incident. The exposed population is often defined using a population density.

## 3.6.2 Performing QRA

QRA process involves four questions:

- What can go wrong to cause adverse consequences?
- What is the probability of frequency of occurrence of adverse consequences?
- What are the range and distribution of the severity of adverse consequences?
- What can be done, at what cost, to manage and reduce unacceptable risks and damage?

Typically EIA should answer the first question, and give at least a qualitative expression of the magnitude of the impacts. The major additional consideration in QRA is the frequency of occurrence of adverse events. Risk management is integrated into QRA because it is the attitudes and concerns of decision makers that set the scope and depth of the study. QRA attempts to quantify the risks to human health, economic welfare, and ecosystems from those human activities and natural phenomena that perturb the natural environment. Therefore, the five-step sequence in performing QRA is:

- Hazard identification - sources of adverse impacts
- Hazard accounting - scoping, setting the boundaries of the ERA
- Scenarios of exposure - how the hazard might be encountered
- Risk characterization - likelihood and severity of impact damage
- Risk management - mitigation or reduction of unacceptable risk

### 3.6.3 Hazard Identification

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

The typical methods for hazard identification employed are:

- Identification of major hazardous units based on Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 of Government of India (as amended in 2000); and
- Identification of hazardous units and segments of pipeline and storage units based on relative ranking technique.

Hazardous substances may be classified into three main classes namely; toxic chemicals, flammable substances, and explosive substances. Flammable substances require interaction with air to trigger the accident. Under certain circumstances, vapours arising from flammable substances when mixed with air may become explosive, especially in confined spaces. However, if present in sufficient quantity such clouds may explode in open air also.

Unstable substances in liquid or solid states may also decompose with such violence causing blast waves. Besides, toxic substances are dangerous and cause substantial damage to life when released into the atmosphere. Classification of hazardous substances as per MSIHC rules are given below.

#### a) Toxic Chemicals

Chemicals with the following values of acute toxicity and owing to their physical and chemical properties, are capable of producing major accident hazards:

**Table 3-8 Values of Toxic Chemicals**

| S.No | Toxicity | Oral toxicity LD50(mg/kg) | Dermal toxicity LD50(mg/kg) | Inhalation toxicity LC50(mg/l) |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| 1. | Extremely toxic | > 5 | <40 | < 0.5 |
| 2. | Highly toxic | >5-50 | >40-200 | < 0.5 - 2.0 |
| 3. | Toxic | >50-200 | > 200-1000 | >2-10 |

### (b) Flammable Chemicals

- Flammable gases: Gases which are at $20^0$C and at standard pressure of 101.3 KPa are:-
  - ignitable when in a mixture of 13 percent or less by volume with air, or
  - have a flammable range with air of at least 12 percentage points regardless of the lower flammable limits.

*Note: - The flammability shall be determined by tests or by calculation in accordance with methods adopted by International Standards Organisation ISO Number10156 of 1990 or by Bureau of Indian Standards ISI Number 1446 of 1985.*

- Extremely flammable liquids: chemicals which have flash point lower than or equal to $23^0$C and boiling point less than $35^0$C
- Very highly flammable liquids: chemicals which have a flash point lower than or equal to $23^0$C and initial boiling point higher than $35^0$C.
- Highly flammable liquids: chemicals which have a flash point lower than or equal to $60^0$C but higher than $23^0$C.
- Flammable liquids: chemicals which have a flash point higher than $60^o$C but lower than $90^0$C.

### (c) Explosives

Explosives are a solid or liquid or pyrotechnic substances (or a mixture of substances) or articles.

- Which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings;
- Which is designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as the result of non-detonative self sustaining exothermic chemical reaction

## 3.6.4 Failure mode analysis: fault tree analysis

During hazard analysis the sequence of events which could lead to hazardous incidents is set out. The likelihood of the incident is then quantified. Fault tree analysis plays a key role in this part of the risk assessment. Fault tree analysis is normally used to evaluate failures in engineering systems. The analysis provides a graphical representation of the relationships between specific events and the ultimate undesired event (sometimes referred to as the "top event"). For example, the ultimate undesired event might be a large fire for which the preceding events might be both spilling a large quantity of flammable liquid and introducing a source of ignition.

Fault tree analysis allows systematic examination of various materials, personnel, and environmental factors influencing the rate of system failure. The method also allows for the recognition of combinations of failures, which may not otherwise be easily

discovered. The fault tree analysis is sufficiently general to allow both qualitative and quantitative estimates of failure probabilities within the analysis.

There are various modes in which flammable and toxic chemicals can leak into atmosphere causing adverse affects. They may be small leaks from gaskets of the flanged joints, or guillotine failure of a pipeline of even catastrophic failure of the storage tank.

## Identification of failure scenarios

A hazardous material either flammable or toxic is safe till it is fully contained and maintained at desired parameters during storage, operation and transportation. In case of the pipeline, the major causes of leakage of oil/gas from the pipelines can be attributed to external factors like mechanical interference, material failure (corrosion) and other causes like construction defects, pipe material defects and human error.

The failure due to external factors generally caused by third party mechanical interference is a puncture or a gouge severely reducing the wall thickness of the pipeline or guillotine failure of the pipeline. The failure can be immediate or may occur sometime later by fatigue.

Pipeline failures by corrosion can be due to internal corrosion or external corrosion. External corrosion failures are due to moisture in the ground and salinity of the soil and can take two forms – small pinhole failures caused by pitting and more generalized corrosion leading to a reduction in pipe wall thickness over a plane area.

The failure cases should be identified as probable in the pipeline system under study by carrying out a preliminary hazard analysis and HAZOP study. Some causes for failure are:

- Unloading arm failure in HSD / SKO pipeline
- Failure of flange in each pipeline
- Partial failure of booster pump discharge on each pipeline
- Catastrophic failure of pipelines at booster pump discharge
- Partial failure of flange at the terminal on pipeline

### Causes of failure for pipelines

Pipelines offer a safe mode of transporting hazardous materials compared to other means of transportation. This is witnessed by a very few recorded incidents of fatality or injury despite the millions of kilometers of pipelines in use worldwide. However, when accidents do occur, pipelines do have the capacity to cause multiple injuries and fatalities and property damage.

Leakages from pipelines have occurred historically due to a variety of reasons. Pipeline transportation has emerged to be the safest mode of transportation of hazardous materials in comparison to other methods such as transport by road, rail and marine vessels. Some of the predominant causes for pipeline failures are discussed below.

The Table 3-9 presents a generic detailed listing of potential incidents for a pipeline system.

**Table 3-9: Listing of Potential Incidents for a Pipeline System**

| Human Errors | Equipment Failures | System or procedural failures | External Events |
|---|---|---|---|
| Pigging operations<br>Hot tapping<br>Slug operation<br>Repair / replacement<br>Startup<br>Changing operations<br>Shutdown<br>Preparation for maintenance<br>Valve operation | Thermal Expansion<br>Internal corrosion<br>External corrosion<br>Bad welds<br>Fatigue<br>Cathodic protection fails<br>Cyclic stress<br>Galvanic corrosion<br>Internal erosion<br>Control system failure<br>Brittle fracture<br>Support failure<br>Construction defects<br>Overpressure<br>Plugging or fouling | Inspection<br>Operation<br>Startup / shutdown<br>Communication<br>Maintenance<br>Leak detection<br>Emergency repair<br>Material specs<br>Modifications | Accidental excavation<br>Post digging<br>Wind (over ground lines)<br>Earthquake<br>Subsidence<br>Avalanche<br>Flood/scouring<br>Lightning<br>Fire<br>Vandalism/sabotage<br>Rail/road crossing<br>Rail derailment<br>Mining |

*Source: American Institute of Chemical Engineers, Centre for Chemical Process*

When considering the databases together, one broad conclusion comes out of the statistics, despite some variation caused by dissimilarity in the type of data collected - failures occur in roughly equal proportions in three broad categories:

- Failures caused by external mechanical interference
- Failures caused by corrosion defects
- Failures caused by miscellaneous factors such as pipe material defects, natural hazards or operator error.

Some of these failures are time independent occurrences (*e.g.* external mechanical interference, earthquakes or overpressure), while others are time dependent (*e.g.* corrosion and fatigue failures).

## Failure from corrosion defects

Pipeline failures by corrosion can be due to internal or external corrosion. Internal corrosion is mainly on account of corrosive or aggressive material being transported-causes have included improper attention at upstream (at source) or erosion due to high velocities or two phase flow.

External corrosion failures are mainly due to moisture in the ground and aggressive soils and take two forms - small pinhole failures caused by pitting and more generalized corrosion leading to a reduction in pipe wall thickness.

### Failures by miscellaneous causes

Pipelines can also fail for a variety of other causes. Typical causes are construction defects, pipe material defects, operator error, and equipment failure, failure due to internal erosion and failure due to ground slip, flood ground erosion, earthquake or mining.

It is apparent that there is a need for good engineering right from the start- these include issues such as route selection (away from population clusters), design margins on pipeline (thickness, class *etc*.), special attention and engineering for crossings, good construction systems, practices and procedures and strong testing and quality control and pre-commissioning and commissioning procedures. After the handover, there have to be consistent and high quality operation and maintenance (O&M) practices.

### Selection of failure scenarios

Potential release rates for a material from containment depend significantly on the initial operating conditions. The pipeline system operating pressures would range from the highest at the starting point to the lowest at the receiving or terminal points.

Factors affecting the "release rate" include the initial pressure, temperature, hole size, hole roughness, hole orientation, gas properties, atmospheric conditions and many other parameters.

Both, the complexity of study and the number of incident outcome cases are affected by the range of initiating events and incidents covered. This not only reflects the inclusion of accidents and/or non-accident-initiated events, but also the size of those events. The following should be evaluated:

- Small and medium size holes - these typically represent failures such as gasket leaks, flange leaks *etc*.
- Large holes– these typically represent "catastrophic" or "guillotine" rupture scenarios, possibly on account of factors such as soil inundation, earthquakes, *etc*.
- Leakage from small bore instrument tappings
- Leakage from cold vents at stations

## 3.6.5 Preliminary hazard analysis

The purpose of the preliminary hazards analysis (PHA) is to identify early in the design process, the potential hazards associated with, or inherent in a process design, thus eliminating costly and time consuming delays caused by design changes made later. This also eliminates potential hazard points at design stage itself.

An assessment of the conceptual design is conducted for the purpose of identifying and examining hazards related to feed stock materials, major process components, utility and support systems, environmental factors, proposed operations, facilities, and safeguards.

### 3.6.5.1 Fire hazards

There could be other areas in the pipeline system that have a potential for fire hazard and require adequate fire fighting equipment for e.g., the valve leakage. These are considered here since uncontrolled fire may trigger the above emergencies due to domino effect.

## 3.6.6 Environmental risk analysis for terminal storage and handling of petroleum products

### Analysis study involves:

- Identification of major hazards for pipelines.
- Consequence analysis of the major hazards to find out hazard distances and impact zones.
- Determination of Individual Risk values by means of risk transects for the pipeline
- Graphical representation of the hazard distances
- Suggestion of mitigating measures to eliminate/reduce hazard level.

The probable methodology is discussed below in brief:

- Study of pipeline route to be done by studying the proposed route and identifying vulnerable locations and other points of concern
- Study of pipeline parameters involves collection of pertinent project information on the pipeline route, process engineering details comprising pipeline parameters, flows, design, hydraulics and other parameters for the pipeline, sectionalizing valve station locations, etc.
- Identification of hazards or HAZID includes estimation of possible hazards through a systematic approach. The HAZID typically covers identification of possible failure scenarios (that are modeled in the next phase) through generic methods for estimating potential failures based on historical records based on worldwide and domestic accident data bases.
- Consequence effects estimation covers assessing the damage potential in terms of heat radiation and establishing the vulnerable zone or distance/ area of interest for fatalities or damage to important equipment/ structure, etc.
- Probability estimation covers the estimation of event probabilities, ignition probabilities and estimates on "how often" the events are likely to occur. This element is extremely important in a QRA since it is not only “how big” the event is, but also “how often” it is likely to occur.
- Individual risk estimation and analysis measures the consequence effect and probability or frequency of occurrence (elaborated later). Individual risk values are compound mathematical derivatives of frequency and consequential effect results. These risk values are also used for planning management action and prioritization of safety measures. Individual risk levels were estimated for members of the general public.
- Risk reduction recommendations - based on the above findings, identifying risk reduction recommendations.

## 3.6.7 Risk analysis for stored petroleum products

### Types of storage of petroleum products

**A. Installations where hazards are mainly due to fire**. This includes storage terminals of Petroleum, Oil & Lubricant (POL) products. Such projects are typified by well-defined storage facilities, operating at ambient temperature and pressure.

For projects in this category, the scenario for consideration should be fire on the largest tank or on the one nearest to periphery - whichever will have longer hazard distances beyond the periphery. In addition, other scenario should be included – to analyse the possibility of escalation of fire from one tank to the adjacent one. Additional scenario should generate information for effective emergency planning.

**B. Installations where hazards are due to fire and explosion**. These are typified by well-defined storage facilities handling explosive material, operating at ambient temperature and corresponding elevated pressure. These include storage facilities of LPG, propane, butane, *etc*.

For projects in this category *i.e*. the isolated storage facilities handling liquefied flammable product, the BLEVE situation has to be addressed. In addition, the release through drain/sample point/pump seals should also be analyzed in respect of dispersion, lower flammability limit (LFL), possible explosion and jet flame.

**C. Pipeline projects where hazards are mainly due to fire and explosion.** Since these are often routed close to habitation and sensitive areas, special scrutiny is required.

For projects in this category, distinction may be made between those involving only POL products and others handling LPG and high-pressure gas. In case of former, scenario may be limited to the analysis of leak through 1-2 inch hole; analysis should provide enough failure data to establish this as a maximum credible scenario. For the latter case, the analysis should also work out the risk transect of individual fatality chance.

### Effects of hydrocarbon release

When hazardous material escapes to atmosphere for some reason or other, this can lead to the formation of a vapor cloud in the air. Direct cloud formation occurs when a gaseous or flashing liquid escapes to atmosphere. Indirect cloud formation occurs through evaporating pools of liquid, which come to rest on ground. In event of hydrocarbon release into atmosphere, the following effects are usually observed.

### A) Dispersion

Hydrocarbon vapor will normally spread out in the direction of wind. If it finds an ignition source before being dispersed below its LFL, a flash fire is likely to occur and the flame may travel back to the source of leak. Any person caught in the flash fire is likely to suffer fatal burn injuries. Therefore, the distance to LFL value is usually taken to indicate the hazard zone or the area, which may be affected by the flash fire. Any other combustible materials within flash fire are also likely to catch fire and secondary fire may ensue. In the area close to source of hydrocarbon leak there is a possibility of oxygen depletion. For human lives, a minimum of 16% oxygen in air is considered essential.

There are three well-recognised modes of vapour dispersion, namely – dispersion (momentum release), heavy gas dispersion and passive or gaussian dispersion. Depending on the physical properties of the vapour and the nature of release, the dispersion pattern will be dominated by one of the modes. Frequently, there is a transition from one mode to other as the physical property of vapour-air mixture undergoes change. Generally speaking, dilution effect diminishes as the mode shifts from jet to heavy gas to passive dispersion.

For jet dispersion, the correlation developed by Ooms *et al* is widely used. The correlation developed by Cox & Carpenter for heavy gas dispersion is the basis of most of

the models. The classical Gaussian dispersion correlations (Pasquill, Suttons, Turner) are widely used in almost all the software programs. The computer models based on these correlations predict the dispersion behavior separately for each mode of dispersion.

### B) Thermal radiation

#### i) Pool fire

Spillage of liquid hydrocarbons result in a pool of liquid, which will evaporate taking heat from the surface forming a flammable atmosphere above it. Ignition of this pool will result in pool fire causing different levels of incident thermal radiation.

Fire on atmospheric storage tanks (cone roof as well as floating roof tanks) is considered to be starting from tank top. In cone roof tanks, flammable hydrocarbon vapour-air mixture is usually present above the liquid surface. In floating roof tanks, flammable vapour-air mixture is present near rim seals and rim vents. Any ignition source, like lightning, static electricity, or mechanical spark finding its way into tank vapour space or near tank rim seals can trigger a tank fire. The fire on floating roof tank usually starts with a rim fire. If the initial rim fire is not extinguished immediately, the roof tank is likely to sink and entire oil surface on tank top may catch fire. From tank fire, most significant hazard is excessive thermal radiation on ground and adjacent equipment.

Thermal radiation due to pool or tank fire may cause various degrees of burns on human body. Moreover, their effects on inanimate objects like equipment, piping or vegetation may also be evaluated to assess the impact. Details of thermal radiation effects on personnel and equipment are given the Table 3-10.

**Table 3-10: Damage Due to Thermal Radiation Intensity**

| Incident Radiation Intensity ($KW/m^2$) | Type of Damage |
|---|---|
| 37.5 | Sufficient to cause damage to Process Equipment |
| 25.0 | Minimum Energy required to ignite wood at infinitely long exposure (non-piloted) |
| 12.5 | Minimum Energy required for piloted ignition of wood, melting plastic tubing etc. |
| 6.3 | Tolerable for humans with light clothing / cover for 20 seconds |
| 4.5 | Sufficient to cause pain to personnel if unable to reach cove within 20 sec, however blistering of skin (I degree burn likely) |
| 1.6 | Will cause no discomfiture to long exposure |

It may be noted that thermal effect of a pool fire is usually limited to a distance of 2 to 3 times the pool diameter.

#### ii) Jet fire

Accidental release of gases from a high-pressure source usually results in a turbulent jet. This when ignited forms a torch or jet flame. Such flame on impingement virtually cuts through equipment, piping and structures causing extensive damage. Thermal radiation due to jet flame may cause various degrees of burns on human body.

The thermal effects of a jet fire are limited to a small distance and do not usually extend beyond the property line. However, in case of natural gas pipeline, guillotine failure scenario - although not credible - may yield flame length over 100 m.

For estimation of thermal effects of a jet fire, usually two well-known correlations are used. One is that outlined in API 520. Normally this is used for flare sizing. The other is that developed by Shell Thronton Research Laboratory. This correlation is used in cases of high-pressure release at any angle. In addition, HSE, UK uses a simple correlation to estimate the effects from torch flame arising out of LPG vapour leak.

### iii) Boiling liquid expanding vapor explosion (BLEVE)

The acronym BLEVE was originally introduced in the USA to describe a specific series of events. When a vessel containing liquefied flammable gas under pressure *i.e.* sphere is subjected to direct flame impingement, the liquid inside the vessel vaporizes rapidly and vapors are released through the safety valve discharge. The PSV's are designed for the fire case of sphere. However, when the metal portion of sphere in the vapor region comes in contact with fire, due to structural weakening of the vessel and the buildup of vapor pressure, the vessel fails, releasing the contents. The definitions of the terms considered here, as contained in the Institute of Chemical Engineers' (UK) booklet "Nomenclature for Hazard and Risk Assessment in the Process Industries are:

- BLEVE: "The sudden rupture of a vessel/system containing liquefied flammable gas under pressure due to fire impingement. The pressure burst and the flashing of the liquid to vapor creates a blast wave, potential missile damage, and immediate ignition of the expanding fuel-air mixture leads to intense combustion creating a fireball."
- Fireball: "A fire, burning sufficiently rapidly for the burning mass to rise into the air as a cloud or ball"•

Thus, a fireball is one of the results of a BLEVE. A fireball results when a vessel containing a highly volatile liquid fails and resulting high mass of vapor cloud gets ignited immediately. The fireball lasts for less than a minute depending on the mass of flammable material present in it. It has high damage potential due to high intensity of radiation, causing damage to neighboring equipment, piping and structures. Also thermal radiation causes various degrees of burns on human body. For transient fires like fireball, the dose of thermal radiation *i.e.* total incident energy is used to estimate threshold levels. Thermal radiation dose is a combination of intensity of radiation and time of exposure.

**Table 3-11: Physiological Effects of Threshold Thermal Doses**

| Dose Threshold ($kJ/m^2$) | Effects |
|---|---|
| 375 | 3rd degree burn |
| 250 | 2nd degree burn |
| 125 | 1st degree burn |
| 65 | Threshold of pain, no reddening or blistering of skin cause |

- 1st degree burns involve epidermis only. Blister may be formed. Example sunburns.
- 2nd degree burns involve the entire epidermis over the area burnt plus some portion of dermis.
- 3rd degree burns involve the entire epidermis and dermis; sub-cutaneous tissues may also be damaged.

BLEVE calculations are carried out to find out the fireball diameter, its duration, various levels of lethality distances (usually 100%, 50%, & 1%) and distances for various thermal loads which can cause 1st, 2nd and 3rd degree burns. HSE correlations are usually adopted.

If the hazards are mainly due to fire, it is suggested that outside population should not be exposed to incident radiation intensity exceeding 4.5 kw/$m^2$. It is desirable to limit the value to 1.7 kw/$m^2$ particularly where schools, hospitals, cinema houses, football stadium, *etc* are located in the hazard zone.

Where the hazards are mainly due to BLEVE (example: pressurized storage of LPG), it should be ensured that the nearest habitation is not subjected to thermal dose exceeding 1% fatality. This approximately corresponds to a thermal dose of 1000 $(kw/m^2)^{4/3}$ s. Again, in case of sensitive developments nearby like hospitals, *etc*., this thermal dose may be reduced to 500$(kw/m^2)^{4/3}$.s. This is in line with the practice followed by HSE in UK. (50% of design capacity of storage may be considered for estimation of effects due to BLEVE.)

### iv) Explosion

The possibility of an explosion due to the ignition of hydrocarbon vapour cloud depends on many factors - the degree of confinement being an important one. In the event of explosion taking place, the resultant blast wave will have damaging effects on equipment, structures, building and piping coming inside the overpressure distances of the blast. The tanks, buildings, structures, *etc*., can only tolerate low level of overpressure. Human body, by comparison, can withstand higher overpressure. But injury or fatality can be inflicted by collapse of building or structures. The blast peak overpressure is a transient one and the equivalent static pressure varies depending on material of construction and other factors. The effects of the over pressure due to an explosion are given in Table 3-29.

The most widely used practice for estimation of the effects of an explosion is trinitro toluene (TNT) method. This is a rather simple and straightforward procedure. TNT methodology was developed based on the damage effects of solid explosive. By nature such explosives are high concentrated and activated close to the ground. Compared to a vapour cloud explosion, it tends to over-predict the near-field effects and under-predicts the far-field ones. TNO and Dutch Safety of Mines (DSM) methods are also used to characterize vapour cloud explosion. More recently, multi-energy method has come into use.

### V) Blast

The release of energy from the pressure burst and the flashing of liquid content to vapor, combine to create a local blast wave. This is solely due to the release of physical, rather than chemical energy, the flammable nature of the material released being irrelevant. (Usually the blast effects are not significant compared with those of heat radiation).

### Vi) Missiles

The fragments of the ruptured containment system are propelled, sometimes over a distance of several hundred meters by the energy released.

### Vii) Fireball

The fuel-air mixture formed when the vessel contents are released is immediately ignited leading to intense combustion and the formation of a large spherical ball of fire, called fireball, which rises from the ground due to buoyancy. This is a type of transient fire, which is not expected to last for more than 30 sec.

The last of these is tile principal hazard arising from a BLEVE though missile fragments, sometimes weighing several tons, can also cause considerable damage. The calculation of the physical blast overpressure is indicated in TNO Yellow book. It is difficult to predict number, size, and the range of the missiles; experience from past incidents is relied upon for assessment. As mentioned earlier usually the distance to 1% fatality from fireball is more of interest while taking decision in respect of siting a facility (HSE norm)

The extent of damage to the victims skin is expressed as a percentage. For example "50% third degree burn" implies that 50% of the skin area has been destroyed to the full extent of the dermal layer.

**Table 3-12: Damage Effects of Blast Overpressure**

| Dose Threshold ($kJ/m^2$) | Effects |
|---|---|
| 375 | 3rd degree burn |
| 250 | 2nd degree burn |
| 125 | 1st degree burn |
| 65 | Threshold of pain, no reddening or blistering of skin cause |

## 3.7 Summary of Applicable National Regulations

A comprehensive list of all the laws, rules, regulations, decrees and other legal instruments which are notified under Environment (Protection) Rules in 1986 and relevant to the proposed isolated storages and handling of hazardous chemicals is annexed as **Annexure IV**.

### 3.7.1 General standards for discharge of environmental pollutants

General standards for discharge of environmental pollutants as per CPCB is given in **Annexure V**.

### 3.7.2 Industry-specific standards - MSIHC Rules

The MSIHC Rules, 1989 (amended in 1994 and 2000), touched upon earlier, framed under the provisions of the Environment (Protection) Act, 1986 was the first comprehensive legislation to address safety throughout the entire operations covering manufacture, storage, import and handling of hazardous chemicals in the country. There were several other Acts and Rules in place such as the Factories Act (which addresses safety issues in notified factories from the labor or Worker angle predominantly), the Explosives Act, Insecticide Act and others – these, however, had limitations in addressing large scale consequential damage from chemicals disasters.

As per the Section 4(2) of the MSIHC Rules, 1989, an occupier who has control of an isolated storage, in which storage of a threshold quantity of a hazardous chemical equal to or more than the specified threshold quantity is involved, has to provide evidence to show that he has i) identified the major accident hazards; and ii) taken adequate steps to (a) prevent such major accidents and to limit their consequences to persons & the environment; and (b) provide to the persons working on the site with the information, training and equipment including antidotes necessary to ensure their safety. As per the Section 13(l) the occupier must also prepare and keep up to date onsite emergency plan detailing how major accidents will be dealt with on the site on which the industrial activity is carried on.

## Mandates of the MSIHC Rules

The MSIHC mandates mainly include:

- Classification of the industrial activities in categories of Major Accident Hazard (MAH) Installations, Isolated Storages and pipeline, (Rule 2 - Definitions.)
- Setting the criteria for the chemicals to be under the hazard category of toxic, highly reactive, flammable and explosive with threshold quantities of concern, (Schedule 1 and 3)
- Designating authorities who would be empowered to enforce the directions of the Rules, (Schedule 5)
- Assigning general responsibility of the occupier during industrial activity, (Rule 4)
- Procedures for the notification of major accident, (Rule 5)
- Approval and the notification of site, (Rules 7 and 8)
- Safety repots and Safety Audit Reports, (Rules 9 and 10)
- Preparation of onsite and offsite emergency plans by the occupier and the prescribed authority, (Rules 13 and 14)
- Information to be given to the persons liable to be affected by a major accident, disclosure of information, etc. (Rules 156 and 17) among other provisions and powers

The isolated storage and handling of hazardous chemicals issue was given attention by the Government of India by the enactment of the MSIHC Rules, 1989 under the Environmental Protection Act, 1986. These were amended in 1994 and 2000.

As per these rules, Isolated Storages are storage of specific chemicals in specified quantities, which are not associated with specified manufacturing process. Thus, these are storage of chemicals in transit or for warehousing, which are subsequently released to consumers for use. Such storages sprung up in large numbers in locations suitable for import-export and warehousing purposes near the manufacturing and usage sites of such chemicals. Such installations were not formally regulated by any regulatory authority/agency before the MSIHC Rules were laid down in the country.

The MHISC Rules were the first major legislative effort to address the issue of handling of hazardous chemicals specifically in their state of "isolated" storage or warehousing, the quantity of the hazardous chemical being the operative criteria to decide upon such locations. The criteria list installations handling such chemicals in the requisite quantity as:

MAH installations, include isolated storages and pipelines and implementing authorities.

### Isolated storages and pipelines

The MSIHC Rules require low, medium and high level controls to be adopted depending upon the Quantity, type of chemical and process, toxicity, flammability, explosibility, *etc*.

- Low level controls include MSDS preparation and dissemination, labeling, reporting of accidents and other provisions
- Medium level controls require preparation of onsite plans, site notification and other provisions (as well as all low level provisions)
- High level controls require preparation of safety report and periodic safety audit as well as medium level controls

The MSIHC Rules specifically lay down the responsibilities for implementation of the rules in respect of different installations. For example;

- the Directorate of Factories is responsible for implementation with respect to Factories notified under the Factories Act
- the Pollution Control Boards in respect of isolated storages
- the DGMS in respect of Mines and
- other agencies for defense, docks, atomic installations, *etc*.

The Rules outline the responsibilities of the occupiers, site notification procedures, promoting awareness by Occupier

### Implementing Authorities

The Authorities appointed in the MSIHC Rules with duties under the various rules with respect to Isolated Storages are:

- Central Pollution Control Board or State Pollution Control Boards or Committees under the Environmental Protection Act, 1986 as the case may be for Isolated storages.
- Chief Inspector of Factories appointed under the Factories Act, 1948 for industrial installations and isolated storages covered under the Factories Act.
- Chief Inspector of Dock Safety appointed under the Dock Workers (Safety, Health and Welfare) Act, 1986 for industrial installations and isolated storages dealing with hazardous chemicals and pipelines inside a Port installation.
- Chief Controller of Explosives appointed under the Indian Explosives Act and Rules, 1983, Gas Cylinder Rules 1981, SMPV Rules 1981, Explosives Rules 1984, Petroleum Act 1934 and Rules 1976 and Calcium Carbide Rules 1987 and in respect of industrial installations and isolated storages dealing with hazardous chemicals and pipelines including interstate pipelines for the above provisions.
- Chief Inspector of Mines appointed under the Mines Act, 1952 for industrial installations and isolated storages dealing with hazardous chemicals and pipelines inside a Port.
- AERB appointed under the Atomic Energy Act 1972 for enforcement under the provisions of the Atomic Energy Act 1972.
- District Collector or District emergency authority for preparation of Offsite Plans as per Rule 13
- DES (CEES) for enforcement of directions and procedures in respect of laboratories and industrial establishments and isolated storages dealing with hazardous chemicals under the Ministry of Defense.

The authorities identified to enforce the provisions of the MSIHC Rules and their responsibilities under the Rules are as follows:

**Table 3-13: Authorities and their Duties**

| Authority(ies) with Legal Backing | Duties and Corresponding Rule |
|---|---|
| State Pollution Control Boards and Committees, (under the EP Act, 1986) | Enforcement of directions and procedures in respect of Isolated Storages of hazardous chemicals, regarding,-<br>▪ Notification of major accidents as per rule 5(1) and 5(2).<br>▪ Notification of sites as per rules 7 to 9.<br>▪ Safety reports in respect of Isolated Storages as per rule 10 to 12.<br>▪ Preparation of on-site emergency plans as per rule 13.<br>▪ Import of hazardous chemicals and enforcement of the directions and procedures on import of hazardous chemicals as per rule 18. |
| Inspector of Factories<br>Under the Factories Act, 1948 | Enforcement of directions and procedures in respect of industrial installations and Isolated Storages covered in the Factories Act, 1948, dealing with hazardous chemicals and pipelines including inter-state pipelines regarding,-<br>▪ Notification of major accidents as per rule 5(1) and 5(2).<br>▪ Notification of sites as per rules 7 to 9.<br>▪ Safety reports as per rule 10 to 12.<br>▪ Preparation of on-site emergency plans as per rule 13.<br>▪ Preparation of off-site emergency plan in consultation with District Collector or District Emergency Authority (as per serial no. 9 of this schedule) |
| Chief Inspector of Dock Safety under the Dock Workers (Safety, Health and Welfare) Act, 1986. | Enforcement of directions and procedures in respect of Industrial installations and Isolated Storages dealing with hazardous chemicals and pipelines inside a port (covered under the Dock Workers (Safety, Health and Welfare Act, 1986) regarding,-<br>▪ Notification of major accidents as per rule 5(1) and 5(2).<br>▪ Notification of sites as per rules 7 to 9.<br>▪ Safety reports as per rule 10 to 12.<br>▪ Preparation of on-site emergency plans as per rule 13.<br>▪ Import of hazardous chemicals and enforcement of the directions and procedures on import of hazardous chemicals as per rule 18. |

Other authorities in respect of Atomic/ Nuclear Installations, Defense Installations, Mines and others have also been specified in the Rules.

## Critical interpretation of regulatory responsibilities

From the above, it is clear that the responsibility to notify a site (and implement provisions under the MSIHC Rules) as an Isolated Storage falls under the purview of various authorities, namely the Inspectorate/ Directorate of Factories, the Pollution Control Board/ Committee, Inspectorate of Dock Safety and others (such as the AERB, the CEES, DGMS, *etc*.).

Some important derivations are given below- these are important to understand the underlying difficulties.

The Directorate (Inspectorate) of Factories and the Central/ State Pollution Control Boards/ Committees

The Inspector of Factories is to designate an installation an Isolated Storage only in respect of "Factories" as (notified) under the Factories Act.

The definition of Factory therefore has a prominent bearing on the definition of Isolated Storages coming under the purview of the Inspector of Factories. This is elaborated below.

The Factories Act, 1948 defines as a premise, including the precinct thereof-

- where ten or more workers are working, or were working on any day of the preceding twelve months, and in any part of which a manufacturing process is being carried out with the aid of power, or is ordinarily so carried on, or
- whereon twenty or more workers are working, or were working on any day of the preceding twelve months, and in any part of which a manufacturing process is being carried out without the aid of power, or is ordinarily so carried on., but doesn't include a mine subject to the operation of the Mines Act, 1952 or a mobile unit belonging to the armed force of the Union, a railway running shed or a hotel, restaurant or eating place.

### Manufacturing process

- Making, altering, repairing, ornamenting, finishing, packing, oiling, washing, cleaning, breaking up, demolition, or otherwise treating or adopting any article or substance with a view to its use, sale, transport, delivery or disposal; or
- pumping oil, water, sewage, or any other substance or
- generating, transforming and transmitting power or
- composing types for printing, printing by letter press, lithography, photogravure or other similar processes or book binding or
- constructing, reconstructing, repairing, refitting finishing or breaking up ships or vessels or
- preserving or storing any article in a cold storage

# 4. OPERATIONAL ASPECTS OF EIA

Prior environmental clearance process has been revised in the Notification issued on 14th September, 2006, into following four major stages *i.e.*, screening, scoping, public consultation and appraisal. Each stage has certain procedures to be followed. This section deals with all the procedural and technical guidance, for conducting objective-oriented EIA studies, their review and decision-making. Besides, the Notification also classifies projects into Category A, which requires prior environmental clearance from MoEF and Category B from SEIAA/UTEIAA.

### Consistency with other requirements

- Clearance from other regulatory bodies is not a pre-requisite for obtaining the prior environmental clearance and all such clearances will be treated as parallel statutory requirements.
- Consent for Establishment (CFE) and Prior Environmental Clearance are two different legal requirements, a project proponent should acquire. Therefore, these two activities can be initiated and proceeded with simultaneously.
- If a project falls within the purview of CRZ and EIA Notifications, then the project proponent is required to take separate clearances from the concerned Authorities.
- Rehabilitation and Resettlement (R&R) issues need not be dealt under the EIA Notification as other statutory bodies deal with these issues. However, socio-economic studies may be considered while taking environmental decisions.

## 4.1 Coverage of the Industry under the Purview of Notification

All new isolated storage and handling of hazardous chemicals industrial projects (As per threshold planning quantity indicated in column 3 of schedule 2 & 3 of MSIHC Rules 1989 amended 2000) including expansion and modernization require prior environmental clearance. Based on pollution potential, all these projects are classified into Category B.

*Note:*

*(i) The recycling units registered under the HSM Rules, are exempted from purview of notification.*

*(ii) Plants/units other than power plants (given against entry no. 1 (d) of the Notification schedule), based on municipal solid waste (non-hazardous) are exempted. (Municipal solid waste in the context of this specific sector refers to segregated organic portion of municipal solid waste excluding recyclables and converted to pellets for use as a fuel.)*

Besides there are general conditions, when it applies, a Category B project will be treated as Category A project. These conditions are discussed in subsequent sections.

The sequence of steps in the process of prior environmental clearance for Category A projects and the Category B projects are shown in Figure 4.1 and Figure 4.2 respectively. The timelines indicated against each stage are the maximum permissible time lines set in the Notification for said task. In case the said task is not cleared/objected by the concerned Authority, within the specified time, said task is deemed to be cleared, in accordance to the proposal submitted by the proponent. Each stage in the process of prior environmental clearance for the isolated storage and handling of hazardous chemicals industrial projects are discussed in subsequent sections. –

In case of Expansion or Modernization of the developmental Activity:

- Any developmental activity, which has an EIA clearance (existing facility), when undergoes expansion or modernization (change in process or technology) with increase in handling capacity beyond the list of products cleared in the issued clearance is required to submit new application for EIA clearance.

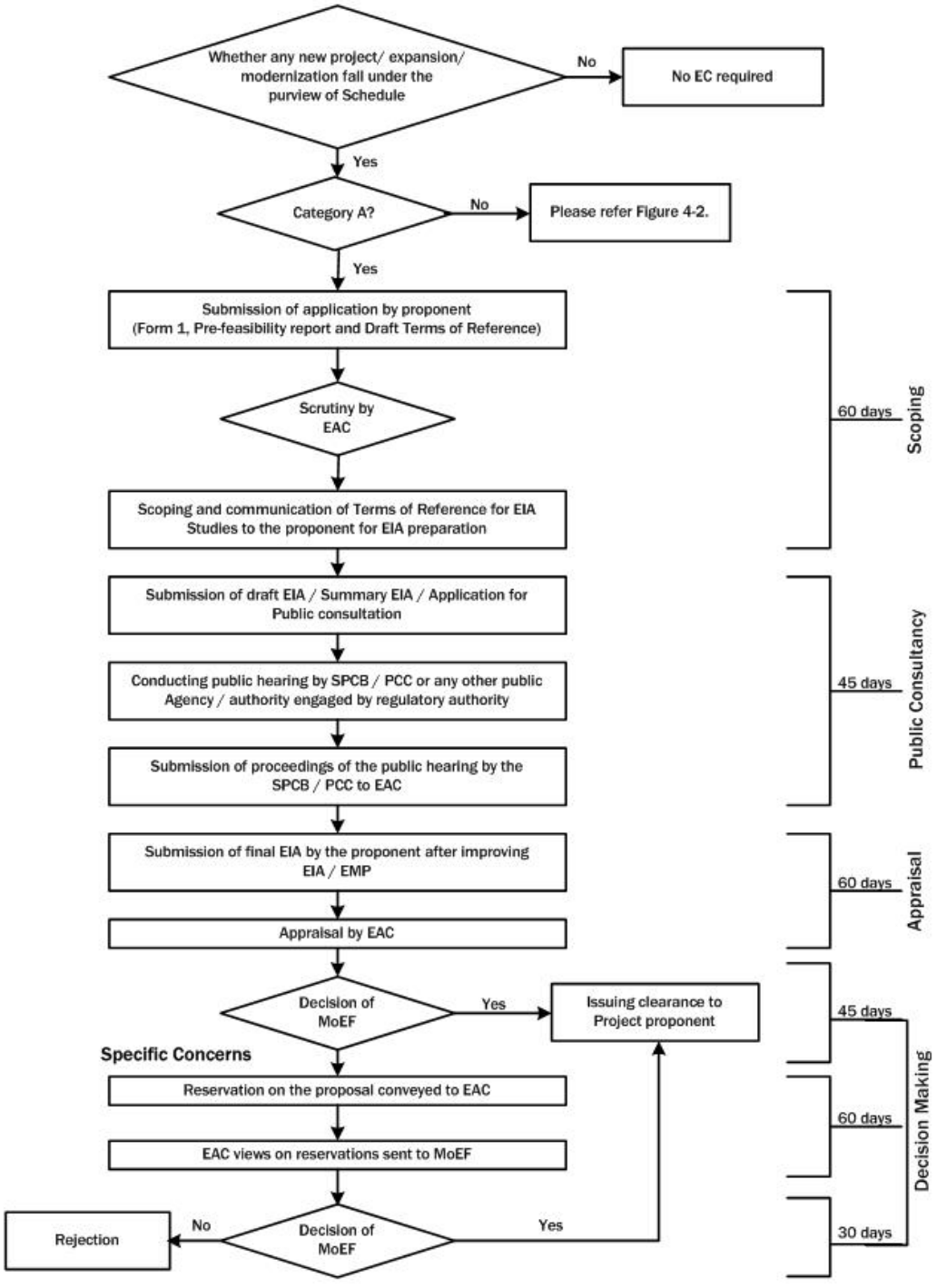


**Figure 4-1: Prior Environmental Clearance Process for Activities Falling Under Category A**

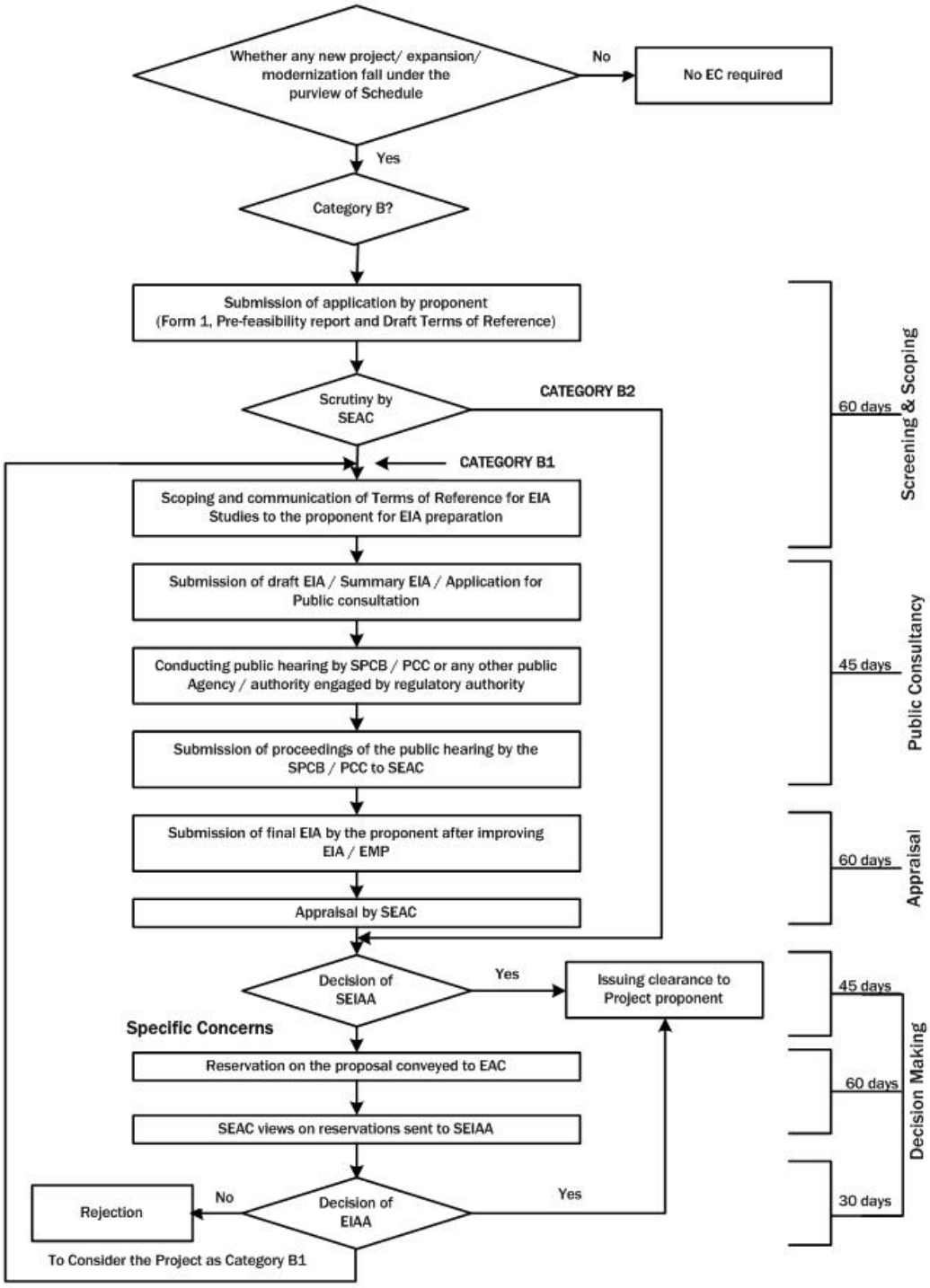


**Figure 4-2: Prior Environmental Clearance Process for Activities Falling Under Category B**

## 4.2 Screening

Screening of the project shall be performed at the initial stage of the project development so that proponents are aware of their obligations before deciding on the budget, project design and execution plan.

This stage is applicable only for Category 'B' developmental activity i.e. if general conditions are applicable for a Category B project, then it will be treated as Category A project. Besides, screening also refers to the classification of Category B projects into either Category B1 or Category B2. Category B1 projects require to follow all stages applicable for a Category A project, but are processed at the SEIAA/UTEIAA. Category B2 projects on the other hand, do not require either EIA or public consultation.

As per the Notification, classification of the Category B projects falls under the purview of the SEAC. This manual provides certain guidelines to the stakeholders for classification of Category B1 and Category B2.

### 4.2.1 Applicable conditions for Category B projects

#### Generic condition

- Any isolated storage and handling of hazardous chemicals industrial projects (usually falling under Category B) will be treated as Category A, if located in whole or in part within 10 km from the boundary of:
  - Protected areas notified under the Wild Life (Protection) Act, 1972,
  - Critically polluted areas as notified by the CPCB from time to time
  - Eco-sensitive areas as notified under section 3 of the E(P) Act, 1986, such as Mahabaleshwar Panchgani, Matheran, Panchmarhi, Dahanu, Doon valley and
  - Inter-State boundaries and international boundaries- provided that the requirement regarding distance of 10 km of the inter-state boundaries can be reduced or completely done away with by an agreement between the respective States/UTs sharing the common boundary
- If any of the conditions listed in above general condition applies, then a Category B project will be treated as Category A
- The SEIAA shall base its decision on the recommendations of a State/UT level EAC for the purpose of prior environmental clearance
- In absence of a duly constituted SEIAA or SEAC, a Category B project shall be appraised at the Central level *i.e* at the MoEF
- The EAC at the State/UT level shall screen the projects or activities in Category B. SEAC shall meet at least once every month
- If any Category B isolated storage and handling of hazardous chemicals project/activity, after proposed expansion of capacity/production or fuel change, falls under the purview of Category A in terms of production capacity, then clearance is required from the Central Government

### 4.2.2 Criteria for classification of Category B1 and B2 projects

The classification of Category B projects or activities into B1 or B2 (except the project or activities listed in item 8(b) in the schedule to the EIA Notification, 2006) will be determined based on whether or not the project or activity requires further environmental

studies for preparation of an EIA for its appraisal prior to the grant of prior environmental clearance. The necessity of which will be decided, depending upon the nature and location specificity of the project, by SEAC after scrutiny of the applications seeking prior environmental clearance for Category B projects or activities.

The projects requiring an EIA report shall be included in Category B1 and remaining projects will fall under Category B2 and will not require an EIA report and public consultation.

### 4.2.3 Application for prior environmental clearance

- The project proponent, after identifying the site and carrying out a pre-feasibility study, is required to apply for the prior environmental clearance using Form 1 given in **Annexure VI**. The proponent has to submit the filled in Form 1 along with the pre-feasibility report and draft TOR for EIA studies to the concerned Authority *i.e.* MoEF, Government of India for Category A projects and the SEIAA in case of Category B projects. Please refer subsequent sections for the information on how to fill the Form 1, contents of pre-feasibility report and draft sector-specific ToRs.
- Prior environmental clearance is required before starting any construction work, or preparation of land is started on the identified site/project or activity by the project management, except for securing the land.
- If the application is made for a specific developmental activity, which has an inherent area development component as a part of its project proposal and the same project also attracts the construction and area development provisions under 8a and 8b of the Schedule, then the project will be seen as a developmental activity other than 8a and 8b of the Schedule.

### 4.2.4 Siting guidelines

These are the guidelines, stakeholders may consider while siting the developmental projects, to minimize the associated possible environmental impacts. In some situations, adhering to these guidelines is difficult and unwarranted. Therefore these guidelines may be kept in the background, as far as possible, while taking the decisions.

#### Areas preferably be avoided

While siting industries, care should be taken to minimize the adverse impact of the industries on immediate neighborhood as well as distant places. Some of the natural life sustaining systems and some specific landuses are sensitive to industrial impacts because of the nature and extent of fragility. With a view to protect such sites, the industries may maintain the following distances, as far as possible, from the specific areas listed:

- Ecologically and/or otherwise sensitive areas: Preferably 5 km; depending on the geo-climatic conditions the requisite distance may be decided appropriately by the agency.
- Coastal areas: Preferably ½ km away from high tide line (HTL).
- Flood plain of the riverine system: Preferably ½ km away from flood plain or modified flood plain affected by dam in the upstream or flood control systems.
- Transport/Communication System: Preferably ½ km. away from highway and railway line.

- Major settlements (3,00,000 population): Distance from major settlements is difficult to maintain because of urban sprawl. At the time of siting of the industry, if the notified limit of any major settlement is found to be within 50 km from the project boundary, the spatial direction of growth of the settlement for at least a decade must be assessed. Subsequently, the industry may be sited at least 25 km from the projected growth boundary of the settlement.

## Compatibility with surrounding environment

- Storage areas should be located away from densely populated areas, from drinking water sources, from areas prone to floods and external sources of hazards. Location should provide easy access for transport and emergency services on the ground, stable enough to support robust & safe buildings and roadways. Adequate services should be provided including – electricity with emergency supply, if needed; water for drinking and firefighting; drainage preventing ground run-off to either public/storm sewer or a waste treatment plant as a part of a site containment plan. The site layout should be designed to allow possible separation of incompatible materials by use of separate buildings, firewalls or other acceptable precautions to permit safe movement and transport of materials. The design should have sufficient space allotted to give reasonable working conditions and allow clear access from two sides
- Storage sites should be selected with due regard to the amount, toxicity, and environmental hazards of the materials stored, and the number and size of containers to be handled. Storage areas containing materials shall be conspicuously marked with signs or placards identifying them. The manufacturers' recommendations regarding the temperature range required to maintain the effectiveness of materials to be stored should be considered when determining the suitability of a particular material storage area for individual material. Ventilation system should assure that vapors from the storage areas do not migrate to other storage areas, staging areas, access aisles, *etc.,*. There should be a means to verify airflow such as a manometer or suspended air strips.
- Avoid setting up of such facilities in critically polluted areas identified by MoEF from time-to-time to the maximum extent possible. Current list of critically polluted areas is given in **Annexure VII.**

Note:

*Ecological and/or otherwise sensitive areas include (i) Religious and Historic Places; (ii) Archaeological Monuments (e.g. identified zone around Taj Mahal); (iii) Scenic Areas; (iv) Hill Resorts; (v) Beach Resorts; (vi) Health Resorts; (vii) Coastal Areas rich in Corals, Mangroves, Breeding Grounds of Specific Species; (viii) Estuaries rich in Mangroves, Breeding grounds of Specific Species; (ix) Gulf Areas; (x) Biosphere Reserves; (xi) National Parks and Sanctuaries; (xii) Natural lakes, Swamps; (xiii) Seismic Zones; (xiv) Tribal Settlements; (xv) Areas of Scientific and Geological Interest; (xvi) Defence Installations, specially those of security importance and sensitive to pollution; (xvii) Border Areas (International) and (xviii) Air Ports.*

*Pre-requisite: State and Central Governments are required to identify such areas on a priority basis.*

## General siting factors

In any particular selected site, the following factors must also be recognized.

- No forest land shall be converted into non-forest activity for the sustenance of the industry (Ref: Forest Conversation Act, 1980).
- No prime agricultural land shall be converted into industrial site.
- Land acquired shall be sufficiently large to provide space for appropriate green cover including greenbelt, around the battery limit of the industry.
- Lay out of the industry that may come up in the area must conform to the landscape of the area without affecting the scenic features of that place.
- Associated township of the industry may be created at a space having physiographic barrier between the industry and the township.

## 4.3 Scoping for EIA Studies

Scoping exercise is taken-up soon after the project contours are defined. The primary purpose of scoping is to identify the concerns and issues which may affect the project decisions. Besides, scoping defines requirements and boundaries of an EIA study.

Scoping refers to the process by which the EAC, in case of Category 'A' projects or activities, and SEAC in case of Category 'B1' projects, including applications for expansion and/or modernization of existing projects, determine ToR for EIA studies addressing all relevant environmental concerns for preparation of an EIA Report for a particular project.

- Project proponent shall submit the application to the concerned Authority. The application (Form 1 as given in Annexure VI) shall be attached with pre-feasibility report and proposed ToR for EIA Studies. The proposed sequence to arrive at the draft ToR is discussed below:
  - Pre-feasibility report summarises the project details and also the likely environmental concerns based on secondary information, which will be availed for filling the Form 1.
  - From the pre-feasibility report and the Form 1, valued environmental components (VECs) may be identified for a given project (the receiving environment/social components, which are likely to get affected due to the project operations/activities).
  - Once the project details from the pre-feasibility report & Form 1; and VECs are identified, a matrix establishing the interactions which can lead to the effects/impacts could be developed (Qualitative analysis).
  - For each identified possible effect in the matrix, significance analysis could be conducted to identify the impacts, which needs to be studied further (quantitative analysis) in the subsequent EIA studies. All such points will find a mention in the draft ToR to be proposed by the project proponent along with the application form. The draft ToR shall include applicable baseline parameters (refer annexure X) and impact prediction tools proposed to be applied (refer annexure XII).
  - The information to be provided in pre-feasibility report, guidelines for filling Form 1 and guidelines for developing draft ToR is summarized in the subsequent sections.
  - Authority consults the respective EAC/SEAC to reply to the proponent. The EAC/SEAC concerned reviews the application form, pre-feasibility report and proposed draft ToR by the proponent and make necessary additions/deletions to

make it a comprehensive ToR that suits the statutory requirements for conducting the EIA studies.

- The concerned EAC/SEAC may constitute a sub-committee for a site visit, if considered necessary. The sub-committee will act up on receiving a written approval from chairperson of the concerned EAC/SEAC. Project proponent shall facilitate such site visits of the sub-committees.
- EAC/SEAC shall provide an opportunity to the project proponent for presentation and discussions on the proposed project and related issues as well as the proposed ToR for EIA studies. If the State Government desires to present its views on any specific project in the scoping stage, it can depute an officer for the same at the scoping stage to EAC, as an invitee but not as a member of EAC. However, non-appearance of the project proponent before EAC/SEAC at any stage will not be a ground for rejection of the application for the prior environmental clearance.
- If a new or expansion project is proposed in a problem area as identified by the CPCB, then the Ministry may invite a representative SEIAA to present their views, if any at the stage of scoping, to the EAC.
- The final set of ToRs for EIA Studies shall be conveyed to the proponent by the EAC/ SEAC within sixty days of the receipt of Form 1 and pre-feasibility report. If the finalized ToR for EIA studies is not conveyed to the proponent within sixty days of the receipt of Form 1, the ToR suggested by the proponent shall be deemed as the final and will be approved for the EIA studies.
- Final ToR for EIA Studies shall be displayed on the websites of the MoEF/SEIAA.
- Applications for prior environmental clearance may be rejected by the concerned Authority based on the recommendations by the concerned EAC or SEAC at the scoping stage itself. In case of such rejection, the decision together with reasons for the same shall be communicated to the proponent in writing within sixty days of the receipt of the application.
- The final EIA report and other relevant documents submitted by the applicant shall be scrutinized by the concerned Authority strictly with reference to the approved ToR for EIA studies.

### 4.3.1 Pre-feasibility report

The pre-feasibility report should include, but not limited to highlight the proposed project information, keeping in view the environmental sensitivities of the selected site, raw material, technology options and its availability. Information required in pre-feasibility report varies from case to case even in same sector depending upon the local environmental setting within which the plant is located/proposed. However, the information which may be furnished in the pre-feasibility report may include as under:

**I. Executive summary**

**II. Project details:** Description of the project including in particular,

- a description of the main characteristics of the production processes, for instance, nature and quantity of materials used,
- an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, *etc.*) resulting from the operation of the proposed project.

- a description of the physical characteristics of the whole project and the land-use requirements during the construction and operational phases

**III. Selection of site based on least possible impacts**

- An outline of the main alternatives studied by the developer and an indication of the main reasons for this choice, taking into account the environmental effects.

**IV. Anticipated impacts based on project operations on receiving environment**

- A description of the aspects of the environment likely to be significantly affected by the proposed project, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors.
- A description of the likely significant effects of the proposed project on the environment resulting from:
  - existence of the project
  - use of natural resources
  - emission of pollutants, the creation of nuisances and the elimination of waste
  - Project proponent's description of the forecasting methods used to assess the effects on the environment.

**V. Proposed broad mitigation measures which could effectively be internalized as project components to have environmental and social acceptance of the proposed site**

- A description of key measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment

**VI. An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the developer in compiling the required information**

Details of the above listed points which may be covered in pre-feasibility report are listed in **Annexure VIII**.

### 4.3.2 Guidance for providing information in Form 1

The information given in specifically designed pre-feasibility report for this developmental activity may also be availed for filling Form 1.

Form 1 is designed to help users identify the likely significant environmental effects of proposed projects right at the scoping stage. There are two stages for providing information under two columns:

- First - identifying the relevant project activities from the list given in column 2 of Form 1. Start with the checklist of questions set out below and complete Column 3 by answering
  - Yes - if the activity is likely to occur during implementation of the project
  - No - if it is not expected to occur
  - May be - if it is uncertain at this stage whether it will occur or not
- Second - Each activity for which the answer in Column 3 is "Yes" the next step is to refer to the fourth column which quantifies the volume of activity which could be judged as significant impact on the local environmental characteristics, and identify

the areas that could be affected by that activity during construction /operation / decommissioning of the project. Form 1 requires information within 15 km around the project, whereas actual study area for EIA studies will be as prescribed by respective EAC/SEAC. Project proponent will need information about the surrounding VECs in order to complete this Form 1.

### 4.3.3 Identification of appropriate valued environmental components

VECs are components of natural resources and human world that are considered valuable and are likely to be affected by the project activities. Value may be attributed for economic, social, environmental, aesthetic or ethical reasons. VECs represent the investigative focal point for further EIA process. The indirect and/or cumulative effects can be concerned with indirect, additive or even synergistic effects due to other projects or activities or even induced developments on the same environmental components as would be considered direct effects. But such impacts tend to involve larger scale VECs such as within entire region, river basins or watersheds; and, broad social and economic VECs such as quality of life and the provincial economy. Once VECs are identified then appropriate indicators are selected for impact assessments on the respective VECs.

### 4.3.4 Methods for identification of impacts

There are various factors which will influence the approach adopted for the assessment of direct, indirect, cumulative impacts, *etc*. for a particular project. The method should be practical and suitable for the project given the data, time and financial resources available. However, the method adopted should be able to provide a meaningful conclusion from which it would be possible to develop, where necessary, mitigation measures and monitoring. Key points to consider when choosing the method(s) include:

- Nature of the impact(s)
- Availability and quality of data
- Availability of resources (time, finance and staff)

The method chosen should not be complex, but should aim at presenting the results in a way that can be easily understood by the developer, decision maker and the public. A comparative analysis of major impact identification methods is given in Table 4-1:

**Table 4-1: Advantages and Disadvantages of Impact Identification Methods**

| Methods | Description | Advantages | Disadvantages |
|---|---|---|---|
| Checklists | ▪ Annotate the environmental features that need to be addressed when identifying the impacts of activities in the project | ▪ Simple to understand and use<br>▪ Good for site selection and priority setting<br>▪ Simple ranking and weighting | ▪ Do not distinguish between direct and indirect impacts<br>▪ Do not link action and impact<br>▪ The process of incorporating values can be controversial |
| Matrices | ▪ Identify the interaction between project activities (along one axis) and environmental characteristics (along | ▪ Link action to impact<br>▪ Good method for displaying EIA results | ▪ Difficult to distinguish direct and indirect impacts<br>▪ Significant |

| Methods | Description | Advantages | Disadvantages |
|---|---|---|---|
| | other axis) using grid like table<br>▪ Entries are made in the cells which highlights impact severity in the form of symbols or numbers or descriptive comments | | potential for double-counting of impacts |
| Networks | ▪ Illustrate cause effect relationship of project activities and environmental characteristics<br>▪ Useful in identifying secondary impacts<br>▪ Useful for establishing impact hypothesis and other structured science based approaches to EIA | ▪ Link action to impact<br>▪ Useful in simplified form for checking for second order impacts<br>▪ Handles direct and indirect impacts | ▪ Can become very complex if used beyond simplified version |
| Overlays | ▪ Map the impacts spatially and display them pictorially<br>▪ Useful for comparing site and planning alternatives for routing linear developments<br>▪ Can address cumulative effects<br>▪ Information incentive | ▪ Easy to understand<br>▪ Good to display method<br>▪ Good siting tool | ▪ Address only direct impacts<br>▪ Do not address impact duration or probability |
| GIS | ▪ Maps the impacts spatially and display them pictorially<br>▪ Useful for comparing site and planning alternatives for routing linear developments<br>▪ Can address cumulative effects<br>▪ Information incentive | ▪ Easy to understand<br>▪ Good to display method<br>▪ Good siting tool<br>▪ Excellent for impact identification and analysis | ▪ Do not address impact duration or probability<br>▪ Heavy reliance on knowledge and data<br>▪ Often complex and expensive |
| Expert System | ▪ Assist diagnosis, problem solving and decision making<br>▪ Needs inputs from user by answering systematically developed questions to identify impacts and determine their mitigability and significance<br>▪ Information intensive, high investment methods of analysis | ▪ Excellent for impact identification and analysis<br>▪ Good for experimenting | ▪ Heavy reliance on knowledge and data<br>▪ Often complex and expensive |

The project team made an attempt to construct an impact matrix considering major project activities (generic operations) and stage-specific likely impacts which is given in Table 4-2.

While the impact matrix is each project-specific, Table 4-2 may facilitate the stakeholders in identifying a set of components and phase-specific project activities for determination of likely impacts. However, the location-specific concerns may vary from case to case; therefore, the components even without likely impacts are also retained in the matrix for the location-specific reference.

**Table 4-2: Matrix of Impacts**

| | | | PHASE I | | | | | PHASE II | | | | | | PHASE III | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Pre Construction | | | | | Construction/Establishment | | | | | | Operation and Maintenance | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| ENVIRONMENT | Component | Project Activities / Parameter/ factor | Detailed Topographic Survey | Land Acquirement | Site Clearing/Deforestation | Burning of wastes, refuse and cleared vegetation | Site Preparation / Change in Topography | Construction of storage tanks | Heavy Equipment operations | Disposal of construction wastes | Influx of construction workers | Generation of sewerage | Transportation of material | Loading and unloading of chemicals | Maintenance of storage tanks | Monitoring of storage tanks – piping, floating storage, product handling, sludge and waste handling, *etc.* |
| Physical | **Soil** | Erosion Risks | | | | | | | | | | | | | | |
| | | Contamination | | | | | | | | | | | | * | * | |
| | | Soil Quality | | | | | | * | | * | | | | * | * | |
| | **Resources** | Fuels/ Electricity | | | | | | | | | | | | * | * | |
| | | Raw materials | | | | | | * | | | | | | * | | |
| | **Water** | Alteration of surface run-off | | | | | * | * | | | | | | | | |
| | | Alteration of aquifers | | | | | * | | | | | | | | | |
| | | Water quality | | | | | | | | | | | | | * | |
| | **Air** | Air quality | | | | * | | * | * | | | | | * | * | * |
| | | Noise | | | | | | * | * | | | | | * | * | |

| | | | PHASE I | | | | | PHASE II | | | | | | PHASE III | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Pre Construction | | | | | Construction/Establishment | | | | | | Operation and Maintenance | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| | | Climate | | | | | | | | | | | | | | |
| Biological | **Terrestrial Flora** | Effect on grass & flowers | | | | | | | | | | | | | | |
| | | Effect on trees & shrubs | | | | | | | | | | | | | | |
| | | Effect on farmland | | | | | | | | | | | | | | |
| | | Endangered species | | | | | | | | | | | | | | |
| | **Aquatic Biota** | Habitat removal | | | | | | | | | | | | | | |
| | | Contamination of habitats | | | | | | | | | | | | | | |
| | | Reduction of aquatic biota | | | | | | | | | | | | | | |
| | **Terrestrial Fauna** | Fragmentation of terrestrial habitats | | | | | | | | | | | | | | |
| | | Disturbance of habitats by noise or vibration | | | | | | | * | * | | | | | * | |
| | | Reduction of Biodiversity | | | | | | | | | | | | * | | |
| Social | **Economy** | Creation of new economic activities | * | | | | | * | | | | | | * | | |
| | | Commercial value of properties | | | | | | * | | * | | | | * | * | |

| | | | PHASE I | | | | | PHASE II | | | | | | PHASE III | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Pre Construction | | | | | Construction/Establishment | | | | | | Operation and Maintenance | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| | | Conflict due to negotiation and/ compensation payments | | | | | | | | | | | | | | |
| | | Generation of temporary and permanent jobs | | | | | | * | * | | | | | * | * | * |
| | | Effect on crops | | | | | | | | | | | | | | |
| | | Income for the state and private sector | | | | | | | | | | | | * | | |
| | **Education** | Training in new technologies | * | | | | | | | | | | | * | * | * |
| | | Training in new skills to workers | * | | | | | * | | | | | | * | * | * |
| | **Public Order** | Political Conflicts | | * | | | | | | | | | | | | |
| | | Unrest, Demonstrations & Social conflicts | | * | | | | | | | | | | | | |
| | **Infrastructure and Services** | Conflicts with projects of urban, commercial or Industrial development | * | | | | | * | | | | | | | * | |
| | **Security and Safety** | Accidents caused by | | | | | | * | * | * | | | * | * | * | |

| | | | PHASE I | | | | | PHASE II | | | | | | PHASE III | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Pre Construction | | | | | Construction/Establishment | | | | | | Operation and Maintenance | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| | **Health** | | | | | | | * | * | * | | | * | * | * | * |
| | **Cultural** | Land use | | | | | | * | | * | | | | | | |
| | | Recreation | | | | | | | | | | | | | * | |
| | | Aesthetics and human interest | | | | | | * | * | * | | | | * | * | |
| | | Cultural status | | | | | | | | | | | | | | |

Note:

*1. Above table represents a model for likely impacts, which will have to be arrived at on a case-to-case basis considering VECs and significance analysis (Ref Section 2.9).*

*2. Project activities are shown as indicative. However, in Form 1 (application for EIA Clearance), for any question for which answer is 'Yes', then the corresponding activity shall reflect in project activities. Similarly 'parameters'/'factors' will also be changed within a component in order to reflect the target species of prime concern in the receiving local environment.*

### 4.3.5 Testing the Significance of Impacts

The following set of conditions may be used as the checklist for testing the significance of the impacts and also to provide information in Column IV of Form 1.

- Will there be a large change in environmental conditions?
- Will new features be out-of-scale with the existing environment?
- Will the effect be unusual in the area or particularly complex?
- Will the effect extend over a large area?
- Will there be any potential for trans-frontier impact?
- Will many people be affected?
- Will many receptors of other types (fauna and flora, businesses, facilities) be affected?
- Will valuable or scarce features or resources be affected?
- Is there a risk that environmental standards will be breached?
- Is there a risk that protected sites, areas, and features will be affected?
- Is there a high probability of the effect occurring?
- Will the effect continue for a long time?
- Will the effect be permanent rather than temporary?
- Will the impact be continuous rather than intermittent?
- If it is intermittent will it be frequent rather than rare?
- Will the impact be irreversible?
- Will it be difficult to avoid, or reduce or repair or compensate for the effect?

For each "Yes" answer in column 3, the nature of effects and reasons for it should be recorded in the column 4. The questions are designed so that an "Yes" answer in column 3, will generally point towards the need for analyzing for the significance and requirement for conducting impact assessment for the effect.

### 4.3.6 Terms of reference for EIA studies

ToR for EIA studies in respect of the isolated storages, which are involved in handling of hazardous chemicals may include, but not limited to the following:

1. Executive summary of the project – giving a *prima facie* idea of the objectives of the proposal, use of resources, justification, *etc*. In addition, it should provide a compilation of EIA report including EMP and the post-project monitoring plan, in brief.

#### Project description

2. Justification for selecting the proposed storage capacity.
3. Land requirement for the project including its break up for various purposes, and its availability and optimization.
4. Details of proposed location layout clearly demarcating various units within the plant.
5. Mode of receiving hazardous chemicals in isolated storages and mode of its distribution.
6. Details on design parameters of the storages, procedures, piping layout, monitoring equipments, emergency requirements, safety controls, relief systems, *etc*.

7. Details on list of hazardous chemicals to be stored at the facility – its category, physical & chemical properties, storage quantities, *etc*., and compatibility with the design parameters of the storages.
8. Details of domino effect of the storage tanks and respective preventive measures including distance between storage units in an isolated storage facility.
9. Details on storage tanks including capacity and storage distance.
10. Details on transfer and handling of hazardous chemicals – piping system, handling techniques, equipments used, standard operating procedures, *etc*.
11. Details on specific equipments, flanges, pumps, compressors proposed to control loss of chemicals. Designed VOC loss accounting.
12. Details of proposed source-specific pollution control schemes/equipments.
13. Details on requirement and availability of power and water with its source and authorization from the concerned department.
14. Management plan for solid/hazardous waste generation, storage, utilization and disposal.
15. Details regarding infrastructure facilities such as sanitation, fuel storage, restroom, *etc*. to the workers during construction and operation phase.
16. Details on safety management plan.
17. In case of expansion of existing storages, remediation measures adopted to restore the environmental quality if the groundwater, soil, crop, air, *etc*., are affected and a detailed compliance to the prior environmental clearance/consent conditions.
18. Any litigation pending against the project and /or any direction /order passed by any Court of Law related to the environmental pollution and impacts in the last two years, if so, details thereof.

### Description of the environment

19. The study area shall be up to a distance of 10 km from the boundary of the proposed storage facility.
20. Location of the storage facility, nearest habitats with distances from the facility to be demarcated on a toposheet (1: 50000 scale).
21. Land use based on satellite imagery including location specific sensitivities such as national parks / wildlife sanctuary, villages, industries, *etc*..
22. Demography details of all the villages falling within the study area.
23. Topography details of the project area.
24. The baseline data to be collected from the study area w.r.t. different components of environment viz. air, noise, water, land, biology and socio-economic (please refer Section 4.4.2 for guidance for assessment of baseline components and identify attributes of concern). Actual monitoring of baseline environmental components shall be strictly in accordance to the parameters prescribed in the ToR after considering the proposed coverage of parameters by the proponent in draft ToR and shall commence after finalization of ToR by the Competent Authority.
25. Geological features and geo-hydrological status of the study area.
26. Details on surface water quality of nearby water sources and other surface drains.

27. Details on ground water quality.
28. Relevant ambient air quality parameters for monitoring including combustion emissions due to traffic, VOCs and stored chemicals, *etc* .
29. Existing ambient air quality, expected emissions such as combustion emissions* due to traffic, VOCs*, stored chemicals*, *etc*.) and evaluation of the adequacy of the proposed pollution control devices to meet standards for point sources and to meet AAQ standards. (* - as applicable)
30. The air quality contours may be plotted on a location map showing the location of storage facility, habitation nearby, sensitive receptors, if any and wind roses.
31. Details on noise levels at sensitive/commercial receptor.
32. Site-specific micro-meteorological data including mixing height.
33. One season site-specific data excluding monsoon season.
34. Proposed baseline monitoring network for the consideration and approval of the Competent Authority.
35. Ecological status (terrestrial and aquatic) of the study area such as habitat type and quality, species, diversity, rarity, fragmentation, ecological linkage, age, abundance, *etc*.
36. If any incompatible landuse attributes fall within the study area, proponent shall describe the sensitivity (distance, area and significance) and propose the additional points based on significance for review and acceptance by the EAC/SEAC. Incompatible land use attributes include:
    - Public water supply areas from rivers/surface water bodies, from ground water
    - Scenic areas/tourism areas/hill resorts
    - Religious places, pilgrim centers that attract over 10 lakh pilgrims a year
    - Protected tribal settlements (notified tribal areas where industrial activity is not permitted)
    - Monuments of national significance, World Heritage Sites
    - Cyclone, Tsunami prone areas (based on last 25 years);
    - Airport areas
    - Any other feature as specified by the State or local government and other features as locally applicable, including prime agricultural lands, pastures, migratory corridors, *etc*.
37. If ecologically sensitive attributes fall within the study area, proponent shall describe the sensitivity (distance, area and significance) and propose the additional points based on significance for review and acceptance by the EAC/ SEAC. Ecological sensitive attributes include:
    - National parks
    - Wild life sanctuaries Game reserve
    - Tiger reserve/elephant reserve/turtle nesting ground
    - Mangrove area
    - Wetlands
    - Reserved forests and protected forests
    - Any other closed/protected area under the Wild Life (Protection) Act, 1972.
    - Any other eco-sensitive areas, *etc.*
38. If the location falls in Valley, specific issues connected to the natural resources management shall be studied and presented.

39. If the location falls in CRZ area: A CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the project and associate facilities w.r.t. CRZ, coastal features such as mangroves, if any.
    - Provide the CRZ map in 1:10000 scale in general cases and in 1:5000 scale for specific observations.
    - Proposed site for disposal of dredged material and environmental quality at the point of disposal/impact areas.
    - Fisheries study should be done w.r.t. Benthos and Marine organic material and coastal fisheries.

### Anticipated environmental impacts and mitigation measures

40. Anticipated generic environmental impacts due to this project are indicated in Table 4-2, which may be evaluated for significance and based on corresponding likely impacts, VECs may be identified. Baseline studies may be conducted for all the concerned VECs and likely impacts will have to be assessed for their magnitude in order to identify mitigation measures (please refer Chapter 4 of the Manual for guidance).
41. Tools as given in Section 4.4.3 may be referred by the proponent for the appropriate assessment of environmental impacts and same may be submitted in draft ToR for consideration and approval by EAC/SEAC.
42. While identifying the likely impacts, also include the following for analysis of significance and required mitigation measures:
    - impacts due to emissions from entry and evacuation of chemicals at storage points
    - impacts due to temperature variations in the tanks
    - impacts due to emissions from handling of chemicals
    - impacts due to emissions from cleaning operations
    - impacts due to odour pollution
    - impacts due to generation of wastewater from drainage facilities, cleaning, tanks, seepage, *etc*.
    - impacts due to noise from tank installations, conveyors, transportation of products, *etc*.
    - impacts due to fugitive emissions/VOCs
    - impacts due to catastrophic failures
    - impacts due to residues/tank bottom sludge, *etc*.
    - impacts due to fire/accidents
    - impact on health of workers due to proposed project activities
43. In case of likely impacts from the proposed storage facility on the surrounding reserve forests, Plan for the conservation of wild fauna in consultation with the State Forest Department.
44. Action plan for the greenbelt development – species, width of plantations, planning schedule, *etc*., in accordance to CPCB published guidelines.
45. In case of likely impact from the proposed project on the surrounding reserve forests, Plan for the conservation of wild fauna in consultation with the State Forest Department.
46. For identifying the mitigation measures, please refer Chapter III for source control and treatment. Besides typical mitigation measures which may also be considered are discussed in Table 4-5.

### Analysis of alternative resources and technologies

47. Comparison of alternate sites considered and the reasons for selecting the proposed site. Conformity of the site with the prescribed guidelines in terms of CRZ, river, highways, railways, *etc*.
48. Details on improved technologies for storing and handling of hazardous chemicals.

### Environmental monitoring program

49. Monitoring programme for source control.
50. Appropriate monitoring network has to be designed and proposed to assess the possible residual impacts on VECs.
51. Monitoring pollutants at receiving environment for the appropriate notified parameters – air quality, groundwater, surface water, soil, *etc*. during operational phase of the project.
52. Leak detection and repair programme.
53. Specific programme to monitor occupational, safety and health protection of workers.
54. Details of in-house monitoring capabilities and the recognized agencies if proposed for conducting monitoring.

### Additional studies

55. Details on risk assessment and damage control during different phases of the project and proposed safeguard measures.
56. Details on status of emergency preparedness – safety procedures, training, personal protective equipments, fire fighting devises, medical aids, safety control systems, management plans, *etc*.
57. Details on socio-economic development activities such as commercial property values, generation of jobs, education, social conflicts, cultural status, accidents, etc.
58. Proposed plan to handle the socio-economic influence on the local community. The plan should include quantitative dimension as far as possible.
59. Details on compensation package for the people affected by the project, considering the socio-economic status of the area, homestead oustees, land oustees, and landless labourers.
60. Points identified in the public hearing and commitment of the project proponent to the same. Detailed action plan addressing the issues raised, and the details of necessary allocation of funds.
61. Details on plan for corporate social responsibility including the villages, population spread, SC/ST/backward communities, upgradation of existing schools, establishing new schools with facilities (such as laboratories, toilets, *etc*.), link roads, community halls, primary health facilities, health camps, *etc*.

### Environmental management plan

62. Administrative and technical organizational structure to ensure proposed post-project monitoring programme for approved mitigation measures.

63. EMP devised to mitigate the adverse impacts of the storage facility should be provided along with item-wise cost of its implementation (Capital and recurring costs).
64. Allocation of resources and responsibilities for plan implementation.
65. Details of the emergency preparedness plan and on-site and off-site disaster management plan.

Note:

*Above points shall be adequately addressed in the EIA report at corresponding chapters, in addition to the contents given in the reporting structure (Table: 4-6).*

## 4.4 Environmental Impact Assessment

The generic approach for accomplishing EIA studies is shown in Figure 4.3. Each stage is discussed, in detail in subsequent sections.

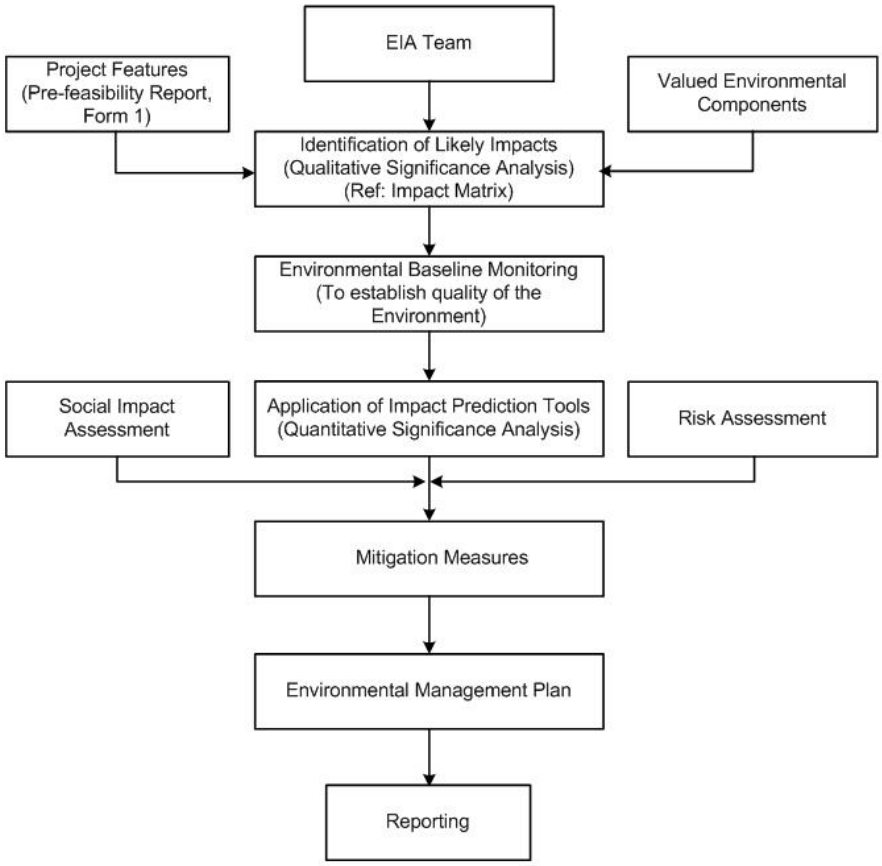


**Figure 4-3: Approach for EIA Study**

### 4.4.1 EIA team

The success of a multi-functional activity like an EIA primarily depends on constitution of a right team at the right time (preferable at the initial stages of an EIA) in order to assess the significant impacts (direct, indirect as well as cumulative impacts).

The professional Team identified for a specific EIA study should consist of qualified and experienced professionals from various disciplines in order to address the critical aspects identified for the specific project. Based on the nature and the environmental setting, following professionals may be identified for EIA studies:

- Environmental management specialist/regulator/
- Environmental urban land use specialist
- Air and noise quality specialist
- Toxicology/Occupational health specialist
- Geology/geo-hydrology specialist
- Organic chemistry specialist
- Chemical engineer
- Safety and risk analysis specialist, *etc*.

### 4.4.2 Baseline quality of the environment

EIA Notification 2006 specifies that an EIA Report should contain a description of the existing environment that would be or might be affected directly or indirectly by the proposed project. Environmental Baseline Monitoring (EBM) is a very important stage of EIA. On one hand EBM plays a very vital role in EIA and on the other hand it provides feedback about the actual environmental impacts of a project. EBM, during the operational phase, helps in judging the success of mitigation measures in protecting the environment. Mitigation measures, in turn are used to ensure compliance with environmental standards, and to facilitate the needed project design or operational changes.

Description of the existing environment should include natural, cultural, socio-economic systems and their interrelationships. The intention is not to describe all baseline conditions, but to focus the collection and description of baseline data on those VECs that are important and are likely to be affected by the proposed industrial activity.

#### 4.4.2.1 Objectives of EBM in EIA context

The term 'baseline' refers to conditions existing before development. EBM studies are carried out to:

- identify environmental conditions which might influence project design decisions (e.g., site layout, structural or operational characteristics);
- identify sensitive issues or areas requiring mitigation or compensation;
- provide input data to analytical models used for predicting effects;
- provide baseline data against which the results of future monitoring programs can be compared.

At this stage of EIA process, EBM is primarily discussed in the context of first purpose wherein the feedback from EBM programs may be used to:

- determine available assimilative capacity of different environmental components within the designated impact zone and whether more or less stringent mitigation measures are needed
- improve predictive capability of EIAs

There are many institutional, scientific, quality control, and fiscal issues that must be addressed in implementation of an environmental monitoring program. Careful

consideration of these issues in the design and planning stages will help avoid many of the pitfalls associated with environmental monitoring programs.

### 4.4.2.2 Environmental monitoring network design

Monitoring refers to the collection of data through a series of repetitive measurements of environmental parameters (or, more generally, to a process of systematic observation). Design of the environmental quality monitoring programme design depends up on the monitoring objectives specified for the selected area of interest. Types of monitoring and network design considerations are discussed in **Annexure IX**.

### 4.4.2.3 Baseline data generation

List of important physical environmental components and indicators of EBM are given in Table 4-3.

**Table 4-3: List of Important Physical Environment Components and Indicators of EBM**

| Environmental Component | Environmental Indicators |
|---|---|
| Climatic variables | ▪ Rainfall patterns – mean, mode, seasonality<br>▪ Temperature patterns<br>▪ Extreme events<br>▪ Climate change projections<br>▪ Prevailing wind - direction, speed, anomalies<br>▪ Relative humidity<br>▪ Stability conditions and mixing height, *etc*. |
| Topography | ▪ Slope form<br>▪ Landform and terrain analysis<br>▪ Specific landform types, *etc*. |
| Drainage | ▪ Surface hydrology<br>▪ Natural drainage pattern and network<br>▪ Rainfall runoff relationships<br>▪ Hydrogeology<br>▪ Groundwater characteristics – springs, *etc*. |
| Soil | ▪ Type and characteristics<br>▪ Porosity and permeability<br>▪ Sub-soil permeability<br>▪ Run-off rate<br>▪ Infiltration capacity<br>▪ Effective depth (inches/centimeters)<br>▪ Inherent fertility<br>▪ Suitability for method of sewage disposal, *etc*. |
| Geology | ▪ Underlying rock type, texture<br>▪ Surgical material<br>▪ Geologic structures (faults, shear zones, *etc*.)<br>▪ Geologic resources (minerals, *etc*.) , *etc* |
| Water | ▪ Raw water availability<br>▪ Water quality<br>▪ Surface water (rivers, lakes, ponds, gullies) – quality, water depths, flooding areas, etc.<br>▪ Ground water – water table, local aquifer storage |

| | |
|---|---|
| | capacity, specific yeild, specific retention, water level depths and fluctuations, etc.<br>▪ Coastal<br>▪ Floodplains<br>▪ Wastewater discharges<br>▪ Thermal discharges<br>▪ Waste discharges, *etc*. |
| Air | ▪ Ambient<br>▪ Respirable<br>▪ Airshed importance<br>▪ Odour levels, *etc*. |
| Noise | ▪ Identiyfing sources of noise<br>▪ Noise due to traffic/transportation of vehicles<br>▪ Noise due to heavy euipment operations<br>▪ Duration and variations in noise over time, *etc*. |
| Coastal dynamics and morphology | ▪ Wave patterns<br>▪ Currents<br>▪ Shoreline morphology – near shore, foreshore<br>▪ Sediment – characteristics and transport, *etc*. |
| Biological | ▪ Species composition of flora and fauna<br>▪ Flora – type, density, exploitation, etc.<br>▪ Fauna – distribution, abundance, rarity, migratory, species diversity, habitat requirements, habitat resilience, economic significance, comemrcial value, etc.<br>▪ Fisheries – migratory species, species with commercial/ recreational value, *etc*. |
| Landuse | ▪ Landuse pattern, *etc*. |

Guidance for assessment of baseline components and attributes describing sampling network, sampling frequency, method of measurement is given in **Annexure X**.

## Infrastructure requirements for EBM

In addition to devising a monitoring network design and monitoring plans/program, it is also necessary to ensure adequate resources in terms of staffing and skills, equipment, training, budget, *etc*., for its implementation. Besides assigning institutional responsibility, reporting requirements, QA/QC plans and its enforcement capability are essential. A monitoring program that does not have an infrastructural support and QA/QC component will have little chance of success.

## Defining data statistics/analyses requirements

The data analyses to be conducted are dictated by the objectives of environmental monitoring program. Statistical methods used to analyze the data should be described in detail prior to data collection. This is important because repetitive observations are recorded in time and space. Besides, the statistical methods could also be chosen so that uncertainty or error estimates in the data can be quantified. For e.g., statistical methods useful in an environmental monitoring program include: 1) frequency distribution analysis; 2) analysis of variance; 3) analysis of covariance; 4) cluster analysis; 5) multiple regression analysis; 6) time series analysis; 7) the application of statistical models.

### Use of secondary data

The EBM program for EIA can at best address temporal and/or spatial variations limited to a limited extent because of cost implications and time limitations. Therefore analysis of all available information or data is essential to establish the regional profiles. So all the relevant secondary data available for different environmental components should be collated and analyzed.

To facilitate stakeholders, IL&FS Ecosmart has made an attempt to compile the list of information required for EIA studies and sources of secondary data, which are given in **Annexure XIA** and **Annexure XIB**.

## 4.4.3 Impact prediction tools

The scientific and technical credibility of an EIA relies on the ability of EIA practitioners to estimate the nature, extent, and magnitude of change in environmental components that may result from project activities. Information about predicted changes is needed for assigning impact significance, prescribing mitigation measures, and designing & developing EMPs and monitoring programs. The more accurate the predictions, the more confident the EIA practitioner will be in prescribing specific measures to eliminate or minimize the adverse impacts of development project.

Choice of models/methods for impact predictions in respect to air, noise, water, land, biological and socio-economic environment are tabulated in **Annexure XII**.

## 4.4.4 Significance of the impacts

Evaluating the significance of environmental effects is perhaps the most critical component of impact analysis. More than other components, however, the interpretation of significance is also a contentious process. The interpretation of significance bears directly on the subsequent EIA process and also during prior environmental clearance on project approvals and condition setting. At an early stage, it also enters into screening and scoping decisions on what level of assessment is required and which impacts and issues will be addressed.

Impact significance is also a key to choosing among alternatives. In total, the attribution of significance continues throughout the EIA process, from scoping to EIS review, in a gradually narrowing "cone of resolution" in which one stage sets up the next. But at this stage it is the most important as better understanding and quantification of impact significance is required.

One common approach is based on determination of the significance of predicted changes in the baseline environmental characteristics and compares these w.r.t regulatory standards, objective criteria and similar 'thresholds' as eco-sensitivity, cultural /religious values. Often, these are outlined in guidance. A better test proposed by the CEAA (1995) is to determine if 'residual' environmental effects are adverse, significant, and likely (given under). But at this stage, the practice of formally evaluating significance of residual impacts, *i.e.*, after predicting the nature and magnitude of impacts based on before-versus-after-project comparisons, and identifying measures to mitigate these effects is not being followed in a systematic way.

### i. Step 1: Are the environmental effects adverse?

Criteria for determining if effects are "adverse" include:

- effects on biota health
- effects on rare or endangered species
- reductions in species diversity
- habitat loss
- transformation of natural landscapes
- effects on human health
- effects on current use of lands and resources for traditional purposes by aboriginal persons
- foreclosure of future resource use or production

### ii. Step 2: Are the adverse environmental effects significant?

Criteria for determining 'significance' are to judge that the impacts:

- are extensive over space or time
- are intensive in concentration or proportion to assimilative capacity
- exceed environmental standards or thresholds
- do not comply with environmental policies, landuse plans, sustainability strategy
- adversely and seriously affect ecologically sensitive areas
- adversely and seriously affect heritage resources, other landuses, community lifestyle and/or indigenous peoples traditions and values

### iii. Step 3: Are the significant adverse environmental effects likely?

Criteria for determining 'likelihood' include:

- probability of occurrence, and
- scientific uncertainty

## 4.5 Social Impact Assessment

Social Impact Assessment (SIA) is an instrument used to analyze social issues and solicit stakeholder views for the design of projects. SIA helps in making the project responsive to social development concerns, including the options that enhance benefits for poor and vulnerable people while mitigating risk and adverse impacts. It analyzes distributional impacts of intended project benefits on different stakeholder groups, and identifies differences in assets and capabilities to access the project benefits.

The scope and depth of the SIA should be determined by the complexity and importance of the issues studied, taking into account the skills and resources available. SIA should include studies related to involuntary resettlement, compulsory land acquisition, impact of imported workforces, job losses among local people, damage to sites of cultural, historic or scientific interest, impact on minority or vulnerable groups, child or bonded labour, use of armed security guards. However, SIA may primarily include the following:

**Description of the socio-economic, cultural and institutional profile**

Conduct a rapid review of available sources of information to describe the socio-economic, cultural and institutional interface in which the project operates.

Socio-economic and cultural profile: Describe the most significant social, economic and cultural features that differentiate social groups in the project area. Describe their different interests in the project, and their levels of influence. Explain specific effects the project may have on the poor and underprivileged. Identify any known conflicts among groups that may affect project implementation.

Institutional profile: Describe the institutional environment; consider both the presence and function of public, private and civil society institutions relevant to the operation. Are there important constraints within existing institutions e.g. disconnect between institutional responsibilities and the interests and behaviors of personnel within those institutions? Or are there opportunities to utilize the potential of existing institutions, e.g. private or civil society institutions, to strengthen implementation capacity.

### Legislative and regulatory considerations

To review laws and regulations governing the project's implementation and the access of poor and excluded groups to goods, services and opportunities provided by the project. In addition, review the enabling environment for public participation and development planning. SIA should build on strong aspects of legal and regulatory systems to facilitate program implementation and identify weak aspects while recommending alternative arrangements.

### Key social issues

SIA provides baseline information for designing the social development strategy. The analysis should determine the key social and institutional issues are which affect the project objectives; identify the key stakeholder groups in this context and determine how relationships between stakeholder groups will affect or be affected by the project; and identify expected social development outcomes and actions proposed to achieve those outcomes.

### Data collection and methodology

Describe the design and methodology for social analysis. In this regard:

- Build on existing data;
- Clarify the units of analysis for social assessment: intra-household, household level, as well as communities/settlements and other relevant social aggregations on which data is available or will be collected for analysis;
- Choose appropriate data collection and analytical tools and methods, employing mixed methods wherever possible; mixed methods include a mix of quantitative and qualitative methods.

### Strategy to achieve social development outcomes

Identify the likely social development outcomes of the project and propose a Social development strategy, including recommendations for institutional arrangements to achieve them, based on the findings of the social assessment. The social development strategy could include measures that:

- strengthen social inclusion by ensuring that both poor and excluded groups and intended beneficiaries are included in the benefit stream; offer access to opportunities created by the project
- empower stakeholders through their participation in the design and implementation of the project, their access to information, and their increased voice and accountability (i.e. a participation framework); and
- enhance security by minimizing and managing likely social risks and increasing the resilience of intended beneficiaries and affected persons to socioeconomic shocks

### Implications for analysis of alternatives

Review proposed approaches for the project, and compare them in terms of their relative impacts and social development outcomes. Consider what implications the findings of the social assessment might have on those approaches. Should some new components be added to the approach, or other components be reconsidered or modified?

If SIA and consultation processes indicate that alternative approaches may have better development outcomes, such alternatives should be described and considered, along with the likely budgetary and administrative effects these changes might have.

### Recommendations for project design and implementation arrangements

Provide guidance to project management and other stakeholders on how to integrate social development issues into project design and implementation arrangements. As much as possible, suggest specific action plans or implementation mechanisms to address relevant social issues and potential impacts. These can be developed as integrated or separate action plans, for example, as Resettlement Action Plans, Indigenous Peoples Development Plans, Community Development Plans, *etc*.

### Developing a monitoring plan

Through SIA process, a framework for monitoring and evaluation should be developed. To the extent possible, this should be done in consultation with key stakeholders, especially beneficiaries and affected people.

The framework shall identify expected social development indicators, establish benchmarks, and design systems and mechanisms for measuring progress and results related to social development objectives. The framework shall identify organizational responsibilities in terms of monitoring, supervision, and evaluation procedures. Wherever possible, participatory monitoring mechanisms shall be incorporated. The framework should establish:

- a set of monitoring indicators to track the progress achieved. The benchmarks and indicators should be limited in number, and should combine both quantitative and qualitative types of data. The indicators for outputs to be achieved by the social development strategy should include indicators to monitor the process of stakeholder participation, implementation and institutional reform
- indicators to monitor social risk and social development outcomes; and indicators to monitor impacts of the project's social development strategy. It is important to suggest mechanisms through which lessons learnt from monitoring and stakeholder feedback can result in changes to improve the operation of the project. Indicators

should be of such a nature that results and impacts can be disaggregated by gender and other relevant social groups

- define transparent evaluation procedures. Depending on context, these may include a combination of methods, such as participant observation, key informant interviews, focus group discussions, census and socio-economic surveys, gender analysis, Participatory Rural Appraisal (PRA), Participatory Poverty Assessment (PPA) methodologies, and other tools. Such procedures should be tailored to the special conditions of the project and to the different groups living in the project area; Estimate resource and budget requirements for monitoring and evaluation activities, and a description of other inputs (such as institutional strengthening and capacity building) needs to be carried out.

## 4.6 Risk Assessment

Industrial accidents results in great personal and financial loss. Managing these accidental risks in today's environment is the concern of every industry including isolated storage and handling of hazardous chemicals, because either real or perceived incidents can quickly jeopardize the financial viability of a business. Risk analysis and quantitative risk methodologies for isolated storages are discussed in Chapter 3.

## 4.7 Mitigation Measures

The purpose of mitigation is to identify measures that safeguard the environment and the community affected by the proposal. Mitigation is both a creative and practical phase of the EIA process. It seeks to find the best ways and means of avoiding, minimizing and remedying impacts. Mitigation measures must be translated into action in right way and at the right time, if they are to be successful. This process is referred to as impact management and takes place during project implementation. A written plan should be prepared for this purpose, and should include a schedule of agreed actions. Opportunities for impact mitigation will occur throughout the project cycle.

### 4.7.1 Important considerations for mitigation methods

The responsibility of project proponents to 'internalize' the full environmental costs of development proposals is now widely accepted under "Polluter Pay" principle. In addition, many proponents have found that good design and impact management can result in significant savings applying the principles of cleaner production to improve their environmental performance.

- The predicted adverse environmental as well as social impacts for which mitigation measures are required should be identified and briefly summarized along with cross referencing them to the significance, prediction components of the EIA report or other documentation.
- Each mitigation measure should be briefly described w.r.t the impact of significances to which it relates and the conditions under which it is required (for example, continuously or in the event of contingencies). These should also be cross-referenced to the project design and operating procedures which elaborate on the technical aspects of implementing the various measures.
- Cost and responsibilities for mitigation and monitoring should be clearly defined, including arrangements for coordination among various Authorities responsible for mitigation.

- The proponent can use the EMP to develop environmental performance standards and requirements for the storage facility as well as supply chain. An EMP can be implemented through EMS for the operational phase of the project.

Prior to selecting mitigation plans it is appropriate to study the mitigation alternatives for cost-effectiveness, technical and socio-political feasibility. Such mitigation measures could include:

- avoiding sensitive areas such as eco-sensitive area e.g. fish spawning areas, dense mangrove areas or areas known to contain rare or endangered species
- adjusting work schedules to minimize disturbance
- engineered structures such as berms and noise attenuation barriers
- pollution control devices such as scrubbers and electrostatic precipitators
- changes in fuel feed, manufacturing, process, technology use, or waste management practices, *etc.*

### 4.7.2 Hierarchy of elements of mitigation plan

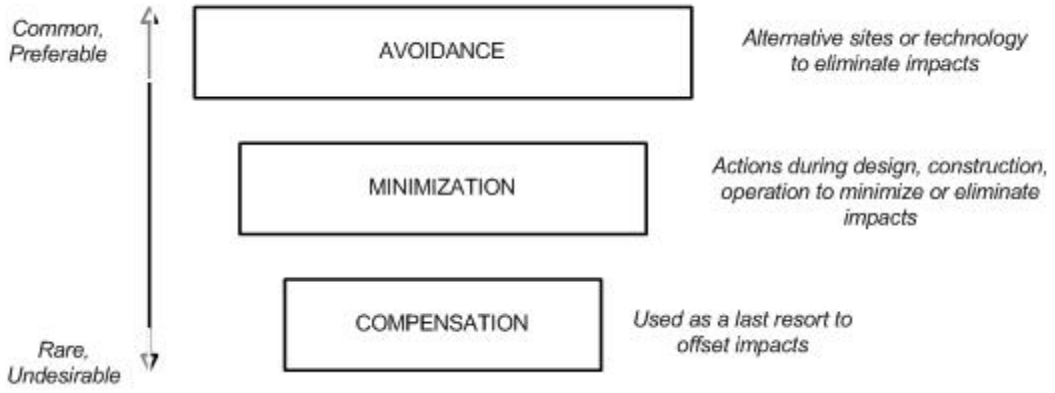


**Figure 4-4: Elements of Mitigation**

A good EIA practice requires technical understanding of relevant issues and the measures that work in such given circumstances. The priority of selection of mitigation measures should be in the order:

#### Step One: Impact avoidance

This step is most effective when applied at an early stage of project planning. It can be achieved by:

- not undertaking certain projects or elements that could result in adverse impacts
- avoiding areas that are environmentally sensitive
- putting in place the preventative measures to stop adverse impacts from occurring, for *e.g.*, release of water from a reservoir to maintain a fisheries regime

#### Step Two: Impact minimization

This step is usually taken during impact identification and prediction to limit or reduce the degree, extent, magnitude, or duration of adverse impacts. It can be achieved by:

- scaling down or relocating the proposal;
- redesigning elements of the project; and
- taking supplementary measures to manage the impacts.

### Step Three: Impact compensation

This step is usually applied to remedy unavoidable residual adverse impacts. It can be achieved by:

- rehabilitation of the affected site or environment, for example, by habitat enhancement and restocking fish
- restoration of the affected site or environment to its previous state or better, as typically required for mine sites, forestry roads and seismic lines
- replacement of the same resource values at another location. For example, by wetland engineering to provide an equivalent area to that lost to drainage or infill

#### Important compensation elements

Resettlement Plans: Special considerations apply to mitigation of proposals that displace or disrupt people. Certain types of projects, such as reservoirs and irrigation schemes and public works, are known to cause involuntary resettlement. This is a contentious issue because it involves far more than re-housing people; in addition, income sources and access to common property resources are likely to be lost. Almost certainly, a resettlement plan will be required to ensure that no one is worse off than before, which may not be possible for indigenous people whose culture and lifestyle is tied to a locality. This plan must include the means for those displaced to reconstruct their economies and communities and should include an EIA of the receiving areas. Particular attention should be given to indigenous, minority and vulnerable groups who are at higher risk from resettlement.

#### In-kind compensation

When significant or net residual loss or damage to the environment is likely, in kind compensation is appropriate. As noted earlier, environmental rehabilitation, restoration or replacement have become standard practices for many proponents. Now, increasing emphasis is given to a broader range of compensation measures to offset impacts and assure the sustainability of development proposals. These include impact compensation 'trading', such as offsetting $CO_2$ emissions by planting forests to sequester carbon.

## 4.7.3 Typical mitigation measures

Choice of location for the developmental activity plays an important role in preventing adverse impacts on the surrounding environment. Detailed guidelines on siting of industries are provided in Section 4.2. However, if the developmental activity produces any more adverse impacts, mitigation measures should be taken.

Previous subsections of the Section 4.7 could be precisely summarized into following:

- Impacts from a developmental project could have many dimensions. As most of the direct impacts are caused by releases from developmental projects, often impact control at source is the best opportunity to either eliminate or mitigate the impacts, in case these are cost-effective. In other words, the best way to mitigate the impacts is to

prevent them from occurring. Choice of raw materials/technologies/processes which produce least impact would be one of the options to achieve it.

- After exploring cost-effective feasible alternatives to control impacts at source, various interventions to minimize the adverse impacts may be considered. These interventions, primarily aim at reducing the residual impacts on VECs of the receiving environment to acceptable concentrations.
- Degree of control at source and external interventions differs from situation-to - situation and is largely governed by techno-economic feasibility. While the regulatory bodies stress for further source control (due to high reliability), the project proponents bargain for other interventions which may be relatively cost-effective than further control at source (in any case project authority is required to meet the industry-specific standards by adopting the best practicable technologies. However, if the location demands further control at source, then the proponents are required to adopt further advanced control technologies i.e. towards best available control technologies). After having discussions with the project proponent, EAC/SEAC reaches to an agreed level of source control+other interventions (together called as mitigation measures in the given context) that achieve the targeted protection levels for the VECs in the receiving environment. These levels will become the principle clearance conditions.
- Chapter 3 of this TGM offers elaborate information on various types of storages and options for pollution control. This information may be used to draw appropriate source control measures applicable at source.

The choice of interventions for mitigation of impacts may also be numerous and depend on various factors. Mitigation measures based on location-specific suitability and some other factors are discussed in sub-sections 4.7.1 and 4.7.2. A few typical measures which may also be explored for mitigation of impacts are listed in Table 4-4. Typical risk mitigation measures for selected storages are given in Table 4-5.

**Table 4-4: Typical Mitigation Measures**

| Impacts | Typical Mitigation Measures |
|---|---|
| Soil | ▪ Windscreens, maintenance, and installation of ground cover<br>▪ Installation of drainage ditches<br>▪ Runoff and retention ponds<br>▪ Minimize disturbances and scarification of the surface<br>▪ Usage of appropriate monitoring and control facilities for construction equipments deployed<br>▪ Methods to reuse earth material generated during excavation, *etc*. |
| Resources – fuel/construction material, etc. | ▪ Availing the resources which could be replenished by natural systems, *etc*. |
| Deforestation | ▪ Plant or create similar areas<br>▪ Initiate a tree planning program in other areas<br>▪ Donate land to conservationalist groups, *etc*. |
| Water pollution | ▪ Develop spill prevention plans in case of chemical discharges and spills<br>▪ Develop traps and containment system and chemically treat discharges on site<br>▪ Runoff and wastewater from the berths may be collected by gravity into STP, *etc*. |
| Ground water | ▪ Monitoring of ground waters. |

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| | ▪ Prohibit discharge of contaminated water onto the land or waterbody.<br>▪ Oil wastes may be collected through tilted plate interceptor and oil skimmer.<br>▪ Storing of oil wastes in lagoons should be minimised in order to avoid possible contamination of the ground water system.<br>▪ Conjunctive use of ground water to prevent depletion of water resources, *etc*. |
| Surface water | ▪ Stormwater drainage system to collect surface runoff<br>▪ Conjunctive use of surface water to prevent flooding/water logging/depletion of water resources. These may include landuse pattern, land filling, lagoon/reservoir/garland canal construction, and rainwater harvesting and pumping rate.<br>▪ Minimise flow variation from the mean flow<br>▪ In case of oil waste, oil separation before treatment and discharge into the environment.<br>▪ By controlling discharge of sanitary sewage and industrial waste into the environment.<br>▪ By avoiding the activities that increases erosion or that contributes nutrients to water (thus stimulating alga growth) , *etc*. |
| Air Pollution | ▪ Periodic checking of vehicles and construction machinery to ensure compliance to emission standards<br>▪ Attenuation of pollution/protection of receptor through greenbelt/green cover<br>▪ Dilution of odourant (dilution can change the nature as well as strength of an odour), odour counteraction or neutralise (certain pairs of odours in appropriate concentrations may neutralise each other), odour masking or blanketing (certain weaker malodours may be suppressed by a considerably stronger good odour).<br>▪ Regular monitoring of air polluting concentrations, *etc*. |
| Dust pollution | ▪ Adopt sprinkling of water<br>▪ Wetting of roadways to reduce traffic dust and re-entrained particles<br>▪ Control vehicle speed on sight<br>▪ Ensure periodical washing of construction equipment and transport vehicles to prevent accumulated dust<br>▪ Ensure that vehicles should be covered during transportation<br>▪ Installation of windscreens to breakup the wind flow<br>▪ Burning of refuse on days when meteorological conditions provide for good mixing and dispersion<br>▪ Providing dust collection equipment at all possible points<br>▪ Maintaining dust levels within permissible limits<br>▪ Provision for masks when dust level exceeds, *etc*. |
| Noise pollution | ▪ Use of suitable muffler systems/enclosures/sound-proof glass panelling on heavy equipment/pumps/blowers<br>▪ Pumps and blowers may be mounted on rubber pads or any other noise absorbing materials<br>▪ Limiting certain activities<br>▪ Placement of equipments emitting high noise in an orientation that directs the noise away from sensitive receptors<br>▪ Periodic maintenance of equipments/replacing whenever necessary / lubrication of rotating parts, *etc*.<br>▪ By using damping, absorption, dissipation, and deflection methods<br>▪ Performance specifications for noise represent a way to insure the procured item is controlled<br>▪ Use of ear protective devices.<br>▪ In case of steady noise levels above 85-dB (A), initiation of hearing |

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| | conservation measures<br>▪ Implementation of greenbelt for noise attenuation may be taken up, *etc*. |
| Biological | ▪ Installation of systems to discourage nesting or perching of birds in dangerous environments<br>▪ Increased employee awareness to sensitive areas, *etc*. |
| Social | ▪ Health and safety measures for workers<br>▪ Development of traffic plan that minimizes road use by workers<br>▪ Upgrade of roads and intersections<br>▪ Provide suffiecient counseling and time to the affected population for relocation<br>▪ Discuss and finalize alternate arrangements and associated infrastructure in places of religious importance<br>▪ Exploration of alternative approach routes in consultation with local community and other stakeholders<br>▪ Provision of alternate jobs in unskilled and skilled categories, *etc*. |
| Occupational health and safety | ▪ Provision of worker camps with proper sanitation and medical facilities, as well as making the worker camps self- sufficient with resources like water supply, power supply, etc<br>▪ Arrangement of periodic health check-ups for early detection and control of communicatble diseases.<br>▪ Arrangement to dispose off the wastes at approved disposal sites.<br>▪ Provide preventive measures for potentital fire hazards with requisite fire detection, fire-fighting facilities and adequate water storage, *etc*. |
| Construction | ▪ Have a transport management plan in place in order to prevent/minimize the disturbance on surrounding habitats<br>▪ Initiate traffic density studies, *etc*. |
| Solid / Hazardous waste | ▪ Proper handling of excavated soil<br>▪ Proper plan to collect and dispose off the solid waste generated onsite.<br>▪ Identify an authorized waste handler for segregation of construction and hazardous waste and its removal on a regular basis to minimise odour, pest and litter impacts<br>▪ Prohibit burning of refuse onsite , *etc*. |

**Table 4-5: Typical Risk Mitigation Measures for Selected Storages**

| Unit | Better operating practices |
|---|---|
| Chlorine handling units (water works) | ▪ Cranes and pulley blocks may be properly maintained and checked annually<br>▪ Copper tube connections may be inspected and replaced when found corroded or damaged or stressed<br>▪ Crane and pulley block operators should be made aware of the danger involved and its consequences and made to adhere to the safe operating procedure under supervision<br>▪ Tonners are to be handled always with the dome cover in place and bolted<br>▪ Cylinder repair kits and gadgets may be available readily and located near the area of operation<br>▪ Personal Protection Equipment (PPE) like gas mask and self-contained breathing apparatus should be available in adequate numbers, well-maintained and operators to be trained to use them properly<br>▪ Wind bags may be installed at prominent heights, visible from all |

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| | locations.<br>▪ Piping layout for connection of cylinders isolation, monitoring and relief facilities may be engineered properly<br>▪ All manifold connections are to be provided with neutralization pits, which are permanently connected by piping for easy evacuation of leaky cylinder<br>▪ Electric and manual sirens may be provide to give alarm in case of emergency<br>▪ A public address system is essential to warn the outside public and instruct them correctly and clearly in case of emergency<br>▪ Mock drills are required to be performed regularly<br>▪ Communication systems should be adequate and operable all the time<br>▪ Transport and medical aids may be adequately available<br>▪ During major emergencies, public in the affected zones may advised to stay in doors with all the windows and doors closed till the chlorine gas disperses safely |
| Biogas handling units | ▪ Gas handling areas may be fenced off and manned to improve security and safety<br>▪ Sign boards like "NO SMOKING" and "PROHIBITED AREA" are to be displayed predominantly<br>▪ All wild grass around the plant areas may be cut and removed to prevent grass fire<br>▪ All instruments and equipments may be maintained on a regular basis. Pipelines and vessels are to be painted to reduce corrosion<br>▪ Gas line to consumers is to be routinely inspected and required maintenance to be done<br>▪ Vulnerable instruments like rupture disks may be protected mechanically in order to prevent failure<br>▪ Wind socks to be provided at vantage points for guiding the operator in case of emergency<br>▪ Importance of water seal to be explained to all operating staff and are to be maintained and inspected regularly<br>▪ PVRV mounted on the top of gas holders and digestors are to be regularly maintained and tested, once in a year |

## 4.8 Environmental Management Plan

A typical EMP shall be composed of the following:

1. summary of potential impacts of the proposal
2. description of recommended mitigation measures
3. description of monitoring programme to ensure compliance with relevant standards and residual impacts
4. allocation of resources and responsibilities for plan implementation
5. implementation schedule and reporting procedures
6. contingency plan when impacts are greater than expected

**Summary of impacts:** The predicted adverse environmental and social impacts for which mitigation measures are identified in earlier sections to be briefly summarized with cross referencing to the corresponding sections in EIA report.

**Description of mitigation measures:** Each mitigation measure should be briefly described w.r.t the impact to which it relates and the conditions under which it is required. These should be accompanied by, or referenced to, project design and operating procedures which elaborate on the technical aspects of implementing the various measures.

**Description of monitoring programme to ensure compliance with relevant standards and residual impacts:** Environmental monitoring refers to compliance monitoring and residual impact monitoring. Compliance monitoring refers to meeting the industry-specific statutory compliance requirements (Ref. Applicable National regulations as detailed in Chapter 3).

Residual impact monitoring refers to monitoring of identified sensitive locations with adequate number of samples and frequency. The monitoring programme should clearly indicate the linkages between impacts identified in the EIA report, measurement indicators, detection limits (where appropriate), and definition of thresholds that will signal the need for corrective actions.

**Allocation of resources and responsibilities for plan implementation:** These should be specified for both the initial investment and recurring expenses for implementing all measures contained in the EMP, integrated into the total project costs, and factored into loan negotiation.

The EMP should contain commitments that are binding on the proponent in different phases of project implementation *i.e.,* pre-construction or site clearance, construction, operation, decommissioning.

Responsibilities for mitigation and monitoring should be clearly defined, including arrangements for co-ordination between the various actors responsible for mitigation. Details should be provided w.r.t deployment of staff (detailed organogram), monitoring network design, parameters to be monitored, analysis methods, associated equipments, *etc*.

**Implementation schedule and reporting procedures:** The timing, frequency and duration of mitigation measure should be specified in an implementation schedule, showing links with overall project implementation. Procedures to provide information on progress and results of mitigation and monitoring measures should also be clearly specified.

**Contingency Plan when the impacts are greater than expected**: There shall be a contingency plan for attending the situations where the residual impacts are higher than expected. It is an imperative requirement for all project Authorities to plan additional programmes to deal with the situation, after duly intimating the concerned local regulatory bodies.

## 4.9 Reporting

Structure of the EIA report (Appendix III of the EIA Notification), applicable for isolated storage and handling of hazardous chemicals industry is given in the Table 4.6. Each task prescribed in ToR shall be incorporated appropriately in the contents in addition to the contents described in the table.

**Table 4-6: Structure of EIA Report**

| S.No | EIA Structure | Contents |
|---|---|---|
| 1. | Introduction | ▪ Purpose of the report<br>▪ Identification of project & project proponent<br>▪ Brief description of nature, size, location of the project and its importance to the country, region<br>▪ Scope of the study – details of regulatory scoping carried out (As per Terms of Reference) |
| 2. | Project Description | Condensed description of those aspects of the project (based on project feasibility study), likely to cause environmental effects. Details should be provided to give clear picture of the following:<br>▪ Type of project<br>▪ Need for the project<br>▪ Location (maps showing general location, specific location, project boundary & project site layout)<br>▪ Size or magnitude of operation (incl. Associated activities required by or for the project)<br>▪ Proposed schedule for approval and implementation<br>▪ Technology and process description<br>▪ Project description including drawings showing project layout, components of project *etc*. Schematic representations of the feasibility drawings which give information important for EIA purpose<br>▪ Description of mitigation measures incorporated into the project to meet environmental standards, environmental operating conditions, or other EIA requirements (as required by the scope)<br>▪ Assessment of new & untested technology for the risk of technological failure |
| 3. | Description of the Environment | ▪ Study area, period, components & methodology<br>▪ Establishment of baseline for VECs, as identified in the scope<br>▪ Base maps of all environmental components |
| 4. | Anticipated Environmental Impacts & Mitigation Measures | ▪ Details of Investigated Environmental impacts due to project location, possible accidents, project design, project construction, regular operations, final decommissioning or rehabilitation of a completed project<br>▪ Measures for minimizing and / or offsetting adverse impacts identified<br>▪ Irreversible and irretrievable commitments of environmental components<br>▪ Assessment of significance of impacts (Criteria for determining significance, Assigning significance)<br>▪ Mitigation measures |
| 5. | Analysis of Alternatives (Technology & Site) | ▪ Incase, the scoping exercise results in need for alternatives:<br>▪ Description of each alternative<br>▪ Summary of adverse impacts of each alternative<br>▪ Mitigation measures proposed for each alternative and selection of alternative |
| 6. | Environmental Monitoring Program | ▪ Technical aspects of monitoring the effectiveness of mitigation measures (incl. measurement methodologies, frequency, location, data analysis, reporting schedules, emergency procedures, detailed budget & procurement schedules) |

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| 7. | Additional Studies | ▪ Public consultation<br>▪ Risk assessment<br>▪ Social impact assessment, R&R action plans |
| 8. | Project Benefits | ▪ Improvements in physical infrastructure<br>▪ Improvements in social infrastructure<br>▪ Employment potential –skilled; semi-skilled and unskilled<br>▪ Other tangible benefits |
| 9. | Environmental Cost Benefit Analysis | ▪ If recommended at the scoping stage |
| 10. | EMP | ▪ Description of the administrative aspects that ensures proper implementation of mitigative measures and their effectiveness monitored, after approval of the EIA |
| 11. | Summary & Conclusion (This will constitute the summary of the EIA Report) | ▪ Overall justification for implementation of the project<br>▪ Explanation of how, adverse effects have been mitigated |
| 12. | Disclosure of Consultants engaged | ▪ Names of the Consultants engaged with their brief resume and nature of Consultancy rendered |

## 4.10 Public Consultation

Public consultation refers to the process by which the concerns of local affected people and others who have plausible stake in the environmental impacts of the project or activity are ascertained.

- Public consultation is not a decision taking process, but is a process to collect views of the people having plausible stake. If the SPCB/Public agency conducting public hearing is not convinced with the plausible stake, then such expressed views need not be considered.
- Public consultation involves two components, one is public hearing, and other one is inviting written responses/objections through Internet/by post, etc., by placing the summary of EIA report on the web site.
- All Category A and Category B1 projects require public hearing except the following:
  - Once prior environmental clearance is granted to industrial estates/SEZs/EPZs *etc*., for a given composition (type and capacity) of industries, then individual units will not require public hearing
  - Expansion of roads and highways, which do not involve any further acquisition of land.
  - All building/construction projects/area development projects/townships
  - All Category B2 projects
  - All projects concerning national defense and security or involving other strategic considerations as determined by the Central Government
- Public hearing shall be carried out at the site or in its close proximity, district-wise, for ascertaining concerns of local affected people.
- Project proponent shall make a request through a simple letter to the Member–Secretary of the SPCB/UTPCC to arrange public hearing.
- Project proponent shall enclose with the letter of request, at least 10 hard copies and 10 soft copies of the draft EIA report including the summary EIA report in English

and in the official language of the state/local language prepared as per the approved scope of work, to the concerned Authority.

- Simultaneously, project proponent shall arrange to send, one hard copy and one soft copy, of the above draft EIA report along with the summary EIA report to the following Authorities within whose jurisdiction the project will be located:
  - District magistrate/District Collector/Deputy Commissioner (s)
  - Zilla parishad and municipal corporation or panchayats union
  - District industries office
  - Urban local bodies (ULBs)/PRIs concerned/development authorities
  - Concerned regional office of the MoEF/SPCB
- Above mentioned Authorities except regional office of MoEF shall arrange to widely publicize the draft EIA report within their respective jurisdictions requesting the interested persons to send their comments to the concerned regulatory authorities. They shall also make draft EIA report for inspection electronically or otherwise to the public during normal office hours till the public hearing is over.
- Concerned regulatory Authority (MoEF/SEIAA/UTEIA) shall display the summary of EIA report on its website and also make full draft EIA report available for reference at a notified place during normal office hours at their head office.
- SPCB or UTPCC concerned shall also make similar arrangements for giving publicity about the project within the State/UT and make available the summary of draft EIA report for inspection in select offices, public libraries or any other suitable location, *etc*. They shall also additionally make available a copy of the draft EIA report to the above five authorities/offices as mentioned above.
- The Member–Secretary of the concerned SPCB or UTPCC shall finalize the date, time and exact venue for the conduct of public hearing within seven days of the date of the receipt of the draft EIA report from the project proponent and advertise the same in one major National Daily and one Regional vernacular Daily/official State language.
- A minimum notice period of 30 (thirty) days shall be provided to the public for furnishing their responses.
- No postponement of the date, time, venue of the public hearing shall be undertaken, unless some untoward emergency situation occurs. Only in case of emergencies and up on recommendation of the concerned District Magistrate/District Collector/Deputy Commissioner, the postponement shall be notified to the public through the same National and Regional vernacular dailies and also prominently displayed at all the identified offices by the concerned SPCB/ UTPCC
- In the above exceptional circumstances fresh date, time and venue for the public consultation shall be decided by the Member–Secretary of the concerned SPCB/ UTPCC only in consultation with the District Magistrate/District Collector/Deputy Commissioner and notified afresh as per the procedure.
- The District Magistrate/District Collector/Deputy Commissioner or his or her representative not below the rank of an Additional District Magistrate assisted by a representative of SPCB or UTPCC, shall supervise and preside over the entire public hearing process.
- The SPCB/UTPCC shall arrange to video film the entire proceedings. A copy of the videotape or a CD shall be enclosed with the public hearing proceedings while forwarding it to the Regulatory Authority concerned.

- The attendance of all those who are present at the venue shall be noted and annexed with the final proceedings
- There shall be *no quorum* required for attendance for starting the proceedings
- Persons present at the venue shall be granted the opportunity to seek information or clarifications on the project from the Proponent. The summary of the public hearing proceedings accurately reflecting all the views and concerns expressed shall be recorded by the representative of the SPCB/UTPCC and read over to the audience at the end of the proceedings explaining the contents in the local/vernacular language and the agreed minutes shall be signed by the District Magistrate/District Collector/Deputy Commissioner or his or her representative on the same day and forwarded to the SPCB/UTPCC concerned.
- A statement of the issues raised by the public and the comments of the proponent shall also be prepared in the local language or the official State language, as the case may be and in English and annexed to the proceedings.
- The proceedings of the public hearing shall be conspicuously displayed at the office of the Panchayats within whose jurisdiction the project is located, office of the concerned Zilla Parishad, District Magistrate/District Collector/Deputy Commissioner, and the SPCB or UTPCC. The SPCB/ UTPCC shall also display the proceedings on its website for general information. Comments, if any, on the proceedings, may be sent directly to the concerned regulatory authorities and the Applicant concerned.
- The public hearing shall be completed within a period of 45 (forty five) days from date of receipt of the request letter from the Applicant. Therefore the SPCB or UTPCC concerned shall send public hearing proceedings to the concerned regulatory authority within eight (8) days of the completion of the public hearing. Simultaneously, a copy will also be provided to the project proponent. The proponent may also directly forward a copy of the approved public hearing proceedings to the regulatory authority concerned along with the final EIA report or supplementary report to the draft EIA report prepared after the public hearing and public consultations incorporating the concerns expressed in the public hearing along with action plan and financial allocation, item-wise, to address those concerns.
- Upon receipt of the same, the Authority will place executive summary of the report on the website to invite responses from other concerned persons having a plausible stake in the environmental aspects of the project or activity.
- If SPCB/UTPCC is unable to conduct public hearing in the prescribed time, the Central Government incase of Category A projects and State Government or UT administration in case of Category B projects at the request of the SEIAA may engage any other agency or Authority for conducting the public hearing process within a further period of 45 days. The respective governments shall pay the appropriate fee to the public agency for conducting public hearing.
- A public agency means a non-profit making institution/ body such as technical/academic institutions, government bodies not subordinate to the concerned Authority.
- If SPCB/Public Agency authorized for conducting public hearing informs the Authority, stating that it is not possible to conduct the public hearing in a manner, which will enable the views of the concerned local persons to be freely expressed, then Authority may consider such report to take a decision that in such particular case, public consultation may not have the component of public hearing.

- Often restricting the public hearing to the specific district may not serve the entire purpose, therefore, NGOs who are local and registered under the Societies Act in the adjacent districts may also be allowed to participate in public hearing, if they so desire.
- Confidential information including non-disclosable or legally privileged information involving intellectual property right, source specified in the application shall not be placed on the website.
- The Authority shall make available on a written request from any concerned person the draft EIA report for inspection at a notified place during normal office hours till the date of the public hearing.
- While mandatory requirements will have to be adhered to, utmost attention shall be given to the issues raised in the public hearing for determining the modifications needed in the project proposal and the EMP to address such issues.
- Final EIA report after making needed amendments, as aforesaid, shall be submitted by the applicant to the concerned Authority for prior environmental clearance. Alternatively, a supplementary report to draft EIA and EMP addressing all concerns expressed during the public consultation may be submitted.

## 4.11 Appraisal

Appraisal means the detailed scrutiny by the EAC/SEAC of the application and the other documents like the final EIA report, outcome of the public consultation including public hearing proceedings submitted by the applicant for grant of prior environmental clearance.

- The appraisal shall be made by EAC to the Central Government or SEAC to SEIAA.
- Project proponent either personally or through consultant can make a presentation to EAC/SEAC for the purpose of appraising the features of the project proposal and also to clarify the issues raised by the members of the EAC/SEAC.
- On completion of these proceedings, concerned EAC/SEAC shall make categorical recommendations to the respective Authority, either for grant of prior environmental clearance on stipulated terms & conditions, if any, or rejection of the application with reasons.
- In case EAC/SEAC needs to visit the site or obtain further information before being able to make categorical recommendations, EAC/SEAC may inform the project proponent accordingly. In such an event, it should be ensured that the process of prior environmental clearance is not unduly delayed to go beyond the prescribed timeframe.
- Upon the scrutiny of the final report, if EAC/SEAC opines that ToR for EIA studies finalized at the scoping stage are covered by the proponent, then the project proponent may be asked to provide such information. If such information is declined by the project proponent or is unlikely to be provided early enough so as to complete the environmental appraisal within prescribed time of 60 days, the EAC/SEAC may recommend for rejection of the proposal with the same reason.
- Appraisal shall be strictly in terms of ToR for EIA studies finalized at the scoping stage and the concerns expressed during public consultation.
- This process of appraisal shall be completed within 60 days from the receipt of the updated EIA report and EMP reports, after completing public consultation.

- The EIA report will be typically examined for following:
  - Project site (storage facility) description supported by topographic maps & photographs – detailed description of topography, land use and activities at the proposed project site (storage facility) and its surroundings (buffer zone) supported by photographic evidence.
  - Clarity in description of drainage pattern, location of eco-sensitive areas, vegetation characteristics, wildlife status - highlighting significant environmental attributes such as feeding, breeding and nesting grounds of wildlife species, migratory corridor, wetland, erosion and neighboring issues.
  - Description of the project site (storage facility) – how well the interfaces between the project related activities and the environment have been identified for the entire project cycle i.e. construction, operation and decommissioning at the end of the project life.
  - How complete and authentic are the baseline data pertaining to flora and fauna and socio economic aspects?
  - Citing of proper references, with regard to the source(s) of baseline data as well as the name of the investigators/ investigating agency responsible for collecting the primary data.
  - How consistent are the various values of environmental parameters with respect to each other?
  - Is a reasonable assessment of the environmental and social impact made for the identified environmental issues including project affected people?
  - To what extent the proposed environmental plan will mitigate the environmental impact and at what estimated cost, shown separately for construction, operation and closure stages and also separately in terms of capital and recurring expenses along with details of agencies that will be responsible for the implementation of environmental plan/ conservation plan.
  - How well the concerns expressed/highlighted during public hearing have been addressed and incorporated in the EMP giving item wise financial provisions and commitments (in quantified terms)?
  - How far the proposed environmental monitoring plan will effectively evaluate the performance of the EMP? Are details for environmental monitoring plan provided in the same manner as the EMP?
  - Identification of hazard and quantification of risk assessment and whether appropriate mitigation plan has been included in the EMP?
  - Does the proposal include a well formulated time bound green belt development plan for mitigating environmental problems such as fugitive emission of dust, gaseous pollutants, noise, odour, etc.
  - Does EIA make a serious attempt to guide the project proponent for minimizing the requirement of natural resources including land, water energy and other non renewable resources?
  - How well has the EIA statement been organized and presented so that the issues, their impact and environmental management strategies emerge clearly from it and how well organized was the power point presentation made before the expert committee?

– Is the information presented in the EIA adequately and appropriately supported by maps, imageries and photographs highlighting site features and environmental attributes?

## 4.12 Decision Making

The Chairperson reads the sense of the Committee and finalizes the draft minutes of the meeting, which are circulated by the Secretary to all expert members invited to the meeting. Based on the response from the members, the minutes are finalized and signed by the Chairperson. This process for finalization of the minutes should be so organized that the time prescribed for various stages is not exceeded.

### Approval / Rejection / Reconsideration

- The Authority shall consider the recommendations of concerned appraisal Committee and convey its decision within 45 days of the receipt of recommendations.
- If the Authority disagrees with the recommendations of the Appraisal Committee, then reasons shall be communicated to concerned Appraisal Committee and applicant within 45 days from the receipt of the recommendations. The Appraisal Committee concerned shall consider the observations of the Authority and furnish its views on the observations within further period of 60 days. The Authority shall take a decision with in the next 30 days based on the views of appraisal Committee.
- If the decision of the Authority is not conveyed within the time, then the proponent may proceed as if the prior environmental clearance sought has been granted or denied by the regulatory authority in terms of the final recommendation of the concerned appraisal Committee. For this purpose, the decision of the Appraisal Committee will be a public document, once the period specified above for taking the decision by the Authority is over.
- In case of Category B projects, application shall be received by the Member–Secretary of the SEIAA and clearance shall also be issued by the same SEIAA.
- Deliberate concealment and/or submission of false or misleading information or data which is material to screening or scoping or appraisal or decision on the application shall make the application liable for rejection, and cancellation of prior environmental clearance granted on that basis. Rejection of an application or cancellation of a prior environmental clearance already granted, on such ground, shall be decided by the regulatory authority, after giving a personal hearing to the applicant, and following the principles of natural justice.

### If approved

- The concerned MoEF/SEIAA will issue an prior environmental clearance for the project.
- The project proponent should make sure that the award of prior environmental clearance is properly publicized in at least two local newspapers of the district or state where the proposed project is located. For instance, the executive summary of the prior environmental clearance may be published in the newspaper along with the information about the location (website/office where it is displayed for public) where the detailed prior environmental clearance is made available. The MoEF and SEIAA/UTEIAA, as the case may be, shall also place the prior environmental

clearance in the public domain on Government Portal. Further copies of the prior environmental clearance shall be endorsed to the Heads of local bodies, Panchayats and Municipal bodies in addition to the relevant offices of the Government.

- The prior environmental clearance will be valid from the start date to actual commencement of the production of the developmental activity.
- Usual validity period will be 5 years from the date of issuing environmental clearance, unless specified by EAC/SEAC.
- A prior environmental clearance issued to a project proponent can be transferred to another legal person entitled to undertake the project, upon application by the transferor to the concerned Authority or submission of no-objection of the transferor by the transferee to the concerned Authority for the concurrence. In this case, EAC/SEAC concurrence is not required, but approval from the concerned authority is required to avail the same project configurations, validity period transferred to the new legally entitled person to undertake the project.

## 4.13 Post-clearance Monitoring Protocol

The MoEF, Government of India will monitor and take appropriate action under the EP Act, 1986.

- In respect of Category A projects, it shall be mandatory for the project proponent to make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by advertising it at least in two local newspapers of the district or State where the project is located and in addition, this shall also be displayed in the project proponents website permanently.
- In respect of Category B projects, irrespective of its clearance by MoEF/SEIAA, the project proponent shall prominently advertise in the newspapers indicating that the project has been accorded environment clearance and the details of MoEF website where it is displayed.
- The MoEF and the SEIAA/UTEIAA, as the case may be, shall also place the environmental clearance in the public domain on Government Portal.
- Copies of the environmental clearance shall be submitted by the project proponents to the Heads of the local bodies, Panchayats and Municipal bodies in addition to the relevant offices of the Government who in turn have to display the same for 30 days from the date of receipt.

The project proponent must submit half-yearly compliance reports in respect of the stipulated prior environmental clearance terms and conditions in hard and soft copies to the regulatory authority concerned, on 1st June and 1st December of each calendar year.

All such compliance reports submitted by the project management shall be public documents. Copies of the same shall be given to any person on application to the concerned regulatory authority. Such latest such compliance report shall also be displayed on the website of the concerned regulatory Authority

The SPCB shall incorporate EIA clearance conditions into consent conditions in respect of Category A and Category B projects and in parallel shall monitor and enforce the same.

# 5. STAKEHOLDERS' ROLES AND RESPONSIBILITIES

Prior environmental clearance process involves many stakeholders *i.e.*, Central Government, State Government, SEIAA, EAC at the National Level, SEAC, Public Agency, SPCB, the project proponent, and the public.

- Roles and responsibilities of the organizations involved in different stages of prior environmental clearance are listed in Table 5-1.
- Organization-specific functions are listed in Table 5-2.

In this Chapter, constitution, composition, functions, *etc*., of the Authorities and the Committees are discussed in detail.

**Table 5-1: Roles and Responsibilities of Stakeholders Involved in Prior Environmental Clearance**

| Stage | MoEF/ SEIAA | EAC/ SEAC | Project Proponent | EIA Consultant | SPCB/ Public Agency | Public and Interest Group |
|---|---|---|---|---|---|---|
| **Screening** | Receives application and takes advice of EAC/ SEAC | Advises the MoEF/ SEIAA | Submits application (Form 1) and provides necessary information | Advises and assists the proponent by providing technical information | | |
| **Scoping** | Approves the ToR, communicates the same to the project proponent and places the same in the website | Reviews the ToR, visits the proposed site, if required and recommends the ToR to the MoEF/ SEIAA | Submits the draft ToR to SEIAA and facilitates the visit of the EAC/SEAC members to the project site | Prepares ToR | | |
| **EIA Report & Public Hearing** | Reviews and forwards copies of the EIA report to SPCB /public agency for conducting public hearing<br>Places the | | Submits detailed EIA report as per the finalized ToR<br>Facilitates the public hearing by arranging presentation on the project, EIA and EMP – takes note of objections and updates the | Prepares the EIA report<br>Presents and appraises the likely impacts and pollution control measures proposed in the public hearing | Reviews EIA report and conducts public hearing in the manner prescribed<br>Submits proceedings and views of SPCB, to | Participates in public hearings and offers comments and observations.<br>Comments can be sent directly to SEIAA through |

| Stage | MoEF/ SEIAA | EAC/ SEAC | Project Proponent | EIA Consultant | SPCB/ Public Agency | Public and Interest Group |
|---|---|---|---|---|---|---|
| | summary of EIA report in the website<br>Conveys objections to the project proponent for update, if any | | EMP accordingly | | the Authority and the project proponent as well | Internet in response to the summary placed in the website |
| **Appraisal and Clearance** | Receives updated EIA<br>Takes advice of EAC/ SEAC, approves EIA and attaches the terms and conditions | Critically examines the reports, presentation of the proponent and appraises MoEF/ SEIAA (recommendations are forwarded to MoEF/ SEIAA) | Submits updated EIA, EMP reports to MoEF/SEIAA.<br>Presents the overall EIA and EMP including public concerns to EAC/SEAC | Provides technical advise to the project proponent and if necessary presents the proposed measures for mitigation of likely impacts (terms and conditions of clearance) | | |
| **Post-clearance Monitoring** | | | Implements environmental protection measures prescribed and submits periodic monitoring results | Conducts periodic monitoring | Incorporates the clearance conditions into appropriate consent conditions and ensures implementation | |

**Table 5-2: Organization-specific Functions**

| Organization | Functions |
|---|---|
| **Central Government** | ▪ Constitutes the EAC<br>▪ Considering recommendations of the State Government, constitutes the SEIAA & SEAC<br>▪ Receives application from the project proponent in case of Category A projects or Category B projects attracting general condition<br>▪ Communicated the ToR finalized by the EAC to the project proponent.<br>▪ Receives EIA report from the project proponent and soft copy of summary of the report for placing in the website<br>▪ Summary of EIA report will be placed in website. Forwards the received responses to the project proponent |

| Organization | Functions |
|---|---|
| | ▪ Engages other public agency for conducting public hearings in cases where the SPCB does not respond within time<br>▪ Receives updated EIA report from project proponent incorporating the considerations from the proceedings of public hearing and responses received through other media<br>▪ Forwards updated EIA report to the EAC for appraisal<br>▪ Either accepts the recommendations of EAC or asks for reconsideration of specific issues for review by the EAC.<br>▪ Takes the final decision – acceptance/ rejection – of the project proposal and communicates the same to the project proponent |
| **State Government** | ▪ Identifies experts as per the composition specified in the Notification and subsequent guidelines to recommend to the the Central Government.<br>▪ Extends funding support to fulfill the functions of SEIAA/SEAC<br>▪ Engages other public agency for conducting public hearings in cases where the SPCB does not respond within time<br>▪ State Governments will suitably pay the public agency for conducting such activity |
| **EAC** | ▪ Reviews Form 1 and its attachments<br>▪ Visits site(s), if necessary<br>▪ Finalizes ToR and recommends to the Central Government, which in turn communicates the finalized ToR to the project proponent, if not exempted by the Notification<br>▪ Reviews EIA report, proceedings and appraises their views to the Central government<br>▪ If the Central Government has any specific views, then the EAC reviews again for appraisal |
| **SEIAA** | ▪ Receives application from the project proponent<br>▪ Considers SEAC's views for finalization of ToR<br>▪ Communicates the finalized ToR to the project proponent<br>▪ Receives EIA report from project proponent<br>▪ Uploads the summary of EIA report in the website in cases of Category B projects<br>▪ Forwards the responses received to the project proponent<br>▪ Receives updated EIA report from project proponent incorporating the considerations from the proceedings of public hearing and responses received through other media<br>▪ Forwards updated EIA report to SEAC for appraisal<br>▪ Either accepts the recommendations of SEAC or asks for reconsideration of specific issues for review by SEAC.<br>▪ Takes the final decision and communicates the same to the project proponent |
| **SEAC** | ▪ Reviews Form 1<br>▪ If necessary visits, site(s) for finalizing the ToR<br>▪ Reviews updated EIA - EMP report and<br>▪ Appraises the SEIAA |
| **SPCB** | ▪ Receives request from project proponent and conducts public hearing in the manner prescribed.<br>▪ Conveys proceedings to concerned authority and project proponent |
| **Public Agency** | ▪ Receives request from the respective Governments to conduct public hearing<br>▪ Conducts public hearing in the manner prescribed.<br>▪ Conveys proceedings to the concerned Authority/EAC /Project proponent |

## 5.1 SEIAA

- SEIAA is constituted by the MoEF to take final decision regarding the acceptance/rejection of prior environmental clearance to the project proposal for all Category 'B' projects.
- The state government may decide whether to house them at the Department of Environment or at any other Board for effective operational support.
- State Governments can decide whether the positions are permanent or part-time. The Central Government (MoEF) continues to follow the model of paying fee (TA/DA, accommodation, sitting fee) to the Chairperson and the members of EAC. As such, the State Government is to fund SEIAA & SEAC and decide the appropriate institutional support for them.

### A. Constitution

- SEIAA is constituted by the Central Government comprising of three members including a Chairperson and Member–Secretary to be nominated by the State Government or UT Administration concerned.
- The Central Government will notify as and when the nominations (in order) are received from the State Governments, within 30 days from the date of receipt.
- The Chairperson and the non-official member shall have a fixed term of three years, from the date of Notification by the Central Government constituting the Authority.

The form used by the State Governments to submit nominations for Notification by the Central Government is provided in **Annexure XIII**.

### B. Composition

- Chairperson shall be an expert in the EIA process
- Member–Secretary shall be a serving officer of the concerned State Government/ UT Administration familiar with the environmental laws.
- Member–Secretary may be of a level equivalent to the Director, Dept. of Environment or above – a full time member.
- All the members including the Chairperson shall be the experts as per the criteria set in the Notification.
- The Government servants can only serve as the Member–Secretary to SEIAA and the Secretary to SEAC. All other members including Chairperson of the SEIAA and SEAC shall not be comprised of serving Government Officers; industry representatives; and the activists.
- Serving faculty (academicians) is eligible for the membership in the Authority and/or the Committees, if they fulfill the criteria given in Appendix VI to the Notification.
- This is to clarify that the serving Government officers shall not be nominated as professional/expert member of SEIAA/SEAC/EAC.
- Professionals/Experts in the SEIAA and SEAC shall be different.

Summary regarding the eligibility criteria for Chairperson and Members of the SEIAA is given in Table 5-3.

## C. Decision-making process

- The decision of the Authority shall be arrived through consensus.
- If there is no consensus, the Authority may either ask SEAC for reconsideration or may reject the approval.
- All decisions of the SEIAA shall be taken in a meeting and shall ordinarily be unanimous. ,In case a decision is taken by majority, the details of views, for and against the decision, shall be clearly recorded in the minutes of meeting and a copy thereof shall be sent to MoEF.

**Table 5-3: SEIAA: Eligibility Criteria for Chairperson / Members / Secretary**

| S. No. | Attribute | | Requirement | | |
|---|---|---|---|---|---|
| | | | Members | Member–Secretary | Chairperson |
| 1 | Professional qualification as per the Notification | | Compulsory | Compulsory | Compulsory |
| 2 | Experience<br>(Fulfilling any one of a, b, c) | a | Professional Qualification + 15 years of experience in one of the expertise area mentioned in the Appendix VI | Professional Qualification + 15 years of experience in one of the expertise area mentioned in the Appendix VI | Professional Qualification + 15 years of experience in one of the expertise area mentioned in the Appendix VI |
| | | b | Professional Qualification +PhD+10 years of experience in one of the expertise area mentioned in Appendix VI | Professional Qualification +PhD+10 years of experience in one of the expertise area mentioned in the Appendix VI | Professional Qualification +PhD+10 years of experience in one of the expertise area mentioned in the Appendix VI |
| | | c | Professional Qualification +10 years of experience in one of the expertise area mentioned in the Appendix VI + 5 years interface with environmental issues, problems and their management | Professional Qualification +10 years of experience in one of the expertise area mentioned in the Appendix VI + 5 years interface with environmental issues, problems and their management | ---------- |
| 3 | Test of independence (conflict of interest) and minimum grade of the Secretary of the Authority | | Shall not be a serving government officer<br>Shall not be a person engaged in industry and their associations<br>Shall not be a person associated with environmental activism | Only serving officer from the State Government (DoE) familiar with environmental laws not below the level of Director | Shall not be a serving government officer<br>Shall not be a person engaged in industry and their associations<br>Shall not be a person associated with environmental activism |

| S. No. | Attribute | Requirement | | |
|---|---|---|---|---|
| | | Members | Member–Secretary | Chairperson |
| 4 | Age | Below 67 years at the time of Notification of the Authority | As per State Government Service Rules | Below 72 Years at the time of the Notification of the Authority |
| 5 | Other memberships in Central/State Expert Appraisal Committees | Shall not be a member in any SEIAA/EAC/SEAC | Shall not be a member in any SEIAA/EAC/SEAC | Shall not be a member in any SEIAA/EAC/SEAC |
| 6 | Tenure of earlier appointment (continuous) | Only one term before this in continuity is permitted | Not applicable | Only one term before this in continuity is permitted |
| 7 | Eminent environmental expertise with understanding on environmental aspects and impacts | Desirable | Desirable | Compulsory |
| 8 | Expertise in the environmental clearance process | Desirable | Desirable | Compulsory |

Notes:

*1. A member after continuous membership in two terms (6 years) shall not be considered for further continuation. His/her nomination may be considered after a gap of one term (three years), if other criteria meet.*

*2. Chairperson/Member once notified may not be removed prior to the tenure of three years without cause and proper enquiry.*

## 5.2 EAC and SEAC

EAC and SEAC are independent Committees to review each developmental activity and offer its recommendations for consideration of the Central Government and SEIAA respectively.

### A. Constitution

- EAC and SEAC shall be constituted by the Central Government comprising a maximum of 15 members including a Chairperson and Secretary. In case of SEAC, the State Government or UT Administration is required to nominate the professionals/experts for consideration and Notification by the Central Government.
- The Central Government will notify as and when the nominations (in order) are received from the State Governments, within 30 days from the date of receipt.
- The Chairperson and the non-official member shall have a fixed term of three years, from the date of Notification by the Central Government.
- The Chairperson shall be an eminent environmental expert with understanding on environmental aspects and environmental impacts. The Secretary of the SEAC shall be a State Government officer, not below the level of a Director/Chief Engineer.

- The members of the SEAC need not be from the same State/UT.
- In case the State Governments/ Union Territories so desire, the MoEF can form regional EAC to serve the concerned States/Union Territories.
- State Governments may decide to their convenience to house SEAC at the Department of Environment or at SPCB or at any other department, to extend support to the SEAC activities.

## B. Composition

- Composition of EAC/SEAC as per the Notification is given in **Annexure XIV.**
- Secretary to EAC/SEAC may invite a maximum of two professionals/experts with the prior approval of the Chairperson, if desired, for taking the advisory inputs for appraisal. In such case, the invited experts will not take part in the decision making process.
- The Secretary of each EAC/SEAC preferably be an officer of the level equivalent to or above the level of Director, MoEF, GoI.

## C. Decision making

The EAC and SEAC shall function on the principle of collective responsibility. The Chairperson shall endeavour to reach a consensus in each case, and if consensus cannot be reached, the view of the majority shall prevail.

## D. Operational issues

- Secretary may deal with all correspondence, formulate agenda and prepare agenda notes. Chairperson and other members may act only for the meetings.
- Chairperson of EAC/SEAC shall be one among the expert members having considerable professional experience with proven credentials.
- EAC/SEAC shall meet at least once every month or more frequently, if so needed, to review project proposals and to offer recommendations for the consideration of the Authority.
- EAC/SEAC members may inspect the site at various stages i.e. during screening, scoping and appraisal, as per the need felt and decided by the Chairperson of the Committee.
- The respective Governments through the Secretary of the Committee may pay/reimburse the participation expenses, honorarium *etc*., to the Chairperson and members.

### i. Tenure of EAC/SEIAA/SEAC

The tenure of Authority/Committee(s) shall be for a fixed period of three years. At the end of the three years period, the Authority and the committees need to be re-constituted. However, staggered appointment dates may be adopted to maintain continuity of members at a given point of time.

### ii. Qualifying criteria for nomination of a member to EAC/SEIAA/SEAC

While recommending nominations and while notifying the members of the Authority and Expert Committees, it shall be ensured that all the members meet the following three criteria:

- Professional qualification
- Relevant experience/Experience interfacing with environmental management
- Absence of conflict of interest

These are elaborated subsequently.

**a) Professional qualification**

The person should have at least (i) 5 years of formal University training in the concerned discipline leading to a MA/MSc Degree, or (ii) in case of Engineering/Technology/ Architecture disciplines, 4 years formal training in a professional training course together with prescribed practical training in the field leading to a B.Tech/B.E./B.Arch. Degree, or (iii) Other professional degree (e.g. Law) involving a total of 5 years of formal University training and prescribed practical training, or (iv) Prescribed apprenticeship/articleship and pass examinations conducted by the concerned professional association (e.g. MBA/IAS/IFS). In selecting the individual professionals, experience gained by them in their respective fields will be taken note of.

**b) Relevant experience**

- Experience shall be related to professional qualification acquired by the person and be related to one or more of the expertise mentioned for the expert members. Such experience should be a minimum of 15 years.
- When the experience mentioned in the foregoing sub-paragraph interfaces with environmental issues, problems and their management, the requirement for the length of the experience can be reduced to a minimum of 10 years.

**c) Absence of conflict of interest**

For the deliberations of the EAC/SEAC to be independent and unbiased, all possibilities of potential conflict of interests have to be eliminated. Therefore, serving government officers; persons engaged in industry and their associations; persons associated with the formulation of development projects requiring prior environmental clearance, and persons associated with environmental activism shall not be considered for membership of SEIAA/ SEAC/ EAC.

### iii. Age

Below 70 years for the members and below 72 years for the Chairperson of the SEIAA/SEAC/EAC. The applicability of the age is at the time of the Notification of the SEIAA/SEAC/EAC by the Central Government.

Summary regarding the eligibility criteria for Chairperson and Members of the EAC/SEAC is given in Table 5-4.

**Table 5-4: EAC/SEAC: Eligibility Criteria for Chairperson / Members / Secretary**

| S. No. | Attribute | | Requirement | | |
|---|---|---|---|---|---|
| | | | Expert members | Secretary | Chairperson |
| 1 | Professional qualification as per the Notification | | Compulsory | Compulsory | Compulsory |
| 2 | Experience<br>(Fulfilling any one of a, b, c) | a | Professional Qualification + 15 years of experience in one of the expertise area mentioned in the Appendix VI | Professional Qualification + 15 years of experience in one of the expertise area mentioned in the Appendix VI | Professional Qualification + 15 years of experience in one of the expertise area mentioned in the Appendix VI |
| | | b | Professional Qualification +PhD+10 years of experience in one of the expertise area mentioned in the Appendix VI | Professional Qualification +PhD+10 years of experience in one of the expertise area mentioned in the Appendix VI | Professional Qualification +PhD+10 years of experience in one of the expertise area mentioned in Appendix VI |
| | | c | Professional Qualification +10 years of experience in one of the expertise area mentioned in the Appendix VI + 5 years interface with environmental issues, problems and their management | Professional Qualification +10 years of experience in one of the expertise area mentioned in the Appendix VI + 5 years interface with environmental issues, problems and their management | ---------- |
| 3 | Test of independence (conflict of interest) and minimum grade of the Secretary of the Committees | | Shall not be a serving government officer<br>Shall not be a person engaged in industry and their associations<br>Shall not be a person associated with environmental activism | In case of EAC, not less than a Director from the MoEF, Government of India<br>Incase of SEAC, not below the level of Director/Chief Engineer from the State Government (DoE) | Shall not be a serving government officer<br>Shall not be a person engaged in industry and their associations<br>Shall not be a person associated with environmental activism |
| 4 | Age | | Below 67 years at the time of Notification of the Committee | As per state Government Service Rules | Below 72 Years at the time of the Notification of the Committee |
| 5 | Membership in Central/State Expert Appraisal committee | | Only one other than this nomination is permitted | Shall not be a member in other SEIAA/EAC/SEAC | Shall not be a member in any other SEIAA/EAC/SEAC |
| 6 | Tenure of earlier appointment (continuous) | | Only one term before this in continuity is permitted | Not applicable | Only one term before this in continuity is permitted |

| S. No. | Attribute | Requirement | | |
|---|---|---|---|---|
| | | Expert members | Secretary | Chairperson |
| 7 | Eminent environmental expertise with understanding on environmental aspects and impacts | Desirable | Not applicable | Compulsory |

Notes:

*1. A member after continuous membership in two terms (six years) shall not be considered for further continuation. His/her nomination may be reconsidered after a gap of one term (three years), if other criteria meet.*

*2. Chairperson/Member once notified may not be removed prior to the tenure of 3 years with out cause and proper enquiry. A member after continuous membership in two terms (6 years) shall not be considered for further continuation. The same profile may be considered for nomination after a gap of three years, i.e., one term, if other criteria are meeting.*

## E. Other conditions that may be considered

- An expert member of one State/UT, can have at the most another State/UT Committee membership, but in no case more than two Committees at a given point of time.
- An expert member of a Committee shall not have membership continuously in the same committee for more than two terms, i.e., six years. They can be nominated after a gap of three years, i.e., one term. When a member of Committee has been associated with any development project, which comes for prior environmental clearance, he/she may not participate in the deliberations and the decisions in respect to that particular project.
- At least four members shall be present in each meeting to fulfill the quorum
- If a member does not consecutively attend six meetings, without prior intimation to the Committee his/her membership may be terminated by the Notifying Authority. Prior information for absence due to academic pursuits, career development and national/state-endorsed programmes may be considered as genuine grounds for retention of membership.

# ANNEXURE I
# MSIHC Rules Schedule II - Isolated Storage at Installations Other than those Covered by Schedule 4

**THE MANUFACTURE, STORAGE AND IMPORT OF HAZARDOUS CHEMICAL RULES, 2000**

# SCHEDULE 2

**[(See rule 2(e) (ii), 4(1) (b), 4(2) (1) and 6(1) (b)]**
**Isolated storage at Installations other than those covered by Schedule 4**

(a) The threshold quantities set out below relate to each installation or group of installations belonging to the same occupier where the distance between installation is not sufficient to avoid, in foreseeable circumstances, any aggravation of major accident hazards. These threshold quantities apply in any case to each group of installations belonging to the same occupier where the distance between the installations is less than 500 metres.

(b) For the purpose of determining the threshold quantity of hazardous chemical at an isolated storage, account shall also be taken of any hazardous chemical which is:-

(i) in that part of any pipeline under the control of the occupier having control of the site wh.ch is within 500 metres of that site and connected to it;

(ii) at any other site under the control of the same occupier any part of the boundary of which is within 500 metres of the said site; and

(iii) in any vehicle, vessel, aircraft or hovercraft, under the control of the same occupier which is used for storage purpose either at the site or within 500 metres of it;

but no account shall be taken of any hazardous chemical which is in a vehicle, vessel, aircraft or a hovercraft used for transporting it.

| S.No | Chemicals | Threshold Quantities (tonnes) | |
|---|---|---|---|
| | | [1]For application of rules 4,5,7 to 9 and 13 to 15 | [1]For application of rule 10 to 12 |
| 1 | 2 | 3 | 4 |
| 1. | Acrylonitrile | 350 | 5,000 |
| 2. | Ammonia | 60 | 600 |
| 3. | Ammonium nitrate (a) | 350 | 2,500 |
| 4. | Ammonium nitrate fertilizers (b) | 1,250 | 10,000 |
| 5. | Chlorine | 10 | 25 |
| 6. | Flammable gases as defined in Schedule 1, paragraph (b) (i) | 50 | 300 |
| [2][7. | Extremely flammable liquids as defined in Schedule 1, paragraph (b) (ii) | 5000 | 50,000 |
| 8. | Liquid oxygen | 200 | 2000 |

[1] Substituted by Rule 10(i) (a) of the MSIHC (Amendment) Rules, 2000 notified by S.O.57(E), dated 19.1.2000 ;

[2] Substituted entry 7 by Rule 10(ii), ibid ;

| S.No | Chemicals | Threshold Quantities (tonnes) | |
|---|---|---|---|
| | | [1]For application of rules 4,5,7 to 9 and 13 to 15 | [1]For application of rule 10 to 12 |
| 1 | 2 | 3 | 4 |
| 9. | Sodium chlorate | 25 | 250 |
| 10. | Sulphur dioxide | 20 | 500 |
| 11. | Sujphur trioxide | 15 | 100 |
| [3][12. | Carbonyl chloride | 0.750 | 0.750 |
| 13. | Hydrogen Sulphide | 5 | 50 |
| 14. | Hydrogen Fluoride | 5 | 50 |
| 15. | Hydrogen Cyanide | 5 | 50 |
| 16. | Carbon disulphide | 20 | 200 |
| 17. | Bromine | 50 | 500 |
| 18. | Ethylene oxide | 5 | 501 |
| 19. | Propylene oxide | 5 | 50 |
| 20. | 2-Propenal (Acrolein) | 20 | 200 |
| 21. | Bromomethane (Methyl bromide) | 20 | 200 |
| 22. | Methyl isocyanate | 0.150 | 0.150 |
| 23. | Tetraethyl lead or tetramethyl lead | 5 | 50 |
| 24. | 1,2 Dibromoethane (Ethylene dibromide) | 5 | 50 |
| 25. | Hydrogen chloride (liquefied gas) | 25 | 250 |
| 26. | Diphenyl methane di-isocyanate (MDI) | 20 | 200 |
| 27. | Toluene di-isocyanate (TDI) | 10 | 100 |
| [4][28. | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | 7,000 | 7,000 |
| 29. | Highly flammable liquids as defined in Schedule 1, paragraph (b) (iv) | 10,000 | 10,000 |
| 30. | Flammable liquids as defined in Schedule-1, paragraph (b) (v) | 15,000 | 1,00,000 |

(a) This applies to ammonium nitrate and mixtures of ammonium nitrates where the nitrogen content derived from the ammonium nitrate is greater than 28 per cent by weight and to aqueous solutions of ammonium nitrate where the concentration of ammonium nitrate is greater than 90 per cent by weight.

(b) This applies to straight ammonium nitrate fertilizers and to compound fertilizers where the nitrogen content derived from the ammonium nitrate is greater than 28 per cent by weight (a compound-fertilizer contains ammonium nitrate together with phosphate and/or potash).

[3] Inserted entries 12 to 27 by Rule 11 of the MSIHC (Amendment) Rules, 1994 notified vide S.O.2882 dated 3.10.1994.

[4] Inserted entries 28, 29 and 30 by 10(iii) of the HSIHC (Amendment) Rules, 2000 notified by S.O.57 (E), dated 19.1.2000.

# ANNEXURE II
# MSIHC Rules Schedule III - List of Hazardous Chemicals for Application of Rules 5 and 7 to 15

**THE MANUFACTURE, STORAGE AND IMPORT OF HAZARDOUS CHEMICAL RULES, 2000**

# SCHEDULE 3

**[See Rule 2(e)(iii), 5 and 6(1) (a)]**
**List of hazardous chemicals for application of rules 5 and 7 to 15**

(a) The quantities set-out-below relate to each installation or group of installations belonging to the same occupier where the distance between the installations is not sufficient to avoid, in foreseeable circumstances, any aggravation of major-accident hazards. These quantities apply in any case to each group of installations belonging to the same occupier where the distance between the installations is less than 500 metres.

(b) (b) For the purpose of determining the threshold quantity of a hazardous chemical in an industrial installation, account shall also be taken of any hazardous chemicals which is:-

(i) in that part of any pipeline under the control of the occupier have control of the site, which is within 500 metres off that site and connected to it;

(ii) at any other site under the control of the same occupier any part of the boundary of which is within 500 metres of the said site ; and

(iii) in any vehicle, vessel, aircraft or hovercraft under the control of the same occupier which is used for storage purpose either at the site or within 500 metres of if;

but no account shall be taken of any hazardous chemical which is in a vehicle, vessel, aircraft or a hovercraft used for transporting it.

**Part –I**

**Named Chemicals**

| S. No. | Chemicals | Threshold Quantity | | |
|---|---|---|---|---|
| | | for application of Rules 5, 7-9 and 13-15 | for application of Rules 10-12 | CAS Number |
| (1) | (2) | (3) | (4) | (5) |
| **GROUP 1-TOXIC SUBSTANCES** | | | | |
| 1. | Aldicarb | 100kg | | 116-06-3 |
| 2. | 4-Aminodiphenyl | 1 kg | | 96-67-1 |
| 3. | Amiton | 1 kg | | 78-53-5 |
| 4. | Anabasine | 100 kg | | 494-52-0 |
| 5. | Arseinc pentoxide, Arsenic (V) acid & salts | 500 kg | | |
| 6. | Arsenic trioxide, Arsenic (III) acid & salts | 100 kg | | |
| 7. | Arsine (Arsenic hydride) | 10kg | | 7784-42-1 |
| 8. | Azinphos-ethyl | 100kg | | 2642-71-9 |
| 9. | Azinphos-methyl | 100 kg | | 86-50-0 |

| S. No. | Chemicals | Threshold Quantity | | CAS Number |
|---|---|---|---|---|
| | | for application of Rules 5, 7-9 and 13-15 | for application of Rules 10-12 | |
| (1) | (2) | (3) | (4) | (5) |
| 10. | Benzidine | 1 kg | | 92-87-5 |
| 11. | Bezidine salts | 1 kg | | |
| 12. | Beryllium (powders, compounds) | 10 kg | | |
| 13. | Bis (2-chloroethyl) sulphide | 1 kg | | 505-60-2 |
| 14. | Bis (chloromethyl) ether | 1 kg | | 542-88-1 |
| 15. | Carbophuran | 100 kg | | 1563-66-2 |
| 16. | Carbophenothion | 100 kg | | 786-19-6 |
| 17. | Chlorefenvinphos | 100 kg | | 470-90-6 |
| 18. | 4-(Chloroformyl) morpholine | 1 kg | | 15159-40-7 |
| 19. | Chloromethyl methyl ether | 1 kg | | 107-30-2 |
| 20. | Cobalt (metal, oxide, carbonates, sulphides, as powders) | 1 t | | |
| 21. | Crimidine | 100 kg | | 535-89-7 |
| 22. | Cynthoate | 100 kg | | 3734-95-0 |
| 23. | Cycloheximide | 100 kg | | 66-81-9 |
| 24. | Demeton | 100 kg | | 8065-48-3 |
| 25. | Dialifos | 100 kg | | 10311-84-9 |
| 26. | OO-Diethyl S-ethylsulphinylmethyl phosphorothiate | 100 kg | | 2588-05-8 |
| 27. | OO-Diethyl S-ethylsulphonylmethyl phosphorothiate | 100 kg | | 2588-06-9 |
| 28. | OO-Diethyl S-ethylthiomethyl Phosphorothioate | 100 kg | | 2600-69-3 |
| 29. | OO-Diethyl S-isoprophylthiomethyl phosphorothiate | 100 kg | | 78-52-4 |
| 30. | OO-Diethyl S-isopropylthiomethyl phosphorodithioate | 100 kg | | 3309-68-0 |
| 31. | Dimefox | 100 kg | | 115-26-4 |
| 32. | Dimethylcarbamoyl chloride | 1 kg | | 79-44-7 |
| 33. | Dimethylnitrosamine | 1 kg | | 62-75-9 |
| 34. | Dimethyl phosphoromidocynicidic acid | 1 t | | 63917-41-9 |
| 35. | Diphacinone | 100 kg | | 82-66-6 |
| 36. | Disulfoton | 100 kg | | 298-04-4 |
| 37. | EPN | 100 kg | | 2104-64-5 |
| 38. | Ethion | 100 kg | | 563-12-2 |
| 39 | Fensulfothion | 100 kg | | 115-90-2 |
| 40. | Fluenetil | 100 kg | | 4301-50-2 |
| 41. | Fluoroacetic acid | 1 kg | | 144-49-0 |
| 42. | Fluoroacetic acid, salts | 1 kg | | |
| 43. | Fluoroacetic acid, esters | 1 kg | | |
| 44. | Fluoroacetic acid, amides | 1 kg | | |
| 45. | 4-Fluorobutyric acid | 1 kg | | 462-23-7 |
| 46. | 4-Fluorobutyric acid, salts | 1 kg | | |
| 47. | 4-Fluorobutyric acid, esters | 1 kg | | |
| 48. | 4-Fluorobutyric acid, amides | 1 kg | | |
| 49. | 4-Fluorobutyric acid | 1 kg | | 37759-72-1 |
| 50. | 4-Fluorocrotonic acid, salts | 1 kg | | |

| S. No. | Chemicals | Threshold Quantity | | CAS Number |
|---|---|---|---|---|
| | | for application of Rules 5, 7-9 and 13-15 | for application of Rules 10-12 | |
| (1) | (2) | (3) | (4) | (5) |
| 51. | 4-Fluorocrotonic acid, esters | 1 kg | | |
| 52. | 4-Fluorocrotonic acid, amides | 1 kg | | |
| 53. | 4-Fluoro-2-hydroxybutyric acid, amides | 1 kg | | |
| 54. | 4-Fluoro-2-hydroxybutyric acid, salts | 1 kg | | |
| 55. | 4-Fluoro-2-hydroxybutyric acid, esters | 1 kg | | |
| 56. | 4-Fluoro-2-hydroxybutyric acid, amides | 1 kg | | |
| 57. | Glycolonitrile (Hydroxyacetonitrile ) | 100 kg | | 107-16-4 |
| 58. | 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin | 100 kg | | 194-8-74-3 |
| 59. | Hexmathylphosphoramide | 1 kg | | 680-31-9 |
| 60. | Hydrogen selenide | 10 kg | | 7783-07-5 |
| 61. | Isobenzan | 100 kg | | 297-78-9 |
| 62. | Isodrin | 100 kg | | 465-73-6 |
| 63. | Juglone (5-Hydroxynaphithalene 1,4 dione) | 100 kg | | 481-39-0 |
| 64. | 4,4-Methylenebis (2-chloroniline) | 10 kg | | 101-14-4 |
| 65. | Mthyl isocynate | 150 kg | 150kg | 624-83-9 |
| 66. | Mevinphos | 100 kg | | 7786-34-7 |
| 67. | 2-Naphthylamine | 1 kg | | 91-59-8 |
| 68. | 2-Nickel (metal, oxides, carbonates), sulphides, as powers) | 1 t | | |
| 69. | Nickel tetracarbonyl | 10 kg | | 13463-39-3 |
| 70. | Oxygendisulfoton | 100 kg | | 2497-07-6 |
| 71. | Oxygen difluoride | 10 kg | | 7783-41-7 |
| 72. | Paraxon (Diethyl 4-nitrophenyl phosphate) | 100 kg | | 311-45-5 |
| 73. | Parathion | 100 kg | | 56-38-2 |
| 74. | Parathion-methyl | 100 kg | | 298-00-0 |
| 75. | Pentaborane | 100 kg | | 19624-22-7 |
| 76. | Phorate | 100 kg | | 298-02-2 |
| 77. | Phosacetim | 100 kg | | 4104-14-7 |
| 78. | Phosgene (carbonyl chloride) | 750 kg | 750kg | 75-44-5 |
| 79. | Phosphamidon | 100 kg | | 13171-21-6 |
| 80. | Phosphine (Hydrogen phosphide) | 100 kg | | 7803-51-2 |
| 81. | Promurit (1-(3,4 dichlorophenyl)-3-triazenthiocarboxamide) | 100 kg | | 5836-73-7 |
| 82. | 1,3-Propanesultone | 1 kg | | 1120-71-4 |
| 83. | 1-Propen-2-chloro-1,3diol diacetate | 10 kg | | 10118-72-6 |
| 84. | Pyrazoxon | 100 kg | | 108-34-9 |
| 85. | Selenium hexafluoride | 10 kg | | 7783-79-1 |
| 86. | Sodium selenite | 100 kg | | 10102-18-8 |
| 87. | Stibine (Antimony hydride) | 100 kg | | 7803-52-3 |
| 88. | Sulfotep | 100 kg | | 3689-24-5 |
| 89. | Sulphur dichloride | 1 t | | 10545-99-0 |
| 90. | Tellurium hexafluoride | 100 kg | | 7783-80-4 |
| 91. | TEPP | 100 kg | | 107-49-3 |
| 92. | 2,3,7,8,-Tetrachlorodibenzo-p-dioxin (TCDD) | 1 kg | | 1746-01-6 |

| S. No. | Chemicals | Threshold Quantity | | CAS Number |
|---|---|---|---|---|
| | | for application of Rules 5, 7-9 and 13-15 | for application of Rules 10-12 | |
| (1) | (2) | (3) | (4) | (5) |
| 93. | Tetramethylenedisulphotetramine | 1 kg | | 80-12-6 |
| 94. | Thionazin | 100 kg | | 297-97-2 |
| 95. | Tirpate (2,4-Dimethyl-1,3-dithiolane-2-carboxaldehyde O-methylcarbamoyloxime) | 100 kg | | 26419-73-8 |
| 96. | Trichloromethanesulphonyl chloride | 100 kg | | 594-42-3 |
| 97. | 1-Tri (cyclohexyl) stannyl 1H-1,2,4-Triazole | 100 kg | | 41083-11-8 |
| 98. | Triethylenemelamine | 10 kg | | 51-18-3 |
| 99. | Warfarin | 100 kg | | 81-81-2 |
| **GROUP -2 TOXIC SUBSTANCES** | | | | |
| 100 | Acetone cyanohydrin (2-Cyanopropan-2-ol | 200 t | | 75-86-5 |
| 101 | Acrolein (2-Propenal) | 20 t | [1][200t] | 107-02-8 |
| 102 | Acrylonitrile | 20 t | 200t | 107-13-1 |
| 103 | Allyl alcohol (Propen-1-ol) | 200 t | | 107-18-6 |
| 104 | Alylamine | 200 t | | 107-11-9 |
| 105 | Ammonia | 50 t | 500t | 7664-41-7 |
| 106 | Bromine | 40 t | [1][500t] | 7726-95-6 |
| 107 | Carbon disulphide | 20 t | 200t | 75-15-0 |
| 108 | Chlorine | 10 t | 25t | 7782-50-5 |
| 109 | Diphneyl ethane di-isocynate (MDI) | 20 t | [1][200t] | 101-68-8 |
| 110 | Ethylene dibromide (1,2-Dibromoethane) | 5 t | [1][50t] | 106-93-4 |
| 111 | Ethyleneimine | 5 t | | 151-56-4 |
| 112 | Formaldehyde (concentration <90%) | 5 t | [1][50t] | 50-00-0 |
| 113 | Hydrogen chloride (liquified gas) | 25 t | 250t | 7647-01-0 |
| 114 | Hydrogen cyanide | 5 t | 20t | 74-90-8 |
| 115 | Hydrogen fluoride | 5 t | 50t | 7664-39-3 |
| 116 | Hydrogen sulphide | 5 t | 50t | 7783-06-4 |
| 117 | Methyl bromide (Bromomethane) | 20 t | [1][200 t] | 74-83-9 |
| 118 | Nitrogen oxides | 50 t | | 11104-93-1 |
| 119 | Propylineimine | 50 t | | 75-55-8 |
| 120 | Sulphur dioxide | 20 t | 250t | 7446-09-5 |
| 121 | Sulphur trioxide | 15 t | 75t | 7446-11-9 |
| 122 | Tetraethyl lead | 5 t | [2][200t] | 78-00-2 |
| 123 | Tetra methyl lead | 5 t | [1][100t] | 75-74-1 |
| 124 | Toluene di-isocynate (TDI) | 10 t | | 584-84-9 |
| **GROUP 3-HIGHLY REACTIVE SUBSTANCES** | | | | |
| 125 | Acetylene (ethyne) | 5 t | | 74-86-2 |
| 126 | a. Ammonium nitrate (1)<br>b. Ammonium nitrate in form of fertilizer (2) | 350t 1250 t | 2500t | 6484-52-2 |

[1] Inserted by Rule14 (a to h) of MSIHC (Amendment) Rules, 1994 notified vide notification S.O.2882, dated 3.10.1994.

[2] Inserted by Rule14 (a to h) of MSIHC (Amendment) Rules, 1994 notified vide notification S.O.2882, dated 3.10.1994.

| S. No. | Chemicals | Threshold Quantity | | CAS Number |
|---|---|---|---|---|
| | | for application of Rules 5, 7-9 and 13-15 | for application of Rules 10-12 | |
| (1) | (2) | (3) | (4) | (5) |
| 127 | 2,2 Bis (tert-butylperoxy) butane) (concentration >70%) | 5 t | | 2167-23-9 |
| 128 | 1, 1-Bis(tert-butylperoxy) cyclohexane (concentration > 80%) | 5 t | | 3006-86-8 |
| 129 | tert-Butyle proxyacetate (concentration ≤70% ) | 5 t | | 107-71-1 |
| 130 | tert-Butyle peroxy isobutyrate (concentration >80%) | 5 t | | 109-13-7 |
| 131 | Tert-Butyl peroxy isopropyl carbonate (concentration ≥80%) | 5 t | | 2372-21-6 |
| 132 | Tert-Butyl peroxymaletate (concentration ≥80%) | 5 t | | 1931-62-0 |
| 133 | Tert-Butyl peroxypivalate (concentration ≥77%) | 50 t | | 927-07-1 |
| 134 | Dibenzyl peroxydicarbonate (concentration≥90%) | 5 t | | 2144-45-8 |
| 135 | Di-sec-butyl peroxydicarbonate (concentration ≥80%) | 5 t | | 19910-65-7 |
| 136 | Diethyl peroxydicarbonate (concentration ≥30% ) | 50 t | | 14666-78-5 |
| 137 | 2,2-dihydroperoxypropane (concentration≥30%) | 5 t | | 2614-76-08 |
| 138 | di-isobutyrl peroxide (concentration ≥50%) | 50 t | | 3437-84-1 |
| 139 | Di-n-propyl peroxydicarbonate (concentration≥80%) | 5 t | | 16066-38-9 |
| 140 | Ethyene oxide | 5 t | 50t | 75-21-8 |
| 141 | Ethyl nitrate | 50 t | | 625-58-1 |
| 142 | 3,3,6,6,9,9 Hexamethyl - 1,2,4 5-tert oxacyclononane (concenttation ≥75%) | 50 t | | 22397-33-7 |
| 143 | Hydrogen | 2 t | 50 t | 1333-74-0 |
| 144 | Liquid Oxygen | 200 t | [3][2000t] | 7782-41-7 |
| 145 | Methyl ethyl ketone peroxide (concentration ≥60%) | 5 t | | 1338-23-4 |
| 146 | Methyl isobutyl ketone peroxide (concentration ≥60%) | 50 t | | 37206-20-5 |
| 147 | Peracetic acid (concentration ≥60%) | 50 t | | 79-21-0 |
| 148 | Propylene oxide | 5 t | [1][50t] | 75-56-9 |
| 149 | Sodium chlorate | 25 t | | 7775-09-9 |
| **GROUP 4-EXPLOSIVE SUBSTANCES** | | | | |
| 150 | Barium azide | [1][100] kg | | 18810-58-7 |

[3] Substituted by Rule 11(i) of the MSIHC (Amendment) Rules, 2000 notified vide S.O.57(E), dated 19.1.2000.

| S. No. | Chemicals | Threshold Quantity | | |
|---|---|---|---|---|
| | | for application of Rules 5, 7-9 and 13-15 | for application of Rules 10-12 | CAS Number |
| (1) | (2) | (3) | (4) | (5) |
| 151 | Bis(2,4,6 -trinitrophenyl) amine | 50 t | | 131-073-7 |
| 152 | Chlorotrinitro benzene | 50 t | | 28260-61-9 |
| 153 | Cellulose nitrate (containing 12.6% Nitrogen) | 50 t | | 9004-70-0 |
| 154 | Cyclotetramethyleneteranitramine | 50 t | | 2691-41-0 |
| 155 | Cyclotrimethylenetiraniramine | 50 t | | 121-82-1 |
| 156 | Diazodinitrophenol | 10 t | | 7008-81-3 |
| 157 | Diethylene glycol dinitrate | 10 t | | 693-21-0 |
| 158 | Dinitrophenol, salts | 50 t | | |
| 159 | Enthylene glycol dinitrate | 10 t | | 628-96-6 |
| 160 | 1-Gyanyl-4-nitrosaminoguanyl-1-tetrazene | [1][100 kg] | | 109-27-3 |
| 161 | 2, 2, 4, 4, 6, 6, -Hexanitositibene | 50 t | | 20062-22-0 |
| 162 | Hydrazine nitrate | 50 t | | 13464-97-6 |
| 163 | Lead azide | [1][100 kg] | | 13424-46-9 |
| 164 | Lead Styphnate ( Lead 2,4,6-trinitroresorcinoxide) | 50 t | | 15245-44-0 |
| 165 | Mercury fuliminate | 10 t | | 20820-45-5<br>628-86-4 |
| 166 | N-Methyl-N,2,4,6-tetranitroaniline | 50 t | | 497-45-8 |
| 167 | Nitroglycerine | 10 t | 10t | 55-63-0 |
| 168 | Pentacrythritol tetra nitrate | 50 t | | 78-11-5 |
| 169 | Picric acid, (2,3,6-Trinitrophenol) | 50 t | | 88-89-1 |
| 170 | Sodium picramate | 50 t | | 831-52-7 |
| 171 | Styphnic acid (2,4,6-Trinitroresorcinol) | 50 t | | 82-71-3 |
| 172 | 1,3,5-Triamino-2,4,6-Trinitrobezene | 50 t | | 3058-38-6 |
| 173 | Trinitroaniline- | 50 t | | 26952-42-1 |
| 174 | 2,4,6-Trinitroanisole | 50 t | | 606-35-9 |
| 175 | Trinitrobenze | 50 t | | 25377-32-6 |
| 176 | Trinitrobenzoic acid | 50 t | | 35860-50-5<br>129-66-8 |
| 177 | Trinitrocresol | 50 t | | 28905-71-7 |
| 178 | 2,4,6-Trinitrophenitole | 50 t | | 4732-4-3 |
| 179 | 2,4,6-Trinitrotoluene | 50 t | 50 t | 118-96-7 |

## [4]Part – II

### Classes of substances as defined in Part – I, Schedule –1 and not specifically named in Part – I of this Schedule

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **GROUP 5 - Flammable substances** | | | |
| 1. | Flammable Gases | 15t | 200t |
| 2. | Extremely flammable liquids | 1000t | 5000t |
| 3. | Very highly flammable liquids | 1500t | 10000t |
| 4. | Highly Flammable liquids which remains liquid under pressure | 25t | 200t |
| 5. | Highly Flammable liquids | 2500t | 20000t |
| 6. | Flammable liquids | 5000t | 50000t] |

(1) This applies to ammonium nitrate and mixtures of ammonium nitrate where the nitrogen content derived from the ammonium nitrate is greater than 28% by weight and aqueous solutions of ammonium nitrate where the concentration of ammonium nitrate is greater than 90% by weight.

(2) This applied to straight ammonium nitrate fertilizers and to compound fertilizers where the nitrogen content derived from the ammonium nitrate is greater than 28% by weight (a compound fertilizer contains ammonium nitrate together with phosphate and/or potash).

[4] Substituted by Rule 11(ii) of the MSIHC (Amendment) Rules, 2000 notified by S.O.57(E), dated 19.1.2000.

## ANNEXURE III
## District Wise Isolated Storages in INDIA

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Andaman & Nicobar | None | IOCL | Port Blair | Petroleum Storage | ATF | 1590 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 1 | Andaman & Nicobar | None | IOCL | Port Blair | Petroleum Storage | SKO | 4244 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 1 | Andaman & Nicobar | None | IOCL | Port Blair | Petroleum Storage | HSD / ELHSD | 15895 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 1 | Andaman & Nicobar | None | IOCL | Port Blair | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 158 | 15000 | 100000 | Port | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 1 | Andaman & Nicobar | None | IOCL | Port Blair | Petroleum Storage | MS / ULP | 1197 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 2 | Andhra Pradesh | Cuddapah | IOCL | Bulk Storage Depot, Goods Shed Road, Guntakal - 515 801 Sr. Depot Manager; Phone no.: 08552 - 26576 | Petroleum Storage | Class B | 13696 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 3 | Andhra Pradesh | Cuddapah | IOCL | Bulk Storage Depot, Opp. Railway Station, Cuddapah - 516 004 Sr. Depot Manager; Phone no.: 08562 - 44644 | Petroleum Storage | HSD / ELHSD | 6573 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 3 | Andhra Pradesh | Cuddapah | IOCL | Bulk Storage Depot, Opp. Railway Station, Cuddapah - 516 004 Sr. Depot Manager; Phone no.: 08562 - 44644 | Petroleum Storage | SKO | 2993 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 4 | Andhra Pradesh | East Godavari | BPCL | Fisheries Road, Vakalapudi, Kakinada | Petroleum Storage | Class A | 15525 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 4 | Andhra Pradesh | East Godavari | BPCL | Fisheries Road, Vakalapudi, Kakinada | Petroleum Storage | Class B | 24439 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 5 | Andhra Pradesh | East Godavari | BPCL | Naphtha Installation, Jagurupadu, Kadiam (M), Rajahmundry | Petroleum Storage | Class A | 12800 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 6 | Andhra Pradesh | East Godavari | BPCL | Rajahmundry | Petroleum Storage | HSD / ELHSD | 4005 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 6 | Andhra Pradesh | East Godavari | BPCL | Rajahmundry | Petroleum Storage | Naphtha | 1478 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 6 | Andhra Pradesh | East Godavari | BPCL | Rajahmundry | Petroleum Storage | SKO | 4730 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 6 | Andhra Pradesh | East Godavari | BPCL | Rajahmundry | Petroleum Storage | MS / ULP | 266 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 7 | Andhra Pradesh | East Godavari | HPCL | Kakinada | Petroleum Storage | Class A | 23400 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 8 | Andhra Pradesh | East Godavari | HPCL | Kakinada Terminal, IDA Vakalapudi, Kakinada | Petroleum Storage | Class A | 23400 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 9 | Andhra Pradesh | East Godavari | HPCL | Rajahmundry Terminal, Gummaladoddi - 533 289 | Petroleum Storage | SKO | 6000 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 9 | Andhra Pradesh | East Godavari | HPCL | Rajahmundry Terminal, Gummaladoddi - 533 289 | Petroleum Storage | HSD / ELHSD | 18000 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 9 | Andhra Pradesh | East Godavari | HPCL | Rajahmundry Terminal, Gummaladoddi - 533 289 | Petroleum Storage | MS / ULP | 5100 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | Andhra Pradesh | Guntur | HPCL | Tatepally, Guntur | Petroleum Storage | Class B | 8906 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 11 | Andhra Pradesh | Guntur | IOCL | Tatepally; Guntur | Petroleum Storage | Class B | 28339 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 12 | Andhra Pradesh | Hyderabad | HPCL | Storage Installation, Sanathnagar, Hyderabad - 500 018 | Petroleum Storage | Class B | 23834 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 13 | Andhra Pradesh | Hyderabad | IBP | Sanathnagar, Hyderabad | Petroleum Storage | MS / ULP | 0 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 13 | Andhra Pradesh | Hyderabad | IBP | Sanathnagar, Hyderabad | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 0 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 13 | Andhra Pradesh | Hyderabad | IBP | Sanathnagar, Hyderabad | Petroleum Storage | SKO | 0 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 13 | Andhra Pradesh | Hyderabad | IBP | Sanathnagar, Hyderabad | Petroleum Storage | HSD / ELHSD | 0 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 14 | Andhra Pradesh | Hyderabad | IOCL | Storage Depot,<br>P.O. Fatehbagh, Industrial Estate,<br>Sanathnagar, Hyderabad - 500 018<br>Sr. Depot Manager; Phone no: 040 - 3703716 | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 5956 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 14 | Andhra Pradesh | Hyderabad | IOCL | Storage Depot,<br>P.O. Fatehbagh, Industrial Estate,<br>Sanathnagar, Hyderabad - 500 018<br>Sr. Depot Manager; Phone no: 040 - 3703716 | Petroleum Storage | ATF | 6577 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 14 | Andhra Pradesh | Hyderabad | IOCL | Storage Depot,<br>P.O. Fatehbagh, Industrial Estate,<br>Sanathnagar, Hyderabad - 500 018<br>Sr. Depot Manager; Phone no: 040 - 3703716 | Petroleum Storage | SKO | 11480 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 14 | Andhra Pradesh | Hyderabad | IOCL | Storage Depot,<br>P.O. Fatehbagh, Industrial Estate,<br>Sanathnagar, Hyderabad - 500 018<br>Sr. Depot Manager; Phone no: 040 - 3703716 | Petroleum Storage | HSD / ELHSD | 20527 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 14 | Andhra Pradesh | Hyderabad | IOCL | Storage Depot,<br>P.O. Fatehbagh, Industrial Estate,<br>Sanathnagar, Hyderabad - 500 018<br>Sr. Depot Manager; Phone no: 040 - 3703716 | Petroleum Storage | MS / ULP | 3912 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 15 | Andhra Pradesh | Krishna | BPCL | Vijayawada TOP | Petroleum Storage | HSD / ELHSD | 4503 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 15 | Andhra Pradesh | Krishna | BPCL | Vijayawada TOP | Petroleum Storage | SKO | 1272 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 15 | Andhra Pradesh | Krishna | BPCL | Vijayawada TOP | Petroleum Storage | MS / ULP | 2025 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 16 | Andhra Pradesh | Krishna | HPCL | VVPL Project, Vijayawada Receiving Terminal<br>Kattubadipalem, G. Konduru (M), Krishna District | Petroleum Storage | Class B | 100527 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 16 | Andhra Pradesh | Krishna | HPCL | VVPL Project, Vijayawada Receiving Terminal<br>Kattubadipalem, G. Konduru (M), Krishna District | Petroleum Storage | Class A | 26177 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 17 | Andhra Pradesh | Nizamabad | BPCL | Depot, Nizamabad | Petroleum Storage | SKO | 368 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | Andhra Pradesh | Nizamabad | BPCL | Depot, Nizamabad | Petroleum Storage | HSD / ELHSD | 4925 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 17 | Andhra Pradesh | Nizamabad | BPCL | Depot, Nizamabad | Petroleum Storage | MS / ULP | 320 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 18 | Andhra Pradesh | Nizamabad | IOCL | Depot,<br>Godown Road,<br>Nizamabad - 503 003<br>Depot Manager; Phone no: 08462 - 20380 | Petroleum Storage | MS / ULP | 164 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 18 | Andhra Pradesh | Nizamabad | IOCL | Depot,<br>Godown Road,<br>Nizamabad - 503 003<br>Depot Manager; Phone no: 08462 - 20380 | Petroleum Storage | HSD / ELHSD | 2106 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 18 | Andhra Pradesh | Nizamabad | IOCL | Depot,<br>Godown Road,<br>Nizamabad - 503 003<br>Depot Manager; Phone no: 08462 - 20380 | Petroleum Storage | SKO | 889 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 19 | Andhra Pradesh | Prakasam | BPCL | Ongole | Petroleum Storage | HSD / ELHSD | 6556 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 19 | Andhra Pradesh | Prakasam | BPCL | Ongole | Petroleum Storage | SKO | 1726 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 19 | Andhra Pradesh | Prakasam | BPCL | Ongole | Petroleum Storage | MS / ULP | 1007 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 20 | Andhra Pradesh | Prakasam | IOCL | Ongole, Prakasham District<br>Andhra Padesh | Petroleum Storage | Class B | 8825 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 21 | Andhra Pradesh | Rangareddi | BPCL | Storage Installation,<br>S. No. 183, IDA Cherlapally,<br>Ranga Reddy District | Petroleum Storage | Class B | 11653 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 22 | Andhra Pradesh | Rangareddi | IBP | SR 183, IDA Cherlapally, Ranga Reddy | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 55 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 22 | Andhra Pradesh | Rangareddi | IBP | SR 183, IDA Cherlapally, Ranga Reddy | Petroleum Storage | HSD / ELHSD | 5515 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 22 | Andhra Pradesh | Rangareddi | IBP | SR 183, IDA Cherlapally, Ranga Reddy | Petroleum Storage | MS / ULP | 2395 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 22 | Andhra Pradesh | Rangareddi | IBP | SR 183, IDA Cherlapally, Ranga Reddy | Petroleum Storage | SKO | 1950 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 23 | Andhra Pradesh | Vishakhapatnam | BPCL | Visakha Installation, Naval Base,<br>Visakhapatnam - 530 014 | Petroleum Storage | Class A | 27256 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 23 | Andhra Pradesh | Vishakhapatnam | BPCL | Visakha Installation, Naval Base,<br>Visakhapatnam - 530 014 | Petroleum Storage | Class B | 86861 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 24 | Andhra Pradesh | Vishakhapatnam | HPCL | Visakha Terminal, Malkapuram<br>Visakhapatnam - 530011. | Petroleum Storage | Class A | 11544 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 24 | Andhra Pradesh | Vishakhapatnam | HPCL | Visakha Terminal, Malkapuram<br>Visakhapatnam - 530011. | Petroleum Storage | Class B | 32965 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 24 | Andhra Pradesh | Vishakhapatnam | HPCL | Visakha Terminal, Malkapuram<br>Visakhapatnam - 530011. | Petroleum Storage | Class C | 33111 | 15000 | 100000 | Port | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 25 | Andhra Pradesh | Vishakhapatnam | IMC Ltd. | AVRN Company; 10-1-30, Waltair Upland<br>Visakhapatnam | Petrochemical Storage | Class B | 19174 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | Andhra Pradesh | Vishakhapatnam | IOCL | Visakha Terminal, Malkapuram P.O. Visakhapatnam - 530 011. Phone No. 0891 - 578300-02 DGM, Phone no: 577116 | Petroleum Storage | Class A | 10391 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 26 | Andhra Pradesh | Vishakhapatnam | IOCL | Visakha Terminal, Malkapuram P.O. Visakhapatnam - 530 011. Phone No. 0891 - 578300-02 DGM, Phone no: 577116 | Petroleum Storage | Class B | 82410 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 27 | Andhra Pradesh | Warangal | BPCL | Warangal | Petroleum Storage | HSD / ELHSD | 5940 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 27 | Andhra Pradesh | Warangal | BPCL | Warangal | Petroleum Storage | SKO | 1800 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 27 | Andhra Pradesh | Warangal | BPCL | Warangal | Petroleum Storage | MS / ULP | 1020 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 28 | Assam | Guwahati | IOCL | Guwahati | Petroleum Storage | HSD / ELHSD | 39 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 28 | Assam | Guwahati | IOCL | Guwahati | Petroleum Storage | SKO | 367 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 28 | Assam | Guwahati | IOCL | Guwahati | Petroleum Storage | ATF | 1113 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 29 | Assam | Kamrup | IOCL (AOD) | Tap Off Point, GSPL Betkuchi, P.O. Sualkuchi, Guwahati - 18 Terminal Manager; Phone no: 0361 - 304133 | Petroleum Storage | HSD / ELHSD | 7644 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 29 | Assam | Kamrup | IOCL (AOD) | Tap Off Point, GSPL Betkuchi, P.O. Sualkuchi, Guwahati - 18 Terminal Manager; Phone no: 0361 - 304133 | Petroleum Storage | MS / ULP | 6786 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 29 | Assam | Kamrup | IOCL (AOD) | Tap Off Point, GSPL Betkuchi, P.O. Sualkuchi, Guwahati - 18 Terminal Manager; Phone no: 0361 - 304133 | Petroleum Storage | SKO | 4343 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 30 | Assam | Lakhimpur | IOCL | Depot, P.O. North Lakhimpore - 787 001 Depot Manager; Phone No: 03752 - 22227 | Petroleum Storage | SKO | 2218 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 30 | Assam | Lakhimpur | IOCL | Depot, P.O. North Lakhimpore - 787 001 Depot Manager; Phone No: 03752 - 22227 | Petroleum Storage | HSD / ELHSD | 2102 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 30 | Assam | Lakhimpur | IOCL | Depot, P.O. North Lakhimpore - 787 001 Depot Manager; Phone No: 03752 - 22227 | Petroleum Storage | MS / ULP | 468 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 30 | Assam | Lakhimpur | IOCL | Depot, P.O. North Lakhimpore - 787 001 Depot Manager; Phone No: 03752 - 22227 | Petroleum Storage | ATF | 345 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 31 | Assam | Sonitpur | IOCL | Depot, Missamari - 784506 Deputy Manager; Phone No: 037142 - 55557 | Petroleum Storage | ATF | 3208 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 31 | Assam | Sonitpur | IOCL | Depot, Missamari - 784506 Deputy Manager; Phone No: 037142 - 55557 | Petroleum Storage | SKO | 4712 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | Assam | Sonitpur | IOCL | Depot, Missamari - 784506<br>Deputy Manager; Phone No: 037142 - 55557 | Petroleum Storage | MS / ULP | 1663 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 31 | Assam | Sonitpur | IOCL | Depot, Missamari - 784506<br>Deputy Manager; Phone No: 037142 - 55557 | Petroleum Storage | HSD / ELHSD | 9326 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 32 | Bihar | Araria | IOCL | PO Forbesganj, Distt. Araria, Bihar<br>Sr. Depot Manager; Phone No.: 06455 - 22589 | Petroleum Storage | HSD / ELHSD | 6179 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 32 | Bihar | Araria | IOCL | PO Forbesganj, Distt. Araria, Bihar<br>Sr. Depot Manager; Phone No.: 06455 - 22589 | Petroleum Storage | MS / ULP | 632 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 32 | Bihar | Araria | IOCL | PO Forbesganj, Distt. Araria, Bihar<br>Sr. Depot Manager; Phone No.: 06455 - 22589 | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 112 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 32 | Bihar | Araria | IOCL | PO Forbesganj, Distt. Araria, Bihar<br>Sr. Depot Manager; Phone No.: 06455 - 22589 | Petroleum Storage | ATF | 55 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 32 | Bihar | Araria | IOCL | PO Forbesganj, Distt. Araria, Bihar<br>Sr. Depot Manager; Phone No.: 06455 - 22589 | Petroleum Storage | SKO | 3474 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 33 | Bihar | Barauni | IOCL | P.O. Barauni Refinery, Disstt. Begusarai - 851 112<br>Phone no.: 06243 - 22409 | Petroleum Storage | ATF | 1416 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 33 | Bihar | Barauni | IOCL | P.O. Barauni Refinery, Disstt. Begusarai - 851 112<br>Phone no.: 06243 - 22409 | Petroleum Storage | HSD / ELHSD | 13706 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 33 | Bihar | Barauni | IOCL | P.O. Barauni Refinery, Disstt. Begusarai - 851 112<br>Phone no.: 06243 - 22409 | Petroleum Storage | MS / ULP | 1920 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 33 | Bihar | Barauni | IOCL | P.O. Barauni Refinery, Disstt. Begusarai - 851 112<br>Phone no.: 06243 - 22409 | Petroleum Storage | SKO | 14279 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 34 | Bihar | Bhagalpur | IOCL | Depot, Mirjanhat Road, Bhagalpur - 812 001<br>Sr. Depot Manager; Phone No.: 0641 - 421602 | Petroleum Storage | HSD / ELHSD | 4202 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 34 | Bihar | Bhagalpur | IOCL | Depot, Mirjanhat Road, Bhagalpur - 812 001<br>Sr. Depot Manager; Phone No.: 0641 - 421602 | Petroleum Storage | SKO | 1625 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 34 | Bihar | Bhagalpur | IOCL | Depot, Mirjanhat Road, Bhagalpur - 812 001<br>Sr. Depot Manager; Phone No.: 0641 - 421602 | Petroleum Storage | MS / ULP | 273 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 35 | Bihar | Dhanbad | IOCL | Depot, Railway Cinema Road, Dhanbad - 826 001<br>Sr. DM; Phone No: 0326 - 302390 | Petroleum Storage | HSD / ELHSD | 1638 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 35 | Bihar | Dhanbad | IOCL | Depot, Railway Cinema Road, Dhanbad - 826 001<br>Sr. DM; Phone No: 0326 - 302390 | Petroleum Storage | MS / ULP | 218 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 35 | Bihar | Dhanbad | IOCL | Depot, Railway Cinema Road, Dhanbad - 826 001<br>Sr. DM; Phone No: 0326 - 302390 | Petroleum Storage | SKO | 534 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 36 | Bihar | East Champaran | IOCL | Raxaul - 845 305<br>Deputy Manager; Phone no.: 06255 - 62784 | Petroleum Storage | MS / ULP | 2436 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36 | Bihar | East Champaran | IOCL | Raxaul - 845 305<br>Deputy Manager; Phone no.: 06255 - 62784 | Petroleum Storage | HSD / ELHSD | 8527 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 36 | Bihar | East Champaran | IOCL | Raxaul - 845 305<br>Deputy Manager; Phone no.: 06255 - 62784 | Petroleum Storage | ATF | 755 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 36 | Bihar | East Champaran | IOCL | Raxaul - 845 305<br>Deputy Manager; Phone no.: 06255 - 62784 | Petroleum Storage | SKO | 3741 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 36 | Bihar | East Champaran | IOCL | Raxaul - 845 305<br>Deputy Manager; Phone no.: 06255 - 62784 | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 613 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 37 | Bihar | Patna | IOCL | P.O.No. 73; Patna - 800 001; Silpara, P.O. Lohinagar; Patna - 800 020<br>Sr. Manager (T); Phone no.: 0612 - 223506 | Petroleum Storage | MS / ULP | 6558 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 37 | Bihar | Patna | IOCL | P.O.No. 73; Patna - 800 001; Silpara, P.O. Lohinagar; Patna - 800 020<br>Sr. Manager (T); Phone no.: 0612 - 223506 | Petroleum Storage | SKO | 9504 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 37 | Bihar | Patna | IOCL | P.O.No. 73; Patna - 800 001; Silpara, P.O. Lohinagar; Patna - 800 020<br>Sr. Manager (T); Phone no.: 0612 - 223506 | Petroleum Storage | HSD / ELHSD | 19032 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 38 | Bihar | Ranchi | IOCL | Namkum Depot, Ranchi - 834010<br>Manager (MO); Phone No.: 0651 - 520053 | Petroleum Storage | HSD / ELHSD | 7976 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 38 | Bihar | Ranchi | IOCL | Namkum Depot, Ranchi - 834010<br>Manager (MO); Phone No.: 0651 - 520053 | Petroleum Storage | SKO | 4051 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 38 | Bihar | Ranchi | IOCL | Namkum Depot, Ranchi - 834010<br>Manager (MO); Phone No.: 0651 - 520053 | Petroleum Storage | ATF | 55 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 38 | Bihar | Ranchi | IOCL | Namkum Depot, Ranchi - 834010<br>Manager (MO); Phone No.: 0651 - 520053 | Petroleum Storage | MS / ULP | 1812 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 39 | Bihar | Tatanagar | IOCL | Tatanagar Installation, P.O. Tatanagar - 831 002<br>Sr. DM; Phone No: 0657 - 271317 | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 1158 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 39 | Bihar | Tatanagar | IOCL | Tatanagar Installation, P.O. Tatanagar - 831 002<br>Sr. DM; Phone No: 0657 - 271317 | Petroleum Storage | MS / ULP | 218 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 39 | Bihar | Tatanagar | IOCL | Tatanagar Installation, P.O. Tatanagar - 831 002<br>Sr. DM; Phone No: 0657 - 271317 | Petroleum Storage | HSD / ELHSD | 2262 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 39 | Bihar | Tatanagar | IOCL | Tatanagar Installation, P.O. Tatanagar - 831 002<br>Sr. DM; Phone No: 0657 - 271317 | Petroleum Storage | SKO | 1528 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 40 | Delhi (NCT) | South West | BPCL | Bijwasan Terminal, Near Airport, New Delhi - 110 061<br>Phone: 5563075, 5563353 | Petroleum Storage | Class A | 25762 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 40 | Delhi (NCT) | South West | BPCL | Bijwasan Terminal, Near Airport, New Delhi - 110 061<br>Phone: 5563075, 5563353 | Petroleum Storage | Class B | 2303 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | Delhi (NCT) | South West | BPCL | Bijwasan Terminal, Near Airport, New Delhi - 110 061 Phone: 5563075, 5563353 | Petroleum Storage | Class C | 135 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 41 | Delhi (NCT) | South West | BPCL | IGI Airport Terminal - II, New Delhi - 110 061. Phone no.: 5652335, 5652197 | Petroleum Storage | ATF | 4680 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 42 | Delhi (NCT) | South West | IOCL | Bijwasan Terminal, Near Airport, New Delhi - 110 061 Phone: 5563349 | Petroleum Storage | Class A | 14965 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 42 | Delhi (NCT) | South West | IOCL | Bijwasan Terminal, Near Airport, New Delhi - 110 061 Phone: 5563349 | Petroleum Storage | Class B | 117249 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 43 | Delhi (NCT) | West | BPCL | Shakur Basti Terminal, Rohtak Road, New Delhi - 110 056. Phone no. : 5190259, 5190155 | Petroleum Storage | Class A | 8452 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 43 | Delhi (NCT) | West | BPCL | Shakur Basti Terminal, Rohtak Road, New Delhi - 110 056. Phone no. : 5190259, 5190155 | Petroleum Storage | Class C | 7603 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 43 | Delhi (NCT) | West | BPCL | Shakur Basti Terminal, Rohtak Road, New Delhi - 110 056. Phone no. : 5190259, 5190155 | Petroleum Storage | Class B | 14660 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 44 | Delhi (NCT) | West | HPCL | Shakur Basti Terminal, Rohtak Road, New Delhi - 110 056. Phone no.: 5190730 | Petroleum Storage | Class A | 5662 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 44 | Delhi (NCT) | West | HPCL | Shakur Basti Terminal, Rohtak Road, New Delhi - 110 056. Phone no.: 5190730 | Petroleum Storage | Class C | 5372 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 44 | Delhi (NCT) | West | HPCL | Shakur Basti Terminal, Rohtak Road, New Delhi - 110 056. Phone no.: 5190730 | Petroleum Storage | Class B | 11193 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 45 | Delhi (NCT) | West | IOCL | Shakur Basti Terminal, Rohtak Road, New Delhi - 110 056. Phone no.: 5115882, 5433001 | Petroleum Storage | Class B | 21128 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 45 | Delhi (NCT) | West | IOCL | Shakur Basti Terminal, Rohtak Road, New Delhi - 110 056. Phone no.: 5115882, 5433001 | Petroleum Storage | Class C | 228 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 45 | Delhi (NCT) | West | IOCL | Shakur Basti Terminal, Rohtak Road, New Delhi - 110 056. Phone no.: 5115882, 5433001 | Petroleum Storage | Class A | 7956 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 46 | Goa | South Goa | IOCL | Vasco da Gama. Goa - 403 802 | Petroleum Storage | Class A | 35334 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 46 | Goa | South Goa | IOCL | Vasco da Gama. Goa - 403 802 | Petroleum Storage | Class B | 57552 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 46 | Goa | South Goa | IOCL | Vasco da Gama. Goa - 403 802 | Petroleum Storage | Class C | 17940 | 15000 | 100000 | Port | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 47 | Gujarat | Ahmedabad | IOCL | Sabarmati; Ahmedabad | Petroleum Storage | Class A | 9398 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 47 | Gujarat | Ahmedabad | IOCL | Sabarmati; Ahmedabad | Petroleum Storage | Class B | 58674 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 47 | Gujarat | Ahmedabad | IOCL | Sabarmati; Ahmedabad | Petroleum Storage | Class C | 1785 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 47 | Gujarat | Ahmedabad | IOCL | Village Kaligam | Petroleum Storage | Petrol, Diesel, Kerosene | 10959 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 48 | Gujarat | Baroda | BPCL | Karachiya,<br>P. O. Jawaharnagar;<br>Baroda - 391 320 | Petroleum Storage | Class A | 81472 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 48 | Gujarat | Baroda | BPCL | Karachiya,<br>P. O. Jawaharnagar;<br>Baroda - 391 320 | Petroleum Storage | Class B | 17773 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 49 | Gujarat | Baroda | GIPCL | Fuel Oil storage Station II<br>Gujarat Industrial Power Corporation Limited;<br>P.O. Petrofils; District Vadodara;<br>Vadodara - 391 347 | Petroleum storage | Class A | 16577 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 50 | Gujarat | Baroda | HPCL | Nandesari;<br>Vadodara | Petroleum Storage | MS / ULP | 7000 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 51 | Gujarat | Bharuch | GACL | Gujarat Alkalies & Chemicals Limited<br>Dahej; Bharuch Distt. | Petroleum Storage | Class A | 23400 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 52 | Gujarat | Bharuch | GCPT | Gujarat Chemical Port Terminal<br>P.O. Lakhigam<br>via Dahej<br>Vagra, Bharuch | Petrochemical Storage | Class B | 18697 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 52 | Gujarat | Bharuch | GCPT | Gujarat Chemical Port Terminal<br>P.O. Lakhigam<br>via Dahej<br>Vagra, Bharuch | Petrochemical Storage | Class C | 2754 | 15000 | 100000 | Port | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 52 | Gujarat | Bharuch | GCPT | Gujarat Chemical Port Terminal<br>P.O. Lakhigam<br>via Dahej<br>Vagra, Bharuch | Petrochemical Storage | Class A | 72930 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 53 | Gujarat | Bharuch | IOCL | Naphtha Storage Terminal<br>Village Haldar<br>Bharuch - 392 210 | Petroleum Storage | Naphtha | 12600 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 54 | Gujarat | Bharuch | IPCL | Dahej, Disc. Bharuch | Petroleum Storage | Class B | 10530 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 54 | Gujarat | Bharuch | IPCL | Dahej, Disc. Bharuch | Petroleum Storage | Class A | 31590 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 55 | Gujarat | Jamnagar | GSFC | Sikka | Petrochemical Storage | Class A | 16969 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 55 | Gujarat | Jamnagar | GSFC | Sikka | Petrochemical Storage | Class B | 4142 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 56 | Gujarat | Jamnagar | IOCL | Okha | Petroleum Storage | Class C | 8939 | 15000 | 100000 | Port | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 56 | Gujarat | Jamnagar | IOCL | Okha | Petroleum Storage | Class A | 24047 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 56 | Gujarat | Jamnagar | IOCL | Okha | Petroleum Storage | Class B | 14803 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 57 | Gujarat | Jamnagar | IOCL | P.O. Moobi Road; Gauriaderd<br>Village Vadinar; Distt. Jamnagar | Petroleum Storage | Class A | 882673 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58 | Gujarat | Jamnagar | RPL | Reliance Petrochemicals Ltd. Village Mora | Petroleum Storage | Class A | 2730 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 58 | Gujarat | Jamnagar | RPL | Reliance Petrochemicals Ltd. Village Mora | Petroleum Storage | Class B | 10296 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 59 | Gujarat | Kachchh | Adani Port Ltd. | P.O. Box.1 - Navinal Island Mundra, Kachchh District | Petrochemical Storage | Black Oil | 56940 | 15000 | 100000 | Port | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 60 | Gujarat | Kachchh | BPCL | Kandla Installation, P.B. No. 33, Gandhidham, Kutch - 370 201 | Petroleum Storage | Class C | 34385 | 15000 | 100000 | Port | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 60 | Gujarat | Kachchh | BPCL | Kandla Installation, P.B. No. 33, Gandhidham, Kutch - 370 201 | Petroleum Storage | Class A | 75855 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 60 | Gujarat | Kachchh | BPCL | Kandla Installation, P.B. No. 33, Gandhidham, Kutch - 370 201 | Petroleum Storage | Class B | 91046 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 61 | Gujarat | Kachchh | Chemicals & Resins Ltd. | Opp. IFFCO, Old Kandla | Petrochemical Storage | Class B | 52362 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 61 | Gujarat | Kachchh | Chemicals & Resins Ltd. | Opp. IFFCO, Old Kandla | Petrochemical Storage | Class A | 56954 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 62 | Gujarat | Kachchh | Friends Salt Works & Allied Industries | Kandla - Kharirohar Road, Old Kandla. | Petrochemical Storage | Class A | 60840 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 63 | Gujarat | Kachchh | IMC Ltd. | Inside Port, Near Labour Canteen, New Kandla | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 18917 | 15000 | 100000 | Port | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 64 | Gujarat | Kachchh | IOCL | Near KPT Booster, Kandla, Kutch | Petroleum Storage | Class A | 493000 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 65 | Gujarat | Kachchh | J. R. Enterprises | Plot No. 3, Old Kandla, District Kutch, Gujarat | Petrochemical Storage | Class A | 13504 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 65 | Gujarat | Kachchh | J. R. Enterprises | Plot No. 3, Old Kandla, District Kutch, Gujarat | Petrochemical Storage | Class B | 7408 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 66 | Gujarat | Kachchh | Jaisu Shipping Co. Pvt. Ltd. | Near Oil Jetty, Old Kandla, District Kutch | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 3253 | 15000 | 100000 | Port | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 67 | Gujarat | Kachchh | Kesar Enterprise Ltd. | Terminal No. 1, Oil Jetty, Old Kandla, Distt. Kutch | Petrochemical Storage | Class A | 19142 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 67 | Gujarat | Kachchh | Kesar Enterprise Ltd. | Terminal No. 1, Oil Jetty, Old Kandla, Distt. Kutch | Petrochemical Storage | Class B | 2886 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 68 | Gujarat | Kachchh | Kesar Enterprise Ltd. | Terminal No. 2, Plot no. 5 & 6, Old Kandla, Distt. Kutch | Petrochemical Storage | Class A | 23744 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 68 | Gujarat | Kachchh | Kesar Enterprise Ltd. | Terminal No. 2, Plot no. 5 & 6, Old Kandla, Distt. Kutch | Petrochemical Storage | Class B | 3209 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 69 | Gujarat | Kachchh | United Storage & Tank Terminals Ltd. | (Liquid Terminal), Opp. Shirva Rly. Station, Near IOC Foreshore Terminal, Kandla | Petrochemical Storage | Class A | 9177 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 69 | Gujarat | Kachchh | United Storage & Tank Terminals Ltd. | (Liquid Terminal), Opp. Shirva Rly. Station, Near IOC Foreshore Terminal, Kandla | Petrochemical Storage | Class B | 14204 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 70 | Gujarat | Mehsana | IOCL | Sidhapur, Mehsana | Petroleum Storage | Class A | 3970 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 70 | Gujarat | Mehsana | IOCL | Sidhapur, Mehsana | Petroleum Storage | Class B | 19422 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 71 | Gujarat | Rajkot | IOCL | Jamnagar Road; Rajkot - 360 006 | Petroleum Storage | MS / ULP | 1862 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 72 | Gujarat | Surat | Essar Power Ltd. | Hazira | Petroleum Storage | Class A | 36520 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 72 | Gujarat | Surat | Essar Power Ltd. | Hazira | Petroleum Storage | Class B | 234 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 73 | Gujarat | Surat | IOCL | Hazira | Petroleum Storage | Class A | 31362 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 74 | Haryana | Hissar | BPCL | Hissar | Petroleum Storage | Class A | 1195 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 74 | Haryana | Hissar | BPCL | Hissar | Petroleum Storage | Class B | 19251 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 74 | Haryana | Hissar | BPCL | Hissar | Petroleum Storage | Class C | 4136 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 75 | Haryana | Panipat | BPCL | TOP, Village Dadlan, Baholi, Distt. Panipat | Petroleum Storage | Class A | 6093 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 75 | Haryana | Panipat | BPCL | TOP, Village Dadlan, Baholi, Distt. Panipat | Petroleum Storage | Class B | 23634 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 76 | Haryana | Panipat | HPCL | Bulk Storage Depot, Baholi - Panipat | Petroleum Storage | Class A | 3903 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 76 | Haryana | Panipat | HPCL | Bulk Storage Depot, Baholi - Panipat | Petroleum Storage | Class B | 19888 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 77 | Haryana | Panipat | IBP Co. Ltd. | Marketing Terminal , Baholi, Panipat | Petroleum Storage | Flammable liquid | 33423 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 78 | Haryana | Panipat | IOCL | Marketing Division, PO Panipat Refinery, Village Baholi, District Panipat, Haryana | Petroleum Storage | MS / ULP | 19220 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 78 | Haryana | Panipat | IOCL | Marketing Division, PO Panipat Refinery, Village Baholi, District Panipat, Haryana | Petroleum Storage | HSD / ELHSD | 30140 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 78 | Haryana | Panipat | IOCL | Marketing Division, PO Panipat Refinery, Village Baholi, District Panipat, Haryana | Petroleum Storage | SKO | 111240 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 79 | Haryana | Rewari | BPCL | Rewari | Petroleum Storage | Class B | 14849 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 79 | Haryana | Rewari | BPCL | Rewari | Petroleum Storage | Class A | 2135 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 80 | Haryana | Rewari | HPCL | Petroleum & Storage Depot, Village & PO: Terminal Karnawas, Rewari - 123 401 | Petroleum Storage | HSD / ELHSD | 9360 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 80 | Haryana | Rewari | HPCL | Petroleum & Storage Depot, Village & PO: Terminal Karnawas, Rewari - 123 401 | Petroleum Storage | SKO | 1560 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 80 | Haryana | Rewari | HPCL | Petroleum & Storage Depot, Village & PO: Terminal Karnawas, Rewari - 123 401 | Petroleum Storage | MS / ULP | 780 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 81 | Haryana | Rewari | IBP Co. Ltd. | Tap off point, Village Karnawas, Bawal Road, Rewari - 123 401 | Petroleum Storage | HSD / ELHSD | 1248 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 81 | Haryana | Rewari | IBP Co. Ltd. | Tap off point, Village Karnawas, Bawal Road, Rewari - 123 401 | Petroleum Storage | SKO | 702 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 82 | Haryana | Rewari | IOCL | KBPL TOP Terminal, PO Karnawas, Karnawas Road, Rewari, Haryana | Petroleum Storage | Flammable liquid | 72900 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 83 | Jammu & Kashmir | Jammu | BPCL | Jammu | Petroleum Storage | Class B | 9045 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 83 | Jammu & Kashmir | Jammu | BPCL | Jammu | Petroleum Storage | Class A | 745 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 84 | Jammu & Kashmir | Jammu | HPCL | Jammu | Petroleum Storage | HSD / ELHSD | 3888 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 84 | Jammu & Kashmir | Jammu | HPCL | Jammu | Petroleum Storage | MS / ULP | 1364 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 84 | Jammu & Kashmir | Jammu | HPCL | Jammu | Petroleum Storage | SKO | 3000 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 85 | Jammu & Kashmir | Jammu | IOCL | Near Railway Station, Jammu | Petroleum Storage | Class B | 33491 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 85 | Jammu & Kashmir | Jammu | IOCL | Near Railway Station, Jammu | Petroleum Storage | Class A | 6183 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 85 | Jammu & Kashmir | Jammu | IOCL | Near Railway Station, Jammu | Petroleum Storage | Class C | 2591 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 86 | Jammu & Kashmir | Srinagar | HPCL | Srinagar | Petroleum Storage | SKO | 1110 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 86 | Jammu & Kashmir | Srinagar | HPCL | Srinagar | Petroleum Storage | HSD / ELHSD | 3770 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 86 | Jammu & Kashmir | Srinagar | HPCL | Srinagar | Petroleum Storage | MS / ULP | 680 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 87 | Jammu & Kashmir | Srinagar | IOCL | Srinagar | Petroleum Storage | SKO | 1250 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 87 | Jammu & Kashmir | Srinagar | IOCL | Srinagar | Petroleum Storage | HSD / ELHSD | 1535 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 87 | Jammu & Kashmir | Srinagar | IOCL | Srinagar | Petroleum Storage | MS / ULP | 400 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 88 | Karnataka | Bangalore | BPCL | Devangonthi, Hoskote TQ. Bangalore | Petroleum Storage | Class B | 13391 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 88 | Karnataka | Bangalore | BPCL | Devangonthi, Hoskote TQ. Bangalore | Petroleum Storage | Class A | 18950 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 89 | Karnataka | Bangalore | IOCL | Aviation Fuel Station, Bellary Road, Yelhanka, Bangalore | Petroleum Storage | Aviation Fuel | 468 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 90 | Karnataka | Bangalore | IOCL | Black Oil Depot Project, Sy. No. 26/28, Kenchiganahalli, S. N. Halli Post, Yelahanka, Bangalore - 64 | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 18720 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 91 | Karnataka | Bangalore | IOCL | Devangonthi, Hoskote Tq. Banglore | Petroleum Storage | Class A | 7800 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 91 | Karnataka | Bangalore | IOCL | Devangonthi, Hoskote Tq. Banglore | Petroleum Storage | Class B | 36121 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 92 | Karnataka | Bangalore | IOCL | Pultanahalli Village Bangalore | Petroleum Storage | Class C | 11828 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 93 | Karnataka | Belgaum | BPCL | Zadshahpur Village, Near Desur Railway Station, Desur Belgaum District | Petroleum Storage | HSD / ELHSD | 4732 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 93 | Karnataka | Belgaum | BPCL | Zadshahpur Village, Near Desur Railway Station, Desur Belgaum District | Petroleum Storage | Class A | 1816 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 94 | Karnataka | Bijapur | IOCL | Depot, NH-13, Spinning Mill Road, Bijapur | Petroleum Storage | MS / ULP | 1025 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 94 | Karnataka | Bijapur | IOCL | Depot, NH-13, Spinning Mill Road, Bijapur | Petroleum Storage | Class B | 10607 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 95 | Karnataka | Dakshin Kannad | BPCL | Village Tamirbani Post Panambur | Petroleum Storage | Class A | 19734 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 96 | Karnataka | Dakshin Kannad | IOCL | Thannerbari | Petroleum Storage | Class A | 35993 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 96 | Karnataka | Dakshin Kannad | IOCL | Thannerbari | Petroleum Storage | Class B | 43460 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 96 | Karnataka | Dakshin Kannad | IOCL | Thannerbari | Petroleum Storage | Class C | 15627 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 97 | Karnataka | Dakshina Kannada | BPCL | Mangalore Coastal Installation, Near APMC Yard, NH-17, Bikampady, Mangalore - 575 011 | Petroleum Storage | SKO | 10353 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 97 | Karnataka | Dakshina Kannada | BPCL | Mangalore Coastal Installation, Near APMC Yard, NH-17, Bikampady, Mangalore - 575 011 | Petroleum Storage | HSD / ELHSD | 19746 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 97 | Karnataka | Dakshina Kannada | BPCL | Mangalore Coastal Installation, Near APMC Yard, NH-17, Bikampady, Mangalore - 575 011 | Petroleum Storage | Naphtha | 25070 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 97 | Karnataka | Dakshina Kannada | BPCL | Mangalore Coastal Installation, Near APMC Yard, NH-17, Bikampady, | Petroleum Storage | MS / ULP | 9301 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 98 | Karnataka | Dakshina Kannada | HPCL | POL, Kattipalla, Kuthittor Post, Mangalore | Petroleum Storage | Class B | 27410 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 98 | Karnataka | Dakshina Kannada | HPCL | POL, Kattipalla, Kuthittor Post, Mangalore | Petroleum Storage | Class A | 6295 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 99 | Karnataka | Dakshina Kannada | IMC Limited | Manglore Oil Jetty, Panambur, Mangore-575010 | Petrochemical Storage | Class A | 30445 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 99 | Karnataka | Dakshina Kannada | IMC Limited | Manglore Oil Jetty, Panambur, Mangore-575010 | Petrochemical Storage | Class B & C | 29000 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 100 | Karnataka | Dakshina Kannada | Indian Port Warehousing Company | Unit of Jagson International Ltd. Near Oil Jetty 9, NMPT, Panambur, Mangalore | Petroleum Storage | Class B | 28080 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 101 | Karnataka | Dakshina Kannada | IOCL | Manglore Terminal Panambur. Manglore-575010 | Petroleum Storage | Class C | 15860 | 15000 | 100000 | Port | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 101 | Karnataka | Dakshina Kannada | IOCL | Manglore Terminal Panambur. Manglore-575010 | Petroleum Storage | Class B | 43475 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 101 | Karnataka | Dakshina Kannada | IOCL | Manglore Terminal Panambur. Manglore-575010 | Petroleum Storage | Class A | 35992 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 102 | Karnataka | Dharwad | IOCL | Bayapore District Dharwar | Petroleum Storage | Class B | 11915 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 103 | Karnataka | Gulbarga | IOCL | Old Jewargi Road, Gulbarga - 585 101 | Petroleum Storage | SKO | 117 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 103 | Karnataka | Gulbarga | IOCL | Old Jewargi Road, Gulbarga - 585 101 | Petroleum Storage | HSD / ELHSD | 2605 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 103 | Karnataka | Gulbarga | IOCL | Old Jewargi Road, Gulbarga - 585 101 | Petroleum Storage | MS / ULP | 109 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 104 | Karnataka | Mysore | IOCL | Mysore Terminal, Mysore - 570 016 | Petroleum Storage | Class A & B | 5460 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 105 | Karnataka | Raichur | BPCL | Good Shed Road, Raichur | Petroleum Storage | MS / ULP | 211 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 105 | Karnataka | Raichur | BPCL | Good Shed Road, Raichur | Petroleum Storage | SKO | 523 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 105 | Karnataka | Raichur | BPCL | Good Shed Road, Raichur | Petroleum Storage | HSD / ELHSD | 3276 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 105 | Karnataka | Raichur | BPCL | Good Shed Road, Raichur | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 80 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 106 | Karnataka | Raichur | IOCL | Good Shed Road, Raichur | Petroleum Storage | HSD / ELHSD | 2215 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 106 | Karnataka | Raichur | IOCL | Good Shed Road, Raichur | Petroleum Storage | MS / ULP | 109 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 106 | Karnataka | Raichur | IOCL | Good Shed Road, Raichur | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 172 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 106 | Karnataka | Raichur | IOCL | Good Shed Road, Raichur | Petroleum Storage | SKO | 1194 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 107 | Kerala | | HPCL | Hindustan Petroleum Corpn. Ltd. Panmana- P.O. Quilon -691583 | Petroleum Storage | MS / ULP | 2000 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 108 | Kerala | Ernakulam | BPCL | The Bharat Petroleum Corpn. Ltd. New Oil Installation, Irumpanam Cochin | Petroleum Storage | Naphtha | 38000 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 108 | Kerala | Ernakulam | BPCL | The Bharat Petroleum Corpn. Ltd. New Oil Installation, Irumpanam Cochin | Petroleum Storage | MS / ULP | 29482 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 108 | Kerala | Ernakulam | BPCL | The Bharat Petroleum Corpn. Ltd., Dr. Salim Ali Road; Cochin 682031 | Petroleum Storage | Naphtha | 7500 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 108 | Kerala | Ernakulam | BPCL | The Bharat Petroleum Corpn. Ltd., Dr. Salim Ali Road; Cochin 682031 | Petroleum Storage | MS / ULP | 7445 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 109 | Kerala | Ernakulam | HPCL | The Hindustan Petroleum Corpn. Ltd. Ernakulam Terminal, Tata Road, Ernakulam-682031 | Petroleum Storage | MS / ULP | 7250 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 110 | Kerala | Thiruvananthapuram | IOCL | The Indian Oil Corpn. Ltd. Titanium Thiruvananthapuram | Petroleum Storage | MS / ULP | 1660 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 111 | Madhya Pradesh | Bhopal | HPCL | Hatpura | Petroleum Storage | Class A | 1310 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 111 | Madhya Pradesh | Bhopal | HPCL | Hatpura | Petroleum Storage | Class B | 10104 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 111 | Madhya Pradesh | Bhopal | HPCL | Hatpura | Petroleum Storage | Class C | 378 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 112 | Madhya Pradesh | Bhopal | IOCL | Nikhatpur | Petroleum Storage | Class C | 627 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 112 | Madhya Pradesh | Bhopal | IOCL | Nikhatpur | Petroleum Storage | Class B | 15579 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 112 | Madhya Pradesh | Bhopal | IOCL | Nikhatpur | Petroleum Storage | Class A | 1221 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 113 | Madhya Pradesh | Bilaspur | HPCL | Bilaspur | Petroleum Storage | Class C | 180 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 113 | Madhya Pradesh | Bilaspur | HPCL | Bilaspur | Petroleum Storage | Class A | 126 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 113 | Madhya Pradesh | Bilaspur | HPCL | Bilaspur | Petroleum Storage | Class B | 1665 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 114 | Madhya Pradesh | Gwalior | BPCL | Gwalior | Petroleum Storage | ClassC | 155 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 114 | Madhya Pradesh | Gwalior | BPCL | Gwalior | Petroleum Storage | Class A | 287 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 114 | Madhya Pradesh | Gwalior | BPCL | Gwalior | Petroleum Storage | Class B | 3906 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 115 | Madhya Pradesh | Gwalior | BPCL | Raisu | Petroleum Storage | Class C | 670 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 115 | Madhya Pradesh | Gwalior | BPCL | Raisu | Petroleum Storage | Class A | 904 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 115 | Madhya Pradesh | Gwalior | BPCL | Raisu | Petroleum Storage | Class B | 11522 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 116 | Madhya Pradesh | Gwalior | HPCL | Royal | Petroleum Storage | Class A | 595 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 116 | Madhya Pradesh | Gwalior | HPCL | Royal | Petroleum Storage | Class B | 4009 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 117 | Madhya Pradesh | Gwalior | IOCL | Raisu | Petroleum Storage | Class C | 219 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 117 | Madhya Pradesh | Gwalior | IOCL | Raisu | Petroleum Storage | Class B | 17189 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 118 | Madhya Pradesh | Hoshangabad | IOCL | Itarsi | Petroleum Storage | Class B | 10635 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 118 | Madhya Pradesh | Hoshangabad | IOCL | Itarsi | Petroleum Storage | Class C | 109 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 118 | Madhya Pradesh | Hoshangabad | IOCL | Itarsi | Petroleum Storage | Class A | 885 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 119 | Madhya Pradesh | Indore | BPCL | Maugalia | Petroleum Storage | Class C | 670 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 119 | Madhya Pradesh | Indore | BPCL | Maugalia | Petroleum Storage | Class A | 1953 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 119 | Madhya Pradesh | Indore | BPCL | Maugalia | Petroleum Storage | Class B | 11273 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 120 | Madhya Pradesh | Indore | IOCL | Indore | Petroleum Storage | Class B | 1415 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 120 | Madhya Pradesh | Indore | IOCL | Indore | Petroleum Storage | Class A | 265 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 120 | Madhya Pradesh | Indore | IOCL | Indore | Petroleum Storage | Class C | 156 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 121 | Madhya Pradesh | Indore | IOCL | Mangligaon | Petroleum Storage | Class B | 16014 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 121 | Madhya Pradesh | Indore | IOCL | Mangligaon | Petroleum Storage | Class C | 11440 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 121 | Madhya Pradesh | Indore | IOCL | Mangligaon | Petroleum Storage | Class A | 3541 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 122 | Madhya Pradesh | Jabalpur | BPCL | Bhitoni | Petroleum Storage | SKO | 2457 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 122 | Madhya Pradesh | Jabalpur | BPCL | Bhitoni | Petroleum Storage | MS /ULP | 1300 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 122 | Madhya Pradesh | Jabalpur | BPCL | Bhitoni | Petroleum Storage | HSD / ELHSD | 5783 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 123 | Madhya Pradesh | Jabalpur | IOCL | Bhitoni | Petroleum Storage | SKO | 5146 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 123 | Madhya Pradesh | Jabalpur | IOCL | Bhitoni | Petroleum Storage | HSD / ELHSD | 10353 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 123 | Madhya Pradesh | Jabalpur | IOCL | Bhitoni | Petroleum Storage | MS / ULP | 270 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 123 | Madhya Pradesh | Jabalpur | IOCL | Bhitoni | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 874 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 124 | Madhya Pradesh | Ratlam | HPCL | Ratlam | Petroleum Storage | MS / ULP | 421 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 124 | Madhya Pradesh | Ratlam | HPCL | Ratlam | Petroleum Storage | HSD / ELHSD | 3260 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 124 | Madhya Pradesh | Ratlam | HPCL | Ratlam | Petroleum Storage | SKO | 1715 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 125 | Madhya Pradesh | Sagar | IOCL | Naurioli | Petroleum Storage | MS / ULP | 796 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 125 | Madhya Pradesh | Sagar | IOCL | Naurioli | Petroleum Storage | SKO | 3167 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 125 | Madhya Pradesh | Sagar | IOCL | Naurioli | Petroleum Storage | HSD / ELHSD | 4750 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 126 | Madhya Pradesh | Satna | IOCL | Satna | Petroleum Storage | HSD / ELHSD | 5070 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 126 | Madhya Pradesh | Satna | IOCL | Satna | Petroleum Storage | MS / ULP | 117 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 126 | Madhya Pradesh | Satna | IOCL | Satna | Petroleum Storage | SKO | 1735 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 127 | Maharashtra | Mumbai | Bharat Shell Ltd. | Base Oil Storage Terminal, Opp. IMC Ltd., Sheva, JNPT, Navi Mumbai - 400 707 | Petroleum Storage | Heavy Oil (Base Oil) | 12564 | 15000 | 100000 | Port | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 128 | Maharashtra | Mumbai | BPCL | Bharat Petroleum Corporation Ltd., Sewree | Petroleum Storage | MS / ULP | 16600 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 128 | Maharashtra | Mumbai | BPCL | Bharat Petroleum Corporation Ltd., Sewree | Petroleum Storage | SKO | 14690 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 129 | Maharashtra | Mumbai | HPCL | Hindustan Petroleum Corporation Ltd., Corridor Road, Mahul, Mumbai | Petroleum Storage | Naphtha | 55355 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 129 | Maharashtra | Mumbai | HPCL | Hindustan Petroleum Corporation Ltd., Mahul Terminal, Gavanpada Village, Chembur | Petroleum Storage | Solvents | 2500 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 129 | Maharashtra | Mumbai | HPCL | Hindustan Petroleum Corporation Ltd., Mahul Terminal, Gavanpada Village, Chembur | Petroleum Storage | MS / ULP | 2700 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 129 | Maharashtra | Mumbai | HPCL | Hindustan Petroleum Corporation Ltd., Mahul Terminal, Gavanpada Village, Chembur | Petroleum Storage | Hexane | 2000 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 130 | Maharashtra | Mumbai | IMC Limited | Plot No. 6; Nava Sheva; New Mumbai | Petrochemical Storage | Class B & C | 54755 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 131 | Maharashtra | Mumbai | Indian Oil Tanking Ltd. | Navhar, Dronagiri Node, NH-4B, Navi Mumbai - 400 707 | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 120900 | 15000 | 100000 | Port | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 132 | Maharashtra | Mumbai | Mumbai Port Trust | Marine Oil Terminal, Jawahar Dweep Mumbai | Petroleum Storage | Highly flammable Liquid | 130680 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 133 | Maharashtra | Nagpur | HPCL | Hindustan Petroleum Corporation Ltd., Khapri Tal | Petroleum Storage | MS / ULP | 796 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 133 | Maharashtra | Nagpur | HPCL | Hindustan Petroleum Corporation Ltd., Khapri Tal | Petroleum Storage | SKO | 2332 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 133 | Maharashtra | Nagpur | HPCL | Hindustan Petroleum Corporation Ltd., Khapri Tal | Petroleum Storage | HSD / ELHSD | 7270 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 133 | Maharashtra | Nagpur | HPCL | Hindustan Petroleum Corporation Ltd., Khapri Tal | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 827 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 134 | Maharashtra | Nagpur | IOCL | Indian oil Corporation Ltd, (Bulk Oil Depot), Wardha road | Petroleum Storage | HSD / ELHSD | 5476 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 134 | Maharashtra | Nagpur | IOCL | Indian oil Corporation Ltd, (Bulk Oil Depot), Wardha road | Petroleum Storage | SKO | 3551 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 134 | Maharashtra | Nagpur | IOCL | Indian oil Corporation Ltd, (Bulk Oil Depot), Wardha road | Petroleum Storage | MS / ULP | 1800 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 134 | Maharashtra | Nagpur | IOCL | Indian oil Corporation Ltd, (Bulk Oil Depot), Wardha road | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 945 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 134 | Maharashtra | Nagpur | IOCL | Indian oil Corporation Ltd, (Bulk Oil Depot), Wardha road | Petroleum Storage | ATF | 5201 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 135 | Maharashtra | Nashik | BPCL | Bharat Petroleum Corporation Ltd., Panewadi, Tal Nandgaon | Petroleum Storage | HSD / ELHSD | 92160 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 135 | Maharashtra | Nashik | BPCL | Bharat Petroleum Corporation Ltd., Panewadi, Tal Nandgaon | Petroleum Storage | MS / ULP | 47798 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 136 | Maharashtra | Pune | HPCL | Hindutan Petroleum Corporation Ltd., Loni Terminal, Loni Kalbhor, Ta-Haveli | Petroleum Storage | HSD / ELHSD | 42000 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 136 | Maharashtra | Pune | HPCL | Hindutan Petroleum Corporation Ltd., Loni Terminal, Loni Kalbhor, Ta-Haveli | Petroleum Storage | MS / ULP | 8000 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 137 | Maharashtra | Raigad | ONGC | Rirawadi, Uran | Petroleum Storage | Heavy Oil (Crude Oil) | 400000 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 138 | Maharashtra | Raigad | RIL | Reliance Industries Ltd., (Storage), A-3, Tankfarm B-1,2, MIDC, Patalganga | Petroleum Storage | SKO | 16640 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 139 | Maharashtra | Ratnagiri | Dabhol Power Company | At Anjalwal, Tal Ghagar | Petroleum Storage | Naphtha | 67000 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 140 | Maharashtra | Sangli | BPCL | Railway Siding, Miraj | Petroleum Storage | MS / ULP | 1096 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 141 | Maharashtra | Sangli | IOCL | Bulk Depot, Chandanwadi, Miraj | Petroleum Storage | MS / ULP | 1375 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 142 | Maharashtra | Thane | HPCL | Hindutan Petroleum Corporation Ltd., TTC, Thane Belapur Road | Petroleum Storage | MS / ULP | 10980 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 143 | Meghalaya | Ri Bhoi | IOCL (AOD) | Umsaw, Ri-Bhoi District | Petroleum Storage | HSD / ELHSD | 2567 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 143 | Meghalaya | Ri Bhoi | IOCL (AOD) | Umsaw, Ri-Bhoi District | Petroleum Storage | MS / ULP | 877 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 143 | Meghalaya | Ri Bhoi | IOCL (AOD) | Umsaw, Ri-Bhoi District | Petroleum Storage | SKO | 1222 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 144 | Nagaland | Dimapur | IOCL | Kevijan Colony, PO Dimapur - 797 112, Nagaland | Petroleum Storage | ATF | 591 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 144 | Nagaland | Dimapur | IOCL | Kevijan Colony, PO Dimapur - 797 112, Nagaland | Petroleum Storage | HSD / ELHSD | 2413 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 144 | Nagaland | Dimapur | IOCL | Kevijan Colony, PO Dimapur - 797 112, Nagaland | Petroleum Storage | SKO | 4370 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 144 | Nagaland | Dimapur | IOCL | Kevijan Colony, PO Dimapur - 797 112, Nagaland | Petroleum Storage | MS / ULP | 1235 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 145 | Orissa | Baleshwar | HPCL | Balasore | Petroleum Storage | MS / ULP | 210 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 145 | Orissa | Baleshwar | HPCL | Balasore | Petroleum Storage | HSD / ELHSD | 1433 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 145 | Orissa | Baleshwar | HPCL | Balasore | Petroleum Storage | SKO | 218 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 145 | Orissa | Baleshwar | HPCL | Balasore | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 663 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 146 | Orissa | Baleshwar | IOCL | Balasore | Petroleum Storage | HSD / ELHSD | 1463 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 146 | Orissa | Baleshwar | IOCL | Balasore | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 289 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 146 | Orissa | Baleshwar | IOCL | Balasore | Petroleum Storage | MS / ULP | 164 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 146 | Orissa | Baleshwar | IOCL | Balasore | Petroleum Storage | SKO | 1000 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 147 | Orissa | Berhampur | IOCL | Berhampur | Petroleum Storage | SKO | 1488 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 147 | Orissa | Berhampur | IOCL | Berhampur | Petroleum Storage | MS / ULP | 109 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 147 | Orissa | Berhampur | IOCL | Berhampur | Petroleum Storage | HSD / ELHSD | 2098 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 148 | Orissa | Cuttack | BPCL | Sikharpur | Petroleum Storage | MS / ULP | 406 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 148 | Orissa | Cuttack | BPCL | Sikharpur | Petroleum Storage | SKO | 395 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 149 | Orissa | Cuttack | HPCL | Sikharpur | Petroleum Storage | MS / ULP | 500 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 149 | Orissa | Cuttack | HPCL | Sikharpur | Petroleum Storage | SKO | 546 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 150 | Orissa | Cuttack | IOCL | Sikharpur | Petroleum Storage | HSD / ELHSD | 1886 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 150 | Orissa | Cuttack | IOCL | Sikharpur | Petroleum Storage | SKO | 1285 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 150 | Orissa | Cuttack | IOCL | Sikharpur | Petroleum Storage | MS / ULP | 275 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 150 | Orissa | Cuttack | IOCL | Sikharpur | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 350 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 151 | Orissa | Jagatsinghpur | HPCL | Paradeep Terminal | Petroleum Storage | Class B | 183899 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 152 | Orissa | Jagatsinghpur | IOCL | Lighterage Terminal | Petroleum Storage | Class B | 140000 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 153 | Orissa | Jagatsinghpur | IOCL | Paradeep Depot | Petroleum Storage | HSD / ELHSD | 77547 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 153 | Orissa | Jagatsinghpur | IOCL | Paradeep Depot | Petroleum Storage | SKO | 23556 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 154 | Orissa | Khordha | IOCL | Jatni | Petroleum Storage | HSD / ELHSD | 7920 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 154 | Orissa | Khordha | IOCL | Jatni | Petroleum Storage | SKO | 4793 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 155 | Orissa | Sambalpur | BPCL | Sambalpur | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 390 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 155 | Orissa | Sambalpur | BPCL | Sambalpur | Petroleum Storage | MS / ULP | 367 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 155 | Orissa | Sambalpur | BPCL | Sambalpur | Petroleum Storage | HSD / ELHSD | 1977 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 155 | Orissa | Sambalpur | BPCL | Sambalpur | Petroleum Storage | SKO | 857 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 156 | Orissa | Sambalpur | IOCL | Modipara | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 779 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 156 | Orissa | Sambalpur | IOCL | Modipara | Petroleum Storage | MS / ULP | 164 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 156 | Orissa | Sambalpur | IOCL | Modipara | Petroleum Storage | SKO | 793 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 156 | Orissa | Sambalpur | IOCL | Modipara | Petroleum Storage | HSD / ELHSD | 1816 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 157 | Orissa | Sambalpur | IOCL | Sambalpur | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 870 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 157 | Orissa | Sambalpur | IOCL | Sambalpur | Petroleum Storage | Hexane | 55 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 157 | Orissa | Sambalpur | IOCL | Sambalpur | Petroleum Storage | HSD / ELHSD | 1638 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 157 | Orissa | Sambalpur | IOCL | Sambalpur | Petroleum Storage | MS / ULP | 164 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 157 | Orissa | Sambalpur | IOCL | Sambalpur | Petroleum Storage | SKO | 784 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 158 | Orissa | Silchar | IOCL | Silchar | Petroleum Storage | ATF | 835 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 158 | Orissa | Silchar | IOCL | Silchar | Petroleum Storage | MS / ULP | 476 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 158 | Orissa | Silchar | IOCL | Silchar | Petroleum Storage | HSD / ELHSD | 1014 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 158 | Orissa | Silchar | IOCL | Silchar | Petroleum Storage | SKO | 765 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 159 | Orissa | Sundargarh | IOCL | Rourkela | Petroleum Storage | HSD / ELHSD | 1399 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 159 | Orissa | Sundargarh | IOCL | Rourkela | Petroleum Storage | MS / ULP | 273 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 159 | Orissa | Sundargarh | IOCL | Rourkela | Petroleum Storage | SKO | 627 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 160 | Punjab | Amritsar | IOCL | Bhagatanwala | Petroleum Storage | HSD / ELHSD | 4475 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 160 | Punjab | Amritsar | IOCL | Bhagatanwala | Petroleum Storage | MS / ULP | 340 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 160 | Punjab | Amritsar | IOCL | Bhagatanwala | Petroleum Storage | SKO | 1275 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 161 | Punjab | Bhatinda | BPCL | Bhatinda | Petroleum Storage | Class C | 278 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 161 | Punjab | Bhatinda | BPCL | Bhatinda | Petroleum Storage | Class A | 3560 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 161 | Punjab | Bhatinda | BPCL | Bhatinda | Petroleum Storage | Class B | 36400 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 162 | Punjab | Bhatinda | HPCL | Bhatinda | Petroleum Storage | Class A | 1812 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 162 | Punjab | Bhatinda | HPCL | Bhatinda | Petroleum Storage | Class B | 18956 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 163 | Punjab | Bhatinda | IOCL | Bhatinda | Petroleum Storage | Class B | 45896 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 163 | Punjab | Bhatinda | IOCL | Bhatinda | Petroleum Storage | Class C | 403 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 163 | Punjab | Bhatinda | IOCL | Bhatinda | Petroleum Storage | Class A | 23885 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 164 | Punjab | Gurdaspur | BPCL | Pathankot | Petroleum Storage | Class C | 305 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 164 | Punjab | Gurdaspur | BPCL | Pathankot | Petroleum Storage | Class A | 602 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 164 | Punjab | Gurdaspur | BPCL | Pathankot | Petroleum Storage | Class B | 8109 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 165 | Punjab | Gurdaspur | IOCL | Chakki Bank; Pathankot | Petroleum Storage | Class C | 1186 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 165 | Punjab | Gurdaspur | IOCL | Chakki Bank; Pathankot | Petroleum Storage | Class B | 20378 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 165 | Punjab | Gurdaspur | IOCL | Chakki Bank; Pathankot | Petroleum Storage | Class A | 1989 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 166 | Punjab | Jalandhar | BPCL | Suchipind | Petroleum Storage | Class B | 15213 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 166 | Punjab | Jalandhar | BPCL | Suchipind | Petroleum Storage | Class A | 5147 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 167 | Punjab | Jalandhar | HPCL | Suchipind | Petroleum Storage | Class A | 3955 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 167 | Punjab | Jalandhar | HPCL | Suchipind | Petroleum Storage | Class B | 9781 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 168 | Punjab | Jalandhar | IOCL | Suchipind | Petroleum Storage | Class A | 24047 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 168 | Punjab | Jalandhar | IOCL | Suchipind | Petroleum Storage | Class B | 122088 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 168 | Punjab | Jalandhar | IOCL | Suchipind | Petroleum Storage | Class C | 4112 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 169 | Punjab | Ludhiana | IOCL | near Airforce Guard Room, Halwara | Petroleum Storage | ATF | 0 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 170 | Punjab | Patiala | BPCL | Lalru | Petroleum Storage | MS / ULP | 286 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 170 | Punjab | Patiala | BPCL | Lalru | Petroleum Storage | SKO | 140 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 170 | Punjab | Patiala | BPCL | Lalru | Petroleum Storage | HSD / ELHSD | 1910 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 170 | Punjab | Patiala | BPCL | Lalru | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 112 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 171 | Punjab | Patiala | BPCL | Patiala | Petroleum Storage | SKO | 171 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 171 | Punjab | Patiala | BPCL | Patiala | Petroleum Storage | MS / ULP | 350 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 171 | Punjab | Patiala | BPCL | Patiala | Petroleum Storage | HSD / ELHSD | 1248 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 172 | Punjab | Patiala | HPCL | Patiala | Petroleum Storage | MS / ULP | 2080 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 172 | Punjab | Patiala | HPCL | Patiala | Petroleum Storage | HSD / ELHSD | 5760 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 173 | Punjab | Patiala | IOCL | Patiala | Petroleum Storage | Class A | 492 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 173 | Punjab | Patiala | IOCL | Patiala | Petroleum Storage | Class C | 1057 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 173 | Punjab | Patiala | IOCL | Patiala | Petroleum Storage | Class B | 5285 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 174 | Punjab | Sangrur | IBP Co. Ltd. | Bir Ashwan, Sangrur | Petroleum Storage | Class A | 2917 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 174 | Punjab | Sangrur | IBP Co. Ltd. | Bir Ashwan, Sangrur | Petroleum Storage | Class B | 16606 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 175 | Punjab | Sangrur | IOCL | KBPL TOP, Jind Road, Sangrur | Petroleum Storage | Class A | 2729 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 175 | Punjab | Sangrur | IOCL | KBPL TOP, Jind Road, Sangrur | Petroleum Storage | Class B | 51777 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 176 | Rajasthan | Ajmer | BPCL | Durai, Ajmer | Petroleum Storage | Class C | 253 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 176 | Rajasthan | Ajmer | BPCL | Durai, Ajmer | Petroleum Storage | Class A | 981 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 176 | Rajasthan | Ajmer | BPCL | Durai, Ajmer | Petroleum Storage | Class B | 11331 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 177 | Rajasthan | Ajmer | IOCL | Ajmer | Petroleum Storage | SKO | 1500 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 177 | Rajasthan | Ajmer | IOCL | Ajmer | Petroleum Storage | MS / ULP | 950 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 177 | Rajasthan | Ajmer | IOCL | Ajmer | Petroleum Storage | HSD / ELHSD | 7000 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 178 | Rajasthan | Bharatpur | BPCL | Bharatpur | Petroleum Storage | MS / ULP | 400 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 178 | Rajasthan | Bharatpur | BPCL | Bharatpur | Petroleum Storage | SKO | 1120 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 178 | Rajasthan | Bharatpur | BPCL | Bharatpur | Petroleum Storage | HSD / ELHSD | 7500 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 179 | Rajasthan | Bharatpur | HPCL | Bharatpur | Petroleum Storage | HSD / ELHSD | 10000 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 179 | Rajasthan | Bharatpur | HPCL | Bharatpur | Petroleum Storage | SKO | 1200 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 179 | Rajasthan | Bharatpur | HPCL | Bharatpur | Petroleum Storage | MS / ULP | 1000 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 180 | Rajasthan | Bharatpur | IOCL | Bharatpur | Petroleum Storage | SKO | 5660 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 180 | Rajasthan | Bharatpur | IOCL | Bharatpur | Petroleum Storage | MS / ULP | 970 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 180 | Rajasthan | Bharatpur | IOCL | Bharatpur | Petroleum Storage | HSD / ELHSD | 10700 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 181 | Rajasthan | Bikaner | IOCL | Bikaner | Petroleum Storage | HSD / ELHSD | 3800 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 181 | Rajasthan | Bikaner | IOCL | Bikaner | Petroleum Storage | SKO | 806 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 181 | Rajasthan | Bikaner | IOCL | Bikaner | Petroleum Storage | MS / ULP | 350 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 182 | Rajasthan | Hanumangarh | HPCL | Hanumangarh | Petroleum Storage | MS / ULP | 219 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 182 | Rajasthan | Hanumangarh | HPCL | Hanumangarh | Petroleum Storage | SKO | 2478 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 182 | Rajasthan | Hanumangarh | HPCL | Hanumangarh | Petroleum Storage | HSD / ELHSD | 5540 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 183 | Rajasthan | Hanumangarh | IOCL | Hanumangarh | Petroleum Storage | SKO | 975 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 183 | Rajasthan | Hanumangarh | IOCL | Hanumangarh | Petroleum Storage | HSD / ELHSD | 5940 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 183 | Rajasthan | Hanumangarh | IOCL | Hanumangarh | Petroleum Storage | MS / ULP | 740 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b)(iii) | Liquid |
| 184 | Rajasthan | Jaipur | BPCL | Jaipur | Petroleum Storage | Class B | 15096 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 184 | Rajasthan | Jaipur | BPCL | Jaipur | Petroleum Storage | Class A | 580 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b)(iii) | Liquid |
| 184 | Rajasthan | Jaipur | BPCL | Jaipur | Petroleum Storage | Class C | 713 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 185 | Rajasthan | Jaipur | HPCL | Sanganer Industrial Area, Sanganer | Petroleum Storage | HSD / ELHSD | 18070 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 185 | Rajasthan | Jaipur | HPCL | Sanganer Industrial Area, Sanganer | Petroleum Storage | MS / ULP | 2570 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b)(iii) | Liquid |
| 185 | Rajasthan | Jaipur | HPCL | Sanganer Industrial Area, Sanganer | Petroleum Storage | SKO | 1800 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 186 | Rajasthan | Jaipur | IOCL | Sanganer | Petroleum Storage | MS / ULP | 16500 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b)(iii) | Liquid |
| 186 | Rajasthan | Jaipur | IOCL | Sanganer | Petroleum Storage | SKO | 13500 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 186 | Rajasthan | Jaipur | IOCL | Sanganer | Petroleum Storage | HSD / ELHSD | 72200 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 187 | Rajasthan | Jodhpur | BPCL | Salawas | Petroleum Storage | MS / ULP | 2244 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b)(iii) | Liquid |
| 187 | Rajasthan | Jodhpur | BPCL | Salawas | Petroleum Storage | HSD / ELHSD | 18100 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 187 | Rajasthan | Jodhpur | BPCL | Salawas | Petroleum Storage | SKO | 1716 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 188 | Rajasthan | Jodhpur | HPCL | Bhagat - Ki Kothi; Jodhpur | Petroleum Storage | Class B | 7730 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 188 | Rajasthan | Jodhpur | HPCL | Bhagat - Ki Kothi; Jodhpur | Petroleum Storage | Class A | 843 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b)(iii) | Liquid |
| 188 | Rajasthan | Jodhpur | HPCL | Bhagat - Ki Kothi; Jodhpur | Petroleum Storage | Class C | 754 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 189 | Rajasthan | Jodhpur | IOCL | Salawas | Petroleum Storage | HSD / ELHSD | 44240 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 189 | Rajasthan | Jodhpur | IOCL | Salawas | Petroleum Storage | SKO | 10832 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 189 | Rajasthan | Jodhpur | IOCL | Salawas | Petroleum Storage | MS / ULP | 10800 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b)(iii) | Liquid |
| 190 | Rajasthan | Kota | BPCL | Kota | Petroleum Storage | SKO | 1068 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 190 | Rajasthan | Kota | BPCL | Kota | Petroleum Storage | HSD / ELHSD | 5958 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 190 | Rajasthan | Kota | BPCL | Kota | Petroleum Storage | MS / ULP | 1272 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 191 | Rajasthan | Kota | IOCL | Kota | Petroleum Storage | Class A | 1287 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 191 | Rajasthan | Kota | IOCL | Kota | Petroleum Storage | Class B | 12535 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 191 | Rajasthan | Kota | IOCL | Kota | Petroleum Storage | Class C | 1482 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 192 | Rajasthan | Udaipur | BPCL | Udaipur | Petroleum Storage | HSD / ELHSD | 1809 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 192 | Rajasthan | Udaipur | BPCL | Udaipur | Petroleum Storage | SKO | 250 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 192 | Rajasthan | Udaipur | BPCL | Udaipur | Petroleum Storage | MS / ULP | 389 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 193 | Rajasthan | Udaipur | HPCL | Udaipur | Petroleum Storage | MS / ULP | 610 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 193 | Rajasthan | Udaipur | HPCL | Udaipur | Petroleum Storage | HSD / ELHSD | 3470 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 193 | Rajasthan | Udaipur | HPCL | Udaipur | Petroleum Storage | SKO | 210 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 194 | Rajasthan | Udaipur | IOCL | Udaipur | Petroleum Storage | Class C | 91 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 194 | Rajasthan | Udaipur | IOCL | Udaipur | Petroleum Storage | Class A | 712 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 194 | Rajasthan | Udaipur | IOCL | Udaipur | Petroleum Storage | Class B | 11616 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 195 | Sikkim | South District | IOCL | Rangpo, PO Amjitar, Via Gangtok, Sikkim | Petroleum Storage | SKO | 437 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 195 | Sikkim | South District | IOCL | Rangpo, PO Amjitar, Via Gangtok, Sikkim | Petroleum Storage | HSD / ELHSD | 628 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 195 | Sikkim | South District | IOCL | Rangpo, PO Amjitar, Via Gangtok, Sikkim | Petroleum Storage | MS / ULP | 246 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 196 | Tamil Nadu | Chennai | BPCL | Bharat Petroleum Corporation Ltd., 35, Vaithyanathan Mudali Street, Tondiarpet, Chennai | Petroleum Storage | Hexane | 200 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 196 | Tamil Nadu | Chennai | BPCL | Bharat Petroleum Corporation Ltd., 35, Vaithyanathan Mudali Street, Tondiarpet, Chennai | Petroleum Storage | MS / ULP | 4860 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 197 | Tamil Nadu | Chennai | HPCL | Basin Bridge, Chennai | Petroleum Storage | Class C | 41964 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 198 | Tamil Nadu | Chennai | HPCL | Hindustan Petroleum Ltd. 98/99 Elaya Mudali Street Washermenpet - 600 021 | Petroleum Storage | HSD / ELHSD | 28634 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 198 | Tamil Nadu | Chennai | HPCL | Hindustan Petroleum Ltd. 98/99 Elaya Mudali Street Washermenpet - 600 021 | Petroleum Storage | MS / ULP | 4787 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 198 | Tamil Nadu | Chennai | HPCL | Hindustan Petroleum Ltd. 98/99 Elaya Mudali Street Washermenpet - 600 021 | Petroleum Storage | SKO | 15876 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 198 | Tamil Nadu | Chennai | HPCL | Tondiarpet<br>Madras<br>98/99, Elayamudali Street<br>P.B. No. 1170, Chennai - 22 | Petroleum Storage | Class A | 8175 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 198 | Tamil Nadu | Chennai | HPCL | Tondiarpet<br>Madras<br>98/99, Elayamudali Street<br>P.B. No. 1170, Chennai - 22 | Petroleum Storage | Class B | 27062 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 199 | Tamil Nadu | Chennai | IOCL | Indian Oil Corpn. (Marketing Division)<br>Madras Port Trust Premises<br>Madras 600 021 | Petroleum Storage | HSD / ELHSD | 26325 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 199 | Tamil Nadu | Chennai | IOCL | Indian Oil Corpn. (Marketing Division)<br>Madras Port Trust Premises<br>Madras 600 021 | Petroleum Storage | SKO | 40082 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 200 | Tamil Nadu | Chennai | IOCL | Indian Oil Corpn. Ltd.<br>Madras Harbour<br>Ennore High Road<br>Madras - 81 | Petroleum Storage | MS / ULP | 5269 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 200 | Tamil Nadu | Chennai | IOCL | Indian Oil Corpn. Ltd.<br>Madras Harbour<br>Ennore High Road<br>Madras - 81 | Petroleum Storage | Class B | 63960 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 200 | Tamil Nadu | Chennai | IOCL | Indian Oil Corpn. Ltd.<br>Madras Harbour<br>Ennore High Road<br>Madras - 81 | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 2463 | 15000 | 100000 | Port | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 201 | Tamil Nadu | Chennai | IOCL | Korukkupet Terminal,<br>Kathivakkam High Road,<br>Chennai - 600 021 | Petroleum Storage | Naphtha | 5000 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 201 | Tamil Nadu | Chennai | IOCL | Korukkupet Terminal,<br>Kathivakkam High Road,<br>Chennai - 600 021 | Petroleum Storage | MS / ULP | 3532 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 202 | Tamil Nadu | Chennai | IOCL | Tondiarpet Terminal,<br>Ennore High Road,<br>Chennai - 600 081 | Petroleum Storage | Class B | 56646 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 202 | Tamil Nadu | Chennai | IOCL | Tondiarpet Terminal,<br>Ennore High Road,<br>Chennai - 600 081 | Petroleum Storage | Class A | 5573 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 202 | Tamil Nadu | Chennai | IOCL | Tondiarpet Terminal,<br>Ennore High Road,<br>Chennai - 600 081 | Petroleum Storage | Class C | 34487 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 203 | Tamil Nadu | Coimbatore | BPCL | Bharat Petroleum Corporation Limited P. O Box No. 1644<br>Peelamedu Coimbatore | Petroleum Storage | MS / ULP | 2920 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 203 | Tamil Nadu | Coimbatore | BPCL | Bharat Petroleum Corporation Limited P. O Box No. 1644<br>Peelamedu Coimbatore | Petroleum Storage | Class B | 14020 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 204 | Tamil Nadu | Coimbatore | HPCL | Attapagundenpudur, Irugur P.O.,<br>Coimbatore - 641 103 | Petroleum Storage | Class B | 17617 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 204 | Tamil Nadu | Coimbatore | HPCL | Attapagundenpudur, Irugur P.O.,<br>Coimbatore - 641 103 | Petroleum Storage | MS / ULP | 1553 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 205 | Tamil Nadu | Coimbatore | IOCL | Attapagundenpudur, Irugur P.O.,<br>Coimbatore - 641 103 | Petroleum Storage | Class B | 27865 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 205 | Tamil Nadu | Coimbatore | IOCL | Attapagundenpudur, Irugur P.O., Coimbatore - 641 103 | Petroleum Storage | MS / ULP | 1238 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 206 | Tamil Nadu | Coimbatore | IOCL | Indian Oil Corpn. Mettupalayam Road Coimbatore 641043 | Petroleum Storage | HSD / ELHSD | 7334 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 206 | Tamil Nadu | Coimbatore | IOCL | Indian Oil Corpn. Mettupalayam Road Coimbatore 641043 | Petroleum Storage | MS / ULP | 1411 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 206 | Tamil Nadu | Coimbatore | IOCL | Indian Oil Corpn. Mettupalayam Road Coimbatore 641043 | Petroleum Storage | SKO | 3133 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 207 | Tamil Nadu | Nagapattinam | IBP Co. Ld. | Cauvery Basin Marketting Terminal, Muttam, Melavinjore P.O., Nagapattinam - 611 002 | Petroleum Storage | SKO | 16385 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 207 | Tamil Nadu | Nagapattinam | IBP Co. Ld. | Cauvery Basin Marketting Terminal, Muttam, Melavinjore P.O., Nagapattinam - 611 002 | Petroleum Storage | HSD / ELHSD | 17561 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 207 | Tamil Nadu | Nagapattinam | IBP Co. Ld. | Cauvery Basin Marketting Terminal, Muttam, Melavinjore P.O., Nagapattinam - 611 002 | Petroleum Storage | Naphtha | 19625 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 207 | Tamil Nadu | Nagapattinam | IBP Co. Ld. | Cauvery Basin Marketting Terminal, Muttam, Melavinjore P.O., Nagapattinam - 611 002 | Petroleum Storage | MS / ULP | 4740 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 208 | Tamil Nadu | Salem | BPCL | Bharat Petoleum Corpn. Ltd. Korur bit, Salem | Petroleum Storage | SKO | 1891 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 208 | Tamil Nadu | Salem | BPCL | Bharat Petoleum Corpn. Ltd. Korur bit, Salem | Petroleum Storage | MS / ULP | 904 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 208 | Tamil Nadu | Salem | BPCL | Bharat Petoleum Corpn. Ltd. Korur bit, Salem | Petroleum Storage | HSD / ELHSD | 7154 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 209 | Tamil Nadu | Salem | BPCL | Sankari Depot, Naranappan Chavadi, Sankari Durg R.S. - 637 302 | Petroleum Storage | Class B | 10111 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 209 | Tamil Nadu | Salem | BPCL | Sankari Depot, Naranappan Chavadi, Sankari Durg R.S. - 637 302 | Petroleum Storage | MS / ULP | 1011 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 210 | Tamil Nadu | Salem | IOCL | Indian Oil Corpn. Ltd. Morur Bit, Sankari (west) Salem | Petroleum Storage | SKO | 4680 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 210 | Tamil Nadu | Salem | IOCL | Indian Oil Corpn. Ltd. Morur Bit, Sankari (west) Salem | Petroleum Storage | HSD / ELHSD | 1720 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 210 | Tamil Nadu | Salem | IOCL | Indian Oil Corpn. Ltd. Morur Bit, Sankari (west) Salem | Petroleum Storage | MS / ULP | 1404 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 211 | Tamil Nadu | Salem | IOCL | Indian Oil Corpn. Ltd. Shevapet, Salem | Petroleum Storage | MS / ULP | 168 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 211 | Tamil Nadu | Salem | IOCL | Indian Oil Corpn. Ltd. Shevapet, Salem | Petroleum Storage | SKO | 853 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 211 | Tamil Nadu | Salem | IOCL | Indian Oil Corpn. Ltd. Shevapet, Salem | Petroleum Storage | HSD / ELHSD | 3769 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 212 | Tamil Nadu | Salem | IOCL | Morur | Petroleum Storage | Class B | 11915 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 213 | Tamil Nadu | Tiruchchirappalli | BPCL | Bharat Petroleum Corpn. Ltd. Good Shed Road , Trichy. | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 242 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 213 | Tamil Nadu | Tiruchchirappalli | BPCL | Bharat Petroleum Corpn. Ltd. Good Shed Road , Trichy. | Petroleum Storage | MS / ULP | 1882 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 213 | Tamil Nadu | Tiruchchirappalli | BPCL | Bharat Petroleum Corpn. Ltd. Good Shed Road , Trichy. | Petroleum Storage | SKO | 3074 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 213 | Tamil Nadu | Tiruchchirappalli | BPCL | Bharat Petroleum Corpn. Ltd. Good Shed Road , Trichy. | Petroleum Storage | HSD / ELHSD | 14643 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 214 | Tamil Nadu | Tiruchchirappalli | BPCL | Karur Receiving Terminal | Petroleum Storage | Class B | 78074 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 214 | Tamil Nadu | Tiruchchirappalli | BPCL | Karur Receiving Terminal | Petroleum Storage | Class A | 28107 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 215 | Tamil Nadu | Tiruchchirappalli | IOCL | Indian Oil Corpn. Ltd. Good Shed Road, Trichy | Petroleum Storage | HSD / ELHSD | 10660 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 215 | Tamil Nadu | Tiruchchirappalli | IOCL | Indian Oil Corpn. Ltd. Good Shed Road, Trichy | Petroleum Storage | MS / ULP | 913 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 215 | Tamil Nadu | Tiruchchirappalli | IOCL | Indian Oil Corpn. Ltd. Good Shed Road, Trichy | Petroleum Storage | SKO | 2457 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 216 | Tamil Nadu | Tirunelveli | BPCL | 86, Goods Shed Road, Thachanallur, Tirunelveli - 627 358 | Petroleum Storage | HSD / ELHSD | 22484 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 216 | Tamil Nadu | Tirunelveli | BPCL | 86, Goods Shed Road, Thachanallur, Tirunelveli - 627 358 | Petroleum Storage | MS / ULP | 1749 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 217 | Tamil Nadu | Tirunelveli | HPCL | POL Depot Tirunelveli | Petroleum Storage | Class B | 9860 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 218 | Tamil Nadu | Tuticorin | IOCL | Indian Oil Corpn. Ltd. Port of New Tuticorin Tuticorin- 628 004 | Petroleum Storage | Class C | 20163 | 15000 | 100000 | Port | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 218 | Tamil Nadu | Tuticorin | IOCL | Indian Oil Corpn. Ltd. Port of New Tuticorin Tuticorin- 628 004 | Petroleum Storage | Class A | 32448 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 218 | Tamil Nadu | Tuticorin | IOCL | Indian Oil Corpn. Ltd. Harbour Estate, Tuticorin- 628 004 | Petroleum Storage | Naphtha | 121392 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 219 | Tamil Nadu | Tuticorin | SPIC | Southern Petrochemical Industries Corporation Ltd. SPIC Nagar Tuticorin | Petroleum Storage | Class A | 20475 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 220 | Tamil Nadu | Viluppuram | IBP | IBP Co. Limited Velipalayam Nagai Quide-e-Milleth | Petroleum Storage | SKO | 12968 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 220 | Tamil Nadu | Viluppuram | IBP | IBP Co. Limited Velipalayam Nagai Quide-e-Milleth | Petroleum Storage | HSD / ELHSD | 17258 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 220 | Tamil Nadu | Viluppuram | IBP | IBP Co. Limited Velipalayam Nagai Quide-e-Milleth | Petroleum Storage | Naphtha | 12750 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 220 | Tamil Nadu | Viluppuram | IBP | IBP Co. Limited Velipalayam Nagai Quide-e-Milleth | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 6624 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 221 | Tripura | Tripura North | IOCL | Rajbari, Dharmanagar, tripura North - 799253 | Petroleum Storage | HSD / ELHSD | 1018 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 221 | Tripura | Tripura North | IOCL | Rajbari, Dharmanagar, tripura North - 799253 | Petroleum Storage | ATF | 164 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 221 | Tripura | Tripura North | IOCL | Rajbari, Dharmanagar, tripura North - 799253 | Petroleum Storage | SKO | 648 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 222 | Uttar Pradesh | Agra | BPCL | Agra | Petroleum Storage | SKO | 1968 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 222 | Uttar Pradesh | Agra | BPCL | Agra | Petroleum Storage | HSD / ELHSD | 10182 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 222 | Uttar Pradesh | Agra | BPCL | Agra | Petroleum Storage | MS / ULP | 1465 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 223 | Uttar Pradesh | Agra | IOCL | Agra | Petroleum Storage | HSD / ELHSD | 22300 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 223 | Uttar Pradesh | Agra | IOCL | Agra | Petroleum Storage | MS / ULP | 1980 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 223 | Uttar Pradesh | Agra | IOCL | Agra | Petroleum Storage | SKO | 8000 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 224 | Uttar Pradesh | Allahabad | IOCL | Allahabad | Petroleum Storage | HSD / ELHSD | 10555 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 224 | Uttar Pradesh | Allahabad | IOCL | Allahabad | Petroleum Storage | MS / ULP | 5374 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 224 | Uttar Pradesh | Allahabad | IOCL | Allahabad | Petroleum Storage | SKO | 7373 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 225 | Uttar Pradesh | Amousi | HPCL | Amousi | Petroleum Storage | SKO | 3270 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 225 | Uttar Pradesh | Amousi | HPCL | Amousi | Petroleum Storage | HSD / ELHSD | 13400 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 225 | Uttar Pradesh | Amousi | HPCL | Amousi | Petroleum Storage | MS / ULP | 5470 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 226 | Uttar Pradesh | Amousi | IBP | Amousi | Petroleum Storage | MS / ULP | 1750 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 226 | Uttar Pradesh | Amousi | IBP | Amousi | Petroleum Storage | SKO | 1470 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 226 | Uttar Pradesh | Amousi | IBP | Amousi | Petroleum Storage | HSD / ELHSD | 9400 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 227 | Uttar Pradesh | Aonla | BPCL | Aonla | Petroleum Storage | MS / ULP | 1224 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 227 | Uttar Pradesh | Aonla | BPCL | Aonla | Petroleum Storage | SKO | 2930 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 227 | Uttar Pradesh | Aonla | BPCL | Aonla | Petroleum Storage | HSD / ELHSD | 11156 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 228 | Uttar Pradesh | Aonla | IOCL | Aonla | Petroleum Storage | MS / ULP | 1720 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 228 | Uttar Pradesh | Aonla | IOCL | Aonla | Petroleum Storage | SKO | 2166 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 228 | Uttar Pradesh | Aonla | IOCL | Aonla | Petroleum Storage | HSD / ELHSD | 8635 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 229 | Uttar Pradesh | Baitalpur | BPCL | Baitalpur | Petroleum Storage | MS / ULP | 1244 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 229 | Uttar Pradesh | Baitalpur | BPCL | Baitalpur | Petroleum Storage | SKO | 2348 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 229 | Uttar Pradesh | Baitalpur | BPCL | Baitalpur | Petroleum Storage | HSD / ELHSD | 6122 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 230 | Uttar Pradesh | Baitalpur | IOCL | Baitalpur | Petroleum Storage | HSD / ELHSD | 7650 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 230 | Uttar Pradesh | Baitalpur | IOCL | Baitalpur | Petroleum Storage | SKO | 5100 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 230 | Uttar Pradesh | Baitalpur | IOCL | Baitalpur | Petroleum Storage | MS / ULP | 900 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 231 | Uttar Pradesh | Banthra | BPCL | Banthra | Petroleum Storage | HSD / ELHSD | 5750 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 231 | Uttar Pradesh | Banthra | BPCL | Banthra | Petroleum Storage | SKO | 2423 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 231 | Uttar Pradesh | Banthra | BPCL | Banthra | Petroleum Storage | MS / ULP | 1065 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 232 | Uttar Pradesh | Banthra | IOCL | Banthra | Petroleum Storage | SKO | 7600 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 232 | Uttar Pradesh | Banthra | IOCL | Banthra | Petroleum Storage | MS / ULP | 1200 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 232 | Uttar Pradesh | Banthra | IOCL | Banthra | Petroleum Storage | HSD / ELHSD | 18000 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 233 | Uttar Pradesh | Bareilly | HPCL | Bareilly | Petroleum Storage | SKO | 1005 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 233 | Uttar Pradesh | Bareilly | HPCL | Bareilly | Petroleum Storage | HSD / ELHSD | 7530 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 233 | Uttar Pradesh | Bareilly | HPCL | Bareilly | Petroleum Storage | MS / ULP | 540 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 234 | Uttar Pradesh | Bareilly | IOCL | Bareilly | Petroleum Storage | SKO | 1265 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 234 | Uttar Pradesh | Bareilly | IOCL | Bareilly | Petroleum Storage | HSD / ELHSD | 4615 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 234 | Uttar Pradesh | Bareilly | IOCL | Bareilly | Petroleum Storage | MS / ULP | 280 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 235 | Uttar Pradesh | Chandauli | BPCL | Village Saresar, Ali Nagar, Mugal sarai, Chandauli | Petroleum Storage | SKO | 7780 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 235 | Uttar Pradesh | Chandauli | BPCL | Village Saresar, Ali Nagar, Mugal sarai, Chandauli | Petroleum Storage | HSD / ELHSD | 20370 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 235 | Uttar Pradesh | Chandauli | BPCL | Village Saresar, Ali Nagar, Mugal sarai, Chandauli | Petroleum Storage | MS / ULP | 7450 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 236 | Uttar Pradesh | Chandauli | IOCL | Mugal sarai, Chandauli | Petroleum Storage | MS / ULP | 5810 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 236 | Uttar Pradesh | Chandauli | IOCL | Mugal sarai, Chandauli | Petroleum Storage | HSD / ELHSD | 15900 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 236 | Uttar Pradesh | Chandauli | IOCL | Mugal sarai, Chandauli | Petroleum Storage | SKO | 6068 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 236 | Uttar Pradesh | Chandauli | IOCL | Mugal sarai, Chandauli | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 1072 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 237 | Uttar Pradesh | Gonda | BPCL | Gonda | Petroleum Storage | MS / ULP | 772 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 237 | Uttar Pradesh | Gonda | BPCL | Gonda | Petroleum Storage | HSD / ELHSD | 3865 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 237 | Uttar Pradesh | Gonda | BPCL | Gonda | Petroleum Storage | SKO | 1565 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 238 | Uttar Pradesh | Gonda | HPCL | Gonda | Petroleum Storage | HSD / ELHSD | 4070 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 238 | Uttar Pradesh | Gonda | HPCL | Gonda | Petroleum Storage | SKO | 522 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 238 | Uttar Pradesh | Gonda | HPCL | Gonda | Petroleum Storage | MS / ULP | 522 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 239 | Uttar Pradesh | Gonda | IOCL | Gonda | Petroleum Storage | SKO | 3880 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 239 | Uttar Pradesh | Gonda | IOCL | Gonda | Petroleum Storage | HSD / ELHSD | 6950 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 239 | Uttar Pradesh | Gonda | IOCL | Gonda | Petroleum Storage | MS / ULP | 630 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 240 | Uttar Pradesh | Gorakhpur | BPCL | Gorakhpur | Petroleum Storage | MS / ULP | 626 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 240 | Uttar Pradesh | Gorakhpur | BPCL | Gorakhpur | Petroleum Storage | SKO | 1235 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 240 | Uttar Pradesh | Gorakhpur | BPCL | Gorakhpur | Petroleum Storage | HSD / ELHSD | 3732 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 241 | Uttar Pradesh | Gorakhpur | IOCL | Gorakhpur | Petroleum Storage | SKO | 1805 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 241 | Uttar Pradesh | Gorakhpur | IOCL | Gorakhpur | Petroleum Storage | HSD / ELHSD | 5700 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 241 | Uttar Pradesh | Gorakhpur | IOCL | Gorakhpur | Petroleum Storage | MS / ULP | 70 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 242 | Uttar Pradesh | Kanpur Rural | IOCL | Panki, Kanpur | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 12601 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 242 | Uttar Pradesh | Kanpur Rural | IOCL | Panki, Kanpur | Petroleum Storage | SKO | 8428 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 242 | Uttar Pradesh | Kanpur Rural | IOCL | Panki, Kanpur | Petroleum Storage | HSD / ELHSD | 43385 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 242 | Uttar Pradesh | Kanpur Rural | IOCL | Panki, Kanpur | Petroleum Storage | MS / ULP | 11036 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 242 | Uttar Pradesh | Kanpur Rural | IOCL | Panki, Kanpur | Petroleum Storage | Naphtha | 35634 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 243 | Uttar Pradesh | Kathgodam | BPCL | Kathgodam | Petroleum Storage | HSD / ELHSD | 400 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 243 | Uttar Pradesh | Kathgodam | BPCL | Kathgodam | Petroleum Storage | SKO | 91 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 243 | Uttar Pradesh | Kathgodam | BPCL | Kathgodam | Petroleum Storage | MS / ULP | 100 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 244 | Uttar Pradesh | Mathura | BPCL | Road No. 26, UPSIDC Site, P.O. Mathura Refinery, Mathura | Petroleum Storage | MS / ULP | 10400 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 244 | Uttar Pradesh | Mathura | BPCL | Road No. 26, UPSIDC Site, P.O. Mathura Refinery, Mathura | Petroleum Storage | SKO | 6361 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 244 | Uttar Pradesh | Mathura | BPCL | Road No. 26, UPSIDC Site, P.O. Mathura Refinery, Mathura | Petroleum Storage | HSD / ELHSD | 45800 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 245 | Uttar Pradesh | Mathura | HPCL | Mathura | Petroleum Storage | SKO | 6090 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 245 | Uttar Pradesh | Mathura | HPCL | Mathura | Petroleum Storage | HSD / ELHSD | 24090 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 245 | Uttar Pradesh | Mathura | HPCL | Mathura | Petroleum Storage | MS / ULP | 6090 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 246 | Uttar Pradesh | Mathura | IBP | Mathura | Petroleum Storage | MS / ULP | 850 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 246 | Uttar Pradesh | Mathura | IBP | Mathura | Petroleum Storage | HSD / ELHSD | 9000 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 246 | Uttar Pradesh | Mathura | IBP | Mathura | Petroleum Storage | SKO | 1980 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 247 | Uttar Pradesh | Mathura | IOCL | Mathura | Petroleum Storage | HSD / ELHSD | 6800 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 247 | Uttar Pradesh | Mathura | IOCL | Mathura | Petroleum Storage | MS / ULP | 500 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 247 | Uttar Pradesh | Mathura | IOCL | Mathura | Petroleum Storage | SKO | 4000 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 248 | Uttar Pradesh | Meerut | BPCL | Meerut | Petroleum Storage | HSD / ELHSD | 6780 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 248 | Uttar Pradesh | Meerut | BPCL | Meerut | Petroleum Storage | MS / ULP | 1032 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 249 | Uttar Pradesh | Mughalsarai | BPCL | Mughalsarai | Petroleum Storage | MS / ULP | 6154 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 249 | Uttar Pradesh | Mughalsarai | BPCL | Mughalsarai | Petroleum Storage | HSD / ELHSD | 23596 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 249 | Uttar Pradesh | Mughalsarai | BPCL | Mughalsarai | Petroleum Storage | SKO | 7373 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 250 | Uttar Pradesh | Mughalsarai | IOCL | Mughalsarai | Petroleum Storage | HSD / ELHSD | 20365 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 250 | Uttar Pradesh | Mughalsarai | IOCL | Mughalsarai | Petroleum Storage | SKO | 7779 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 250 | Uttar Pradesh | Mughalsarai | IOCL | Mughalsarai | Petroleum Storage | MS / ULP | 7413 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 251 | Uttar Pradesh | Najibabad | BPCL | Najibabad | Petroleum Storage | HSD / ELHSD | 6850 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 251 | Uttar Pradesh | Najibabad | BPCL | Najibabad | Petroleum Storage | MS / ULP | 2100 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 251 | Uttar Pradesh | Najibabad | BPCL | Najibabad | Petroleum Storage | SKO | 2330 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 252 | Uttar Pradesh | Najibabad | HPCL | Najibabad | Petroleum Storage | HSD / ELHSD | 2022 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 252 | Uttar Pradesh | Najibabad | HPCL | Najibabad | Petroleum Storage | SKO | 522 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 252 | Uttar Pradesh | Najibabad | HPCL | Najibabad | Petroleum Storage | MS / ULP | 522 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 253 | Uttar Pradesh | Najibabad | IOCL | Najibabad | Petroleum Storage | SKO | 7400 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 253 | Uttar Pradesh | Najibabad | IOCL | Najibabad | Petroleum Storage | HSD / ELHSD | 19200 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 253 | Uttar Pradesh | Najibabad | IOCL | Najibabad | Petroleum Storage | MS / ULP | 2770 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 254 | Uttar Pradesh | Partapur | HPCL | Partapur | Petroleum Storage | MS / ULP | 1070 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 254 | Uttar Pradesh | Partapur | HPCL | Partapur | Petroleum Storage | SKO | 1270 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 254 | Uttar Pradesh | Partapur | HPCL | Partapur | Petroleum Storage | HSD / ELHSD | 3070 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 255 | Uttar Pradesh | Partapur | IBP | Partapur | Petroleum Storage | SKO | 900 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 255 | Uttar Pradesh | Partapur | IBP | Partapur | Petroleum Storage | HSD / ELHSD | 4200 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 255 | Uttar Pradesh | Partapur | IBP | Partapur | Petroleum Storage | MS / ULP | 1200 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 256 | Uttar Pradesh | Partapur | IOCL | Partapur | Petroleum Storage | SKO | 4080 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 256 | Uttar Pradesh | Partapur | IOCL | Partapur | Petroleum Storage | HSD / ELHSD | 6120 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 256 | Uttar Pradesh | Partapur | IOCL | Partapur | Petroleum Storage | MS / ULP | 1800 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 257 | Uttar Pradesh | Saharanpur | BPCL | Sahranpur | Petroleum Storage | SKO | 626 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 257 | Uttar Pradesh | Saharanpur | BPCL | Sahranpur | Petroleum Storage | HSD / ELHSD | 3600 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 257 | Uttar Pradesh | Saharanpur | BPCL | Sahranpur | Petroleum Storage | MS / ULP | 538 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 258 | Uttar Pradesh | Saharanpur | IOCL | Sahranpur | Petroleum Storage | SKO | 70 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 258 | Uttar Pradesh | Saharanpur | IOCL | Sahranpur | Petroleum Storage | HSD / ELHSD | 2520 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 258 | Uttar Pradesh | Saharanpur | IOCL | Sahranpur | Petroleum Storage | MS / ULP | 420 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 259 | West Bengal | Burdwan | BPCL | BPCL, RAJBANDH TOP, DURGAPUR - 713 212, BURDWAN | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 94 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 259 | West Bengal | Burdwan | BPCL | BPCL, RAJBANDH TOP, DURGAPUR - 713 212, BURDWAN | Petroleum Storage | SKO | 3042 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 259 | West Bengal | Burdwan | BPCL | BPCL, RAJBANDH TOP, DURGAPUR - 713 212, BURDWAN | Petroleum Storage | MS / ULP | 1482 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 259 | West Bengal | Burdwan | BPCL | BPCL, RAJBANDH TOP, DURGAPUR - 713 212, BURDWAN | Petroleum Storage | HSD / ELHSD | 8112 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 260 | West Bengal | Burdwan | IOCL | Rajbandh Terminal, Durgapur, Burdawan - 713 212 | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 3180 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 260 | West Bengal | Burdwan | IOCL | Rajbandh Terminal, Durgapur, Burdawan - 713 212 | Petroleum Storage | MS / ULP | 10349 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 260 | West Bengal | Burdwan | IOCL | Rajbandh Terminal, Durgapur, Burdawan - 713 212 | Petroleum Storage | HSD / ELHSD | 27995 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 260 | West Bengal | Burdwan | IOCL | Rajbandh Terminal, Durgapur, Burdawan - 713 212 | Petroleum Storage | SKO | 22594 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 260 | West Bengal | Burdwan | IOCL | Rajbandh Terminal, Durgapur, Burdawan - 713 212 | Petroleum Storage | SRN | 23947 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 260 | West Bengal | Burdwan | IOCL | Rajbandh Terminal, Durgapur, Burdawan - 713 212 | Petroleum Storage | ATF | 10563 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 261 | West Bengal | Hawrah | HPCL | HPCL, RAMNAGAR TERMINAL, 1, HARI MOHAN GHOSH ROAD, GARDEN REACHCALCUTTA - 700 024 | Petroleum Storage | Class B | 7656 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 261 | West Bengal | Hawrah | HPCL | HPCL, RAMNAGAR TERMINAL, 1, HARI MOHAN GHOSH ROAD, GARDEN REACHCALCUTTA - 700 024 | Petroleum Storage | Class C | 2459 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 262 | West Bengal | Hawrah | IOCL | IOCL MOURIGRAM TERMINAL, P.O. RADHADASI, PANCHPARA, HOWRAH - 711 313 | Petroleum Storage | Class B | 87234 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 262 | West Bengal | Hawrah | IOCL | IOCL MOURIGRAM TERMINAL, P.O. RADHADASI, PANCHPARA, HOWRAH - 711 313 | Petroleum Storage | Class A | 15330 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 263 | West Bengal | Hawrah | S.K.Oil Co. | Calcutta Port | Petroleum Storage | Highly flammable liquid | 21878 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 264 | West Bengal | Jalpaiguri | BPCL | BPCL, NEW JALPAIGURI TERMINAL, BHAKTINAGAR, JALPAIGURI | Petroleum Storage | Class B | 10477 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 264 | West Bengal | Jalpaiguri | BPCL | BPCL, NEW JALPAIGURI TERMINAL, BHAKTINAGAR, JALPAIGURI | Petroleum Storage | Class C | 655 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 265 | West Bengal | Jalpaiguri | IOCL | IOCL HASIMARA DEPOT, P.O. HASIMARA JALPAIGURI | Petroleum Storage | MS / ULP | 996 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 265 | West Bengal | Jalpaiguri | IOCL | IOCL HASIMARA DEPOT, P.O. HASIMARA JALPAIGURI | Petroleum Storage | SKO | 2947 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 265 | West Bengal | Jalpaiguri | IOCL | IOCL HASIMARA DEPOT, P.O. HASIMARA JALPAIGURI | Petroleum Storage | Heavy Oil (FO / LSHS / LDO / Furnace Oil) | 176 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 265 | West Bengal | Jalpaiguri | IOCL | IOCL HASIMARA DEPOT, P.O. HASIMARA JALPAIGURI | Petroleum Storage | ATF | 109 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 265 | West Bengal | Jalpaiguri | IOCL | IOCL HASIMARA DEPOT, P.O. HASIMARA JALPAIGURI | Petroleum Storage | HSD / ELHSD | 3303 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 266 | West Bengal | Jalpaiguri | IOCL | IOCL SILIGURI TERMINAL, P.O. BHAKTINAGAR, JALPAIGURI IOCL (MARKETING DIVISION) SHRI S. MAJUMDAR, SENIOR TERMINAL MANAGER | Petroleum Storage | Class C | 26735 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 266 | West Bengal | Jalpaiguri | IOCL | IOCL SILIGURI TERMINAL, P.O. BHAKTINAGAR, JALPAIGURI IOCL (MARKETING DIVISION) SHRI S. MAJUMDAR, SENIOR TERMINAL MANAGER | Petroleum Storage | Class A | 33377 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 266 | West Bengal | Jalpaiguri | IOCL | IOCL SILIGURI TERMINAL, P.O. BHAKTINAGAR, JALPAIGURI IOCL (MARKETING DIVISION) SHRI S. MAJUMDAR, SENIOR TERMINAL MANAGER | Petroleum Storage | Class B | 43676 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 267 | West Bengal | Jalpaiguri | IOCL | New Jalpaiguri, Jalpaiguri - 734 425 | Petroleum Storage | Class A | 23000 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 268 | West Bengal | Maldah | IOCL | IOCL P.O. NAGESWARPUR, MALDA | Petroleum Storage | HSD / ELHSD | 8580 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 268 | West Bengal | Maldah | IOCL | IOCL P.O. NAGESWARPUR, MALDA | Petroleum Storage | MS / ULP | 1092 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 268 | West Bengal | Maldah | IOCL | IOCL P.O. NAGESWARPUR, MALDA | Petroleum Storage | SKO | 4680 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 269 | West Bengal | Midnapore | BPCL | Midnapore | Petroleum Storage | Class C | 4602 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 269 | West Bengal | Midnapore | BPCL | Midnapore | Petroleum Storage | Class A | 4665 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 269 | West Bengal | Midnapore | BPCL | Midnapore | Petroleum Storage | Class B | 46090 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 270 | West Bengal | Midnapore | HPCL | Haldia, Midnapore | Petroleum Storage | Class B | 25048 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 271 | West Bengal | Midnapore | IBP Co. Ltd. | Haldia, Midnapore | Petroleum Storage | Class B | 13701 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 271 | West Bengal | Midnapore | IBP Co. Ltd. | Haldia, Midnapore | Petroleum Storage | Class A | 47 | 7000 | 7000 | Mainland | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 272 | West Bengal | Midnapore | IOCL | IOCL HALDIA INSTALLATION (MARKETING DIVISION), P.O. HALDIA OIL REFINERY, HALDIA, MIDNAPORE | Petroleum Storage | Class C | 36535 | 15000 | 100000 | Mainland | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 272 | West Bengal | Midnapore | IOCL | IOCL HALDIA INSTALLATION (MARKETING DIVISION), P.O. HALDIA OIL REFINERY, HALDIA, MIDNAPORE | Petroleum Storage | Class B | 1529198 | 10000 | 10000 | Mainland | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 273 | West Bengal | South 24 Parganas | BPCL | BPCL, BUDGE BUDGE INSTALLATION, P.O. BUDGE BUDGE, 24 PRAGANAS | Petroleum Storage | Class A | 17652 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 273 | West Bengal | South 24 Parganas | BPCL | BPCL, BUDGE BUDGE INSTALLATION, P.O. BUDGE BUDGE, 24 PRAGANAS | Petroleum Storage | Class B | 52123 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 273 | West Bengal | South 24 Parganas | BPCL | BPCL, BUDGE BUDGE INSTALLATION, P.O. BUDGE BUDGE, 24 PRAGANAS | Petroleum Storage | Class C | 9852 | 15000 | 100000 | Port | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 274 | West Bengal | South 24 Parganas | IOCL | 35 A, DBCR Road, Chitragunj, Budge Budge | Petroleum Storage | SKO | 1064 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 274 | West Bengal | South 24 Parganas | IOCL | 35 A, DBCR Road, Chitragunj, Budge Budge | Petroleum Storage | HSD / ELHSD | 12667 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 274 | West Bengal | South 24 Parganas | IOCL | 35 A, DBCR Road, Chitragunj, Budge Budge | Petroleum Storage | MS / ULP | 8117 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 275 | West Bengal | South24-Parganas | HPCL | HPCL BUDGE BUDGE TERMINAL - I, 1, GRAHAM ROAD, BUDGE BUDGE, 24 PARGANAS | Petroleum Storage | Class C | 24589 | 15000 | 100000 | Port | Flammable liquids as defined in Schedule1, paragraph (b)(v) | Liquid |
| 275 | West Bengal | South24-Parganas | HPCL | HPCL BUDGE BUDGE TERMINAL - I, 1, GRAHAM ROAD, BUDGE BUDGE, 24 PARGANAS | Petroleum Storage | Class B | 26715 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 275 | West Bengal | South24-Parganas | HPCL | HPCL BUDGE BUDGE TERMINAL - I, 1, GRAHAM ROAD, BUDGE BUDGE, 24 PARGANAS | Petroleum Storage | Class A | 3120 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 276 | West Bengal | South24-Parganas | HPCL | HPCL BUDGE BUDGE TERMINAL - II , 28, DBC ROAD, DISTRICT 24 PARGANAS (S) - 743319 | Petroleum Storage | Class B | 11000 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 276 | West Bengal | South24-Parganas | HPCL | HPCL BUDGE BUDGE TERMINAL - II , 28, DBC ROAD, DISTRICT 24 PARGANAS (S) - 743319 | Petroleum Storage | Class A | 8297 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |

| Unit ref No. | Name of the State | Name of District | Name of the Company | Address | Location Category | Chemical Name | Storage Capacity of the Chemical | Theshold Quantity | TQ (for rule 10-12) | PorM | Category | Storage-state |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 277 | West Bengal | South24-Parganas | IBP | IBP CO. LTD., 10, P.N. BANERJEE ROAD, BUDGE BUDGE, 24 PARGANAS (S) | Petroleum Storage | Class A | 5589 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 277 | West Bengal | South24-Parganas | IBP | IBP CO. LTD., 10, P.N. BANERJEE ROAD, BUDGE BUDGE, 24 PARGANAS (S) | Petroleum Storage | Class B | 10372 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 278 | West Bengal | South24-Parganas | IOCL | M.G.Road, Budge Budge Terminal | Petroleum Storage | MS / ULP | 1724 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 278 | West Bengal | South24-Parganas | IOCL | M.G.Road, Budge Budge Terminal | Petroleum Storage | ATF | 3510 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 278 | West Bengal | South24-Parganas | IOCL | M.G.Road, Budge Budge Terminal | Petroleum Storage | HSD / ELHSD | 3620 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 278 | West Bengal | South24-Parganas | IOCL | M.G.Road, Budge Budge Terminal | Petroleum Storage | Hexane | 55 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |
| 278 | West Bengal | South24-Parganas | IOCL | M.G.Road, Budge Budge Terminal | Petroleum Storage | SKO | 9583 | 10000 | 10000 | Port | Highly flammable liquids as defined in Schedule1, paragraph (b)(iv) | Liquid |
| 279 | West Bengal | South24-Parganas | MEIFPL | Mundial Export Import Finame Pvt. Ltd. 13, Graham Road, Budge Budge, 24- Pgss | Petroleum Storage | Class A | 7700 | 7000 | 7000 | Port | Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii) | Liquid |

# ANNEXURE IV
# A Compilation of Legal Instruments

| Sl. No. | Legal Instrument (Type, Reference, Year) | Responsible Ministries or Bodies | Chemical Use Categories/ Pollutants | Objective of Legislation | Relevant Articles/Provisions |
|---|---|---|---|---|---|
| 1 | Air (Prevention and Control of Pollution) Act, 1981 amended 1987 | Central Pollution Control Board and State Pollution Control Boards | Air pollutants from chemical industries | The prevention, control and abatement of air pollution | Section 2: Definitions<br>Section 21: Consent from State Boards<br>Section 22: Not to allow emissions exceeding prescribed limits<br>Section 24: Power of Entry and Inspection<br>Section 25: Power to Obtain Information<br>Section 26: Power to Take Samples<br>Section 37-43: Penalties and Procedures |
| 2 | Air (Prevention and Control of Pollution) (Union Territories) Rules, 1983 | Central Pollution Control Board and State Pollution Control Boards | Air pollutants from chemical industries | The prevention, control and abatement of air pollution | Rule 2: Definitions<br>Rule 9: Consent Applications |
| 3 | Water (Prevention and Control of Pollution) Act, 1974 amended 1988 | Central Pollution Control Board and State Pollution Control Boards | Water Pollutants from water polluting industries | The prevention and control of water pollution and also maintaining or restoring the wholesomeness of water | Section 2: Definitions<br>Section 20: Power to Obtain Information<br>Section 21: Power to Take Samples<br>Section 23: Power of Entry and Inspection<br>Section 24: Prohibition on Disposal<br>Section 25: Restriction on New Outlet and New Discharge<br>Section 26: Provision regarding existing discharge of sewage or trade effluent<br>Section 27: Refusal or withdrawal of consent by state boards<br>Section 41-49: Penalties and Procedures |
| 4 | Water (Prevention and Control of Pollution) Rules, 1975 | Central Pollution Control Board and State Pollution Control Boards | Water Pollutants from water polluting industries | The prevention and control of water pollution and also maintaining or restoring the wholesomeness of water | Rule 2: Definitions<br>Rule 30: Power to take samples<br>Rule 32: Consent Applications |
| 5 | The Environment (Protection) Act, 1986, | Ministry of Environment and | All types of environmental pollutants | Protection and Improvement of the Environment | Section 2: Definitions<br>Section 7: Not to allow emission or discharge of |

| | | | | | |
|---|---|---|---|---|---|
| | amended 1991 | Forests, Central Pollution Control Board and State Pollution Control Boards | | | environmental pollutants in excess of prescribed standards<br>Section 8: Handing of Hazardous Substances<br>Section 10: Power of Entry and Inspection<br>Section 11: Power to take samples<br>Section 15-19: Penalties and Procedures |
| 6 | Environmental (Protection) Rules, 1986 (Amendments in 1999, 2001, 2002, 2002, 2002, 2003, 2004) | Ministry of Environment and Forests, Central Pollution Control Board and State Pollution Control Boards | All types of Environmental Pollutants | Protection and Improvement of the Environment | Rule 2: Definitions<br>Rule 3: Standards for emission or discharge of environmental pollutants<br>Rule 5: Prohibition and restriction on the location of industries and the carrying on process and operations in different areas<br>Rule 13: Prohibition and restriction on the handling of hazardous substances in different areas<br>Rule 14: Submission of environmental statement |
| 7 | Hazardous Waste (Management and Handling) Rules, 1989 amended 2000 and 2003 | MoEF, CPCB, SPCB, DGFT, Port Authority and Customs Authority | Hazardous Wastes generated from industries using hazardous chemicals | Management & Handling of hazardous wastes in line with the Basel convention | Rule 2: Application<br>Rule 3: Definitions<br>Rule 4: Responsibility of the occupier and operator of a facility for handling of wastes<br>Rule 4A: Duties of the occupier and operator of a facility<br>Rule 4B: Duties of the authority<br>Rule 5: Grant of authorization for handling hazardous wastes<br>Rule 6: Power to suspend or cancel authorization<br>Rule 7: Packaging, labeling and transport of hazardous wastes<br>Rule 8: Disposal sites<br>Rule 9: Record and returns<br>Rule 10: Accident reporting and follow up<br>Rule 11: Import and export of hazardous waste for dumping and disposal<br>Rule 12: Import and export of hazardous waste for recycling and reuse |

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| | | | | | Rule 13: Import of hazardous wastes<br>Rule 14: Export of hazardous waste<br>Rule 15: Illegal traffic<br>Rule 16: Liability of the occupier, transporter and operator of a facility<br>Rule 19: Procedure for registration and renewal of registration of recyclers and re-refiners<br>Rule 20: Responsibility of waste generator |
| 8 | Manufacture Storage and Import of Hazardous Chemicals Rules, 1989 amended 2000 | Ministry of Environment & Forests, Chief Controller of Imports and Exports, CPCB, SPCB, Chief Inspector of Factories, Chief Inspector of Dock Safety, Chief Inspector of Mines, AERB, Chief Controller of Explosives, District Collector or District Emergency Authority, CEES under DRDO | Hazardous Chemicals - Toxic, Explosive, Flammable, Reactive | Regulate the manufacture, storage and import of Hazardous Chemicals | Rule 2: Definitions<br>Rule 4: responsibility of the Occupier<br>Rule 5: Notification of Major Accidents<br>Rule 7-8: Approval and notification of site and updating<br>Rule 10-11: Safety Reports and Safety Audit reports and updating<br>Rule 13: Preparation of Onsite Emergency Plan<br>Rule 14: Preparation of Offsite Emergency Plan<br>Rule 15: Information to persons likely to get affected<br>Rule 16: Proprietary Information<br>Rule 17: Material Safety Data Sheets<br>Rule 18: Import of Hazardous Chemicals |
| 9 | Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 | CCG, SCG, DCG, LCG and MAH Units | Hazardous Chemicals - Toxic, Explosive, Flammable, Reactive | Emergency Planning Preparedness and Response to chemical accidents | Rule 2: Definitions<br>Rule 5: Functions of CCG<br>Rule 7: Functions of SCG<br>Rule 9: Functions of DCG<br>Rule 10: Functions of LCG |
| 10 | EIA Notification, 2006 | MoEF, SPCB | For all the identified developmental activities in the notification | Requirement of environmental clearance before establishment of or modernization / expansion of identified developmental projects. | Requirements and procedure for seeking environmental clearance of projects |

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|---|---|---|---|---|---|
| 11 | The Petroleum Act, 1934 | Ministry of Petroleum and Natural Gas | Petroleum (Class A, B and C - as defined in the rules) | Regulate the import, transport, storage, production, refining and blending of petroleum | Section 2: Definitions<br>Section 3: Import, transport and storage of petroleum<br>Section 5: Production, refining and blending of petroleum<br>Section 6: Receptacles of dangerous petroleum to show a warning<br>Section 23-28 Penalties and Procedure |
| 12 | The Petroleum Rules, 2002 | Ministry of Petroleum and Natural Gas, Ministry of Shipping (for notification of authorized ports for import), Ministry of Environment & Forests or SPCB (for clearance of establishment of loading/unloading facilities at ports) Chief Controller of Explosives, district authority, Commissioner of Customs, Port Conservator, State Maritime Board (Import) | Petroleum (Class A, B and C - as defined in the rules) | Regulate the import, transport, storage, production, refining and blending of petroleum | Rule 2: Definition<br>Chapter I part II: General Provision<br>Chapter II: Importation of Petroleum<br>Chapter III: Transport of Petroleum<br>Chapter VII: Licenses |
| 13 | The Calcium Carbide Rules, 1987 | Ministry of Petroleum and Natural Gas, Chief Controller of Explosives, Customs Collector, Port Conservator, DGCA, District Authority | Calcium Carbide | To regulate the import, production, storage, transportation, sale, use and handling and disposal of Calcium carbide with a view to prevent accidents | Rule 2: Definitions<br>Chapter II: General provisions<br>Chapter III: Importation of Carbide<br>Chapter IV: Transportation of carbide<br>Chapter V: Storage of carbide<br>Chapter VI: Licensing<br>Chapter VII: Notice of accident |

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| 14 | The Explosives Act, 1884 | Ministry of Commerce and Industry (Department of Explosives) | Explosive substances as defined under the Act | To regulate the manufacture, possession, use, sale, transport, export and import of explosives with a view to prevent accidents | Section 4: Definition<br>Section 6: Power for Central government to prohibit the manufacture, possession or importation of especially dangerous explosives<br>Section 6B: Grant of Licenses |
| 15 | The Explosive Rules, 1983 | Ministry of Commerce and Industry and Chief Controller of Explosives, port conservator, customs collector, railway administration | Explosive substances as defined under the Act | To regulate the manufacture, possession, use, sale, transport, export and import of explosives with a view to prevent accidents | Rule 2: Definition<br>Chapter II: General Provisions<br>Chapter III: Import and Export<br>Chapter IV: Transport<br>Chapter V: Manufacture of explosives<br>Chapter VI: Possession sale and use<br>Chapter VII: Licenses |
| 16 | The Gas Cylinder Rules, 2004 | Ministry of Commerce and Industry and Chief Controller of Explosives, port conservator, customs collector, DGCA, DC, DM, Police (sub inspector to commissioner) | Gases (Toxic, non toxic and non flammable, non toxic and flammable, Dissolved Acetylene Gas, Non toxic and flammable liquefiable gas other than LPG, LPG | Regulate the import, storage, handling and transportation of gas cylinders with a view to prevent accidents | Rule 2: Definition<br>Chapter II: General Provisions<br>Chapter III: Importation of Cylinder<br>Chapter IV: Transport of Cylinder<br>Chapter VII: Filling and Possession |
| 17 | The Static and Mobile Pressure Vessels (Unfired) Rules, 1981 | Ministry of Commerce and Industry and Chief Controller of Explosives, port conservator, customs collector, DGCA, DC, DM, Police (sub inspector to commissioner) | Gases (Toxic, non toxic and non flammable, non toxic and flammable, Dissolved Acetylene Gas, Non toxic and flammable liquefiable gas other than LPG, LPG | Regulate the import, manufacture, design, installation, transportation, handling, use and testing of mobile and static pressure vessels (unfired) with a view to prevent accidents | Rule 2: Definition<br>Chapter III: Storage<br>Chapter IV: Transport<br>Chapter V: Licenses |

## ANNEXURE V
## General Standards for Discharge of Environmental Pollutants as per CPCB

## Table: Water Quality Standards

| S. No. | Parameter | Standards | | | |
|---|---|---|---|---|---|
| | | Inland Surface Water | Public Sewer | Land for Irrigation | Marine Coastal Areas |
| 1. | 2. | 3. | | | |
| | | (a) | (b) | (c) | (d) |
| 1. | Colour and odour | See Note-1 | — | See Note-1 | See Note-1 |
| 2. | Suspended Solids, mg/l, Max | 100 | 600 | 200 | (a) For process waste water-100<br>(b) For cooling water effluent-10 per cent above total suspended matter of influent cooling water. |
| 3. | Particle size of suspended solids | Shall pass 850 micron IS Sieve | — | — | (a) Floatable solids, Max 3 mm<br>(b) Settleable solids Max 850 microns. |
| 4. | Dissolved solids (inorganic), mg/a, mac | 2100 | 2100 | 2100 | — |
| 5. | pH value | 5.5 to 9.0 | 5.5 to 9.0 | 5.5 to 9.0 | 5.5 to 9.0 |
| 6. | Temperature $^{o}$C, Max | Shall not exceed 40 in any section of the stream within 15 meters down stream from the effluent outlet | 45 at the point of discharge | — | 45 at the point of discharge |
| 7. | Oil and grease, mg/l, max | 10 | 20 | 10 | 20 |
| 8. | Total residual chlorine, mg/l, Max. | 1.0 | — | — | 1.0 |
| 9. | Ammonical nitrogen (as N), mg/l, Max. | 50 | 50 | — | 50 |
| 10. | Total Kjeldahl nitrogen (as N), mg/l, Max. | 100 | — | — | 100 |
| 11. | Free Ammonia (as NH3), mg/l, Max. | 5.0 | — | — | 5.0 |
| 12. | Biochemical Oxygen Demand (5 days at 20$^{o}$C) Max. | 30 | 350 | 100 | 100 |
| 13. | Chemical Oxygen Demand, mg/l, Max. | 250 | — | — | 250 |
| 14. | Arsenic (as As), mg/l, Max. | 0.2 | 0.2 | 0.2 | 0.2 |
| 15. | Mercury (as Hg), mg/l, Max. | 0.01 | 0.01 | — | 0.01 |
| 16. | Lead (as Pb), mg/l, Max. | 0.1 | 1.0 | — | 1.0 |
| 17. | Cadmium (as Cd), mg/l, Max. | 2.0 | 1.0 | — | 2.0 |

| | | | | | |
|---|---|---|---|---|---|
| 18. | Hexavalent chromium (as Cr+6) mg/l, Max. | 0.1 | 2.0 | — | 1.0 |
| 19. | Total chromium as (Cr), mg/l, Max. | 2.0 | 2.0 | — | 2.0 |
| 20. | Copper (as Cu), mg/l, Max. | 3.0 | 3.0 | — | 3.0 |
| 21. | Zinc (as Zn), mg/l, Max. | 5.0 | 15 | — | 15 |
| 22. | Selenium (as Se), mg/l, Max. | 0.05 | 0.05 | — | 0.05 |
| 23. | Nickel (as Ni), mg/l, Max. | 3.0 | 3.0 | — | 5.0 |
| 24. | Boron (as B), mg/l, Max. | 2.0 | 2.0 | 2.0 | — |
| 25. | Percent Sodium, Max. | — | 60 | 60 | — |
| 26. | Residual sodium carbonate, mg/l, Max. | — | — | 5.0 | — |
| 27. | Cyanide (as CN), mg/l, Max. | 0.2 | 2.0 | 0.2 | 0.2 |
| 28. | Chloride (as Cl), mg/l, Max. | 1000 | 1000 | 600 | (a) |
| 29. | Fluoride (as F), mg/l, Max. | 2.0 | 15 | — | 15 |
| 30. | Dissolved Phosphates (as P), mg/l, Max. | 5.0 | — | — | — |
| 31. | Sulphate (as SO4), mg/l, Max. | 1000 | 1000 | 1000 | — |
| 32. | Sulphide (as S), mg/l, Max. | 2.0 | — | — | 5.0 |
| 33. | Pesticides | Absent | Absent | Absent | Absent |
| 34. | Phenolic compounds (as $C_6H_5OH$), mg/l, Max. | 1.0 | 5.0 | — | 5.0 |
| 35. | Radioactive materials<br>(a) Alpha emitters MC/ml, Max.<br>(b) Beta emitters uc/ml, Max. | $10^{-7}$<br>$10^{-6}$ | $10^{-7}$<br>$10^{-6}$ | $10^{-8}$<br>$10^{-7}$ | $10^{-7}$<br>$10^{-6}$ |

Note :-

1. All efforts should be made to remove colour and unpleasant odour as far as practicable.
2. The standards mentioned in this notification shall apply to all the effluents discharged such as industrial mining and mineral processing activities municipal sewage etc.

## Table: Noise Standards

Ambient air quality standards in respect of noise

| Area Code | Category of Area | Limits in dB (A) Leq | |
|---|---|---|---|
| | | Day Time | Night Time |
| (A) | Industrial area | 75 | 70 |
| (B) | Commercial area | 65 | 55 |
| (C) | Residential area | 55 | 45 |
| (D) | Silence zone | 50 | 40 |

Note :

1. Day time is reckoned in between 6.00 AM and 9.00 PM
2. Night time is reckoned in between 9.00 PM and 6.00 AM
3. Silence zone is defined as areas upto 100 meters around such premises as hospitals, educational institutions and courts. The Silence zones are to be declared by the Competent Authority.
4. Use of vehicular horns, loudspeakers and bursting of crackers shall be banned in these zones.
5. Mixed categories of areas should be declared as one of the four above mentioned categories by the Competent Authority and the corresponding standards shall apply.

## Standards/Guidelines for Control of Noise Pollution from Stationary Diesel Generator (DG) Sets

**(A) Noise Standards for DG Sets (15-500 KVA)**

The total sound power level, Lw, of a DG set should be less than, 94+10 log10 (KVA), dB (A), at the manufacturing stage, where, KVA is the nominal power rating of a DG set.

This level should fall by 5 dB (A) every five years, till 2007, i.e. in 2002 and then in 2007.

**(B) Mandatory acoustic enclosure/acoustic treatment of room for stationary DG sets (5 KVA and above)**

Noise from the DG set should be controlled by providing an acoustic enclosure or by treating the room acoustically.

The acoustic enclosure/acoustic treatment of the room should be designed for minimum 25 dB(A) Insertion Loss or for meeting the ambient noise standards, whichever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/acoustic treatment. Under such circumstances the performance may be checked for noise reduction upto actual ambient noise level, preferably, in the night time). The measurement for Insertion Loss may be done at different points at 0.5m from the acoustic enclosure/room, and then averaged.

The DG set should also be provide with proper exhaust muffler with Insertion Loss of minimum 25 dB(A).

**(C) Guidelines for the manufacturers/users of DG sets (5 KVA and above)**

1. The manufacturer should offer to the user a standard acoustic enclosure of 25 dB(A) Insertion Loss and also a suitable exhaust muffler with Insertion Loss of 25 dB(A).

2. The user should make efforts to bring down the noise levels due to the DG set, outside his premises, within the ambient noise requirements by proper siting and control measures.
3. The manufacturer should furnish noise power levels of the unlicensed DG sets as per standards prescribed under (A)
4. The total sound power level of a DG set, at the user's end, shall be within 2 dB(A) of the total sound power level of the DG set, at the manufacturing stage, as prescribed under (A).
5. Installation of a DG set must be strictly in compliance with the recommendation of the DG set manufacturer.
6. A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.

**Order of the Lt. Governor of Delhi in respect of D.G. Sets** (5th December, 2001)

In exercise of the powers conferred by section 5 of the Environment (Protection) Act, 1986, (29 of 1986), read with the Government of India, Ministry of Home Affairs notification S.O. 667 (E) bearing No. F.No. U-11030/J/91-VTL dated 10th September, 1992, the Lt. Governor of Government of National Capital of Delhi hereby directs to all owners/users of generators sets in the National Capital Territory of Delhi as follows :-

1. that generator sets above the capacity of 5 KVA shall not be operated in residential areas between the hours of 10.00 PM to 6.00 AM;
2. that the generator sets above the capacity of 5 KVA in all areas residential/commercial/industrial shall operate only with the mandatory acoustic enclosures and other standards prescribed in the Environment (Protection) Rules, 1986;
3. that mobile generator sets used in social gatherings and public functions shall be permitted only if they have installed mandatory acoustic enclosures and adhere to the prescribed standards for noise and emission as laid down in the Environment (Protection) Rules, 1986.

The contravention of the above directions shall make the offender liable for prosecution under section 15 of the said Act which stipulates punishment of imprisonment for a term which may extend to five years with fine which may extend to one lakh rupees, or with both, and in case the failure of contravention continues, with additional fine which may extend to five thousand rupees for every day during which such failure or contravention continues after the conviction for the first such failure or contravention and if still the failure or contravention continues beyond a period of one year after the date of contravention, the offender continues beyond a period of one year after the date of contravention, the offender shall be punishable with imprisonment for a term which may extend to seven years.

**Order Dated: 21st June, 2002**

In exercise of the powers conferred by section 5 of the Environment (Protection) Act, 1986 (29 of 1986) read with the Govt. of India, Ministry of Home Affairs notification S.O. 667(E) bearing No. U-11030/J/91-VTL dated the 10th September, 1992, the Lt. Governor Govt. of the National Capital Territory of Delhi hereby makes the following amendment/modification in his order dated the 5th December, 2001 regarding the operation of generator sets, namely:-

**Amendments/modifications**

In the above said order, for clause(1), the following shall be substituted, namely:-

"(1) that the generator sets above 5KVA shall not be operated in residential areas between the hours from 10.00 p.m. to 6.00 a.m. except generator sets of Group Housing Societies and Multi-storey residential apartments".

## DIESEL GENERATOR SETS: STACK HEIGHT

The minimum height of stack to be provided with each generator set can be worked out using the following formula:

$H = h + 0.2 \times \sqrt{KVA}$

H = Total height of stack in metre

h = Height of the building in metres where the generator set is installed

KVA = Total generator capacity of the set in KVA

Based on the above formula the minimum stack height to be provided with different range of generator sets may be categorized as follows:

| For Generator Sets | Total Height of stack in metre |
|---|---|
| 50 KVA | Ht. of the building + 1.5 metre |
| 50-100 KVA | Ht. of the building + 2.0 metre |
| 100- 150 KVA | Ht. of the building + 2.5 metre |
| 150-200 KVA | Ht. of the building + 3.0 metre |
| 200-250 KVA | Ht. of the building + 3.5 metre |
| 250-300 KVA | Ht. of the building + 3.5 metre |

Similarly for higher KVA ratings a stack height can be worked out using the above formula

Source: Evolved By CPCB

[Emission Regulations Part IV: COINDS/26/1986-87]

## ANNEXURE VI
## Form 1 (Application Form for Obtaining EIA Clearance)

## FORM 1

## (I) BASIC INFORMATION

| S. No. | Item | Details |
|---|---|---|
| 1. | Name of the project/s | |
| 2. | S.No. in the schedule | |
| 3. | Proposed capacity/area/length/tonnage to be handled/command area/lease area/number of wells to be drilled | |
| 4. | New/Expansion/Modernization | |
| 5. | Existing Capacity/Area etc. | |
| 6. | Category of Project i.e., 'A' or 'B' | |
| 7. | Does it attract the general condition? If yes, please specify. | |
| 8. | Does it attract the specific condition? If yes, Please specify. | |
| 9. | Location | |
| | Plot/Survey/Khasra No. | |
| | Village | |
| | Tehsil | |
| | District | |
| | State | |
| 10. | Name of the applicant | |
| 11. | Registered Address | |
| 12. | Address for correspondence: | |
| | Name | |
| | Designation (Owner/Partner/CEO) | |
| | Address | |
| | Pin Code | |
| | E-mail | |
| | Telephone No. | |
| | Fax No. | |
| 13. | Details of alternative Sites examined, if any location of these sites should be shown on a toposheet. | Village-District-State<br>1.<br>2.<br>3. |

| S. No. | Item | Details |
|---|---|---|
| 14. | Interlined Projects | |
| 15. | Whether separate application of interlined project has been submitted | |
| 16. | If yes, date of submission | |
| 17. | If no, reason | |
| 18. | Whether the proposal involves approval/clearance under:<br>The Forest (Conservation) Act, 1980<br>The Wildlife (Protection) Act, 1972<br>The C.R.Z. Notification, 1991 | |
| 19. | Forest land involved (hectares) | |
| 20. | Whether there is any litigation pending against the project and/or land in which the project is propose to be set up<br>Name of the Court<br>Case No.<br>Orders/directions of the Court, if any and its relevance with the proposed project. | |

## (II) ACTIVITY

**1. Construction, operation or decommissioning of the Project involving actions, which will cause physical changes in the locality (topography, land use, changes in water bodies, etc.)**

| S.No. | Information/Checklist confirmation | Yes/No | Details thereof (with approximate quantities /rates, wherever possible) with source of information data |
|---|---|---|---|
| 1.1 | Permanent or temporary change in land use, land cover or topography including increase in intensity of land use (with respect to local land use plan) | | |
| 1.2 | Clearance of existing land, vegetation and buildings? | | |
| 1.3 | Creation of new land uses? | | |
| 1.4 | Pre-construction investigations e.g. bore houses, soil testing? | | |
| 1.5 | Construction works? | | |

| S.No. | Information/Checklist confirmation | Yes/No | Details thereof (with approximate quantities /rates, wherever possible) with source of information data |
|---|---|---|---|
| 1.6 | Demolition works? | | |
| 1.7 | Temporary sites used for construction works or housing of construction workers? | | |
| 1.8 | Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations | | |
| 1.9 | Underground works including mining or tunneling? | | |
| 1.10 | Reclamation works? | | |
| 1.11 | Dredging? | | |
| 1.12 | Offshore structures? | | |
| 1.13 | Production and manufacturing processes? | | |
| 1.14 | Facilities for storage of goods or materials? | | |
| 1.15 | Facilities for treatment or disposal of solid waste or liquid effluents? | | |
| 1.16 | Facilities for long term housing of operational workers? | | |
| 1.17 | New road, rail or sea traffic during construction or operation? | | |
| 1.18 | New road, rail, air waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc? | | |
| 1.19 | Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements? | | |
| 1.20 | New or diverted transmission lines or pipelines? | | |
| 1.21 | Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers? | | |
| 1.22 | Stream crossings? | | |
| 1.23 | Abstraction or transfers of water form ground or surface waters? | | |
| 1.24 | Changes in water bodies or the land surface affecting drainage or run-off? | | |
| 1.25 | Transport of personnel or materials for construction, operation or decommissioning? | | |

| S.No. | Information/Checklist confirmation | Yes/No | Details thereof (with approximate quantities /rates, wherever possible) with source of information data |
|---|---|---|---|
| 1.26 | Long-term dismantling or decommissioning or restoration works? | | |
| 1.27 | Ongoing activity during decommissioning which could have an impact on the environment? | | |
| 1.28 | Influx of people to an area in either temporarily or permanently? | | |
| 1.29 | Introduction of alien species? | | |
| 1.30 | Loss of native species or genetic diversity? | | |
| 1.31 | Any other actions? | | |

**2. Use of Natural resources for construction or operation of the Project (such as land, water, materials or energy, especially any resources which are non-renewable or in short supply):**

| S.No. | Information/checklist confirmation | Yes/No | Details thereof (with approximate quantities /rates, wherever possible) with source of information data |
|---|---|---|---|
| 2.1 | Land especially undeveloped or agricultural land (ha) | | |
| 2.2 | Water (expected source & competing users) unit: KLD | | |
| 2.3 | Minerals (MT) | | |
| 2.4 | Construction material – stone, aggregates, sand / soil (expected source – MT) | | |
| 2.5 | Forests and timber (source – MT) | | |
| 2.6 | Energy including electricity and fuels (source, competing users) Unit: fuel (MT), energy (MW) | | |
| 2.7 | Any other natural resources (use appropriate standard units) | | |

**3. Use, storage, transport, handling or production of substances or materials, which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health.**

| S.No | Information/Checklist confirmation | Yes/No | Details thereof (with approximate quantities/rates, wherever possible) with source of information data |
|---|---|---|---|
| 3.1 | Use of substances or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies) | | |
| 3.2 | Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases) | | |
| 3.3 | Affect the welfare of people e.g. by changing living conditions? | | |
| 3.4 | Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc., | | |
| 3.5 | Any other causes | | |

**4. Production of solid wastes during construction or operation or decommissioning (MT/month)**

| S.No. | Information/Checklist confirmation | Yes/No | Details thereof (with approximate quantities/rates, wherever possible) with source of information data |
|---|---|---|---|
| 4.1 | Spoil, overburden or mine wastes | | |
| 4.2 | Municipal waste (domestic and or commercial wastes) | | |
| 4.3 | Hazardous wastes (as per Hazardous Waste Management Rules) | | |
| 4.4 | Other industrial process wastes | | |
| 4.5 | Surplus product | | |
| 4.6 | Sewage sludge or other sludge from effluent treatment | | |
| 4.7 | Construction or demolition wastes | | |
| 4.8 | Redundant machinery or equipment | | |

| S.No. | Information/Checklist confirmation | Yes/No | Details thereof (with approximate quantities/rates, wherever possible) with source of information data |
|---|---|---|---|
| 4.9 | Contaminated soils or other materials | | |
| 4.10 | Agricultural wastes | | |
| 4.11 | Other solid wastes | | |

**5. Release of pollutants or any hazardous, toxic or noxious substances to air (kg/hr)**

| S.No | Information/Checklist confirmation | Yes/No | Details thereof (with approximate quantities/rates, wherever possible) with source of information data |
|---|---|---|---|
| 5.1 | Emissions from combustion of fossil fuels from stationary or mobile sources | | |
| 5.2 | Emissions from production processes | | |
| 5.3 | Emissions from materials handling including storage or transport | | |
| 5.4 | Emissions from construction activities including plant and equipment | | |
| 5.5 | Dust or odours from handling of materials including construction materials, sewage and waste | | |
| 5.6 | Emissions from incineration of waste | | |
| 5.7 | Emissions from burning of waste in open air (e.g. slash materials, construction debris) | | |
| 5.8 | Emissions from any other sources | | |

## 6. Generation of Noise and Vibration, and Emissions of Light and Heat:

| S.No. | Information/Checklist confirmation | Yes/No | Details thereof (with approximate quantities/rates, wherever possible) with source of information data with source of information data |
|---|---|---|---|
| 6.1 | From operation of equipment e.g. engines, ventilation plant, crushers | | |
| 6.2 | From industrial or similar processes | | |
| 6.3 | From construction or demolition | | |
| 6.4 | From blasting or piling | | |
| 6.5 | From construction or operational traffic | | |
| 6.6 | From lighting or cooling systems | | |
| 6.7 | From any other sources | | |

## 7. Risks of contamination of land or water from releases of pollutants into the ground or into sewers, surface waters, groundwater, coastal waters or the sea:

| S.No. | Information/Checklist confirmation | Yes/No | Details thereof (with approximate quantities/rates, wherever possible) with source of information data |
|---|---|---|---|
| 7.1 | From handling, storage, use or spillage of hazardous materials | | |
| 7.2 | From discharge of sewage or other effluents to water or the land (expected mode and place of discharge) | | |
| 7.3 | By deposition of pollutants emitted to air into the land or into water | | |
| 7.4 | From any other sources | | |
| 7.5 | Is there a risk of long term build up of pollutants in the environment from these sources? | | |

**8. Risk of accidents during construction or operation of the Project, which could affect human health or the environment**

| S.No | Information/Checklist confirmation | Yes/No | Details thereof (with approximate quantities/rates, wherever possible) with source of information data |
|---|---|---|---|
| 8.1 | From explosions, spillages, fires etc from storage, handling, use or production of hazardous substances | | |
| 8.2 | From any other causes | | |
| 8.3 | Could the project be affected by natural disasters causing environmental damage (e.g. floods, earthquakes, landslides, cloudburst etc)? | | |

**9. Factors which should be considered (such as consequential development) which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality**

| S. No. | Information/Checklist confirmation | Yes/No | Details thereof (with approximate quantities/rates, wherever possible) with source of information data |
|---|---|---|---|
| 9.1 | Lead to development of supporting facilities, ancillary development or development stimulated by the project which could have impact on the environment e.g.:<br>▪ Supporting infrastructure (roads, power supply, waste or waste water treatment, etc.)<br>▪ housing development<br>▪ extractive industries<br>▪ supply industries<br>▪ other | | |
| 9.2 | Lead to after-use of the site, which could have an impact on the environment | | |
| 9.3 | Set a precedent for later developments | | |
| 9.4 | Have cumulative effects due to proximity to other existing or planned projects with similar effects | | |

## (III) ENVIRONMENTAL SENSITIVITY

| S.No. | Areas | Name/ Identity | Aerial distance (within 15 km.) Proposed project location boundary |
|---|---|---|---|
| 1 | Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value | | |
| 2 | Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests | | |
| 3 | Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration | | |
| 4 | Inland, coastal, marine or underground waters | | |
| 5 | State, National boundaries | | |
| 6 | Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas | | |
| 7 | Defence installations | | |
| 8 | Densely populated or built-up area | | |
| 9 | Areas occupied by sensitive man-made land uses *(hospitals, schools, places of worship, community facilities)* | | |
| 10 | Areas containing important, high quality or scarce resources *(ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)* | | |
| 11 | Areas already subjected to pollution or environmental damage. *(those where existing legal environmental standards are exceeded)* | | |
| 12 | Areas susceptible to natural hazard which could cause the project to present environmental problems (*earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions*) | | |

## (IV) PROPOSED TERMS OF REFERENCE FOR EIA STUDIES

"I hereby given undertaking that the data and information given in the application and enclosure are true to the best of my knowledge and belief and I am aware that if any part of the data and information submitted is found to be false or misleading at any stage, the project will be rejected and clearance give, if any to the project will be revoked at our risk and cost.

Date:_____
Place:_____

Signature of the applicant
With Name and Full Address
(Project Proponent / Authorized Signatory)

**NOTE:**

1. The projects involving clearance under Coastal Regulation Zone Notification, 1991 shall submit with the application a C.R.Z. map duly demarcated by one of the authorized, agencies, showing the project activities, w.r.t. C.R.Z. and the recommendations of the State Coastal Zone Management Authority. Simultaneous action shall also be taken to obtain the requisite clearance under the provisions of the C.R.Z. Notification, 1991 for the activities to be located in the CRZ.
2. The projects to be located within 10km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendations or comments of the Chief Wildlife Warden thereon."

## ANNEXURE VII
## Critically Polluted Industrial Areas and Clusters/Potential Impact Zones

**Table 1: Details of Critically Polluted Industrial Areas and Clusters / Potential Impact Zone (Ref: Office Memorandum No. J-11013/5/2010-IA.II(I) Dated 13.1.2010)**

| S. No. | Critically Polluted Industrial Area and CEPI | Industrial Clusters/ Potential Impact Zones |
|---|---|---|
| 1. | Ankeshwar (Gujarat)<br>CEPI-88.50(Ac_Wc_Lc) | ▪ GIDC Ankeshwar and GIDC, Panoli |
| 2 | Vapi (Gujarat)<br>CEPI-88.09(Ac_Wc_Lc) | ▪ GIDC Vapi |
| 3 | Ghaziabad (Uttar Pradesh)<br>CEPI-87.37(Ac_Wc_Lc) | Sub-cluster A<br>▪ Mohan nagar industrial area<br>▪ Rajinder nagar industrial area<br>▪ Sahibabad industrial area<br>Sub-cluster B<br>▪ Pandav nagar industrial area<br>▪ Kavi nagar industrial area<br>▪ Bulandshahar road industrial area<br>▪ Amrit nagar<br>▪ Aryanagar industrial area<br>Sub-cluster C<br>▪ Merrut road industrial are<br>Sub-cluster D<br>▪ Loni industrial area<br>▪ Loni Road industrial area<br>▪ Roop nagar industrial area<br>Sub-cluster E<br>▪ Hapur Road industrial area<br>▪ Dasna<br>▪ Philkura<br>Sub-cluster F (Other scattered industrial areas)<br>▪ South side of GT road<br>▪ Kavi Nagar<br>▪ Tronica city<br>▪ Anand Nagar<br>▪ Jindal Nagar<br>▪ Prakash Nagar<br>▪ Rural industrial estate |
| 4 | Chandrapur<br>(Maharashtra)<br>CEPI-83.88 (Ac_Wc_Lc) | ▪ Chandrapur (MIDC Chandrapur, Tadali, Ghuggus, Ballapur) |
| 5 | Kobra (Chhatisgarh)<br>CEPI-83.00 (Ac_Ws_Lc) | ▪ Industrial areas and their townships of NTPC, BALCO, CSEB (East) & CSEB (West)<br>▪ Korba town |
| 6 | Bhiwadi (Rajasthan)<br>CEPI-82.91 (Ac_Wc_Ls) | ▪ RIICO industrial areas Phase I to IV<br>▪ Bhiwadi town<br>▪ Other surrounding industrial areas: Chopanki, Rampura Mundana, Khuskhera Phase I to III |
| 7 | Angul Talcer(Orissa)<br>CEPI-82.09 (Ac_Wc_Lc) | ▪ MCL Coal mining area, Augul – Talcer region<br>▪ Industrial area (60 km x 45 km)<br>Following blocks of Augul district:<br>▪ Kohina block<br>▪ Talcher block |

| | | |
|---|---|---|
| | | ▪ Angul block<br>▪ Chhendipada block<br>▪ Banarpal block<br>▪ Odapada block of Dhenkamal district |
| 8 | Vellore (North Arcot) (Tamil Nadu)<br>CEPI-81.79 (Ac_Wc_Lc) | ▪ Ranipet, SIPCOT industrial complex |
| 9 | Singrauli (Uttar Pradesh)<br>CEPI-81.73 (Ac_Wc_Ls) | Sonebhadra (UP)<br>▪ Dala-Tola<br>▪ Obra<br>▪ Renukoot<br>▪ Anpara<br>▪ Renusagar<br>▪ Kakri<br>▪ Dudhichuwa<br>▪ Bina<br>▪ Khadia<br>▪ Shakti nagar<br>▪ Rihand nagar<br>▪ Bijpur<br>Sigrauli (Madhya Pradesh)<br>Vindhyachal nagar and Jaynat, Nigahi, Dudhichua, Amlohri & Jhingurdah townships |
| 10 | Ludhiana (Punjab)<br>CEPI-81.66 (Ac_Wc_Ls) | Ludhiana municipal limits covering industrial clusters:<br>▪ Focal point along with NH-I- Total eight phase<br>▪ Industrial area-B- from sherpur chowk to Gill road & Gill road to Miller Kotla road (left side of road)<br>▪ Mixed industrial area – right side of Gill road<br>▪ Industrial area –C (near Juglana village)<br>▪ Industrial area A & extension: area between old GT road and Ludhiana bypass road<br>▪ Industrial estate: near Dholwal chowk<br>▪ Mixes industrial area (MIA) Miller gunj<br>▪ MIA – bypass road<br>▪ Bahdur industrial area<br>▪ Tejpur industrial complex |
| 11 | Nazafgarh drain basin, Delhi<br>CEPI-79.54 (As_Wc_Lc) | ▪ Industrial areas: Anand Parvat, Naraina, Okhla and Wazirpur |
| 12 | Noida (Uttar Pradesh)<br>CEPI-78.90 (Ac_Wc_Lc) | Territorial Jurisdiction of:<br>▪ Noida Phase-1<br>▪ Noida Phase-2<br>▪ Noida Phase-3<br>▪ Surajpur industrial area<br>▪ Greater Noida industrial area<br>▪ Village- Chhaparaula |
| 13 | Dhanbad (Jharkhand)<br>CEPI-78.63 (Ac_Ws_Lc) | Four blocks of Dhanbad district:<br>▪ Sadar (Dhanbad Municipality)<br>▪ Jharia (Jharia Municipality, Sindri industrial area)<br>▪ Govindpur (Govindpur industrial estate)<br>▪ Nirsa |
| 14 | Dombivalli (Maharashtra)<br>CEPI-78.41 (Ac_Wc_Ls) | ▪ MIDC Phase- I, Phase- II |

| | | |
|---|---|---|
| 15 | Kanpur (Uttar Pradesh)<br>CEPI-78.09 (Ac_Wc_Ls) | Industrial areas:<br>▪ Dada nagar<br>▪ Panki<br>▪ Fazalganj<br>▪ Vijay nagar<br>▪ Jajmau |
| 16 | Cuddalore (Tamil Nadu)<br>CEPI-77.45 (As_Wc_Lc) | ▪ SIPCOT industrial complex, Phase I & II |
| 17 | Aurangabad (Maharashtra)<br>CEPI-77.44 (Ac_Wc_Ls) | ▪ MIDC Chikhalthana, MIDC Waluj, MIDC Shendra, and Paithan road industrial area |
| 18 | Faridabad (Haryana)<br>CEPI-77.07 (Ac_Ws_Lc) | ▪ Sector 27-A, B, C, D<br>▪ DLF phase- 1, sector 31,32<br>▪ DLF phase- 2, sector 35<br>▪ Sector 4, 6, 24, 27, 31, 59<br>▪ Industrial area Hatin<br>▪ Industrial model township |
| 19 | Agra (Uttar Pradesh)<br>CEPI-76.48 (As_Wc_Ls) | ▪ Nunihai industrial estate, Rambag nagar, UPSIDC industrial area, and Runukata industrial area |
| 20 | Manali (Tamil Nadu)<br>CEPI-76.32 (Ac_Ws_Ls) | ▪ Manali industrial area |
| 21 | Haldia (West Bengal)<br>CEPI-75.43 (As_Wc_Ls) | ▪ 5 km wide strip (17.4 x 5.0 km) of industrial area on the southern side of the confluence point of Rivers Hugli and Rupnarayan, covering<br>▪ Haldia municipal area & Sutahata block – I and II |
| 22 | Ahmedabad (Gujarat)<br>CEPI-75.28 (Ac_Ws_Ls) | ▪ GIDC Odhav<br>▪ GIDC Naroda |
| 23 | Jodhpur (Rajasthan)<br>CEPI-75.19 (As_Wc_Ls) | ▪ Industrial areas including Basni areas (phase-I & II), industrial estate, light & heavy industrial areas, industrial areas behind new power house, Mandore, Bornada, Sangariya and village Tanwada & Salawas.<br>▪ Jodhpur city |
| 24 | Greater Cochin (Kerala)<br>CEPI-75.08 (As_Wc_Ls) | ▪ Eloor-Edayar industrial belt,<br>▪ Ambala Mogal industrial areas |
| 25 | Mandi Gobind Garh (Punjab)<br>CEPI-75.08 (Ac_Ws_Lc) | ▪ Mandi Govindgarh municipal limit and khanna area |
| 26 | Howrah (West Bengal)<br>CEPI-74.84 (As_Ws_Lc) | ▪ Liluah-Bamangachhi region, Howrah<br>▪ Jalan industrial complex-1, Howrah |
| 27 | Vatva (Gujarat)<br>CEPI-74.77 (Ac_Wc_Ls) | ▪ GIDC Vatva, Narol industrial area (Villages Piplaj, Shahwadi, Narol) |
| 28 | Ib Valley (Orissa)<br>CEPI-74.00 (Ac_Ws_Ls) | ▪ Ib Valley of Jharsuguda (Industrial and mining area) |
| 29 | Varansi-Mirzapur (Uttar Pradesh)<br>CEPI-73.79 (As_Wc_Ls) | ▪ Industrial estate, Mirzapur<br>▪ Chunar<br>▪ Industrial estate, Chandpur, Varansi<br>▪ UPSIC, industrial estate, Phoolpur<br>▪ Industrial area, Ramnagar, Chandauli |
| 30 | Navi Mumbai (Maharashtra)<br>CEPI-73.77 (Ac_Ws_Ls) | ▪ TTC industrial area, MIDC, Navi Mumbai (including Bocks-D, C, EL, A, R, General, Kalva) |

| | | |
|---|---|---|
| 31 | Pali (Rajasthan)<br>CEPI-73.73 (As_Wc_Ls) | ▪ Existing industrial areas: Mandia road, Puniyata road, Sumerpur<br>▪ Pali town |
| 32 | Mangalore (Karnataka)<br>CEPI-73.68 (Ac_Ws_Ls) | ▪ Baikampady industrial area |
| 33 | Jharsuguda (Orissa)<br>CEPI-73.34 (Ac_Ws_Ls) | ▪ Ib valley of Jharsuguda (Industrial and mining area) |
| 34 | Coimbatore (Tamil Nadu)<br>CEPI-72.38 (Ac_Ws_Ln) | ▪ SIDCO, Kurichi industrial Clusters |
| 35 | Bhadravati (Karnataka)<br>CEPI-72.33 (Ac_Ws_Ln) | ▪ KSSIDC Industrial area, Mysore paper mill & VISL township complex |
| 36 | Tarapur (Maharashtra)<br>CEPI-72.01 (Ac_Ws_Ls) | ▪ MIDC Tarapur |
| 37 | Panipat (Haryana)<br>CEPI-71.91 (As_Ws_Ls) | ▪ Panipat municipal limit and its industrial clusters |
| 38 | Indore (Madhya Pradesh)<br>CEPI-71.26 (As_Ws_Ls) | Following 09 industrial area:<br>▪ Sanwer road<br>▪ Shivaji nagar<br>▪ Pologround<br>▪ Laxmibai nagar<br>▪ Scheme no.71<br>▪ Navlakha<br>▪ Pipliya<br>▪ Palda<br>▪ Rau<br>Indore city<br>Other surrounding industrial areas: Manglia, Rajoda, Asrawad, Tejpur Gadwadi |
| 39 | Bhavnagar (Gujarat)<br>CEPI-70.99 (As_Ws_Ls) | ▪ GIDI Chitra, Bhavnagar |
| 40 | Vishakhapatnam (Andhra Pradesh)<br>CEPI-70.82 (As_Ws_Ls) | ▪ Bowl area (the area between Yarada hill range in the south to Simhachalam hill range in the north and sea on the east and the present NH-5 in the west direction) |
| 41 | Junagarh (Gujarat)<br>CEPI-70.82 (As_Ws_Ls) | Industrial areas:<br>▪ Sabalpur<br>▪ Jay Bhavani<br>▪ Jay Bhuvneshwari<br>▪ GIDC Junagarh (I&II) |
| 42 | Asansole (West Bengal)<br>CEPI-70.20 (As_Ws_Ls) | ▪ Bumpur area surrounding IISCO |
| 43 | Patancheru - Bollaram<br>(Andhra Pradesh)<br>CEPI-70.07 (As_Ws_Ls) | Industrial area:<br>▪ Patancheru<br>▪ Bollaram |

Note:

Names of identified industrial clusters/potential impact zones are approximate location based on rapid survey and assessment and may alter partially subject to the detailed field study and monitoring. Detailed mapping will be made available showing spatial boundaries of the identified industrial clusters including zone of influence/ buffer zone, after in depth field study.

# ANNEXURE VIII
# Pre-Feasibility Report: Points for Possible Coverage

## Table: Points for Possible Coverage in Pre-feasibility Report

| S. No. | Contents | Points of Coverage in Pre-feasibility Report |
|---|---|---|
| **I.** | **Executive summary** | ▪ A miniature report of entire pre feasibility report |
| **II.** | **Project Details** | |
| | Need/Justification of the Project | ▪ Current demand scenario of the storage facility<br>▪ Alternatives to meet the demand<br>▪ Post project scenario on residual demand, *etc*. |
| | Capacity of the isolated storages involved in handling of hazardous chemicals | ▪ Handling capacity of the plant<br>▪ Sustainable supply of chemicals<br>▪ Optimization of storage capacity, *etc*. |
| | Features of the storage facilities | ▪ Profile of chemicals<br>▪ Type of storages (atmospheric/pressurized vessels, *etc*.)<br>▪ Loading and unloading<br>▪ Material for construction<br>▪ Emissions handling, *etc*.<br>▪ Flaring of emissions, *etc*.<br>▪ Broad specifications of the proposed storage facility<br>▪ Specific equipments for preventing losses<br>▪ General plant layout, *etc*. |
| | Resources | ▪ Details on hazardous chemicals – type, category, quantities, *etc*.<br>▪ Water requirement for utilities, domestic, etc.<br>▪ Manpower<br>▪ Infrastructure<br>▪ Electrical power<br>▪ Construction material like sand, brick, stone chips, borrow earth, metals, *etc*. |
| | Pollution potential | ▪ Air emissions – vapours, VOCs, dust, etc.<br>▪ Water pollution – wastewater<br>▪ Waste – sludge, etc.<br>▪ Noise<br>▪ Odour, *etc*. |
| | Technical profile | ▪ Construction details<br>- Estimated duration<br>- Number of construction workers including migrating workers<br>- Construction equipment<br>- Vehicular traffic<br>- Source, mode of transportation and storage of construction material<br>▪ Traffic that would arise during different phases of the project and transportation mechanism to handle such traffic<br>▪ New facilities needed<br>▪ Technical parameters of the plant & equipments to be used<br>▪ Material storage, handling and associated transportation system |
| | Project schedule | ▪ Project implementation schedule |
| | Future prospects | ▪ Ascertain the costs and benefits of the proposed project for project life<br>▪ Technical and logistic constraints/ requirements of |

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| | | project sustainability, *etc*. |
| **III.** | **Selection of site based on least possible impacts** | |
| **i.** | **Choice of site selection** | |
| | Major techno-economic feasibility considerations | ▪ Land availability & its development<br>▪ Facility demand around the selected site<br>▪ Access to site for transportation of equipments/ construction machinery, material, *etc*.<br>▪ Optimal transportation to the storage points<br>▪ Water availability and consumptive use<br>▪ Distribution of stored chemicals<br>▪ Infrastructure availability at selected site<br>▪ Compatibility with the surrounding environment<br>▪ Inter-state issue, if any, *etc*. |
| | Incompatible landuse and ecologically sensitive attributes with respect to identified suitable sites | ▪ If any incompatible landuse attributes fall within the study area, the following details may be provided:<br>- Public water supply areas from rivers/surface water bodies, from groundwater<br>- Scenic areas/tourism areas/hill resorts<br>- Religious places, pilgrim centers that attract over 10 lakh pilgrims a year<br>- Protected tribal settlements (notified tribal areas where industrial activity is not permitted); CRZ<br>- Monuments of national significance, World Heritage Sites<br>- Cyclone, Tsunami prone areas (based on last 25 years);<br>- Airport areas<br>- Any other feature as specified by the State or local government and other features as locally applicable, including prime agricultural lands, pastures, migratory corridors, etc.<br>▪ If ecologically sensitive attributes fall within the study area, please give details. Ecologically sensitive attributes include:<br>- National parks<br>- Wild life sanctuaries Game reserve<br>- Tiger reserve/elephant reserve/turtle nesting ground<br>- Mangrove area<br>- Wetlands<br>- Reserved and protected forests<br>- Endangered species of flora and fauna<br>- Any other eco-sensitive areas etc. |
| | Social aspects | ▪ Corporate social responsibilities<br>▪ Employment and infrastructure added in the vicinity of the plant<br>▪ Status of current and post project land use variation<br>▪ Social sensitivity and likely project affected people |
| **ii.** | **Details of selected site** | |
| | Land details | ▪ Land requirement and availability<br>▪ Land ownership details such as Government, private, tribal, non-tribal, etc.<br>▪ Total area of the project/site<br>▪ Prevailing land cost details, *etc*. |
| | Location | ▪ Geographical details - Longitude & latitude, village, taluka, district, state<br>▪ Approach to site – roads, railways and airports |

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| | | ▪ Distance from nearest residential and industrial areas<br>▪ Distance from nearest water bodies such as river, canal, dam, etc<br>▪ Distance from ecologically sensitive areas<br>▪ In case of flood prone areas, HFL of the site<br>▪ In case of seismic areas, seismic zone, active faults, occurrence on earthquakes, etc.<br>▪ Proximity from infrastructural facilities, *etc*. |
| | Physical characteristics | ▪ Demography<br>▪ Meteorological data<br>▪ Landuse pattern such as agricultural, barren, forest, *etc.* and details thereof<br>▪ Topography of the area<br>▪ Drainage patterns<br>▪ Soil condition and soil investigation results<br>▪ Ground profile and levels, *etc*. |
| **IV.** | **Anticipated impacts based on project operations on receiving environment** | ▪ Population<br>▪ Flora and fauna<br>▪ Water<br>▪ Soil<br>▪ Air<br>▪ Climate<br>▪ Landscape, *etc.* |
| **V.** | **Proposed broad mitigation measures which could effectively be internalized as project components to have environmental and social acceptance of the proposed site** | ▪ Preventive measures<br>▪ Source control measures<br>▪ Mitigation measures at the receiving environment, *etc*. |
| **VI.** | **An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the developer in compiling the required information.** | |

The above listing is not exhaustive. Thus the proponent may provide additional necessary information, felt appropriate, to include in the pre-feasibility study report in support of selecting the site for the proposed developmental activities. The Concerned EAC/SEAC during scrutiny, may specifically ask for any additional information/data required to substantiate the requirement to prescribe the ToR for EIA studies. However, it is to make clear that all the required further information by EAC/SEAC may be mentioned in one single letter, within the prescribed time.

# ANNEXURE IX
# Types of Monitoring and Network Design Considerations

# TYPES OF MONITORING AND NETWORK DESIGN CONSIDERATIONS

## A. Types of Monitoring

Monitoring refers to the collection of data using a series of repetitive measurements of environmental parameters (or, more generally, to a process of systematic observation). The environmental quality monitoring programme design will be dependent upon the monitoring objectives specified for the selected area of interest. The main types of EIA monitoring activities are:

- Baseline monitoring is the measurement of environmental parameters during the pre-project period for the purpose of determining the range of variation of the system and establishing reference points against which changes can be measured. This leads to the assessment of the possible (additional available) assimilative capacity of the environmental components in pre-project period w.r.t. the standard or target level.
- Effects monitoring is the measurement of environmental parameters during project construction and implementation to detect changes which are attributable to the project to provide the necessary information to:
  - verify the accuracy of EIA predictions; and
  - determine the effectiveness of measures to mitigate adverse effects of projects on the environment.
  - Feedback from environmental effect monitoring programs may be used to improve the predictive capability of EIAs and also determine whether more or less stringent mitigation measures are needed
- Compliance monitoring is the periodic sampling or continuous measurement of environmental parameters to ensure that regulatory requirements and standards are being met.

Compliance and effects monitoring occurs during the project construction, operation, and abandonment stages. The resources and institutional set-up should be available for the monitoring at these stages. All large-scale construction projects will require some construction stage monitoring. To control the environmental hazards of construction as specified in the EIA, a monitoring program should be established to ensure that each mitigation measure is effectively implemented. There are numerous potential areas for monitoring during operations.

The scope of monitoring topics discussed in this chapter is limited to Baseline and Effects monitoring. In addition, this chapter will also discuss the Compliance monitoring during the construction phase. Post-project monitoring requirements are discussed in the EMP.

Before any field monitoring tasks are undertaken there are many institutional, scientific, and fiscal issues that must be addressed in the implementation of an environmental monitoring program. Careful consideration of these issues in the design and planning stages will help avoid many of the pitfalls associated with environmental monitoring programs. Although these issues are important but the discussions here are confined to the monitoring network design component.

## B. Network Design

### Analysis of Significant Environmental Issues

At the outset of planning for an environmental monitoring network, the EIA manager may not know exactly what should be monitored, when monitoring should begin, where it should monitor, which techniques should be employed, and who should take responsibility for its conduct. Because there are usually a number of objective decisions associated with network design to be made, it is important to start with an analysis of environmental issues. The scoping phase of an EIA is designed to identify and focus on the major issues. Scoping should provide a valuable source of information on the concerns that need to be addressed by the monitoring network design. These are project specific as well as specific to the environmental setting of the location where the project is proposed to be located

Hence, the network designs are associated with questions like:

- What are the expected outputs of the monitoring activity?
- Which problems do we need to address to? *etc*.

Defining the output will influence the design of the network and optimize the resources used for monitoring. It will also ensure that the network is specially designed to optimize the information on the problems at hand

### What to Monitor?

The question of what to monitor is associated with the identification of VECs.

VECs are generally defined as environmental attributes or components of the environment that are valued by society as identified during the scoping stage of the project. They are determined on the basis of perceived public concerns. For example, changes to water quality and quantity could have implications on fish by affecting habitat, food supply, oxygen, and contaminant uptake. Similarly, employment and business, and economies are both VECs that serve as pathways.

The choice of VECs is also related to the perceived significant impact of the project implementation on important environmental components. In general, the significance or importance of environmental components is judged based on:

- legal protection provided (for example, rare and endangered species)
- political or public concerns (for example, resource use conflicts and sustainable development)
- scientific judgment (for example, ecological importance); or
- commercial or economic importance

However, in addition to their economic, social, political or ecological significance, the chosen VEC should also have unambiguous operational ease, be accessible to prediction and measurement; and be susceptible to hazard. Once the VECs are defined, the VECs may be directly measured (for example, extent of habitat for an endangered species). In cases where it is impossible or impractical to directly measure the VECs, the chosen measurement endpoints or environmental indicators must correspond to, or be predictive of assessment endpoints.

The chosen environmental indicators must be: 1) measurable; 2) appropriate to the scale of disturbance/ contamination; 3) appropriate to the impact mechanism; 4) appropriate

and proportional to temporal dynamics; 5) diagnostic; and 6) standardized; as well as have: 1) a low natural variability; 2) a broad applicability; and 3) an existing data series.

### Where, How and How Many Times to Monitor?

These are the other components of Monitoring Network Design. These questions are best answered based on local field conditions, capacity and resources available, prevailing legal and regulatory priorities, *etc*. For this screening or reconnaissance Surveys of the study area also necessary. This may also include some simple inexpensive measurements and assimilative/dispersion modeling. The data will give some information on the prevailing special and temporal variations, and the general background air pollution in the area. The number of monitoring stations and the indicators to be measured at each station in the final permanent network may then be decided upon based on the results of the screening study as well as on the knowledge of the sources of the proposed development and prevailing local environmental/meteorological conditions. The best possible definition of the air pollution problem, together with the analysis of the resources: personnel, budget and equipment available, represent the basis for the decision on the following questions:

- What spatial density (number) of sampling stations is required? How many samples are needed and during what period (sampling (averaging) time and frequency)?
- Where should the stations be located?
- What kind of equipment should be used?
- What additional background information is needed?
  - meteorology
  - topography
  - population density
  - emission sources and emission rates
  - effects and impacts
- How will the data be made available/communicated?

## C. Site Selection

This normally means that for designing a monitoring programme in an (study) area which might have an impact, several monitoring stations are needed for characterizing the baseline conditions of the impacted area. When considering the location of individual samplers, it is essential that the data collected are representative for the location and type of area without the undue influence from the immediate surroundings. In any measurement point in the study area the total ambient concentration is the representative of:

- natural background concentration
- regional background
- impact of existing large regional sources such as Industrial emissions and other power plants

To obtain the information about the importance of these different contributions it is therefore necessary to locate monitoring stations so that they are representative for different impacts. In addition to the ambient pollution data, one would often need other data governing the variations such as meteorological data for air pollution, to identify and quantify the sources contributing to the measurements.. When considering the location of individual samplers, it is essential that the data collected are representative for the location and type of area without undue influence from the immediate surroundings.

# ANNEXURE X
# Guidance for Assessment of Baseline Components and Attributes

## GUIDANCE FOR ASSESSMENT OF BASELINE COMPONENTS AND ATTRIBUTES*

| Attributes | Sampling | | Measurement Method | Remarks |
|---|---|---|---|---|
| | **Network** | **Frequency** | | |
| **A. Air** | | | | |
| Meteorological<br>▪ Wind speed<br>▪ Wind direction<br>▪ Dry bulb temperature<br>▪ Wet bulb temperature<br>▪ Relative humidity<br>▪ Rainfall<br>▪ Solar radiation<br>▪ Cloud cover | ▪ Minimum 1 site in the project impact area requirements<br>▪ Other additional site(s) are require depending upon the model applied or site sensitivities | ▪ Min: 1 hrly observations from continuous records | ▪ Mechanical / automatic weather station<br>▪ Rain gauge<br>▪ As per IMD<br>▪ As per IMD | ▪ IS 5182 Part 1-20 Sit-specific primary data is essential<br>▪ Secondary data from IMD, New Delhi for the nearest IMD station |
| Pollutants<br>▪ SPM<br>▪ PM10, PM2.5<br>▪ $SO_2$<br>▪ $NO_2$<br>▪ CO<br>▪ $H_2S$*<br>▪ $NH*_3$<br>▪ HC*<br>▪ Fluoride*<br>▪ Pb*<br>▪ VOC-PAH*<br>▪ Ozone<br>▪ Benzene<br>▪ Benzo(a)pyrene (Particulate phase only)<br>▪ Arsenic<br>▪ Nickel<br>(parameters to be proposed by the proponent, in draft ToR, which will be reviewed and approved by | ▪ 10 to 15 locations in the project impact area | ▪ 24 hrly twice a week<br>▪ 8 hrly twice a week<br>▪ 24 hrly twice a week | ▪ Gravimetric (High – Volume)<br>▪ Gravimetric (High – Volume with Cyclone)<br>▪ EPA Modified West & Gaeke method<br>▪ Arsenite Modified Jacob & Hochheiser<br>▪ NDIR technique<br>▪ Methylene-blue<br>▪ Nessler's Method<br>▪ Infra Red analyzer<br>▪ Specific lon meter<br>▪ TOEM<br>▪ Beta attenuation<br>▪ UV photometric<br>▪ Chemilminescence<br>▪ Chemical method<br>▪ Gas chromatography based continuos analyzer<br>▪ Adsorption and desorption followed by GC analysis | ▪ Monitoring Network<br>▪ Minimum 2 locations in upwind side, more sites in downwind side / impact zone<br>▪ All the sensitive receptors need to be covered<br>▪ Measurement Methods<br>▪ As per CPCB standards for NAQM, 1994 |

| Attributes | Sampling | | Measurement Method | Remarks |
|---|---|---|---|---|
| | Network | Frequency | | |
| EAC/SEAC) | | | ▪ Solvent extraction folllowed by HPLC/GC analysis<br>▪ AAS/ICP method after sampling on EPM 2000 or equivalent filter paper | |
| **B. Noise** | | | | |
| Hourly equivalent noise levels | ▪ Same as for Air Pollution along with others Identified in study area | ▪ At lest one day continuous in each season on a working and non-working day | ▪ Instrument : Sensitive Noise level meter (preferably recording type) | ▪ Min: IS: 4954- 1968 as adopted by CPCB |
| Hourly equivalent noise levels | ▪ Inplant (1.5 m from machinery or high emission processes) | ▪ Same as above for day and night | ▪ Instrument : Noise level metre | ▪ CPCB / OSHA |
| Hourly equivalent noise levels | ▪ Highways (within 500 metres from the road edge) | ▪ Same as above for day and night | ▪ Instrument : Noise level meter | ▪ CPCB / IS : 4954-1968 |
| Peak particle velocity | ▪ 150- 200m from blast site | ▪ Based on hourly observations | ▪ PPV meter | ▪ |
| **C. Water** | | | | |
| Parameters for water quality<br>▪ Ph, temp, turbidity, magnesium hardness, total alkalinity, chloride, sulphate, nitrate, fluoride, sodium, potassium salinity<br>▪ Total nitrogen, total phosphorus, DO, BOD, COD, Phenol<br>▪ Heavy metals<br>▪ Total coliforms, faecal coliforms<br>▪ Phyto plankton<br>▪ Zooplankton | ▪ Set of grab samples during pre and post-monsoon for ground and surface water for the whole study zone. For lab analysis the samples should be preserved for transport safe | ▪ Diurnal and season-wise | ▪ Samples for water quality should be collected and analyzed as per:<br>▪ IS: 2488 (Part 1-5) methods for sampling and testing of industrial effluents<br>▪ Standard methods for examination of water and waste water analysis published by American Public Health Association.<br>▪ International standard practices for benthos and | |

| Attributes | Sampling | | Measurement Method | Remarks |
|---|---|---|---|---|
| | Network | Frequency | | |
| ▪ Fish & other aquatic flora & fauna<br>(parameters are given in ToR for EIA studies based on nature of project, raw material & process technology, location-nature/activities within of air basin) | | | aquatic flora & fauna | |
| **For Surface Water Bodies** | | | | |
| ▪ Total Carbon<br>▪ PH<br>▪ Dissolved Oxygen<br>▪ Biological Oxygen<br>▪ Demand<br>▪ Free $NH_4$<br>▪ Boron<br>▪ Sodium Absorption ratio<br>▪ Electrical Conductivity | ▪ Monitoring locations should include up-stream, on site, down stream of proposed discharge point. Besides sampling should cover width of the river in case water quality modeling is proposed.<br>▪ Standard methodology for collection of surface water (BIS standards)<br>▪ At least one grab sample per location per season | ▪ Yield & impact on water sources to be measured during critical season<br>▪ River Stretch within project area be divided in grids (say 1 km length and 1/3 width) and samples should be from each grid at a time when the wastewater discharged by other sources of pollution is expected to be maximum | ▪ Samples for water quality should be collected and analyzed as per:<br>▪ IS: 2488 (Part 1-5) methods for sampling and testing of industrial effluents<br>▪ Standard methods for examination of water and wastewater analysis published by American Public Health Association.<br>▪<br>▪ | ▪ Historical data should be collected from relevant offices such as central water commission, state and central ground water board, Irrigation dept.<br>▪ |
| **Parameters for wastewater characterization** | | | | |
| ▪ Temp, colour, odour, turbidity, TSS, TDS<br>▪ PH , alkalinity as CaCO3, p value, M value, tatal hardness as CaCO3, chloride as cl, sulphate as S04, Nitrate as NO3, Floride as F, Phosphate as P04, Chromium as Cr (Hexavalent, total) Ammonical Nitrogen as N, TKN, % sodium, BOD at 20 C, COD, | ▪ Implant Source depending upon the different waste streams the parameters can be optimized<br>▪ Grab and composite sampling representing avg of different process operations as well as worst emission scenario should be represented | ▪ Different operational cycles as well as raw material variations should be reflected in the analysis | ▪ Samples for water quality should be collected and analyzed as per:<br>▪ IS: 2488 (Part 1-5) methods for sampling and testing of industrial effluents<br>▪ Standard methods for examination of water and wastewater analysis published by American | All plant sources categorized as:<br>▪ Different Process waste streams as well as run-off conditions<br>▪ ETP wastewater<br>▪ Domestic/ sanitary wastewater |

| Attributes | Sampling | | Measurement Method | Remarks |
|---|---|---|---|---|
| | Network | Frequency | | |
| DO, total residual chlorine as $Cl_2$, oil and grease, sulphide, phenolic compound | | | Public Health Association. | |
| **D. Land Environment** | | | | |
| ▪ Soil<br>▪ Particle size distribution<br>▪ Texture<br>▪ pH<br>▪ Electrical conductivity<br>▪ Caution exchange capacity<br>▪ Alkali metals<br>▪ Sodium Absorption Ratio (SAR)<br>▪ Permeability<br>▪ Porosity | ▪ One surface sample from each landfill and/or hazardous waste site (if applicable) and prime villages, (soil samples be collected as per BIS specifications) in the study area | ▪ Season-wise | ▪ Collected and analyzed as per soil analysis reference book, M.I.Jackson and soil analysis reference book by C.A. Black<br>▪ | ▪ The purpose of impact assessment on soil (land environment) is to assess the significant impacts due to leaching of wastes or accidental releases and contaminating<br>▪ |
| **Landuse / Landscape** | | | | |
| ▪ Location code<br>▪ Total project area<br>▪ Topography<br>▪ Drainage (natural)<br>▪ Cultivated, forest plantations, water bodies, roads and settlements | ▪ At least 20 points along with plant boundary and general major land use categories in the study area. | ▪ Drainage once in the study period and land use categories from secondary data (local maps) and satellite imageries | ▪ Global positioning system<br>▪ Topo-sheets<br>▪ Satellite Imageries (1:25,000) | ▪ Drainage within the plant area and surrounding is very important for storm water impacts.<br>▪ From land use maps sensitive receptors (forests, parks, mangroves etc.) can be identified |

| Attributes | Sampling | | Measurement Method | Remarks |
|---|---|---|---|---|
| | Network | Frequency | | |
| **E. Solid Waste** | | | | |
| **Quantity:**<br>▪ Based on waste generated from per unit production<br>▪ Per capita contribution<br>▪ Collection, transport and disposal system<br>▪ Process Waste<br>▪ Quality (oily, chemical, biological) | ▪ For green field unites it is based on secondary data base of earlier plants. | ▪ Process wise or activity wise for respective raw material used. Domestic waste depends upon the season also | Guidelines<br>▪ IS 9569 : 1980<br>▪ IS 10447 : 1983<br>▪ IS 12625 : 1989<br>▪ IS 12647 : 1989<br>▪ IS 12662 (PTI) 1989 | |
| **Quality:**<br>▪ General segregation into biological/organic/inert/hazardous<br>▪ Loss on heating<br>▪ pH<br>▪ Electrical Conductivity<br>▪ Calorific value, metals etc. | ▪ Grab and Composite samples | ▪ Process wise or activity wise for respective raw material used. Domestic waste depends upon the season also | Analysis<br>▪ IS 9334 : 1979<br>▪ IS 9235 : 1979<br>▪ IS 10158 : 1982 | |
| **Hazardous Waste** | | | | |
| ▪ Permeability And porosity<br>▪ Moisture pH<br>▪ Electrical conductivity<br>▪ Loss on ignition<br>▪ Phosphorous<br>▪ Total nitrogen<br>▪ Caution exchange capacity<br>▪ Particle size distribution<br>▪ Heavy metal<br>▪ Ansonia<br>▪ Fluoride | ▪ Grab and Composite samples. Recyclable components have to analyzed for the recycling requirements | ▪ Process wise or activity wise for respective raw material used. | Analysis<br>▪ IS 9334 : 1979<br>▪ IS 9235 : 1979<br>▪ IS 10158 : 1982 | ▪ Impacts of hazardous waste should be performed critically depending on the waste characteristics and place of discharge. For land disposal the guidelines should be followed and impacts of accidental releases should be assessed |
| **F. Biological Environment Aquatic** | | | | |
| ▪ Primary productivity<br>▪ Aquatic weeds | ▪ Considering probable impact, sampling points | ▪ Season changes are very important | ▪ Standards techniques (APHA et. Al. 1995, Rau | ▪ Seasonal sampling for aquatic biota |

| Attributes | Sampling | | Measurement Method | Remarks |
|---|---|---|---|---|
| | Network | Frequency | | |
| ▪ Enumeration of<br>▪ phytoplankton, zooplankton and benthos<br>▪ Fisheries<br>▪ Diversity indices<br>▪ Trophic levels<br>▪ Rare and endangered species<br>▪ Sanctuaries / closed areas / Coastal regulation zone (CRZ)<br>▪ Terrestrial<br>▪ Vegetation – species, list, economic importance, forest produce, medicinal value<br>▪ Importance value index (IVI) of trees<br>▪ Wild animals | and number of samples to be decided on established guidelines on ecological studies based on site eco-environment setting within 10/25 km radius from the proposed site<br>▪ Samples to collect from upstream and downstream of discharge point, nearby tributaries at down stream, and also from dug wells close to activity site | | and Wooten 1980) to be followed for sampling and measurement | ▪ One season for terrestrial biota, in addition to vegetation studies during monsoon season<br>▪ Preliminary assessment<br>▪ Microscopic analysis of plankton and meiobenthos, studies of macrofauna, aquatic vegetation and application of indices, viz. Shannon, similarity, dominance IVI etc<br>▪ Point quarter plot-less method (random sampling) for terrestrial vegetation survey. |
| **Avifauna**<br>▪ Rare and endangered species<br>▪ Sanctuaries / National park / Biosphere reserve | ▪ For forest studies, chronic as well as short-term impacts should be analyzed warranting data on micro climate conditions | | | ▪ Secondary data to collect from Government offices, NGOs, published literature<br>▪ Plankton net<br>▪ Sediment dredge<br>▪ Depth sampler<br>▪ Microscope<br>▪ Field binocular |
| **G. Socio Economic** | | | | |
| ▪ Demographic structure<br>▪ Infrastructure resource base<br>▪ Economic resource base<br>▪ Health status: Morbidity pattern<br>▪ Cultural and aesthetic attributes | ▪ Socio-economic survey is based on proportionate, stratified and random sampling method | ▪ Different impacts occurs during construction and operational phases of the project | ▪ Primary data collection through R&R surveys (if require) or community survey are based on personal interviews and questionnaire | ▪ Secondary data from census records, statistical hard books, toposheets, health records and relevant official records available with Govt. agencies |

* Project Specific concerned parameters needs to be identified by the project proponent and shall be incorporated in the draft ToR, to be submitted to the Authority for the consideration and approval by the EAC/SEAC.

## ANNEXURE XI
## Sources of Secondary Data

## Annexure XIA: Potential Sources of Data For EIA

| | Information | Source |
|---|---|---|
| | Air Environment | |
| 1. | Meteorology- Temperature, Rainfall, Humidity, Inversion, Seasonal Wind rose pattern (16 point compass scale), cloud cover, wind speed, wind direction, stability, mixing depth | ⑨ Indian Meteorology Department, Pune |
| 2. | Ambient Air Quality- 24 hourly concentration of SPM, RPM, $SO_2$, $NO_x$, CO | ⑨ Central Pollution Control Board (CPCB),<br>⑨ State Pollution Control Board (SPCB),<br>⑨ Municipal Corporations<br>⑨ Ministry of Environment and Forests (MoEF)<br>⑨ State Department of Environment (DoEN) |
| | Water Environment | |
| 3. | Surface water- water sources, water flow (lean season), water quality, water usage, Downstream water users<br>Command area development plan<br>Catchment treatment plan | ⑨ Central Water Commission (CWC),<br>⑨ Central Pollution Control Board (CPCB),<br>⑨ State Pollution Control Board (SPCB), Central Water and Power Research Institute (CWPRS), Pune<br>⑨ State Irrigation Department<br>⑨ Hydel Power generation organizations such as NHPC, State SEBs |
| 4. | Ground Water- groundwater recharge rate/withdrawal rate, ground water potential groundwater levels (pre monsoon, post monsoon), ground water quality, changes observed in quality and quantity of ground water in last 15 years | ⑨ Central Ground Water Board (CGWB)<br>⑨ Central Ground Water Authority (CGWA)<br>⑨ State Ground Water Board (SGWB)<br>⑨ National Water Development Authority (NWDA) |
| 5. | Coastal waters- water quality, tide and current data, bathymetry | ⑨ Department of Ocean Development, New Delhi<br>⑨ State Maritime Boards<br>⑨ Naval Hydrographer's Office, Dehradun<br>⑨ Port Authorities<br>⑨ National Institute of Oceanography (NIO), Goa |
| | Biological Environment | |
| 6. | Description of Biological Environment- inventory of flora and fauna in 7 km radius, endemic species, endangered species, Aquatic Fauna, Forest land, forest type and density of vegetation, biosphere, national parks, wild life sanctuaries, tiger reserve, elephant reserve, turtle nesting ground, core zone of biosphere reserve, habitat of migratory birds, routes of migratory birds | ⑨ District Gazetteers<br>⑨ National Remote Sensing Agency (NRSA), Hyderabad<br>⑨ Forest Survey of India, Dehradun<br>⑨ Wildlife Institute of India<br>⑨ World Wildlife Fund<br>⑨ Zoological Survey of India<br>⑨ Botanical Survey of India<br>⑨ Bombay Natural History Society, (BNHS), Mumbai<br>⑨ State Forest Departments<br>⑨ State Fisheries Department<br>⑨ Ministry of Environment and Forests<br>⑨ State Agriculture Departments<br>⑨ State Agriculture Universities |
| | Land Environment | |
| 7. | Geographical Information-Latitude, Longitude, Elevation ( above MSL) | ⑨ Toposheets of Survey of India, Pune<br>⑨ National Remote Sensing Agency (NRSA), Hyderabad<br>⑨ Space Application Centre (SAC), Ahmedabad |

| | Information | Source |
|---|---|---|
| 8. | Nature of Terrain, topography map indicating contours (1:2500 scale) | ⑨ Survey of India Toposheets<br>⑨ National Remote Sensing Agency (NRSA), Hyderabad<br>⑨ State Remote Sensing Centre,<br>⑨ Space Application Centre (SAC), Ahmedabad |
| 9. | Hydrogeology- Hydrogeological report (in case of ground water is used/area is drought prone/wastewater is likely to discharged on land)<br>Geomorphological analysis (topography and drainage pattern)<br>Geological analysis (Geological Formations/Disturbances- geological and structural maps, geomorphological contour maps, structural features, including lineaments, fractures, faults and joints)<br>Hydrogeological analysis (disposition of permeable formations, surface-ground water links, hydraulic parameter determination etc)<br>Analysis of the natural soil and water to assess pollutant absorption capacity | ⑨ NRSA, Hyderbad<br>⑨ Survey of India Toposheets<br>⑨ Geological Survey of India<br>⑨ State Geology Departments<br>⑨ State Irrigation Department<br>⑨ Department of Wasteland Development, Ministry of Rural Areas<br>⑨ National Water Development Authority (NWDA) |
| 10. | Nature of Soil, permeability, erodibility classification of the land | ⑨ Agriculture Universities<br>⑨ State Agriculture Department<br>⑨ Indian Council for Agriculture Research<br>⑨ State Soil Conservation Departments<br>⑨ National Bureau of Soil Survey and Landuse Planning<br>⑨ Central Arid Zone Research Institute (CAZRI), Jodhpur |
| 11. | Landuse in the project area and 10 km radius of the periphery of the project | ⑨ Survey of India- Toposheets<br>⑨ All India Soil and Landuse Survey; Delhi<br>⑨ National Remote Sensing Agency (NRSA), Hyderabad<br>⑨ Town and County Planning Organisation<br>⑨ State Urban Planning Department<br>⑨ Regional Planning Authorities (existing and proposed plans)<br>⑨ Village Revenue Map- District Collectorate<br>⑨ Directorate of Economics and Statistics-State Government<br>⑨ Space Application Centre, Ahmedabad |
| 12. | Coastal Regulation Zones- CRZMP, CRZ classification, Demarcation of HTL and LTL* | ⑨ Urban Development Department<br>⑨ State Department of Environment<br>⑨ State Pollution Control Board<br>⑨ Space Application Centre*<br>⑨ Centre for Earth Sciences Studies, Thiruvanthapuram*<br>⑨ Institute of Remote Sensing, Anna University Chennai*<br>⑨ Naval Hydrographer's Office, Dehradun*<br>⑨ National Institute of Oceanography, Goa*<br>⑨ National Institute of Ocean Technology, Chennai<br>⑨ Centre for Earth Science Studies |

* *Agencies authorized for approval of demarcation of HTL and LTL*

| | Information | Source |
|---|---|---|
| | Social | |
| 13. | Socioeconomic - population, number of houses and present occupation pattern within 7 km from the periphery of the project | ⑨ Census Department<br>⑨ District Gazetteers- State Government<br>⑨ District Statistics- District Collectorate<br>⑨ International Institute of Population Sciences, Mumbai (limited data)<br>⑨ Central Statistical Organisation |
| 14. | Monuments and heritage sites | District Gazetteer<br>Archeological Survey of India,<br>INTACH<br>District Collectorate<br>Central and State Tourism Department<br>State Tribal and Social Welfare Department |
| | Natural Disasters | |
| 15. | Seismic data (Mining Projects)- zone no, no of earthquakes and scale, impacts on life, property existing mines | ⑨ Indian Meteorology Department, Pune<br>⑨ Geological Survey of India |
| 16. | Landslide prone zone, geomorphological conditions, degree of susceptibility to mass movement, major landslide history (frequency of occurrence/decade), area affected, population affected | ⑨ Space Application Centre |
| 17. | Flood/cyclone/droughts- frequency of occurrence per decade, area affected, population affected | ⑨ Natural Disaster Management Division in Department of Agriculture and Cooperation<br>⑨ Indian Meteorological Department |
| | Industrial | |
| 18. | Industrial Estates/Clusters, Growth Centres | ⑨ State Industrial Corporation<br>⑨ Industrial Associations<br>⑨ State Pollution Control Boards<br>⑨ Confederation Indian Industries (CII)<br>⑨ FICCI |
| 19. | Physical and Chemical properties of raw material and chemicals (Industrial projects); fuel quality | ⑨ Material and Safety Data Sheets<br>⑨ ENVIS database of Industrial Toxicological Research Centre, Lucknow<br>⑨ Indian Institute Petroleum |
| 20. | Occupational Health and Industrial Hygiene- major occupational health and safety hazards, health and safety requirements, accident histories | ⑨ Central Labour Institute, Mumbai<br>⑨ Directorate of Industrial Safety<br>⑨ ENVIS Database of Industrial Toxicological Research Centre, Lucknow<br>⑨ National Institute of Occupational Health, Ahmedabad |
| 21. | Pollutant release inventories (Existing pollution sources in area within 10 km radius) | ⑨ Project proponents which have received EC and have commenced operations |
| 22. | Water requirement (process, cooling water, DM water, Dust suppression, drinking, green belt, fire service) | ⑨ EIA Reports<br>⑨ National and International Benchmarks |

## Annexure XIB: Summary of Available Data with Potential Data Sources for EIA

| | Agency | Information Available |
|---|---|---|
| 1. | Archaeological Survey of India<br>Department of Culture<br>Government of India<br>Janpath, New Delhi - 110011<br>Asi@del3.vsnl.net.in | ⑨ Inventory of monuments and sites of national importance- Listing and documentation of monuments according to world heritage, pre historic, proto historic and secular, religious places and forts |
| 2. | Botanical Survey Of India<br>P-8, Brabourne Road Calcutta 700001<br>Tel#033 2424922<br>Fax#033 2429330<br>Email: envis@cal2.vsnl.net.in. .<br><br>RO - Coimbatore, Pune, Jodhpur, Dehradun, Allahabad, Gantok, Itanagar, Port Blair | ⑨ Photodiversity documentation of flora at National, State and District level and flora of protected areas, hotspots, fragile ecosystems, sacred groves etc<br>⑨ Identification of threatened species including endemics, their mapping, population studies<br>⑨ Database related to medicinal plants, rare and threatened plant species<br>⑨ Red data book of Indian plants (Vol 1,2, and 3)<br>⑨ Manual for roadside and avenue plantation in India |
| 3. | Bureau of Indian Standards<br>Manak Bhawan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002<br>Tel#3230131, 3233375, 3239402 (10 lines)<br>Fax : 91 11 3234062, 3239399, 3239382<br>Email- bis@vsnal.com | ⑨ Bureau of Indian Standards Committees on Earthquake Engineering and Wind Engineering have a Seismic Zoning Map and the Wind Velocity Map including cyclonic winds for the country |
| 4. | Central Water Commission (CWC)<br>Sewa Bhawan, R.K.Puram<br>New Delhi - 110066<br>cmanoff@niccwc.delhi.nic.in<br><br>RO- Bangalore, Bhopal, Bhubaneshwar, Chandigarh, Coimbatore/Chennai, Delhi, Hyderabad, Lucknow, Nagpur, Patna, Shillong, Siliguri and Vadodara | ⑨ Central Data Bank -Collection, collation and Publishing of Hydrological, Hydrometeorological, Sediment and Water Quality data-.<br>⑨ Basin wise Master Plans<br>⑨ Flood atlas for India<br>⑨ Flood Management and Development and Operation of Flood Forecasting System- CWC operate a network of forecasting stations Over 6000 forecasts are issued every year with about 95% of the forecasts within the permissible limit.<br>⑨ Water Year Books, Sediment Year Books and Water Quality Year Books.<br>⑨ Also actively involved in monitoring of 84 identified projects through National, State and Project level Environmental Committees for ensuring implementation of environmental safeguards |
| 5. | Central Ground Water Board (HO) N.H.IV, New CGO Complex,<br>Faridabad - 121001<br>RO - Guwahati, Chandigarh, Ahemadabad, Trivandrum, Calcutta, Bhopal, Lucknow, Banglore, Nagpur, Jammu, Bhubneshwar, Raipur, Jaipur, Chennai, Hyderabad, Patna | ⑨ surveys, exploration, monitoring of ground water development |

[16] *Based on web search and literature review*

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| 6. | Central Pollution Control Board<br>Parivesh Bhawan, CBD-cum-Office Complex<br>East Arjun Nagar, DELHI - 110 032<br>INDIA<br>E-mail : cpcb@alpha.nic.in | ⑨ National Air Quality Monitoring Programme<br>⑨ National River Water Quality Monitoring Programme- Global Environment Monitoring , MINARS<br>⑨ Zoning Atlas Programme<br>⑨ Information on 17 polluting category industries (inventory, category wise distribution, compliance, implementation of pollution control programmes |
| 7. | Central Arid Zone Research Institute, Jodhpur<br>Email : cazri@x400.nicgw.nic.in<br><br>Regional Centre at Bhuj in Gujarat | ⑨ AGRIS database on all aspects of agriculture from 1975 to date<br>⑨ Also have cell on Agriculture Research Information System;<br>⑨ Working on ENVIS project on desertification<br>⑨ Repository of information on the state of natural resources and desertification processes and their control<br>⑨ The spectrum of activities involves researches on basic resource inventories; monitoring of desertification, rehabilitation and management of degraded lands and other areas |
| 8. | Central Inland Capture Fisheries Research Institute, Barrackpore-743101,<br>Tel#033-5600177<br>Fax#033-5600388<br>Email : cicfri@x400.nicgw.nic.in | ⑨ Data Base on<br>Ecology and fisheries of major river systems of India.<br>Biological features of commercially important riverine and estuarine fish species.<br>Production functions and their interactions in floodplain wetlands.<br>⑨ Activities - Environmental Impact Assessment for Resource Management ; Fisheries Resource surveys |
| 9. | Central Institute of Brackish Water Aquaculture<br>141, Marshalls Road, Egmore , Chennai - 600 008,<br>Tel# 044-8554866, 8554891,<br>Director (Per) 8554851<br>Fax#8554851, | ⑨ Repository of information on brackish water fishery resources with systematic database of coastal fishery resources for ARIS<br>⑨ Agricultural Research Information System (ARIS) database covers State wise data on soil and water quality parameters, land use pattern, production and productivity trends,<br>⑨ Social, economic and environmental impacts of aquaculture farming,<br>⑨ Guidelines and effluent standards for aquaculture farming |
| 10. | Central Marine Fisheries Research Institute (CMFRI), Cochin | ⑨ Assessing and monitoring of exploited and un-exploited fish stocks in Indian EEZ<br>⑨ Monitoring the health of the coastal ecosystems, particularly the endangered ecosystems in relation to artisanal fishing, mechanised fishing and marine pollution<br>⑨ The institute has been collecting data on the catch and effort and biological characteristics for nearly half a century based on scientifically developed sampling scheme, covering all the maritime States of the country<br>⑨ The voluminous data available with the institute is managed by the National Marine Living Resources Data Centre (NMLRDC) |
| 11. | Central Water and Power Research Station, Pune<br>Tel#020-4391801-14; 4392511; 4392825<br><br>Fax #020-4392004,4390189 | ⑨ Numerical and Physical models for hydro-dynamic simulations |
| 12. | Central Institute of Road Transport, Bhosari, Pune<br>411 026, India.<br>Tel : +91 (20) 7125177, 7125292, 7125493, 7125494 | ⑨ Repository of data on all aspects of performance of STUs and a host of other related road transport parameters |

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| 13. | Department of Ocean Development | ⑨ Assessment of environment parameters and marine living resources (primary and secondary) in Indian EEZ (Nodal Agency NIO Kochi)<br>⑨ Stock assessment, biology and resource mapping of deep sea shrimps, lobsters and fishes in Indian EEZ (Nodal agency-Fisheries Survey of India)<br>⑨ Investigations of toxical algal blooms and benthic productivity in Indian EEZ (Nodal agency- Cochin University of Science and technology)<br>⑨ Coastal Ocean Monitoring and Prediction System (COMAP) - monitoring and modelling of marine pollution along entire Indian coast and islands. Parameters monitored are temp, salinity, DO, pH, SS, BOD, inorganic phosphate, nitrate, nitrite, ammonia, total phosphorus, total nitrite, total organic carbon, petroleum hydrocarbons, pathogenic vibros, pathogenic E.coli, shigella, salmonella, heavy metals (Cd, Hg, Pb) and pesticide residues (DDT, BHC, Endosulfan). Monitoring is carried out along the ecologically sensitive zones and urban areas (NIO Mumbai- Apex coordinating agency).<br>⑨ Sea Level Measurement Programe (SELMAM)- sea level measurement at selected stations (Porbandar, Bombay, Goa, Cochin, Tuticorin, Madras, Machilipatnam, Visakhapatnam, Paradeep, Calcutta and Kavaratti (Lakshadweep Island)) along Indian coast and islands using modern tide gauges<br>⑨ Detailed coastal maps through Survey of India showing contour at 1/2 a metre interval in the scale of 1:25000. (Nellore- Machhalipatnam work already over)<br>⑨ Marine Data Centre (MDC) IMD for Ocean surface meteorology, GSI for marine geology, SOI for tide levels, Naval Hydrographic Office for bathymetry, NIO Goa for physical chemical and biological oceanography, NIO Mumbai for marine pollution, CMFRI for coastal fisheries, Institute of Ocean Management Madras for coastal geomorphology<br>⑨ DOD has setup Indian National Centre for Ocean Information Services (INCOIS) at Hyderabad for generation and dissemination of ocean data products (near real time data products such as sea surface temperature, potential fishing zones, upwelling zones, maps, eddies, chlorophyll, suspended sediment load etc). MDC will be integrated with INCOIS<br>⑨ Integrated Coastal and Marine Area Management (ICMAM) programme - GIS based information system for management of 11 critical habitats namely Pichavaram, Karwar, Gulf of Mannar, Gulf of Khambat, Gulf of Kutch, Malvan, Cochin, Coringa mangroves, Gahirmata, Sunderbans and Kadamat (Lakshadeep)<br>⑨ Wetland maps for Tamil Nadu and Kerala showing the locations of lagoons, backwaters, estuaries, mudflats etc (1:50000 scale)<br>⑨ Coral Reef Maps for Gulf of Kachch, Gulf of Mannar, Andaman and Nicobar and Lakshadeep Islands (1:50,000 scale) indicating the condition of corals, density etc |
| 14. | Environment Protection Training and Research Institute<br>Gachibowli, Hyderabad - 500 019,<br>India Phone: +91-40-3001241, 3001242, 3000489<br>Fax: +91-40- 3000361<br>E-mail: info@eptri.com | ⑨ Environment Information Centre- has appointed EPTRI as the Distributed Information Centre for the Eastern Ghats region of India.<br>EIC Collaborates with the Stockholm Environment Institute Sweden<br>Database on Economics of Industrial Pollution Prevention in India<br>Database of Large and Medium Scale Industries of Andhra Pradesh<br>Environmental Status of the Hyderabad Urban Agglomeration<br>Study on 'water pollution-health linkages' for a few Districts of A.P |

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| | | ⑨ Environment Quality Mapping<br>Macro level studies for six districts in the State of Andhra Pradesh<br>Micro level studies for two study zones presenting the permissible pollutant load and scoping for new industrial categories<br>Zonation of the IDA, Parwada which helped APIIC to promote the land for industrial development<br>Disaster management plan for Visakhapatnam Industrial Bowl Area |
| 15. | Forest Survey of India (FSI)<br>Kaulagarh Road, P.O., IPE<br>Dehradun - 248 195<br>Tel# 0135-756139, 755037, 754507<br>Fax # 91-135-759104<br>E-Mail : fsidir@nde.vsnl.net.in<br>fsihq@nde.vsnl.net.in<br><br>RO- Banglore, Calcutta, Nagpur and Shimla | ⑨ State of Forest Report (Biannual)<br>⑨ National Forest Vegetation Map (Biannual exercise) (on 1: 1 million scale)<br>⑨ Thematic mapping on 1:50,000 scale depicting the forest type, species composition, crown density of forest cover and other landuse National<br>⑨ Basic Forest Inventory System<br>⑨ Inventory survey of non forest area<br>⑨ Forest inventory report providing details of area estimates, topographic description, health of forest, ownership pattern, estimation of volume and other growth parameters such as height and diameter in different types of forest, estimation of growth, regeneration and mortality of important species, volume equation and wood consumption of the area studied |
| 16. | Geological Survey of India<br>27 Jawaharlal Nehru Road, Calcutta 700 016, India Telephone +91-33-2496941 FAX 91-33-2496956<br>gsi_chq@vsnl.com | ⑨ Environmental hazards zonation mapping in mineral sector<br>⑨ Codification of base line information of geo-environmental appreciation of any terrain and related EIA and EMP studies<br>⑨ Lineament and geomorphological map of India on 1:20,000 scale.<br>⑨ Photo-interpreted geological and structural maps of terrains with limited field checks. |
| 17. | Indian Council of Agriculture Research,<br>Krishi Bhawan, New Delhi,<br>Tel#011-338206<br><br>– ICAR complex, Goa- Agro metrology<br>– Central Arid Zone Research Institute- Agro forestry<br>– Central Soil salinity Research Institute,<br>– Indian Institute of Soil Science<br>– Central Soil and Water Conservation Research and Training Institute<br>– National Bureau of Soil Survey and Landuse Planning | ⑨ A total of 80,000 profiles at 10 kms grid across the country were analyzed to characterize the soils of India.<br>⑨ Detailed soil maps of the Country (1:7 million), State (1:250,000) and districts map (1:50,000) depicting extent of degradation (1:4.4 millions) have been prepared.<br>⑨ Thematic maps depicting soil depth, texture drainage, calcareousness, salinity, pH, slope and erosion have been published<br>⑨ Agro-climate characterization of the country based on moisture, thermal and sunshine regimes<br>⑨ Agro-ecological zones (20) and sub-zones (60) for the country were delineated based on physiography, soils, climate, Length of Growing Period and Available Water Content, and mapped on 1:4.4 million scale.<br>⑨ Digitization of physiography and soil resource base on 1:50,000 scale for 14 States have been completed.<br>⑨ .Soil fertility maps of N,P,K,S and Zn have also been developed<br>⑨ Water quality guidelines for irrigation and naturally occurring saline/sodic water<br>⑨ Calibration and verification of ground water models for predicting water logging and salinity hazards in irrigation commands |
| 18. | Indian Bureau of Mines<br>Indira Bhawan, Civil Lines Nagpur<br>Ph no - 0712-533 631,<br>Fax- 0712-533 041 | ⑨ National mineral inventory for 61 minerals and mineral maps<br>⑨ Studies on environmental protection and pollution control in regard to the mining and mineral beneficiation operations<br>⑨ Collection, processing and storage of data on mines, minerals and mineral-based industries, collection and maintenance of world mineral intelligence, foreign mineral legislation and other related matters |

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| 19. | Indian Meteorology Department<br>Shivaji nagar, Pune 41100<br><br>RO- Mumbai, Chennai, Calcutta, New Delhi, Nagpur, Guwahati | ⑨ Meteorological data<br>⑨ Background air quality monitoring network under Global Atmospheric Watch Programme (operates 10 stations)<br>⑨ Seismicity map, seismic zoning map; seismic occurrences and cyclone hazard monitoring; list of major earthquakes<br>⑨ Climatological Atlas of India , Rainfall Atlas of India and Agroclimatic Atlas of India<br>⑨ Monthly bulletin of Climate Diagnostic Bulletin of India<br>⑨ Environmental Meteorological Unit of IMD at Delhi to provide specific services to MoEF |
| 20. | INTACH<br>Natural Heritage, 71 Lodi Estate, New Delhi-110 003<br>Tel. 91-11-4645482, 4632267/9, 4631818, 4692774, 4641304 Fax : 91-11-4611290<br>E-mail : nh@intach.net | ⑨ Listing and documentation of heritage sites identified by municipalities and local bodies (Listing excludes sites and buildings under the purview of the Archaeological Survey of India and the State Departments of Archaeology) |
| 21. | Industrial Toxicology Research Centre<br>Post Box No. 80, Mahatma Gandhi Marg, Lucknow-226001,<br>Phone: +91-522-221856,213618,228227; Fax : +91-522 228227<br>Email: itrc@itrcindia.org | ⑨ Activities include health survey on occupational diseases in industrial workers, air and water quality monitoring studies, ecotoxicological impact assessment, toxicity of chemicals, human health risk assessment<br>⑨ Five databases on CD-ROM in the area of environmental toxicology viz: TOXLINE, CHEMBANK, POISINDEX, POLTOX and PESTBANK. The Toxicology Information Centre provides information on toxic chemicals including household chemicals<br>⑨ ENVIS centre and created a full-fledged computerized database (DABTOC) on toxicity profiles of about 450 chemicals |
| 22. | Indian Institute of Forest Management<br>Post Box No. 357, Nehru Nagar<br>Bhopal - 462 003<br>Phone # 0755-575716, 573799, 765125, 767851<br>Fax # 0755-572878 | ⑨ Consultancy and research on joint forest management (Ford Foundation, SIDA, GTZ, FAO etc) |
| 23. | Indian Institute of Petroleum<br>Mohkampur , Dehradun, India, 248005<br>0135- 660113 to 116<br>0135- 671986 | ⑨ Fuel quality characterisation<br>⑨ Emission factors |
| 24. | Ministry of Environment and Forest | ⑨ Survey of natural resources<br>⑨ National river conservation directorate<br>⑨ Environmental research programme for eastern and western ghats<br>⑨ National natural resource management system<br>⑨ Wetlands conservation programme- survey, demarcation, mapping landscape planning, hydrology for 20 identified wetlands National<br>⑨ wasteland identification programme |
| 25. | Mumbai Metropolitan Regional Development Authority | ⑨ Mumbai Urban Transport Project<br>⑨ Mumbai Urban Development Project<br>⑨ Mumbai Urban Rehabilitation Project<br>⑨ Information on MMR; statistics on councils and corporations Regional<br>⑨ Information Centre- Basic data on population, employment, industries and other sectors are regularly collected and processed |

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| 26. | Municipal Corporation of Greater Mumbai | ⑨ Air Quality Data for Mumbai Municipal Area<br>⑨ Water quality of lakes used for water supply to Mumbai |
| 27. | Ministry of Urban Development<br>Disaster Mitigation and Vulnerability Atlas of India<br><br>Building Materials & Technology Promotion Council<br>G-Wing,Nirman Bhavan, New Delhi-110011<br>Tel: 91-11-3019367<br>Fax: 91-11-3010145<br>E-Mail: bmtpc@del2.vsnl.net.in | ⑨ Identification of hazard prone area<br>⑨ Vulnerability Atlas showing areas vulnerable to natural disasters<br>⑨ Land-use zoning and design guidelines for improving hazard resistant construction of buildings and housing<br>⑨ State wise hazard maps (on cyclone, floods and earthquakes) |
| 28. | Natural Disaster Management Division in Department of Agriculture and Cooperation | ⑨ Weekly situation reports on recent disasters, reports on droughts, floods, cyclones and earthquakes |
| 29. | National Bureau Of Soil Survey & Land Use Planning<br>P.O. Box No. 426, Shankar Nagar<br>P.O., Nagpur-440010<br>Tel#91-712-534664,532438,534545<br>Fax#:91-712-522534<br><br>RO- Nagpur, New Delhi, Banglore, Calcutta, Jorhat, Udaipur | ⑨ NBSS&LUP Library has been identified as sub centre of ARIC (ICAR) for input to AGRIS covering soil science literature generated in India<br>⑨ Research in weathering and soil formation, soil morphology, soil mineralogy, physicochemical characterisation, pedogenesis, and landscape-climate-soil relationship.<br>⑨ Soil Series of India- The soils are classified as per Soil Taxonomy. The described soil series now belong to 17 States of the country.<br>⑨ Landuse planning- watershed management, land evaluation criteria, crop efficiency zoning<br>⑨ Soil Information system is developed state-wise at 1:250,000 scale. Presently the soil maps of all the States are digitized, processed and designed for final output both digital and hardcopy. The thematic layers and interpreted layers of land evaluation (land capability, land irrigability and crop suitability), Agro-Ecological Zones and soil degradation themes are prepared.<br>⑨ Districts level information system is developed for about 15 districts at 1: 50, 000 scale. The soil information will be at soil series level in this system.<br>Soil resource inventory of States, districts water-sheds (1:250,000; 1:50,000; 1:10,000/8000) |
| 30. | National Institute of Ocean Technology,<br>Velacherry-Tambaram main road<br>Narayanapuram<br>Chennai, Tamil Nadu<br>Tel#91-44-2460063 / 2460064/ 2460066/ 2460067<br>Fax#91-44-2460645 | ⑨ Waste load allocation in selected estuaries (Tapi estuary and Ennore creek) is one the components under the Integrated Coastal and Marine Area Management (ICMAM) programme of the Department of Ocean Development ICMAM is conducted with an IDA based credit to the Government of India under the Environmental Capacity Building project of MoEF (waste assimilation capacity of Ennore creek is over)<br>⑨ Physical oceanographic component of Coastal & Ocean monitoring Predictive System (COMAPS) a long term monitoring program under the Department of Ocean Development<br>⑨ Identification of suitable locations for disposal of dredge spoil using mathematical models & environmental criteria<br>⑨ EIA Manual and EIA guidelines for port and harbour projects |
| 31. | National Institute of Oceanography, Goa<br><br>RO- Mumbai, Kochi | ⑨ Coastal Ocean Monitoring and Predictions(COMAP)-Monitoring of coastal waters for physicochemical and biological parameters including petroleum hydrocarbons, trace metals, heavy metals, and biomass of primary (phytoplankton) and secondary (zooplankton, microbial and benthic organisms)<br>⑨ Marine Biodiversity of selected ecosystem along the West Coast of India |

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| 32. | National Botanical Research Institute,<br>Post Box No 436 Rana Pratap Marg<br>Lucknow- 226001,<br>Tel: (+91) 522 271031-35 Fax: (+91) 522 282849, 282881<br>Lucknow | ⑨ Dust filtering potential of common avenue trees and roadside shrubs has been determined, besides studies have also been conducted on heavy-metals accumulation potential of aquatic plants supposedly useful as indicators of heavy metal pollution in water bodies and capable of reducing the toxic metals from water bodies.<br>⑨ Assessment of bio-diversity of various regions of India |
| 33. | National Geophysical Research Institute, Uppal Road, Hyderabad<br>Telephone:0091-40-7171124,<br>FAX:0091-40-7171564 | ⑨ Exploration, assessment and management of ground water resources including ground water modelling and pollution studies |
| 34. | National Environmental Engineering Research Institute, Nagpur<br>RO- Mumbai, Delhi, Chennai, Calcutta, Ahmedabad, Cochin, Hyderabad, Kanpur | ⑨ National Air Quality Monitoring (NAQM) for CPCB<br>⑨ Database on cleaner technologies of industrial productions |
| 35. | National Hydrology Institute, Roorkee<br>RO- Belgaum (Hard Rock Regional Centre), Jammu (Western Himalayan Regional Centre), Guwahati (North Eastern Regional Centre), Kakinada (Deltaic Regional Centre), Patna (Ganga Plains North Regional Centre), and Sagar (Ganga Plains South) | ⑨ Basin studies, hydrometeorological network improvement, hydrological year book, hydrological modelling, regional flood formulae, reservoir sedimentation studies, environmental hydrology, watershed development studies, tank studies, and drought studies. |
| 36. | National Institute Of Urban Affairs, India Habitat Centre, New Delhi | ⑨ Urban Statistics Handbook |
| 37. | National Institute of Occupational Health<br>Meghaninagar, Ahmedabad<br><br>RO- Banglore, Calcutta | ⑨ epidemiological studies and surveillance of hazardous occupations including air pollution, noise pollution, agricultural hazards, industrial hazards in organised sectors as well as small scale industries, carcinogenesis, pesticide toxicology, etc<br>⑨ WHO collaborative centre for occupational health for South East Asia region and the lead institute for the international programme on chemical safety under IPCS (WHO) |
| 38. | NRSA Data Centre<br>Department of Space, Balanagar,<br>Hyderabad 500 037<br>Ph- 040-3078560<br>3078664<br>sales@nrsa.gov.in | ⑨ Satellite data products (raw data, partially processed (radiometrically corrected but geometrically uncorrected), standard data (radiometrically and geometrically corrected), geocoded data(1:50,000 and 1:25000 scale), special data products like mosaiced, merged and extracted) available on photographic (B?W and FCC in form of film of 240 mm X 240mm or enlargements/paper prints in scale varying between 1:1M and 1:12500 and size varying between 240mm and 1000mm) and digital media (CD-ROMs, 8 mm tapes) |
| 39. | Rajiv Gandhi National Drinking Water Mission | ⑨ Database for groundwater using remote sensing technology (Regional Remote Sensing Service Centre involved in generation of ground water prospect maps at 1:50,000 scale for the State of Kerala, Karnataka, AP, MP and Rajasthan for RGNDWM) |
| 40. | Space Application Centre<br>Value Added Services Cell (VASC)<br>Remote Sensing Application Area<br>Ahmedabad 380 053<br>079-676 1188 | ⑨ National Natural Resource Information System<br>⑨ Landuse mapping for coastal regulation zone (construction setback line) upto 1:12500 scale<br>⑨ Inventory of coastal wetlands, coral reefs, mangroves, seaweeds<br>⑨ Monitoring and condition assessment of protected coastal areas |

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| | Fax- 079-6762735 | ⑨ Wetland mapping and inventory<br>⑨ Mapping of potential hotspots and zoning of environmental hazards<br>⑨ General geological and geomorphological mapping in diverse terrain<br>⑨ Landslide risk zonation for Tehre area |
| 41. | State Pollution Control Board | ⑨ State Air Quality Monitoring Programme<br>⑨ Inventory of polluting industries<br>⑨ Identification and authorization of hazardous waste generating industries<br>⑨ Inventory of biomedical waste generating industries<br>⑨ Water quality monitoring of water bodies receiving wastewater discharges<br>⑨ Inventory of air polluting industries<br>⑨ Industrial air pollution monitoring<br>⑨ Air consent, water consent, authorization, environment monitoring reports |
| 42. | State Ground Water Board | |
| 43. | Survey of India | ⑨ Topographical surveys on 1:250,000 scales, 1:50,000 and 1:25,000 scales<br>⑨ Digital Cartographical Data Base of topographical maps on scales 1:250,000 and 1:50,000<br>⑨ Data generation and its processing for redefinition of Indian Geodetic Datum<br>⑨ Maintenance of National Tidal Data Centre and receiving/ processing of tidal data of various ports.<br>⑨ Coastal mapping along the Eastern coast line has been in progress to study the effect of submergence due to rise in sea-level and other natural phenomenon. Ground surveys have been completed for the proposed coastal region and maps are under printing.<br>⑨ District planning maps containing thematic information (135 maps) have been printed out of 249 maps covering half the districts of India. Districts planning maps for remaining half of the area are being processed by National Atlas and Thematic Mapping Organisation (NATMO) |
| 44. | Town and Country Planning Organisation | ⑨ Urban mapping - Thematic maps and graphic database on towns (under progress in association with NRSA and State town planning department) |
| 45. | Wildlife Institute of India Post Bag No. 18, Chandrabani Dehradun - 248 001, Uttaranchal<br>Tel#0135 640111 -15,<br>Fax#0135 640117<br>email : wii@wii . | ⑨ Provide information and advice on specific wildlife management problems.<br>⑨ National Wildlife Database |
| 46. | Zoological Survey of India<br>Prani Vigyan Bhawan<br>'M' Block, New Alipore<br>Calcutta - 700 053<br>Phone # 91-33-4786893, 4783383<br>Fax # 91-33-786893<br>RO - Shillong, Pune, Dehradun, Jabalpur, Jodhpur, Chennai, Patna, Hyderabad, Canning, Behrampur, Kozikode, Itanagar, Digha, Port Bliar, Solan | ⑨ Red Book for listing of endemic species<br>⑨ Survey of faunal resources |

# ANNEXURE XII
# Impact Prediction Tools

**Table 1: Choice of Models for Impact Prediction: Air Environment***

| Model | Application | Remarks |
|---|---|---|
| ISCST 3 | ▪ Appropriate for point, area and line sources<br>▪ Application for flat or rolling terrain<br>▪ Transport distance up to 50 km valid<br>▪ Computes for 1 hr to annual averaging periods | ▪ Can take up to 99 sources<br>▪ Computes concentration on 600 receptors in Cartesian on polar coordinate system<br>▪ Can take receptor elevation<br>▪ Requires source data, meteorological and receptor data as input. |
| AERMOD with AERMET | ▪ Settling and dry deposition of particles;<br>▪ Building wake effects (excluding cavity region impacts);<br>▪ Point, area, line, and volume sources;<br>▪ Plume rise as a function of downwind distance;<br>▪ Multiple point, area, line, or volume sources;<br>▪ Limited terrain adjustment;<br>▪ Long-term and short-term averaging modes;<br>▪ Rural or urban modes;<br>▪ Variable receptor grid density;<br>▪ Actual hourly meteorology data | ▪ Can take up to 99 sources<br>▪ Computes concentration on 600 receptors in Cartesian on polar coordinate system<br>▪ Can take receptor elevation<br>▪ Requires source data, meteorological and receptor data as input. |
| PTMAX | ▪ Screening model applicable for a single point source<br>▪ Computes maximum concentration and distance of maximum concentration occurrence as a function of wind speed and stability class | ▪ Require source characteristics<br>▪ No met data required<br>▪ Used mainly for ambient air monitoring network design |
| PTDIS | ▪ Screening model applicable for a single point source<br>▪ Computes maximum pollutant concentration and its occurrences for the prevailing meteorological conditions | ▪ Require source characteristics<br>▪ Average met data (wind speed, temperature, stability class *etc*.) required<br>▪ Used mainly to see likely impact of a single source |
| MPTER | ▪ Appropriate for point, area and line sources applicable for flat or rolling terrain<br>▪ Transport distance up to 50 km valid<br>▪ Computes for 1 hr to annual averaging periods<br>▪ Terrain adjustment is possible | ▪ Can take 250 sources<br>▪ Computes concentration at 180 receptors up to 10 km<br>▪ Requires source data, meteorological data and receptor coordinates |
| CTDM PLUS (Complex Terrain Dispersion Model) | ▪ Point source steady state model, can estimate hrly average concentration in isolated hills/ array of hills | ▪ Can take maximum 40 Stacks and computes concentration at maximum 400 receptors<br>▪ Does not simulate calm met conditions<br>▪ Hill slopes are assumed not to exceed 15 degrees<br>▪ Requires sources, met and terrain characteristics and receptor details |
| UAM (Urban Airshed Model) | ▪ 3-D grid type numerical simulation model<br>▪ Computes $O_3$ concentration short term episodic conditions lasting for 1 or 2 days resulting from NOx and VOCs<br>▪ Appropriate for single urban area having significant $O_3$ problems | ▪ |

| Model | Application | Remarks |
|---|---|---|
| RAM (Rural Airshed Model) | ▪ Steady state Gaussian plume model for computing concentration of relatively stable pollutants for 1 hr to 1 day averaging time<br>▪ Application for point and area sources in rural and urban setting | ▪ Suitable for flat terrains<br>▪ Transport distance less than 50 km. |
| CRESTER | ▪ Applicable for single point source either in rural or urban setting<br>▪ Computes highest and second highest concentration for 1hr, 3hr, 24hr and annual averaging times<br>▪ Tabulates 50 highest concentration for entire year for each averaging times | ▪ Can take up to 19 Stacks simultaneously at a common site.<br>▪ Unsuitable for cool and high velocity emissions<br>▪ Do not account for tall buildings or topographic features<br>▪ Computes concentration at 180 receptor, circular wing at five downwind ring distance 36 radials<br>▪ Require sources, and met data |
| OCD (Offshore and coastal Dispersion Model) | ▪ It determines the impact of offshore emissions from point sources on the air quality of coastal regions<br>▪ It incorporates overwater plume transport and dispersion as well as changes that occur as the plume crosses the shore line<br>▪ Most suitable for overwater sources shore onshore receptors are below the lowest shore height | ▪ Requires source emission data<br>▪ Require hrly met data at offshore and onshore locations like water surface temperature; overwater air temperature; relative humidity *etc*. |
| FDM (Fugitive Dust Model) | ▪ Suitable for emissions from fugitive dust sources<br>▪ Source may be point, area or line (up to 121 source)<br>▪ Require particle size classification max. up to 20 sizes<br>▪ Computes concentrations for 1 hr, 3hr, 8hr, 24hr or annual average periods | ▪ Require dust source particle sizes<br>▪ Source coordinates for area sources, source height and geographic details<br>▪ Can compute concentration at max. 1200 receptors<br>▪ Require met data (wind direction, speed, Temperature, mixing height and stability class)<br>▪ Model do not include buoyant point sources, hence no plume rise algorithm |
| RTDM (Rough Terrain Diffusion Model) | ▪ Estimates GLC is complex/rough (or flat) terrain in the vicinity of one or more co-located point sources<br>▪ Transport distance max. up to 15 km to up to 50 km<br>▪ Computes for 1 to 24 hr. or annual ave5rage concentrations | ▪ Can take up to 35 co-located point sources<br>▪ Require source data and hourly met data<br>▪ Computes concentration at maximum 400 receptors<br>▪ Suitable only for non reactive gases<br>▪ Do not include gravitational effects or depletion mechanism such as rain/ wash out, dry deposition |
| CDM(Climatol ogically<br><br>Dispersion Model) | ▪ It is a climatologically steady state GPM for determining long term (seasonal or annual)<br>▪ Arithmetic average pollutant concentration at any ground level receptor in an urban area | ▪ Suitable for point and area sources in urban region, flat terrain<br>▪ Valid for transport distance less than 50 km<br>▪ Long term averages: One month to one year or longer |
| PLUVUE-II (Plume Visibility Model) | ▪ Applicable to assess visibility impairment due to pollutants emitted from well defined point sources<br>▪ It is used to calculate visual range reduction | ▪ Require source characteristics, met data and receptor coordinates & elevation<br>▪ Require atmospheric aerosols |

| Model | Application | Remarks |
|---|---|---|
| | and atmospheric discoloration caused by plumes<br>▪ It predicts transport, atmospheric diffusion, chemical, conversion, optical effects, and surface deposition of point source emissions. | (back ground & emitted) characteristics, like density, particle size<br>▪ Require background pollutant concentration of $SO_4$, $NO_3$, NOx, $NO_2$, $O_3$, $SO_2$ and deposition velocities of $SO_2$, $NO_2$ and aerosols |
| MESO-PUFF II (Meso scale Puff Model) | ▪ It is a Gaussian, Variable trajectory, puff superposition model designed to account fro spatial and temporal variations in transport, diffusion, chemical transformation and removal mechanism encountered on regional scale.<br>▪ Plume is modeled as a series of discrete puffs and each puff is transported independently<br>▪ Appropriate for point and area sources in urban areas<br>▪ Regional scale model. | ▪ Can model five pollutants simultaneously (SO2, SO4, NOx, HNO3 and NO3)<br>▪ Require source characteristics<br>▪ Can take 20 point sources or 5 area source<br>▪ For area source – location, effective height, initial puff size, emission is required<br>▪ Computes pollutant concentration at max. 180 discrete receptors and 1600 (40 x 40) grided receptors<br>▪ Require hourly surface data including cloud cover and twice a day upper air data (pressure, temp, height, wind speed, direction)<br>▪ Do not include gravitational effects or depletion mechanism such as rain/ wash out, dry deposition |

**Table 2: Choice of Models for Impact Modeling: Noise Environment***

| Model | Application |
|---|---|
| FHWA (Federal Highway Administration) | Noise Impact due to vehicular movement on highways |
| Dhwani | For predictions of impact due to group of noise sources in the industrial complex (multiple sound sources) |
| Hemispherical sound wave propagation<br>Air Port | Fore predictive impact due to single noise source<br>For predictive impact of traffic on airport and rail road |

**Table 3: Choice of Models for Impact Modeling: Land Environment***

| Model | Application | Remarks |
|---|---|---|
| Digital Analysis Techniques | Provides land use / land cover distribution | |
| Ranking analysis for soil suitability criteria | Provides suitability criteria for developmental conversation activities | Various parameters viz. depth, texture, slope, erosion status, geomorphology, flooding hazards, GW potential, land use *etc*., are used. |

**Table 4: Choice of Models for Impact Modeling: Water Environment***

| Model | Application | Remarks |
|---|---|---|
| QUAL-II E | Wind effect is insignificant, vertical dispersive effects insignificant applicable to streams<br>Data required<br>Deoxygenation coefficients, re-aeration coefficients for carbonaceous, nitrogenous and benthic substances, dissolved oxygen deficit | Steady state or dynamic model |
| | The model is found excellent to generate water quality parameters<br>Photosynthetic and respiration rate of suspended and attached algae | |
| | Parameters measured up to 15 component can be simulated in any combination, e.g. ammonia, nitrite, nitrate, phosphorous, carbonaceous BOD, benthic oxygen demand, DO, coliforms, conservative substances and temperature | |
| DOSAG-3, USEPA: (1-D) RECEIV – II, USEPA | Water quality simulation model for streams & canal<br>A general Water quality model | Steady-state |
| Explore –I, USEPA | A river basin water quality model | Dynamic, Simple hydrodynamics |
| HSPE, USEPA | Hydrologic simulation model | Dynamic, Simple hydrodynamics |
| RECEIVE-II, USEPA | A general dynamic planning model for water quality management | |
| Stanford watershed model | This model simulates stream flows once historic precipitation data are supplied<br>The major components of the hydrologic cycle are modeled including interception, surface detention, overland inflow, groundwater, evapo-transpiration and routing of channel flows, temperature, TDS, DO, carbonaceous BOD coliforms, algae, zooplanktons, nitrite, nitrate, ammonia, phosphate and conservative substances can be simulated | |
| Hydrocomp model | Long-term meteorological and wastewater characterization data is used to simulate stream flows and stream water quality | Time dependant (Dynamic) |
| Stormwater Management model (SWMM) | Runoff is modeled from overland flow, through surface channels, and through sewer network Both combined and separate sewers can be modeled.<br>This model also enables to simulate water quality effects to stormwater or combined sewer discharges. This model simulates runoff resulting from individual rainfall events. | Time Dependent |
| Battelle Reservoir model | Water body is divided into segments along the direction of the flow and each segment is divided into number of horizontal layers. The model is found to generate excellent simulation of temperature and good prediction of water quality parameters.<br>The model simulates temperature, DO, total and | Two Dimensional multi-segment model |

| Model | Application | Remarks |
|---|---|---|
| | benthic BOD, phytoplankton, zooplankton, organic and inorganic nitrogen, phosphorous, coliform bacteria, toxic substances and hydrodynamic conditions. | |
| TIDEP (Turbulent diffusion temperature model reservoirs) | Horizontal temperature homogeneity Coefficient of vertical turbulent diffusion constant for charge of area with depth negligible coefficient of thermal exchange constant<br>Data required wind speed, air temperature, air humidity, net incoming radiation, surface water temperature, heat exchange coefficients and vertical turbulent diffusion coefficients. | Steady state model |
| BIOLAKE | Model estimates potential fish harvest from a take | Steady state model |
| Estuary models/ estuarial Dynamic model | It is simulates tides, currents, and discharge in shallow, vertically mixed estuaries excited by ocean tides, hydrologic influx, and wind action<br>Tides, currents in estuary are simulated | Dynamic model |
| Dynamic Water Quality Model | It simulates the mass transport of either conservative or non-conservative quality constituents utilizing information derived from the hydrodynamic model Bay-Delta model is the programme generally used.<br>Up to 10 independent quality parameters of either conservative or non-conservative type plus the BOD-DO coupled relationship can be handled | Dynamic model |
| HEC -2 | To compute water surface profiles for stead7y, gradually: varying flow in both prismatic & non-prismatic channels | |
| SMS | Lake circulation, salt water intrusion, surface water profile simulation model | Surface water Modeling system Hydrodynamic model |
| RMA2 | To compute flow velocities and water surface elevations | Hydrodynamic analysis model |
| RMA4 | Solves advective-diffusion equations to model up to six non-interacting constituents | Constituent transport model |
| SED2D-WES | Model simulates transport of sediment | Sediment transport model |
| HIVEL2D | Model supports subcritical and supercritical flow analysis | A 2-dimensional hydrodynamic model |
| MIKE-II, DHI | Model supports, simulations of flows, water quality, and sediment transport in estuaries, rives, irrigation systems, channels & other water bodies | Professional Engineering software package |

**Table 5: Choice of Models for Impact Modeling: Biological Environment***

| Name | Relevance | Applications | Remarks |
|---|---|---|---|
| **Flora** | | | |
| Sample plot methods | Density and relative density<br>Density and relative | Average number of individuals species per unit area<br>Relative degree to which a | The quadrant sampling technique is applicable in all types of plant communities and for the study of submerged, sessile (attached at the base) or |

| Name | Relevance | Applications | Remarks |
|---|---|---|---|
| | dominance | species predominates a community by its sheer numbers, size bulk or biomass | sedentary plants |
| | Frequency and relative frequency importance value | Plant dispersion over an area or within a community | Commonly accepted plot size:<br>0.1 $m^2$- mosses, lichens & other mat-like plants |
| | | Average of relative density, relative dominance and relative frequency | 0.1 $m^2$- herbaceous vegetation including grasses |
| | | | 10.20 $m^2$ – for shrubs and saplings up to 3m tall, and |
| | | | 100 $m^2$ – for tree communities |
| Transects & line intercepts methods | Cover | Ratio of total amount of line intercepted by each species and total length of the line intercept given its cover | This methods allows for rapid assessment of vegetation transition zones, and requires minimum time or equipment of establish |
| | Relative dominance | It is the ratio of total individuals of a species and total individuals of all species | Two or more vegetation strata can be sampled simultaneously |
| Plot-less sampling methods | Mean point plant<br>Mean area per plant | Mean point – plant distance<br>Mean area per plant | Vegetation measurements are determined from points rather than being determined in an area with boundaries |
| | Density and relative density | | Method is used in grass-land and open shrub and tree communities |
| | Dominance and relative dominance | | It allows more rapid and extensive sampling than the plot method |
| | Importance value | | Point- quarter method is commonly used in woods and forests. |
| **Fauna** | | | |
| Species list methods | Animal species list | List of animal communities observed directly | Animal species lists present common and scientific names of the species involved so that the faunal resources of the area are catalogued |
| Direct Contact Methods | Animal species list | List of animals communities observed directly | This method involves collection, study and release of animals |
| Count indices methods (Roadside and aerial count methods) | Drive counts<br>Temporal counts | Observation of animals by driving them past trained observers | Count indices provide estimates of animal populations and are obtained from signs, calls or trailside counts or roadside counts |
| | Call counts | Count of all animals passing a fixed point during some stated | These estimates, through they do not provide absolute population |

| Name | Relevance | Applications | Remarks |
|---|---|---|---|
| | | interval of time | numbers, Provide an index of the various species in an area |
| | | | Such indices allow comparisons through the seasons or between sites or habitats |
| Removal methods | Population size | Number of species captured | Removal methods are used to obtain population estimates of small mammals, such as, rodents through baited snap traps |
| Market capture methods | Population size estimate (M) | Number of species originally marked (T)<br>Number of marked animals recaptured (t) and total number of animals captured during census (n)<br>N = nT/t | It involves capturing a portion of the population and at some later date sampling the ratio of marked to total animals caught in the population |

**Table 6: Choice of Models for Impact Predictions: Socio-economic Environment***

| Relevance | | |
|---|---|---|
| **Name** | **Application** | **Remarks** |
| Extrapolative Methods | A prediction is made that is consistent with past and present socio-economic data, e.g. a prediction based on the linear extrapolation of current trends | |
| Intuitive Forecasting (Delphi techniques) | Delphi technique is used to determine environmental priorities and also to make intuitive predictions through the process of achieving group consensus | Conjecture Brainstorming Heuristic programming Delphi consensus |
| Trend extrapolation and correlation | Predictions may be obtained by extrapolating present trends Not an accurate method of making socio-economic forecasts, because a time series cannot be interpreted or extrapolated very far into the future with out some knowledge of the underlying physical, biological, and social factors | Trend breakthrough precursor events correlation and regression |
| Metaphors and analogies | The experience gained else where is used to predict the socio-economic impacts | Growth historical simulation commonsense forecasts |
| Scenarios | Scenarios are common-sense forecasts of data. Each scenario is logically constructed on model of a potential future for which the degrees of "confidence" as to progression and outcome remain undefined | Common-sense |
| Dynamic modeling (Input- Out model) | Model predicts net economic gain to the society after considering all inputs required for conversion of raw materials along with cost of finished product | |
| Normative Methods | Desired socio-economic goals are specified and an attempt is made to project the social environment backward in time to the present to examine whether existing or planned resources and | Morphological analysis technology scanning contextual mapping<br>- functional array |

| Relevance | | |
|---|---|---|
| **Name** | **Application** | **Remarks** |
| | environmental programmes are adequate to meet the goals | - graphic method<br>Mission networks and functional arrays decision trees & relevance trees matrix methods scenarios |

*** NOTE:** (i) If a project proponent prefer to use any model other than listed, can do so, with prior concurrence of concerned appraisal committee. (ii) Project-specific proposed prediction tools need to be identified by the project proponent and shall be incorporated in the draft ToR to be submitted to the Authority for the consideration and approval by the concerned EAC/SEAC.

## ANNEXURE XIII

## Form through which the State Governments/Administration of the Union Territories Submit Nominations for SEIAA and SEAC for the Consideration and Notification by the Central Government

| Form for Nomination of a professional/expert as Chairperson / Member / Secretary of the SEIAA / EAC / SEAC | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Name (in block letters) | | | | | |
| 2 | Address for communication | | | | | |
| 3 | Age & Date of Birth<br>(Shall be less than 67 years for the members and 72 years for the Chairman) | | | | | |
| 4 | Area of Expertise (As per Appendix VI) | | | | | |
| 5 | Professional Qualifications (As per Appendix VI) | Qualification(s) | | University | Year of passing | Percentage of marks |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| 6 | Work experience<br><br>(High light relevant experience as per Appendix VI) | Position | Years of association | | | Nature of work. If required, attach separate sheets |
| | | | From | to | Period in years | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| 7 | Present position and nature of job | Serving Central / State Government Office? | | | Yes/No | |
| | | Engaged in industry or their associations? | | | Yes/No | |
| | | Associated with environmental activism? | | | Yes/No | |
| | | If no is the answer for above three, please specify the present position and name of the organization | | | | |
| 8 | Whether experienced in the process of prior environmental clearance? | Yes/No.<br>If yes, please specify the experience in a separate sheet (Please restrict to 500 words) | | | | |
| 9 | Whether any out-standing expertise has been acquired? | Yes/ No<br>If yes, please provide details in a separate sheet (Please restrict to 500 words). | | | | |
| 10 | Any other relevant information? | May like to attach separate sheets (Research projects, consultancy projects, publications, memberships in associations, trainings undergone, international exposure cum experience etc.) | | | | |

**The Government of……is pleased to forward the Nomination of Dr./Sh. ……..…. for the position of Chairperson / Member / Secretary of the SEIAA / SEAC / EAC to the Ministry of Environment & Forests, the Government of India for the Notification.**

**(Authorized Signature with Seal)**

## ANNEXURE XIV
## Composition of EAC/SEAC

## Composition of the EAC/SEAC

The Members of the EAC shall be Experts with the requisite expertise and experience in the following fields /disciplines. In the event that persons fulfilling the criteria of "Experts" are not available, Professionals in the same field with sufficient experience may be considered:

- Environment Quality Experts: Experts in measurement/monitoring, analysis and interpretation of data in relation to environmental quality
- Sectoral Experts in Project Management: Experts in Project Management or Management of Process/Operations/Facilities in the relevant sectors.
- Environmental Impact Assessment Process Experts: Experts in conducting and carrying out Environmental Impact Assessments (EIAs) and preparation of Environmental Management Plans (EMPs) and other Management plans and who have wide expertise and knowledge of predictive techniques and tools used in the EIA process
- Risk Assessment Experts
- Life Science Experts in floral and faunal management
- Forestry and Wildlife Experts
- Environmental Economics Expert with experience in project appraisal

## ANNEXURE XV

## Best Practices available and reference

# Best Practices available and reference

**General storage guidelines:**

Items should be isolated and stored in accordance with guidance provided on its container or packaging. It should not be put into use until satisfactory user information is provided. Containers and packages should be stowed closed and the storage location kept clean and tidy.

**Guidance on the storage of Liquefied Gases:**

• Pressurised receptacles should be suitably protected against physical damage from other cargo, stores or equipment.
• Pressurised receptacles should not be over-stowed with other heavy goods or other items.
• Pressurised receptacles should be stowed in such a position that the safety relief device is in contact with the vapour space within the receptacle.
• Valves should be protected against any form of physical damage with a suitable protection cap in place at all times when the cylinder is not in use.
• Cylinders should be in compartments or holds capable of being ventilated and away from accommodation and working areas and all sources of heat.
• Oxygen cylinders should be stowed separately from flammable gas cylinders.
• Temperatures should be kept down and hold temperatures should not be permitted to rise above 50ºC. Hold temperatures should be checked constantly and, if they approach this level, the storage locations should be ventilated.

**Containers for Hazardous Waste**:

1. Chemicals for disposal must be placed in a sealed container, preferably with a screw type cap. Containers with cracked or corroded caps, paraffin, rubber, cork, or glass stoppers are not acceptable.

2. Corrosives and halogenated solvents should not be stored in metal cans. Metal cans are preferable for flammable liquids.

3. Glass bottles should stand in a suitable secondary container such as a tray or plastic bucket.

4. Containers must be clearly marked with a WASTE label, appropriate hazard warning label, and labeled as to contents.

5. The outside of all containers must be free of any chemical residue.

6. Larger quantities of solid materials such as pesticides may be disposed of in bags, provided that they are double-bagged and the outside bag is clear plastic.

7. Combine partially full containers of compatible waste so that containers are full whenever possible.

8. Place small amounts of waste in small containers. Waste containers cannot exceed 5 gallons for liquids and 50 pounds for solids. Small vials may be over packed in a larger glass container.

**Short Term Storage of Hazardous waste**:

1. Waste should be stored in an assigned storage area that is cool, dry, well ventilated, and out of direct sunlight. Chemicals that may react together should be separated. A common and unsafe practice is to store all waste together. This practice may cause explosions, or the release of toxic vapors. Waste should be stored according to chemical class.

2. Toxic chemicals should be stored away from fire hazards, heat, and moisture, and isolated from acids, corrosives, and reactive chemicals. Special care should be taken to ensure that toxic chemicals are not released into the environment. Highly toxic chemicals should be stored in a hood in unbreakable secondary containers.

3. Corrosive chemicals should not be stored with combustibles, flammables, organics, or reactives. Acid and bases should not be stored together. Organic acids should be separated from sulfuric, nitric, perchloric acid and other strong oxidizers.

4. Flammable liquids should not be stored near exits, sources of heat, ignition, or near strong oxidizing agents, explosives, or reactives. Smoking is prohibited in storage areas. Storage areas should be adequately ventilated to prevent vapor build up. Proper fire extinguishers should be readily available. Metal dispensing and receiving containers should be grounded and bonded together by a suitable conductor to prevent static sparks. Storage in laboratories is limited to 10 gallons outside of flammable storage cabinets or approved safety cans. Storage in glass containers is limited to 1 pint for Class IA liquids and 1 quart for Class IB liquids.

5. Reactive chemicals should be protected from shock, heat, ignition sources, and rapid temperature changes. Containers should be separated from corrosives, flammables, organic materials, toxins, and oxidizers. Water reactive chemicals should be separated from sprinkler systems, emergency showers, eyewash stations and other water sources. Keep containers well sealed. Store water reactives under an inert non-flammable solvent. Reactive wastes shall be isolated and reported to the Safety Manager for immediate removal or special handling by the hazardous waste disposal firm.

6. Ethers, picric acid, and perchloric acid that have deteriorated in storage present potential explosion hazards. Ethers older than one year and picric acid and perchloric acid with visible crystal formation should not be touched or opened.

**Sources:**

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