जहाँ है हरियाली ।
वहाँ है खुशहाली ।।

Ministry of Environment & Forests
GOVERNMENT OF INDIA, NEW DELHI

Environmental Impact Assessment Guidance Manual for BUILDING, CONSTRUCTION, TOWNSHIPS and AREA DEVELOPMENT PROJECTS

Prepared by

Administrative Staff College of India
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February 2010

Environmental
Impact Assessment Guidance Manual
for

Building, Construction, Townships and Area Development

Foreword

The EIA Notification 2006 not only reengineered the entire EC process specified under the EIA Notification 1994 but also highlighted the need to introduce specific sectors/categories under the sectors such as Industry and Infrastructure and also introduced new sectors such as Construction to be brought in the ambit of the EC process based on their extent of impacts on environment. The EIA Notification 2006 has notified 39 developmental sectors, which require prior environmental clearance. Based on the capacity, the Projects have been categorised into Category A or B which has been further categorised as B1 or B2. The Ministry of Environment and Forests (MOEF) has so far constituted 25 State level Environmental Impact Assessment Authorities (SEIAs) and State Expert Appraisal Committees (SEACs) to appraise B category projects.

The need for Sector specific manuals and guidelines for appraisal of projects under the EIA Notification 2006 has been felt for some time with a view to bringing clarity in the EC process consists of Screening, Scoping, Public Consultation and Appraisal for the purpose of granting and expediting environmental clearance. This need was further reinforced after the constitution of various SEIAs and SEACs in the various States, who were assigned this task for the first time. It was also felt that Manuals on each Sector would help in standardisation of the quality of appraisal and in reducing inconsistencies between SEACs/SEIAAs in granting ECs for similar projects in different States.

The MOEF at the first instance decided to bring out EIA Sector Specific Manuals for 37 developmental projects and the preparation of EIA Manuals of ten of these Sectors was assigned to Administrative Staff College of India (ASCI), Hyderabad.

1. Mining
2. Mineral Beneficiation
3. Ports & Harbours
4. Airports
5. (A) Building Construction
5. (B) Townships
6. Asbestors
7. Highways
8. Coal Washery
9. Aerial Ropeways
10. Nuclear Power Plants, Nuclear Fuel Processing Plants and Nuclear Waste Management Plants

The Manual for the sectors contain Model TOR of that Sector, technological options and processes for a cleaner production and waste minimisation, wherever applicable, monitoring of environmental quality, related regulations, and procedure of obtaining EC if linked to other clearances for eg., CRZ, etc.

The draft Manuals were uploaded on the MOEF website and comments/responses received were considered and finalised. Since the environmental clearance process itself is a dynamic one dependent on developmental needs, technologies available and standards for cleaner environment for a sustainable development, these manuals would require regular updation in the future. I hope the Manuals in their present form are of use and we would appreciate receiving responses from various stakeholders for further improvements that could be taken up in the future.

I congratulate the entire team in the Administrative Staff College of India, Hyderabd, experts of the sectors who were involved in the preparation of the Manuals, members of the Core and Peer Committees of various sectors and various Resource persons whose inputs were indeed valuable in the preparation and finalisation of the Manuals.

(JAIRAM RAMESH)
MINISTER OF STATE FOR ENVIROMENT & FORESTS

5th May 2010

Siripurapu K. Rao
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DIRECTOR GENERAL

asci
Leadership through Learning

Acknowledgements

Environmental Impact Assessment (EIA) is a planning tool generally accepted as an integral component of sound decision-making. EIA is to give the environment its due place in the decision-making process by clearly evaluating the environmental consequences of the proposed activity before action is taken. Early identification and characterization of critical environmental impacts allow the public and the government to form a view about the environmental acceptability of a proposed developmental project and what conditions should apply to mitigate or reduce those risks and impacts.

Environmental Clearance (EC) for certain developmental projects has been made mandatory by the Ministry of Environment & Forests through its Notification issued on 27.01.1994 under the provisions of Environment (Protection) Act, 1986. Keeping in view a decade of experience in the Environmental Clearance process and the demands from various stakeholders, the Ministry of Environment and Forests (MoEF) issued revised Notification on EC process in September 2006 and amended it in December 2009.It was considered necessary by MoEF to make available EIA guidance manuals for each of the development sector.

Accordingly, at the instance of the MoEF, the Administrative Staff College of India, with the assistance of experts, undertook the preparation of sector specific Terms of Reference (TOR) and specific guidance manual for **Building, Construction, townships and area development projects**. I wish to thank **Mr. J. M. Mauskar,** IAS, Additional Secretary, Govt. of India MoEF for his continuing support during the preparation of the manuals. I wish to place on record also my sincere thanks to **Dr. B. Sengupta**, former Member Secretary, Central Pollution Control Board and Chairman of the Core Committee for his help in the preparation of the manuals. His suggestions helped us a great deal in improving the technical quality of the manuals. **Mr M. Parabrahmam**, Former advisor MoEF and Chairman of the Peer Committee II for this project, has given constant guidance to the ASCI project team. His vast experience has been immensely helpful in preparing these manuals. I would like to thank the officials of the Ministry, **Dr. Nalini Bhat** and **Dr. T. Chandini,** for coordinating the project from the Ministry side and for providing guidance whenever needed. My thanks are also due to **Dr. Bharat Bhushan** and **Dr. A. Senthil Vel** of MoEF for the valuable inputs they had given during our interactions with the Officials at Delhi and Hyderabad.

I thank **Dr. I. V. Murali Krishna**, Professor and Former Director R&D JNT University, resource person, who, drawing on his vast experience in the sector, prepared the EIA guidance manual on **Building, Construction, townships and area development projects** along with **Dr. Valli Manickam**, Member of Faculty of ASCI. The efforts put in by both of them are commendable.

I would like to thank all the Peer and Core Committee members for having given a valuable feed back in the preparation of the manual. I hope the manuals would prove to be useful to the community at large and to the experts working in this area in particular.

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S.K. Rao

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ABBREVIATIONS

ADA	-	Area Development Authority
ASCI	-	Administrative Staff College of India
BUD	-	Built up area
CGWB	-	Central Ground Water Board
CPCB	-	Central Pollution Control Board
CRZ	-	Coastal Regulation Zone
CSR	-	Corporate Social Responsibility
CTP	-	Chief Town Planner DP Development Plan
DMP	-	Disaster Management Plan
DP	-	Development Plan
EAC	-	Expert Appraisal Committee
EC	-	Environmental Clearance
ECS	-	Equivalent Car Space
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
ETP	-	Effluent Treatment Plant
FSI	-	Floor Space Index
GRIHA	-	Green Rating for Integrated Habitat Assessment
IA	-	Impact Assessment
LPCD	-	Liters Per Capita Per Day
MLD	-	Million Liters Per Day
MoEF	-	Ministry of Environment and Forests
MSL	-	Mean Sea level
NDC	-	National Development Council
O & M	-	Operation and Maintenance
R O	-	Regional offices
R&R	-	Rehabilitation and Resettlement
SPCBs	-	State Pollution Control Boards
STP	-	Sewage Treatment Plant
TCPO	-	Town and Country Planning Department
TOR	-	Terms of Reference
UPDFI	-	Urban Development Plans Formulation and Implementation

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ABOUT THE MANUAL

Environmental Impact Notification S.O.1533 (E), dt.14th September 2006,as amended 2009, issued under Environment (Protection) Act 1986, has made it mandatory to obtain environmental Environmental Impact Notification S.O.1533 (E), dt.14th September 2006,as amended 2009, issued under Environment (Protection) Act 1986, has made it mandatory to obtain environmental clearance for scheduled development projects. The notification has classified projects under two categories 'A' & 'B'. Category A projects (including expansion and modernization of existing projects) require clearance from Ministry of Environment and Forest (MoEF), Govt. of India (GoI) and for category B from State Environmental Impact Assessment Authority (SEIAA), constituted by Government of India.

The existing manual on Environmental Impact Assessment (EIA) of MoEF, is common for all the sectors requiring prior environmental clearance. Considering the diversity in all sectors related to infrastructure and industrial development projects, MoEF launched a program for development of sector specific technical EIA guidance manuals. The EIA guidance manual will help the project proponent/consultant in the preparation of the EIA report. It also helps the regulatory authority to review the report as well as the public to become aware of the related environmental issues. This EIA guidance manual accordingly addresses the related environmental concerns for the specific sector - **"Building, Construction, Townships and Area Development Projects".** This manual consists of terms of reference (TOR), manual and questionnaire.

The sector specific manual consists of eleven chapters, which correspond to the generic structure given as per EIA notification 2006, as amended Dec 2009.

The manual is given in two sections - Section A and Section B.

Section A of this manual describes issues to be addressed for environmental clearances in building and construction projects as defined in the item 8 (a) of the EIA notification 2006.

Section B gives details with issues related to Townships and area development projects as defined in the item 8 (b) of the EIA notification 2006.

The chapter headings are the same in each section but specific issues are discussed in the respective sections.

Chapter 1: Introduction

This chapter contains the general information on the building sector, major sources of environmental impact in respect of building, construction, townships and area development projects and details of the environmental clearance process.

Chapter 2: Project Description

In this chapter the proponent should furnish detailed description of the proposed project, such as the type of the project, need for the project, project location, land availability, utilities (power and water supply) and infrastructure facilities such as roads and other requirements. The project implementation schedule, estimated cost of development should also be included.

Chapter 3: Description of Environment

This chapter should cover baseline data in the project area and study area.

Chapter 4: Impact Analysis and Mitigation Measures

This chapter describes the anticipated impact on the environment and mitigation measures. The method of assessment of impact including studies carried out, modelling techniques adopted to assess the impact where pertinent should be elaborated in this chapter. It should give the details of the impact on the baseline parameters, both during the construction and operational phases and suggests the mitigation measures to be implemented by the proponent.

Chapter 5: Analysis of Alternatives (Technology and Site)

This chapter includes the options, details of the alternatives of materials that are to be used in building construction and the energy conservation methods to be adopted. The various details regarding the transportation sector, road connectivity, link facilities, parking details etc. are to be discussed in this chapter.

Chapter 6: Environmental Monitoring Program

This chapter should cover the planned environmental monitoring program. It should also include the technical aspects of monitoring the effectiveness of mitigation measures.

Chapter 7: Additional Studies

This chapter should cover the details of the additional studies required in addition to those specified in the ToR and which are necessary to cater to more specific issues applicable to the particular project.

Chapter 8: Project Benefits

This chapter should cover the benefits accruing to the locality, neighbourhood, region and nation as a whole. It should bring out details of benefits by way of improvements in the physical infrastructure, social infrastructure, employment potential and other tangible benefits.

Chapter 9: Environmental Management Plan

This chapter should comprehensively present the Environmental Management Plan (EMP), which includes the administrative and technical setup, summary matrix of EMP, the cost involved to implement the EMP, both during the construction and operational phase and provisions made towards the same in the cost estimates of project construction and operation. This chapter should also describe the proposed post-monitoring scheme as well as inter-organizational arrangements for effective implementation of the mitigation measures.

Chapter 10: Summary and Conclusions

This chapter gives the summary of the full EIA report condensed to ten A-4 size pages at the maximum. It should provide the overall justification for implementation of the project and should explain how the adverse effects have been mitigated.

Chapter 11: Disclosure of Consultants

This chapter should include the names of the consultants engaged with their brief resume and nature of consultancy rendered.

The contents of the manual are to be considered as version 1.0 (2010). The ministry as per the requirements will take up an updating/revision of the manual. In case of interpretation of any question related to law, the provisions of the original laws and the Rules made thereunder with various Government directions/resolutions will have to be read and followed. In case of amendment to the original Act/Rules/Notifications made thereunder, the provisions as amended from time to time shall be applicable. Any obligations of international conventions, where GoI is a signatory and accepted for implementation are also to be followed.

Section A

BUILDING AND CONSTRUCTION PROJECTS

1

INTRODUCTION

1.0 Preamble

This section of the manual provides information and guidance on Environmental Impact Assessment (EIA) in building construction projects. It is intended as a resource for those who are involved in EIA practice. Particular emphasis is given to concepts, procedures and tools that are used currently or are potentially relevant in preparing environmental impact assessment reports for clearance from regulatory agencies. EIA is a technical exercise, to predict environmental impacts, assess their significance, and provide recommendations for their mitigation. EIA report covers a wide range of technical disciplines and covers areas such as noise and vibration, air quality, ecology, contamination, water quality & hydrology, archaeology & cultural heritage, landscape & visual character, sustainability and socio-economics. The EIA report will describe how the project has been improved through the EIA process and what alternatives were considered.

1.1 General Information on Building Construction

Construction activities in India have been pursued without giving much attention on environmental issues. This has resulted in pressure on its finite natural resources. Unplanned and unsustainable urban development has lead to severe environmental pressures. The green cover, ground water resources have been forced to give way to the rapidly developing urban centres. Modern buildings built in our cities have high levels of energy consumption because of requirements of air-conditioning and lighting. In this scenario it is necessary to critically access the utilization of natural resources in these activities.

Approximately 50 percent of the energy use in buildings is devoted to producing an artificial indoor climate through heating, cooling, ventilation, and lighting. Water conservation and efficiency programs have begun to lead to substantial decreases in the use of water within buildings. Studies have shown that water-efficient appliances and fixtures can reduce consumption by up to 30 percent or more. As demand on water increases with urban growth, the economic impact of water conservation and efficiency will increase proportionately. Water efficiency not only can lead to substantial water savings, but it also can reduce the requirement for expansion of water treatment facilities.

The building industry is slowly beginning to recycle its waste but there is need to achieve significant waste reductions through more reuse of building material and adaptation, as opposed to demolition.

Conventional buildings often fail to consider the interrelationship among building siting, design elements, energy and resource constraints, building systems, and building function. Green buildings, through an integrated design approach, take into consideration the effect these factors have on one another. Climate and building orientation, design factors such as daylighting

opportunities, and building envelope and system choices, as well as economic guidelines and occupant activities, are all factors that need to be considered in an integrated approach.

Application of new building concepts can yield for savings during the construction process. Measures that are relatively easy to implement can result in savings to natural resources in the following areas:

- Lower energy costs, by monitoring usage, installing energy-efficient lamps and fixtures, and using occupancy sensors to control lighting fixtures;
- Lower water costs, by monitoring consumption and reusing stormwater and/or construction wastewater where possible;
- Lower site-clearing costs, by minimizing site disruption and movement of earth and installation of artificial systems;
- Lower landfill dumping fees and associated hauling charges, through reuse and recycling of construction and demolition debris;
- Lower materials costs, with more careful purchase and reuse of resources and materials;
- Possible earnings from sales of reusable items removed during building demolition; and

1.2 Environmental Clearance Process

The objective of the EIA Notification, 2006 is to set procedures of environmental clearance before establishment of identified nature and size. The suitability of site for a proposed development is one of primary concerns in according environmental clearance to a project.

The applicant will have to furnish, along with the application, in addition to Form 1 and the supplementary Form 1A, a copy of the conceptual plan. The details of the categories mentioned in the given schedule are as follows:

Project or Activity		Category with threshold limit - B Category	General Conditions
8.	**Building /Construction projects/Area Development projects and Townships**		
8(a)	Building and Construction projects	≥20000 sq.mtrs and <1,50,000 sq.mtrs. of built-up area#	"Any project or activity specified in Category 'B' will be treated as Category 'A' if located in whole or in part within 10 km from the boundary of: (i) Protected areas notified under the Wildlife

8(b)	Townships and Area Development projects.	Covering an area ≥ 50 ha and or built up area ≥1,50,000 sq .mtrs ++	(Protection) Act, 1972; (ii) Critically polluted areas as identified by the Central Pollution Control Board from time to time; (iii) Eco-sensitive areas as notified under section 3 of the Environment (Protection) Act, 1986, such as, Mahabaleswar Panchangi, Matheran, Pachmarhi, Dahanu, Doon Valley and (iv) inter-state boundaries and international boundaries. Provided that the requirement regarding distance of 10km of the inter-state boundaries can be reduced or completely done away with by an agreement between the respective states or U.Ts sharing the common boundary in the case the activity does not fall within 10 kilometers of the areas mentioned at item (i), (ii) and (iii) above
#(built up area for covered construction; in the case of facilities open to the sky, it will be the activity area)			
++All projects under Item 8(b) shall be appraised as Category B1			

This section of the manual addresses the important issues to be discussed in the environmental impact assessment of building construction projects. Fig.1 shows the EIA clearance process for the building construction, townships and area development projects.

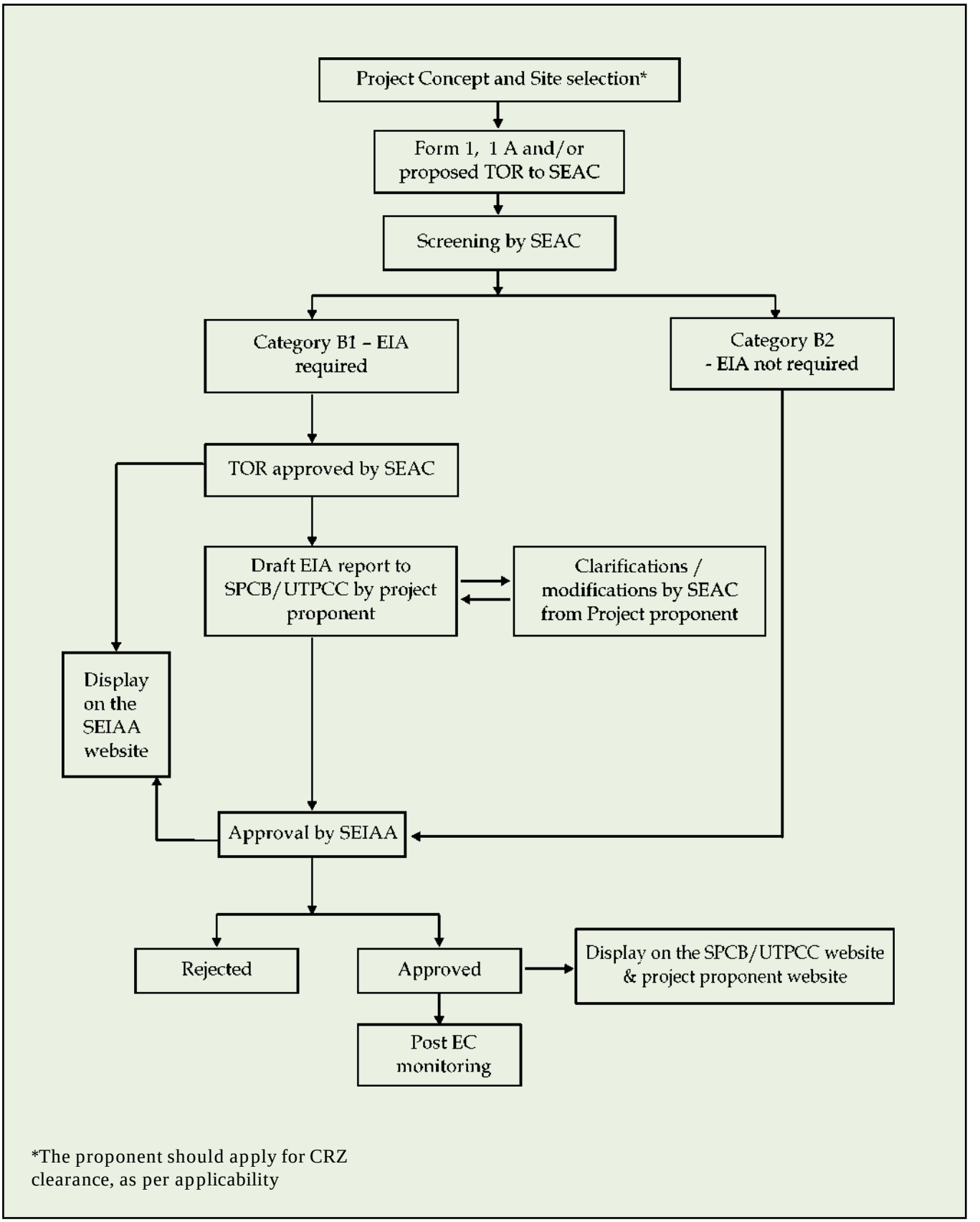


Figure 1.1: Prior Environmental Clearance Process for Category B Projects

The projects requiring an Environmental Impact Assessment report termed Category 'B1' and remaining projects termed Category 'B2' and will not require an Environment Impact Assessment report. For categorization of projects into B1 or B2 except item 8 (b), the Ministry of Environment and Forests should issue appropriate guidelines from time to time. All projects and activities listed as Category 'B' in Item 8 of the Schedule (Construction / Township / Commercial Complexes /Housing) shall not require scoping and will be appraised on the basis of Form 1/ Form 1A and the conceptual plan.

- The projects involving clearance under Coastal Regulation Zone Notification, 1991 shall submit with the application a CRZ map duly demarcated by one of the authorized agencies, showing the project activities, w.r.t. C.R.Z (at the stage of TOR) and the recommendations of the State Coastal Zone Management Authority (at the stage of EC). Simultaneous action shall also be take to obtain the requisite clearance under the provisions of the CRZ notification, 1991 for the activities to be located in the CRZ
- 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 (at the stage of EC)
- All correspondence with the Ministry of Environment & Forests including submission "of application for TOR/Environmental Clearance, subsequent clarifications, as may be required from time to time, participation in the EAC meeting on behalf of the project proponent shall be made by the authorized signatory only. The authorized signatory should also submit a document in support of his claim of being an authorized signatory for the specific project"

Ref:- EIA notification - Amendment 2009

1.3 Terms of Reference (TOR)

The terms of reference (TOR) pertinent to preparation of EIA study reports for building construction, township and area development projects is attached as Annexure 1 to this EIA guidance Manual. TOR relevant to individual projects is to be added by the proponent and should be submitted with the application along with 'Form 1' and 'Form 1A' and the State Level Expert Appraisal Committee. The issues are addressed separately for building construction projects and townships and area development projects.

1.4 Validity of Environmental Clearance

The prior environmental clearance granted is valid for a period of five years. The regulatory authority concerned may extend this validity period by a maximum period of five years provided an application is made to the regulatory authority by the applicant within the validity period, together with an updated Form 1, and Supplementary Form 1A, for construction projects or activities (item 8 of the schedule)

1.5 Post Environmental Clearance Monitoring

For 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 environmental clearance and the details of MoEF website where it is displayed.

The Project management shall submit half-yearly compliance reports in respect of the stipulated prior environmental clearance terms and conditions on 1st June and 1st December of each calendar year. All such reports shall be public documents.

1.6 Transferability of Environmental Clearance

A prior environmental clearance granted for a specific project or activity to an applicant may be transferred during its validity to another legal person entitled to undertake the project or activity on application by the transferor or the transferee with a written "no objection" by the transferor, to, and by the regulatory authority concerned, on the same terms and conditions under which the prior environmental clearance was initially granted, and for the same validity period.

1.7 Generic Structure of Environmental Impact Assessment Document

In terms of the EIA notification of the MoEF dated 14th September 2006, the generic structure of the EIA document should be as under:

- Introduction
- Project Description
- Description of the Environment
- Anticipated Environmental Impacts & Mitigation Measures
- Analysis of Alternatives (Technology and site)
- Environmental Monitoring Programme
- Additional Studies
- Project Benefits
- Environmental Management Plan
- Summary & Conclusion
- Disclosure of Consultants engaged

1.8 Identification of Project Proponent

Profile of the project proponent, contact address with e-mail, fax, phone number etc should be furnished. All correspondence with MoEF shall be made by the authorized signatory only. The authorized signatory should also submit a document in support of his claim of being an authorized signatory for the specific project

1.9 Brief Description of Project

In this section details of the project nature, size, location and its importance to the country and the region are to be included. Project site description; survey/khasra nos, village, tehsil, district, state & extent of the land, latitude & longitude of the boundaries are to be furnished.

Description of existing national and international environmental laws/regulations on the proposed activity is to be brought out clearly. If there are any notified restrictions/limitations from environmental angle, issued by the district administration, State or Central government, the same should be furnished. Details of litigation(s) pending against the project/ proposed site and or any direction passed by the court of law against the project, if any, should be stated.

In case of expansion/ modernization of the project, the environmental compliance status for the existing project should be furnished for the following:

- Status of Environmental Clearance and compliance for the terms & conditions for the existing project
- Validity of the Air & Water Consent orders, and Hazardous Waste Authorization (HWA) from SPCB/ PCC for existing project
- Notices/directions issued by the regulatory agencies under section 33(A) of the Water Act, 1974 as amended, under section 31(A) of the Air Act 1981 as amended and any directions issued under the provisions of the E (P) Act, 1986 during the last one year.

PROJECT DESCRIPTION

2

2.0 General

This chapter on project description in the EIA study report to be prepared by the proponent should include the following aspects:

- Purpose of the project, goals and objectives of the proposed project
- Overall suitability of the site and the proposed activity in light of the existing environmental acts and serious deviations, if any.

2.1 Description of the Project

Location (use maps showing general location, specific location, project boundary and project site layout).

Essential Toposheets / Maps to be Provided with TOR application

A map of the study area 500meters from the boundary of the project area, delineating the major topographical features such as land use, drainage, locations of habitats, major constructions including roads, railways, pipelines, industries if any in the area are to be mentioned.

A map covering aerial distance of 15 kms from the boundary of the proposed project area delineating environmental sensitive areas as specified in Form I of EIA notification dated 14th Sept. 2006. In the same map the details of environmental sensitive areas present within a radial distance of 1 Km from the project boundary should be specifically shown.

Remote Sensing Satellite Imagery

Land use map of the study area in 1:10,000 scale based on high resolution satellite imagery delineating the forest, agricultural land, water bodies, settlements, and other cultural features.

Digital Elevation Model / Contour Map

Contour map on 1:10000 scale for the study area showing the various proposed break-up of the land.

Description of the project site, geology, topography, climate, transport and connectivity, demographic aspects, socio, cultural and economic aspects, villages, settlements should be given.

Details of environmentally sensitive places, land acquisition, rehabilitation of communities/ villages, present status of such activities are to be mentioned.

Historical data on climate conditions such as wind pattern, history of cyclones, storm surges, earth quake etc., for the last 25 years are to be given. An analysis and interpretation of the data has to be given by the project proponent.

Detailed layout plan of proposed project development, communication facilities, access/approach roads, landscape, sewage disposal facilities, and waste disposal etc; to be given. Layout plan of

proposed development of built up areas with covered construction such as buildings, recreational facilities, DG set rooms, water supply installations etc; are to be given. Requirement of natural resources and their sources are to be detailed out.

Litigations if any: In some of the states, there may be some litigation in process between public / State Govt. agencies/ other industries and the project proponent or other projects relevant to the project proposed. In such cases, court rulings / directions on the matter may be mentioned. These may be studied and highlighted in the project report to avoid loss of time and money in planning the project.

2.2 Site Selection

Development of new construction projects, should not have a negative impact on the existing bio diversity and ecosystem of the site. Development of the project on the located site should not disturb sites with heritage and cultural values such as protected monuments. Geographical latitude and microclimatic factors such as wind loads and solar access should be assessed. The way in which a building or group of buildings are sited in relation to other buildings, natural topography and landscape should be given clearly.

The factors which should influence site selection for the development of a project are the infrastructure and utilities available, expected water and power requirement by the proposed new buildings and feasibility study of how much is available and what is the source of supply for power and water. The developer should submit the list of items asked in Form 1 and 1A.

Site selection should be carried out in light of a holistic perspective of land use, development intensity, social well-being and preservation of the environment.

Proposed land use must conform to the approved Master Plan/Development plan of the area. If there is no approved Plan, consent from appropriate authority should be taken and should be submitted for Environment clearance. If the area is outside municipal limits /outside planning area, full justification for the proposed development should be provided.

2.3 Manpower Requirement

The proponent should indicate the requirement of various categories of manpower such as skilled, semi-skilled, unskilled workers, technicians, engineers, and managers during the construction phase.

The proponent should give the details of compliance of Acts related to employees' service and their welfare measure as per the provisions of government of India. This is because the building and other construction works is characterized by its casual nature, temporary relationship between employer and employee, uncertain working hours, lack of basic amenities and inadequacy of welfare facilities.

The following are the Acts for compliance by proponent regarding Manpower employment. The proponent should follow any later modification or Revisions for these Acts automatically

- Minimum Wages Act 1948,
- Contract Labour (Regulation & Abolition) Act1970

- Inter-State Migrant Workmen (Regulation of Employment & Conditions of Services) Act 1979
- The Building and other construction workers (Regulation and Employment of Service) Act, 1996
- The Building and other construction workers Welfare Cess Act 1996.

2.4 Project Implementation Schedule

The proponent should also submit the detailed project implementation schedule bar chart, CPM / PERT chart etc., duly bringing out interrelationship of major activities.

3

DESCRIPTION OF THE ENVIRONEMENT

3.0 Introduction

Environment facets to be considered in relation to building construction are: (a) land (b) air (c) noise (d) water (e) biological (f) socio-economic and (g) solid waste management. Hence it is necessary to ascertain the baseline data of these environmental facets.

Study Area

In the case of building construction projects, EIA guidelines are specifically mentioned in Form 1A of EIA notification 2006. The following details are to be given:

1. Site development area
2. Area with angular distance of 500 meters surrounding the site.

The project study area comprises the site earmarked for building construction with specified surrounding area. The baseline data collection / monitoring should be from primary and secondary sources and field monitoring studies. When secondary data is used source of data is to be mentioned clearly. The period of study for collecting primary data would be one season other than the monsoon season.

3.1 Land Environment

Existing status of baseline conditions of land use can be determined by studying the changes in the land use pattern in the past 10yrs by collecting data from secondary sources such as census records, agricultural census and land records. The land use pattern covering forest land, total irrigated land, non-irrigated land, cultivable waste, are to be calculated and given as a map (Annexure 2).

Mainly climate, geology, relief and other biotic interactions influence soil formation. The soil characteristics in the project area, which would affect the agricultural and afforestation potential of the area need to be studied. Particle size scale is to be given based on the texture analysis. Soil porosity and SAR ratios are important and are to be assessed for all locations. The samples are to be collected and analyzed as per CPCB norms (Annexure 3). The hydraulic conductivities in soil are important for building construction activities and are given in Annexure 4. The rating chart for the soil test values for primary nutrients is given in Annexure 4. The physical and chemical properties of soil are to be analysed and presented as given in Table 3.1 and 3.2

3.2 Water Environment

The physiography of the land will control the drainage pattern in the region. The drainage pattern in the area is to be drawn. Hydro-geological settings and the ground water levels are to be

examined and presented. Ground water and surface water in the study area is to be collected as per CPCB norms (annexure 3) and examined for physico- chemical, heavy metals and bacteriological parameters. The drinking water and fresh water standards are given in Annexure 5. These projects create a continuous demand on the water resources. As per BIS, for residential buildings with a population of 20,000-1,00,000, the per capita consumption is 100-150 lpcd and for those with population above 1,00,000, the consumption is 150-200 lpcd. Out of the 150 to 200 litres per head per day, 45 litres per head per day for flushing requirements and the remaining quantity for other domestic purposes. For the other types of buildings, the water requirement varies between 30 to 340 lpcd. The water requirements for different type of buildings are given in Annexure 6. The format for ground water quality data presentation is given in Table 3.3 and Table 3.4 and for surface water quality as shown in Tables 3.5 and 3.6.

3.3 Air Environment

The climatic data procured from secondary sources is very important for identifying the season and period of monitoring primary data. The climatic data can help in using suitable building technologies and energy conservation measures. The methodology to be adopted for collection of climatic data specific to the site is to compile the mean monthly normals of atmospheric parameters, form previous 10yrs data recorded by the nearest IMD station. Wind Roses for each month giving the wind direction speed are to be collected and presented. Most probable wind speed class and wind direction at the nearest IMD site is to be estimated from this.

Baseline data of air pollutant parameters extending an area of 500meters from the project should be monitored at a number of locations. Description of baseline data of ambient air parameters namely RSPM, nitrogen dioxide, sulphur dioxide, and carbon monoxide are to be collected. One season data is to be monitored other than monsoon as per the CPCB Norms. Sampling locations are to be located as per CPCB norms. The air quality standards are given in Annexure 7. Number and locations of Ambient Air quality monitoring (AAQM) stations are decided based on the nature of project, meteorological conditions, Topography, selected pollution pockets in the area and likely impact areas. The parameters measured, frequencies of sampling, technique to be as prescribed by CPCB are given in Annexure 3. The monitoring locations for air quality are to be given as shown in Table 3.7. The monitoring locations are to be shown on the area map. The data is to be shown as represented in Table 3.8.

3.4 Noise Environment

Construction equipment and road traffic are the major sources of noise. Baseline data of noise at the project area and the neighbourhood habitat areas is to be ascertained. Day-time and night-time data should be collected and presented as shown in Table 3.9. The parameters, frequencies of sampling are shown in Annexure 3 and the standards for noise are given in Annexure 8.

3.5 Biological Environment

Baseline data from field observations for various terrestrial and aquatic systems are to be generated. Wild life sanctuaries and National parks location within 10km radius from project boundary are

identified based on secondary data. Primary data on survey of the wild animals and birds in the study area is collected and identified with the classification into various schedules taken from secondary data.

3.6 Socio-economic Environment

Baseline data on the socio economic environment in the study area is to be collected. The issues to be focused include demographic structure, economic activity, education, literacy profile, land use and infrastructure resources. Primary data through designed questionnaires from the house hold survey within the study area is collected and from secondary sources represented as shown in Table 3.10 and 3.11. The demographic details consisting of population distribution, Average household size, population density, sex ratio, social structure and literacy levels within project study area are concluded from this data collected.

3.7 Solid Waste

Present data available on solid waste generated in the area are to be collected. If possible the present quantities of wastes – hazardous, biomedical and non-hazardous generated in the study are to be collected and presented.

ANTICIPATED IMPACT AND MITIGATION MEASURES

4.0 Introduction

Impacts can be classified in the presentation as direct, indirect and cumulative impacts. These can be further subdivided for convenience and clarity to positive and negative impacts, random and predictable impacts, local and widespread impacts, temporary and permanent impacts, long term and short term impacts. The report should preferable cover the impacts as discussed above. Identification and assessment of environmental liability of earlier use of the project site, especially if there had been an industrial unit at that site is to be clearly mentioned.

4

Suitable avoidance / mitigation methods can be given for each of the alternatives provided. The most feasible one can be chosen by the project proponent. The list of critically polluted areas identified by CPCB is given in Annexure 9.

Prediction of Impact During Construction Phases

The activities that take place during construction phases of the project are leveling of site, construction and erection of buildings etc., and associated equipments in operation. The potential primary and secondary impacts on the environment, their prediction, significance and mitigation are to be discussed. Dismantling of unwanted existing structures, site clearance, storage and haulage of construction materials, and disposal of surplus earth, debris and refuse is to mentioned clearly in the report.

Prediction of Impact During Operational Phases

The potential significant impacts are on topography, land use, soil quality, ambient air quality, noise levels, traffic densities, water resources, water quality, biological environment, demography and socio-economics. During construction and operational phase of the project, various activities may have impact on some or other environmental parameters. Various environmental attributes are to be studied during these phases for their overall impact on the surrounding environment.

4.1 Land Environment

Anticipated Impact

Impacts caused due to activity have to be identified and mentioned clearly in the EIA report. Some of the impacts could be

- Compaction of soils by earth moving equipment
- Erosion and modification of surface
- Over exploitation of agricultural soils due to future development in a zone sensitive to erosion
- Irreversible salinization and acidification of mangrove swamp soils

Mitigation Measures

Some mitigation measures are given below. These measures may be used wherever applicable

- The environmental impact of soil erosion can best be mitigated by removing vegetative cover only from the specific site on which construction is to take place and by disturbing the vegetation in adjacent areas as little as possible. Land clearing activities should be kept to the absolute minimum and use crushed stone rather than asphalt or concrete for surfacing parking areas should be attempted.
- Disturbing the existing vegetation and natural contour of the land as little as possible can mitigate increases in surface runoff. Vegetation along watercourses should not be cleared indiscriminately. Neither should potholes or swamps be drained unless absolutely necessary for successful completion of the activity.
- Construction, land management, or mining activities that result in the soil being laid bare could be scheduled in such a way that some type of vegetative cover appropriate to the site could be established prior to the onset of intense rain or windstorms. If grass is to be seeded, mulch of straw will help to protect the soil from less extreme erosive forces until vegetative and root development begins.
- Natural drainage patterns can often be maintained by preparing sodden waterways or installing culverts.
- Steep slopes can be terraced, thereby effectively reducing the length of slope.
- Check dams built near construction sites can reduce the quantity of eroded soil particles reaching free-flowing streams or lakes.
- Use of "floating" foundations and height restrictions in earthquake zones and increased foundation height, wall strength, and roof support in areas periodically subject to cyclones can reduce the hazards.
- All forms of temporary structures should be avoided from the flood plain, and all permanent structures should be raised to a height above the level which flood waters can be expected to reach once every 100 years (100-year flood).
- Installation of underground drainage structures helps to reduce sediment loads
- Engineering plans can be drawn to reduce the area of earth cuts on fills below what might otherwise be acceptable, provide physical support for exposed soil or rock faces, concentrate or distribute – as appropriate the weight loading of foundations to areas or state better able to support that weight, restricting the number, frequency and area of movement of heavy machinery
- Compatibility between adjacent land uses can best be assured by providing a green belt between the proposed activity and nearby properties where any significant degree of incompatibility is likely to result.

4.2 Water Environment

Construction Phase

The construction phase would involve water requirements for the following activities

- site preparation: Involves levelling for infrastructure development and removal of vegetation. Water is required for dust settlement, consolidation, compaction and curing.
- Construction of building infrastructure involves water for construction activities and domestic and other water requirements for labour and staff onsite.
- The period of this activity is the be mentioned

Impact Prediction

- Use of large quantities of water in curing
- Use during the operational phase by residence for routine activities

Mitigation Measures

Measures for reducing water demand during construction

To avoid wastage of curing water, following guidelines are to be followed:

- Curing water should be sprayed on concrete structures; free flow of water should not be allowed for curing.
- After liberal curing on the first day, all concrete structures should be painted with curing chemical to save water. This will stop daily water curing hence save water.
- Concrete structures should be covered with thick cloth/gunny bags and then water should be sprayed on them. This would avoid water rebound and will ensure sustained and complete curing.
- Ponds should be made using cement and sand mortar to avoid water flowing away from the flat surface while curing.
- Water ponding should be done on all sunken slabs, this would also highlight the importance of having an impervious formwork.

The quantity of ground water usage and waste water generated during both the phases is to be estimated based on the population, reuse and recycle activities planned. Based on the quantification of waste water, the treatment plants should be suitably designed. The effluent discharge standards are given in Annexure 10.

4.3 Air Environment

Anticipated Impact

Construction phase would involve site clearances and preparation, infrastructure development, building construction and other related activities and

Operational phase would involve emission from vehicular movement and diesel generators, and negligible emissions from sewage and solid waste handling and disposal.

The building material carrying vehicles as well as the construction machinery generate emissions

and pollute the environment. Dusts include brick and silica dusts, wood dust from joinery and other woodworking and from earthmoving and other vehicle movements within the site. Asbestos-containing dust especially during the demolition of buildings is very harmful. It is a difficult task to separate these wastes. Construction machineries pose a special threat to air quality. It is estimated that construction machineries emit toxic pollutants and are sources of fine particulate matter (PM2.5, which lodges deeply in the human lung) and oxides of nitrogen (NOx), a key ingredient in the formation of ground-level ozone and urban smog.

Mitigation Measures

The mains concerns during demolition activities are the emissions generated by the vehicles and the machineries. Air Pollution may be caused by areas or point sources such as cities, industrial areas, factories or by linear sources such as highways. Vegetation buffers can minimize the built–up of pollution levels in urban areas by acting as pollution sinks.

- Wind erosion is a serious problem in areas where the ground is virtually bare and devoid of vegetation. Vegetation methods are found to be most effective in the form of windbreaks and shelterbelts.
- A dense belt provides greater shelter immediately to leeward but the sheltered area is not as extensive as when a more permeable zone of vegetation is provided.
- Plants are good absorbers of sulphur dioxide. Parks with trees have an SO_2 level lower than city streets.
- Heavy roadside planting in the form of shelterbelts can result in reduction in airborne lead
- Complete dust interception can be achieved by a 30 m belt of trees. Even a single row of trees may bring about 25 percent reductions in airborne particulate.
- Evergreen trees are found to be more effective.
- The species chosen must be resistant to pollutants, particularly in the early stages of their growth.

Mitigation Measures for Dust Control

Adopting techniques like, air extraction equipment, and covering scaffolding, hosing down road surfaces and cleaning of vehicles can reduce dust and vapour emissions. Measures include appropriate containment around bulk storage tanks and materials stores to prevent spillages entering watercourses.

The other measures to reduce the air pollution on site are:

- Sprinkling of water and fine spray from nozzles to suppress the dust.
- On-Road- Inspection should be done for black smoke generating machinery.
- Promotion of use of cleaner fuel should be done.
- All DG sets should comply emission norms notified by MoEF.
- Vehicles having pollution under control certificate may be allowed to ply.

- Use of covering sheet to prevent dust dispersion at buildings and infrastructure sites, which are being constructed.
- Use of covering sheets should be done for trucks to prevent dust dispersion from the trucks, implemented by district offices.
- Paving is a more permanent solution to dust control, suitable for longer duration projects. High cost is the major drawback to paving.
- Reducing the speed of a vehicle to 20 kmph can reduce emissions by a large extent. Speed bumps are commonly used to ensure speed reduction. In cases where speed reduction cannot effectively reduce fugitive dust, it may be necessary to divert traffic to nearby paved areas.

Material storages / warehouses – Care should be taken to keep all material storages adequately covered and contained so that they are not exposed to situations where winds on site could lead to dust / particulate emissions. Fabrics and plastics for covering piles of soils and debris is an effective means to reduce fugitive dust.

4.4 Noise Environment

Anticipated Impact

During the construction phase of the site, the following source of noise pollution is expected:

- Construction equipment

During operational phase the following sources of noise pollution is expected:

- Diesel generator operations
- Increase in transport noise from within the site from near by roads.

Mitigation Measures

It is important that no new development is carried out within areas where expected noise levels will cause mental and physical fatigue or permanent loss of hearing. In case development in such areas is essential, adequate sound insulation should be provided for the building. There are two ways of applying controls or measures. The first is to plan so as to keep the noise at a distance. Under this aspect comes the separation of housing from traffic noise by interposing buffer zones, and the protection of schools and hospitals by green belts, public gardens, etc. The second is the principle of shading or screening. Use of noise deflectors can also help in reducing the noise. This consists of deliberately interposing a less vulnerable building to screen a more vulnerable one or by providing a solid barrier such as a wall between the source and the location to be protected.

Setting up the barriers: National Building Code 2005 suggests that design solutions such as barrier blocks should be used to reduce external LA10 noise levels to at least 60-70dB(A) at any point 1.0 m from any inward looking façade. Green belts and landscaping could act as an effective means to control noise pollution. In case of railway tracks, a minimum distance of 50m to 70m may be provided between the buildings and the tracks. Thick belts of planting greater than 30 meters are useful for cutting the noise levels from road traffic. Strong leafy trees may be planted to act as noise baffles. Shrubs and creepers may also be planted for additional protection between tree

trunks; artificial mounds and banks should be formed where practicable. As little hard paving and as much grass as possible may be used. The creation of green belt is particularly advisable on the perimeter of aerodromes, along railway lines and arterial roads, through or past built up areas and adjoining industrial zones.

Control of noise from Air traffic: The problem caused by aircraft noise have become very acute, therefore a commonly used criterion is the noise exposure forecast (NEF). Aircraft noise can seriously affect living conditions no matter how much insulation has been applied. For this reason it is recommended that no residential development should be allowed beyond NEF 35 level. For very critical buildings such as buildings necessary for maintaining and supplementing the airport services, and for commercial development, such as hotels, it is possible to provide sealed windows and to centrally air condition the entire building.

Control of noise from railway lines: Wherever possible no residential or public building zone should be along the railway lines. The appropriate zones along side railway lines are industrial and commercial buildings other than office buildings.

Control of noise from road traffic: Trees with heavy foliage planted on both sides of carriage way help slightly muffle the noise provided; the foliage extends for a considerable distance of 30m or above.

4.5 Biological Environment

The mitigation measures should be suggested that will help in reducing the impact on terrestrial ecology and aquatic ecology. Massive plantation, landscaping are to be ensured in the new construction areas. Also trees, plants should be identified for specific areas so that the plants survive in these conditions. The few common pollutant resistant species are given in Annexure 11.

4.6 Socio- economic

Anticipated Impact

The impact on the socio-economic status of the people in the area is to be studied and detailed out. Positive impacts could include job creation, preservation of environment, infrastructure development and benefits to local population by way of job opportunities. Long term impacts include aspects of demography, aesthetics, and archeological sites. Negative impacts include impacts on cultural aspects and well being.

Construction activities generate large volumes of particulate matters during construction work leading to air pollution. Unhygienic site sanitation facilities cause damage to environment and to health of the construction workers. Buildings sensitive to the environment and its resources should address these issues.

Mitigation Measures

The objective is to ensure health and safety of the workers during construction, with effective provisions for the basic facilities of sanitation, drinking water, safety of equipments or machinery etc. Following are some of the recommendations to be followed:

- Comply with the safety procedures, norms and guidelines (as applicable) as outlined in the document Part 7 _Constructional practices and safety, 2005, National Building code of India, Bureau of Indian Standards
- Provide clean drinking water to all workers
- Provide adequate number of decentralized latrines and urinals to construction workers.
- Guarding all parts of dangerous machinery.
- Precautions for working on machinery.
- Maintaining hoists and lifts, lifting machines, chains, ropes, and other lifting tackles in good condition.
- Durable and reusable formwork systems to replace timber formwork and ensure that formwork where used is properly maintained.
- Ensuring that walking surfaces or boards at height are of sound construction and are provided with safety rails or belts.
- Provide protective equipment; helmets etc.
- Provide measures to prevent fires. Fire extinguishers and buckets of sand to be provided in the fire-prone area and elsewhere.
- Provide sufficient and suitable light for working during night time.
- Dangers, health hazards, and measures to protect workers from materials of construction, transportation, storage etc.
- Safety policies of the construction firm/division/company.

4.7Solid Waste

The construction phase waste will comprise of excavated and demolition material while operational phase waste may comprise of domestic, commercial and biomedical wastes, depending upon the type of the project. The different types of wastes need to be handled as per their needs and regulatory requirements. It is not possible to dispose off all type of wastes onto the land and has to be dealt with depending upon their type and characteristics. Building construction leads to generation of sand, gravel, concrete, stone, bricks, wood, metal, glass, polythene sheets plastic, paper etc. as waste.

Type of wastes, which are generated, can be classified into four categories.

1. Construction or demolition waste, i.e., massive and inert waste
2. Municipal waste, i.e., biodegradable and recyclable waste
3. Hazardous waste,
4. E-waste

The waste characterization in constructional stage should be estimated by reviewing other similar already existing projects and given in tabular form. Similarly wastes generated in operational phase should be estimated and classified as

- biodegradable
- recyclable
- inert
- hazardous

and quantified for percentage composition estimation.

Construction and Demolition Waste Management

The construction and demolition waste includes debris, concrete (often recycled and reused at the site), steel and other metals, pallets, packaging and paper products, fluorescent tubes, wood beams, joists, studs, baseboards, cabinets and cupboards, railings, brick, doors and casings, interior windows, bathroom fixtures, light fixtures, ceiling grid and tile, furnishings, replant trees, shrubs. Orderly deconstruction is the proper measure for reuse of the demolished matter. In contrast to demolition, where buildings are knocked down and materials are either land filled or recycled, deconstruction involves carefully taking apart portions of buildings or removing their contents with the primary goal being reuse. It can be as simple as stripping out cabinetry, fixtures, and windows, or manually taking apart the building frame. Gross segregation of construction and demolition wastes into roadwork materials, structural building material, salvaged building parts and site clearance wastes is necessary. Additional segregation is required to facilitate reuse/ recycling.

Disposal of excess earth that is unearthed due to the construction activity is to be properly undertaken.

Waste recycling plans should be developed for construction and demolition projects, prior to beginning construction activity. The plans should identify wastes to be generated, and designate handling, recycling and disposal method to be followed. Handling of waste material requires special precautions such as personal protective equipment and special procedures to prevent the injury. Developers must operate safe methods for waste collection, storage, and disposal operations in a manner to protect the health and safety of personnel, minimize environmental impact and promote material recovery and recycling.

Solid Waste During Operational Phase

Adequate provision should be made for storage of solid waste and for easy access to the dustbins;

- for labours from source to the place of storage, and
- from the place of storage to a collection point specified by the waste collection authority and/or contractor
- Three colours of wheeled bins: - dark grey for inert waste, green for wood and ply waste and blue for hazardous waste can be used.

A minimum of 4% of the total site area should be allocated for storage and pre treatment of the waste. This storage area should be covered and the pollutants from the waste should not affect the surrounding.

Access to and from Bin Storage Areas

Wheeled bins should be made access with ramps. To ensure this vehicle access, paths should be

paved and at least 1.2 metres wide with a maximum gradient of 1 in 10. The surface of the path should be smooth, continuous and hardwearing. Ramped kerbs should be provided where the path meets the highway, and bins should not have to pass across designated parking spaces. Where collection vehicles have to enter developments, there should be sufficient space on paved roads with turning circles for easy circulation. This ensures the refuse vehicles to enter the vicinity of the site without being prevented from doing so by cars parked close to the entrance. Vehicles should never have to reverse onto or from a highway to make a collection. Roadways used by refuse vehicles must be designed to withstand a laden weight of not less than 28 tonnes.

Municipal Solid Waste Management

Waste generated by users- Domestic wastes food leftovers, vegetable peels, plastic, house sweepings, clothes, ash, etc. commercial waste generally comprises of paper, cardboard, plastic, wastes like batteries, bulbs, tube lights etc.

Three-bin system is a good option for segregation at household level. Storage facilities should be created and established by taking into account quantities of waste generation in a given area and the population densities. A storage facility should be so placed that it is accessible to users, within a radius of 25 meter from the source. Local authorities should provide different coloured bins for different categories of waste. Adequate provision should be made for storage of solid waste.

Three colours of wheeled bins: - dark grey for non-recyclable waste, green for kitchen food/ compostable garden waste and blue for paper (generally used for flats, schools, offices etc). In addition, boxes must be provided for the collection of other recyclable materials; a green box is used for paper and a black box is used for cans and plastic collections. Individual properties should be allocated a 20-litter bin although for single-family occupancy. Boxes should have lids. Flats and multi-storeyed buildings should have bulk dustbin type container, with a general guide of one 1100 litre bin being adequate for every 60 units, for smaller blocks. The one to five ratio outlined above could be increased or decreased according to the number or properties with greater or less than two bedrooms per unit. The ratio of approx one paper bin to three residual waste bins is only a guide. Waste and Cleansing Section can advise on individual cases.

Hazardous Waste Management

Products, such as paints, cleaners, oils, batteries, and pesticides that contain potentially hazardous ingredients require special care when you dispose of them. Improper disposal of household hazardous wastes can include pouring them down the drain, on the ground, into storm sewers, or in some cases putting them out with the trash.

Hazardous wastes from construction and demolition activities are centering oil, formwork oil, tar and tar products (bitumen, felt, waterproofing compounds, etc.), wood dust from treated wood, lead containing products, chemical admixtures, sealants, adhesive solvents, Explosives and related products and equipment used in excavation, acrylics, and silica, etc. The dustbins for these wastes should be made of durable materials like metal, HDPE, fibre glass and masonry if the projects spans for more than a year.

List of Hazardous wastes from construction projects

- Asbestos products – insulation, tiles etc
- Fuels and Heating oils and other volatile / flammable liquids such as coolants, grease etc.
- Centering oil, formwork oil

- Tar and Tar products (bitumen, felt, water proofing compounds etc.)
- Lead containing products
- Chemicals, admixtures, sealants, adhesives solvents etc.
- Paints, pigments, dyes and primers
- Pesticides
- Tarpaulin
- Explosives and related products and equipment used in excavations
- Product packaging (cement bags, cartons, containers, plastic covers etc.)
- Plastics, Acrylics, Silica, PVC
- Fluorescent Lamps Intact and Crushed, Halogen Lamps, Arc Lamps, UV Lamps, High Pressure Sodium Lamps, , Neon Lamps, Incandescent Lamps.
- Mercury Containing Lamps and Tubes, Mercury Vapour Lamps, Mercury Containing Devices – Mercury switches, relays, regulators, thermostats, thermometers, manometers and debris containing mercury
- All types of Batteries
- Electronic Ballasts, PCBs, Transformers, capacitors, switchgear, Lead Cable, Oil filled / gel filled cables
- Electronic Waste– computer products, circuit boards, CRTs, electronic parts, solder dross, weld waste.

Due to the characteristics, the wastes generated from the healthcare establishments are also hazardous in nature. Biomedical wastes have to be dealt with as per the Biomedical Wastes (Handling & Management) Rules, 2000.

- Lead based paints and other hazardous materials may be removed from the structure prior to deconstruction or demolition activities to minimize special handling and disposal requirements for the construction and demolition waste. These activities must be conducted by qualified personnel using appropriate health and safety procedures in accordance with the regulatory requirements.
- Isolated storage for hazardous wastes released from the whole site should be provided on site.
- Source segregation of similar wastes is highly recommended.
- Installation of fire extinguisher is mandatory near storage of hazardous wastes.

E-waste Management

Collection and storage

Various types of electrical and electronic wastes generated in the building, which includes PC in case of offices and homes, Xerox machine components from office and shops, should be collected separately for transportation to the authorized recyclers approved by the state/Central pollution control boards. There should also be provision for storage of these wastes in the building before transportation.

5

ALTERNATIVE TECHNOLOGIES

5.0 General

Consideration of alternative technologies to be used in building material, energy conservation and transportation methods are to be addressed in this chapter.

5.1 Building Materials

The conventional practice of clay, brick consumes large quantity of energy in terms of coal and other fuels which are primarily non-renewable and highly polluting. Water requirements of building industry are also very high. Steel which is used in the construction process is manufactured by non-renewable resource. Normally conventional materials used for construction are non-renewable sources.

Use of alternative technologies for each component of the buildings of envelope, superstructure, finishes and the road and surrounding areas are discussed in detail. Some of them are given below:

- Brick and block products with waste and recycled contents such as fly ash (waste from coal burning plants), blast furnace slag, sewage sludge, waste wood fibre etc.
- Fly ash based lightweight aerated concrete blocks can be used for walls.
- Perforated bricks can be used for wall structures.
- Brick panel with joists, Filler slab roofing, brick funicular shell roofing, RCC channel units, micro-concrete roofing tiles are some of the alternative techniques for roofing.

Some of the alternate materials for openings in construction are:-

- Use of precast thin lintels, use of ferrocement-sunshade cum lintel etc.
- Use of renewable timber for doors and windows
- Use of steel manufactures from recycled content
- Aluminum from verified recycled content
- Saw dust based doors and window frames
- Ferrocement shutters, PVC doors and windows, Rice husk boards, Natural fibre-reinforced polymer composite door panels
- Bamboo based products, bamboo strips boards.
- Alternatives for finishes include Fly ash, Ceramic tiles, Terrazzo floors

The use of the alternatives for building materials will help reduce the use of non-renewable resources and impact on natural resources. The materials used should be mentioned specifically in the EIA report.

Natural Hazard Prone Areas

Areas likely to have moderate to high intensity of earthquake, or cyclonic storm, or significant flood or inundation, or land slides/ mud flows / avalanches etc are identified as risk zones. The structural design of foundation, elements of masonry, timber, plain concrete, reinforced concrete, pre-stressed concrete, and structural steel should conform to the general structural safety of the National Building code (Annexure 12).

Green Buildings

The appearance of a Green Building will be similar to any other building. However, the difference is in the approach, which revolves round a concern for extending the life span of natural resources; provide human comfort, safety and productivity. This approach results in reduction in operating costs like energy and water, besides several intangible benefits. Some of the salient features of a Green Building are:

- Minimal disturbance to landscapes and site condition
- Use of Recycled and Environmental Friendly Building Materials
- Use of Non-Toxic and recycled/recyclable Materials
- Efficient use of Water and Water Recycling
- Use of Energy Efficient and Eco-Friendly Equipment
- Use of Renewable Energy
- Indoor Air Quality for Human Safety and Comfort
- Effective Controls and Building Management Systems

Issues in Green Building

Energy Efficiency and Renewable Energy

- Building orientation to take advantage of solar access, shading, and natural lighting
- Effects of micro-climate on building
- Thermal efficiency of building envelope and fenestration
- Properly sized and efficient heating, ventilating, and air-conditioning (HVAC) system
- Alternative energy sources
- Minimization of electric loads from lighting, appliances, and equipment
- Utility incentives to offset costs

Direct and Indirect Environmental Impact

- Integrity of site and vegetation during construction
- Use of integrated pest management
- Use of native plants for landscaping
- Minimization of disturbance to the watershed and additional non-point-source pollution

- Effect of materials choice on resource depletion and air and water pollution
- Use of indigenous building materials
- Amount of energy used to produce building materials

Resource Conservation and Recycling

- Use of recyclable products and those with recycled material content
- Reuse of building components, equipment, and furnishings
- Minimization of construction waste and demolition debris through reuse and recycling
- Easy access to recycling facilities for building occupants
- Minimization of sanitary waste through reuse of graywater and water-saving devices
- Use of rainwater for irrigation
- Water conservation in building operations
- Use of alternative wastewater treatment methods

Indoor Environmental Quality

- Volatile organic compound content of building materials
- Minimization of opportunity for microbial growth
- Adequate fresh air supply
- Chemical content and volatility of maintenance and cleaning materials
- Minimization of business-machine and occupant pollution sources
- Adequate acoustic control
- Access to daylight and public amenities

Community issues

- Access to site by mass transit and pedestrian or bicycle paths
- Attention to culture and history of community
- Climatic characteristics as they affect design of building or building materials
- Local incentives, policies, regulations that promote green design
- Infrastructure in community to handle demolition-waste recycling
- Regional availability of environmental products and expertise

Building Green concentrates on one key aspect of the greening process: the use of plants on and around urban buildings. Green buildings and greenspaces together define an integrated approach to plant life in cities that is central to any green programme. Trees and shrubs can help reduce overall energy use in buildings. The amount of energy saved depends on the building type, choice of tree species, positioning around the building and the prevailing climate.

Balconies and small terraces have become standard architectural features for multiple dwelling developments. The balcony garden is a natural development of the balcony's role as a link between interior and exterior environments.

Green walls - Modern cities provide enormous areas of wall space, in many cases stretching high above the street. Not all of this space is appropriate for growing plants, but much of it is – certainly much more than has been utilised in recent years.

Roofs present by far the most significant opportunities for the greening of buildings. Many cities have millions of sqmts of unused and unattractive roofs. They represent enormous wasted opportunities for improving the quality of city life. Some of the advantages for green roof include:-

- protection of roof surface from ultra-violet radiation and mechanical damage
- thermal insulation
- acoustic insulation
- lower maintainance costs for roofing materials
- reduction of stormwater runoff
- gardens for inhabitants of buildings
- masks ugly rooftops
- complements building forms
- absorption of CO_2, some air pollutants and dust

GRIHA, an acronym for Green Rating for Integrated Habitat Assessment, is the National Rating System of India. It is a green building 'design evaluation system', and is suitable for all kinds of buildings in different climatic zones of the country (*www.mnre.gov.in and* www.grihaindia.org). The basics benefits of following GRIHA rating system are

- Up to 30% reduction in energy consumption
- Limited waste generation due to recycling
- Less consumption of water
- Reduced pollution load & liability

The details for developing greening of roofs are given in Annexure 20.

5.2 Energy Conservation

There is a need to adopt energy efficient technologies for conservation of energy. This section discusses some important recommendations of the energy conservation building code and the National building code 2005 on energy conservation.

The building form can affect the solar access of the building. The compactness of the building is measured using a ratio of surface area to volume. *Compactness = S/V,*where, S = Surface area and V = volume. The orientation of the building is also an important fact with regard to energy conservation in the building. The building envelope for all air conditioned buildings / spaces are to comply with the ECBC code *(www.beeindia@nic.in).* Roofs and opaque walls should comply

with the maximum assembly U factor or the minimum insulation R-value as given in Table 5.1 and Table 5.2 respectively.

Table 5.1 Roof assembly U-factor and insulation R-value requirements

Climate Zone	24-Hour use buildings Hospitals, Hotels, Call Centers etc.		Daytime use buildings Other Building Types	
	Maximum U-factor of the overall assembly (W/m^2-^0C)	Minimum R-value of insulation alone (m^2-^0C/W)	Maximum U-factor of the overall assembly (W/m^2-^0C)	Minimum R-value of insulation alone (m^2-^0C/W)
Composite	U-0.261	R-3.5	U-0.409	R-2.1
Hot and Dry	U-0.261	R-3.5	U-0.409	R-2.1
Warm and Humid	U-0.261	R-3.5	U-0.409	R-2.1
Moderate	U-0.409	R-2.1	U-0.409	R-2.1
Cold	U-0.261	R-3.5	U-0.409	R-2.1

Source: ECBC Code 2005

Table 5.2 Opaque wall assembly U-factor and insulation R-value requirements

Climate Zone	Hospitals, Hotels Call Call Centers etc.		Other Building Types (Daytime)	
	Maximum U-factor of the overall assembly (W/m^2-^0C)	Minimum R-value of insulation alone (m^2-^0C/W)	Maximum U-factor of the overall assembly (W/m^2-^0C)	Minimum R-value of insulation alone (m^2-^0C/W)
Composite	U-0.352	R-2.35	U-0.352	R-2.35
Hot and Dry	U-0.369	R-2.20	U-0.352	R-2.35
Warm and Humid	U-0.352	R-2.35	U-0.352	R-2.35
Moderate	U-0.431	R-1.80	U-0.397	R-2.00
Cold	U-0.369	R-2.20	U-0.352	R-2.35

The concept of passive solar design emphasizes architectural design approaches that minimize building energy consumption by integrating conventional energy-efficient devices, such as mechanical and electrical pumps, fans, lighting fixtures, and other equipment, with passive design elements, such as building siting, an efficient envelope, appropriate amounts of fenestration, increased daylighting design, and thermal mass. The basic idea of passive solar design is to allow daylight, heat, and airflow into a building only when beneficial.

Passive building design starts with consideration of siting and day-lighting opportunities and the building envelope; then building systems are considered. Almost every element of a passive solar design serves more than one purpose. Landscaping can be aesthetic while also providing critical shading or direct air flow. Window shades are both a shading device and part of the

interior design scheme. Masonry floors store heat and also provide a durable walking surface. Sunlight bounced around a room provides a bright space and task light.

Day-lighting brings light into a building interior and distributing it in a way that provides more desirable and better quality illumination than artificial light sources. This reduces the need for electrical light sources, thus cutting down on electricity use and its associated costs and pollution. The general day-lighting principles include:-

- Avoid direct sunlight on critical tasks and excessive brightness.
- Bring the daylight in at a high location.
- Filter the daylight.
- Bounce daylight off of surrounding surfaces.
- Integrate daylight with other building systems and strategies.

Energy efficient lighting design focuses on methods and materials that improve quality of lighting (Annexure 13). The general lighting systems need to comply with the ECBC code and apply to the following:-

(a) Interior spaces of buildings,

(b) Exterior building features, including facades, illuminated roofs, architectural features, entrances, exits, loading docks, and illuminated canopies, and,

(c) Exterior building grounds lighting that is provided through the building's electrical service.

Exceptions to above:

(a) Emergency lighting that is automatically off during normal building operation and is powered by battery, generator, or other alternate power source; and,

(b) Lighting in dwelling units except for dwelling units where the developer is providing lighting fixtures inside the units (however, common area lighting of residential complexes fall under purview of the code)

Solar photovoltaic systems (SPV) can be used as it is direct conversion of sunlight into electricity and could be a viable option. Street lighting, fixed type solar lighting system are some applications of SPV systems. The recommended values for illuminance is given in Annexure 14.

The design considerations for the air conditioned space, the outdoor design conditions and the minimum fresh air conditioned spaces required are given in Annexures 15 to 17.

Development of Energy Efficient Windows

Indian buildings still lack the use of energy efficient glazing system, whereas more and more buildings are being converted into air-conditioned buildings without implementing any energy efficiency measures in almost all the climatic zones. This indicates a considerable amount of electricity wastage in Indian housing, which can be reduced easily through energy efficient glazing. A significant reduction in specific energy demand is possible just by replacing the current single glazed windows with energy efficient multiple glazed windows. In hot & dry with double glazed,

double glazed Low-E and triple glazed energy efficient windows, savings of 5% to 27% were observed for 10% and 20% glazing area respectively. For other five climatic zones the possible savings are given below.

Energy saving potential of multiple glazed windows over single glazing (24 hours usage)

Window Type	Percentage Area	Specific Energy Demand kWh/m2/a (includes lighting) [Percentage saving as compared to the single glazing]				
		Warm & Humid	Composite	Moderate	Cold & Cloudy	Cold & Sunny
Double Glazed	10%	350[7.8]	299 [11.7]	139 [6.1]	145 [3.9]	472 [9.6]
	20%	385 [7.8]	334 [11.1]	145 [11]	150 [4.4]	514 [10.9]
Double Low-E with Argon	10%	336 [11.5]	286 [15.6]	134 [9.4]	142 [5.9]	428 [19. 2]
	20%	369 [11.7]	323 [14.1]	137 [15.9]	147 [6.3]	446 [25.6]
Triple Glazed Energy Efficient Windows	10%	322 [15.3]	268 [20.9]	124 [16.2]	140 [7.8]	401 [24.3]
	20%	354 [15.3]	307 [18.3]	129 [20.8]	145 [7.6]	431 [28.1]

Source: MoEF manual on Large construction projects

These simulation results are on the basis of 24 hours usage of the building and can fit well for the residential sector. For commercial sector buildings operation for 8 hours a day and 5 days a week, the results indicate a much better saving potential in most of the climates except moderate and cold & sunny because the buildings are in use during day hours. Simulations were carried out for 20% window area (generally practiced in commercial buildings for natural lighting) with 5 days a week and 8 hours of operation. Details of energy saving potential in commercial buildings are given below.

Energy saving potential for commercial buildings of multiple glazed windows over single glazing

Window Type	Percentage saving as compared to the single glazing					
	Hot & Dry	Warm & Humid	Composite	Moderate	Cold & Cloudy	Cold & Sunny
Double Glazed	15.8	8.1	14.3	6.2	5.7	11.3
Double Low-E with Argon	26.1	12.3	14.7	16.2	6.8	26.9
Triple Glazed Energy Efficient Windows	28.1	16.5	18.6	21.5	8.1	28.7

(Source: Inderjeet Singh 2004)

5.3 Transportation

Some of the factors are important and must be taken into the consideration, while planning, are the movement of heavy traffic loads and operation of construction machinery. Construction machinery due to its operation produces smoke, dust and noise and vibration. Internal road design should be done with due consideration for environment, and safety of the people residing or working near the roads. Proper sidewalk should be provided for the residence to commute. The width of sidewalk depends upon the expected pedestrian flows and should be fixed with the help of guidelines given by IRC in IRC: 103-1988 (Annexure 18).

According to population size, the cities have been classified into five categories, i.e., less than 50,000, 50,000 to 2,00,000, 2,00,000 to 10,00,00, 10,00,000 to 50,00,000, and above 50,00,000 and the area requirements for one car parking is given in Annexure 19.

Parking facilities for residence and visitors

- For individual homes it is necessary to provide 1 visitor car park
- For multi dwelling units it is necessary to provide an additional 10% parking area over and above the normal parking requirements
- Design of the building is to ensure that adequate parking provisions are made to cater to the occupants as well as visitors
- The parking provisions should take into consideration the two wheelers and four wheelers. It is also desirable to design parking facilities with basement / stilts parking to reduce the heat island effect. When inevitable the surface parking planned should cover issues to address heat island effect.
- It is also desirable to have electric charging facility for vehicles which could cater for both two and four wheelers.
- Parking provision for bicycles
- Internal Circulation to provide for movement of fire tender, paving that permits infiltration of rain water, avoidance of very sharp and blind corners
- Elimination of risks to children and old people in crossing the internal roads to reach play areas and recreational facilities.

6

ENVIRONMENTAL MONITORING PROGRAM

6.0 General

This includes the technical aspects of monitoring the effectiveness of mitigation measures (including measurement methodologies, data analysis, reporting schedules, emergency procedures, detailed budget and procurement schedules). The details should include:

- Summary matrix of environmental monitoring covering location of monitoring stations, frequency of sampling, method of sampling analysis and data evaluation - during construction and operational stages
- Requirement of monitoring facilities
- Frequency of air quality monitoring of stack emission, static background dust sampling at project boundary
- Stack monitoring provisions as per CPCB norms
- Changes with reference to base line data and compliance to accepted norms
- Plantation monitoring programme and greening of roof tops etc (Annexure 20)

The description of the monitoring programme should include:

(a) A technical plan which spells out in detail the methodologies for measurement, the required frequencies of measurement, the planned location of measurement, data storage and analysis, reporting schedules and emergency procedures, and

(b) Detailed budgets and procurement schedules for, necessary equipment and supplies, technical and administrative man power.

The environmental monitoring includes

- Air pollution
- Noise level monitoring
- Water quality monitoring and ground water level monitoring
- Maintenance of rainwater harvesting pits and other water conservation methods used are to be done regularly (Annexure 21).

The entire data is to be furnished to the regulatory agencies.

7

ADDITIONAL STUDIES

7.0 General

This chapter covers the risk assessment and disaster management plan. Apart from these, R & R Action Plan and Natural Resource Conservation plan are also included in this chapter.

7.1 Risk Assessment and Disaster Management Plan (DMP)

Emergency prevention through good design, operation, maintenance and inspection are essential to reduce the probability of occurrence and consequential effect of such eventualities. The overall objective of the Emergency Response Plan ERP is to make use of the combined resources at the site and outside services to achieve the following:-

- Localize the emergency
- Minimize effects on property and people
- Effective rescue and medical treatment
- Evacuation

Major hazards identified include:-

- Hazards pertaining to fires in buildings
- Fire in diesel storage areas
- Earthquakes
- LPG gas leak

7.2 Natural Resource Conservation

Plan of action for conservation of natural resources and recycle waste materials due to the project activity in the construction and operational phase of the project is to be discussed.

7.3 R&R Action Plan

Detailed R&R Plan with data on the existing socio-economic status of the population in the study area and broad plan for resettlement of the displaced population, site for the resettlement colony, alternative livelihood concerns/employment for the displaced people, civil and housing amenities being offered, etc and the schedule of he implementation of the project specific R&R Plan if any is to be given. Details of provisions (capital & recurring) for the project specific R&R Plan .

8

PROJECT BENEFITS

8.0 General

This chapter should include benefits accruing to the locality, neighborhood, region and nation as a whole. It should bring out details of benefits by way of:

- Improvements in the physical infrastructure of project, ancillary industries that may come up on account of the project.
- Improvements in the social infrastructure like roads, railways, townships, housing, water supply, electrical power, drainage, educational institutions and hospitals etc.
- Employment potential skilled; semi-skilled and unskilled labour both during construction and operational phases of the project with specific attention to employment potential of local population as well as necessity for imparting any specialized skills to them to be eligible for such employment in the project on a long term basis i.e., during operational and maintenance stages of the project

ENVIRONMENTAL MANAGEMENT PLAN

9.0 General

Environmental Management Plan (EMP) deals with evaluation of significance of unavoidable or residual impacts following mitigation and the proposed monitoring. The Environmental Management Plan (EMP) is needed to ensure that the mitigation measures specified in the EIA will actually be complied with when the project is approved for implementations. The administration of EMP may be required the establishment of an Environmental management cell to house monitoring staff after the closure of the EIA office. Funding to cover the costs of establishing and operating an appropriate Environmental Management Cell to administer the EMP should be guaranteed in the basic project budget.

The EIA report should include a description of the administrative aspects of ensuring that mitigative measures are implemented and their effectiveness monitored after approval of EIA. The environmental management plan should clearly mention the landscaping and the tree plantation to be taken up in the area. Also the parks and gardens if any to be developed are to be mentioned. The total number of plantations to be developed in the area is to be mentioned.

The plans to be adopted for handling of the domestic wastewaters and the solid waste management plan are to be detailed out.

10

SUMMARY AND CONCLUSIONS

10.0 General

The summary should be a clear presentation of the critical facts that make up each issue, and the resolution of the issues. Whenever possible, the summary should make use of base maps, tables and figures. Information should be condensed into succinct, but meaningful presentations. It must be able to stand alone as a document. It should necessarily cover and brief the following chapters of the full EIA report and address the following:-

- Introduction
- Project description & Project benefits
- Environmental Examination
- Additional Studies
- Environmental Management Plan and Post Project Monitoring Program
- Environmental Risk Assessment (ERA) and Disaster Management Plan (DMP)

The following should be highlighted in the EIA report

- Public health and safety issues related to the project;
- The socio-economic impacts of the project;
- New building technologies to be implemented
- Energy conservation measures to be implemented
- Statement of overall impact of the construction activity on the environment.

11

DISCLOSURE OF CONSULTANT ENGAGED

11.0 General

The EIA consultants shall have accreditation with Quality Control of India (QCI)/National Accreditation Board of Education and Training (NABET) as per office memorandum dated 2nd December 2009 of MoEF. This chapter shall include the names of the consultants engaged with their brief resume and nature of consultancy rendered. The consultants shall include the copy of the accreditation certificate and data provided by the other organizations/ laboratories including their status of approvals etc.

Section B
TOWNSHIP
AND
AREA DEVELOPMENT PROJECTS

1

INTRODUCTION

1.0 Preamble

This section of the manual provides information and guidance on Environmental Impact Assessment (EIA) in townships and area development projects. It is intended as a resource for those who are involved in EIA practice. Particular emphasis is given to concepts, procedures and tools that are used currently or are potentially relevant in preparing environmental impact assessment reports for clearance from regulatory agencies. EIA is a technical exercise, to predict environmental impacts, assess their significance, and provide recommendations for their mitigation. The assessment covers construction and operation of the development and can consider site decommissioning. EIA report covers a wide range of technical disciplines and covers areas such as noise and vibration, air quality, ecology, contamination, water quality & hydrology, archaeology & cultural heritage, landscape & visual character, sustainability and socio-economics. The EIA report will describe how the project has been improved through the EIA process and what alternatives were considered.

1.1 General Information on Township and Area Development Projects

Township in general, is self contained and integrated in the social infrastructure needs, services, shopping, entertainment and waste management. Infrastructure and services include road network, water supply and management, electricity supply and management and proper communication services. Social infrastructure includes schools, medicare, recreation and community centre. Shopping centre with adequate facilities should be housed in the township itself.

Proper waste management including garbage collection, segregation, treatment and disposal with the township should be provided. Maintenance of infrastructure and proper security and safety of the residents is to be ensured.

1.2Environmental Clearance Process

The objective of the EIA Notification, 2006 is to set procedures of environmental clearance before establishment of identified nature and size. The suitability of site proposed for a proposed development is one of primary concerns in according environmental clearance to a project.

The applicant will have to furnish, along with the application, in addition to Form 1 and the supplementary Form 1A, a copy of the conceptual plan. The details of the categories mentioned in the given schedule are as follows:

Project or Activity		Category with threshold limit - B Category	General Conditions
8.	**Building /Construction Projects/Area Development Projects and Townships**		
8(a)	Building and Construction projects	≥20000 sq.mtrs and <1,50,000 sq.mtrs. of built-up area#	"Any project or activity specified in Category 'B' will be treated as Category 'A' if located in whole or in part within 10 km from the boundary of: (i) Protected areas notified under the Wildlife
8(b)	Townships and Area Development	Covering an area ha and or built up area ≥ 1,50,000 sq. mtrs. ++	(Protection) Act, 1972; (ii) Critically polluted areas as identified by theCentral Pollution Control Board from time to time; (iii) Eco-sensitive areas as notified under section 3 of the Environment (Protection) Act, 1986, such as, Mahabaleswar Panchangi, Matheran, Pachmarhi, Dahanu, Doon Valley and (iv) inter-state boundaries and international boundaries. Provided that the requirement regarding distance of 10km of the inter-state boundaries can be educed or completely done away with by an agreement between he respective states or U.Ts haring the common boundary in the case the activity does not fall within 10 kilometers of the areas mentioned at item (i), (ii) and (iii) above
# (built up area for covered construction; in the case of facilities open to the sky, it will be the activity area)			
++All projects under Item 8(b) shall be appraised as Category B1			

This manual addresses the important issues to be discussed in the environmental impact assessment of building construction, townships and area development projects. Fig.1 shows the EIA clearance process for the building construction, townships and area development projects.

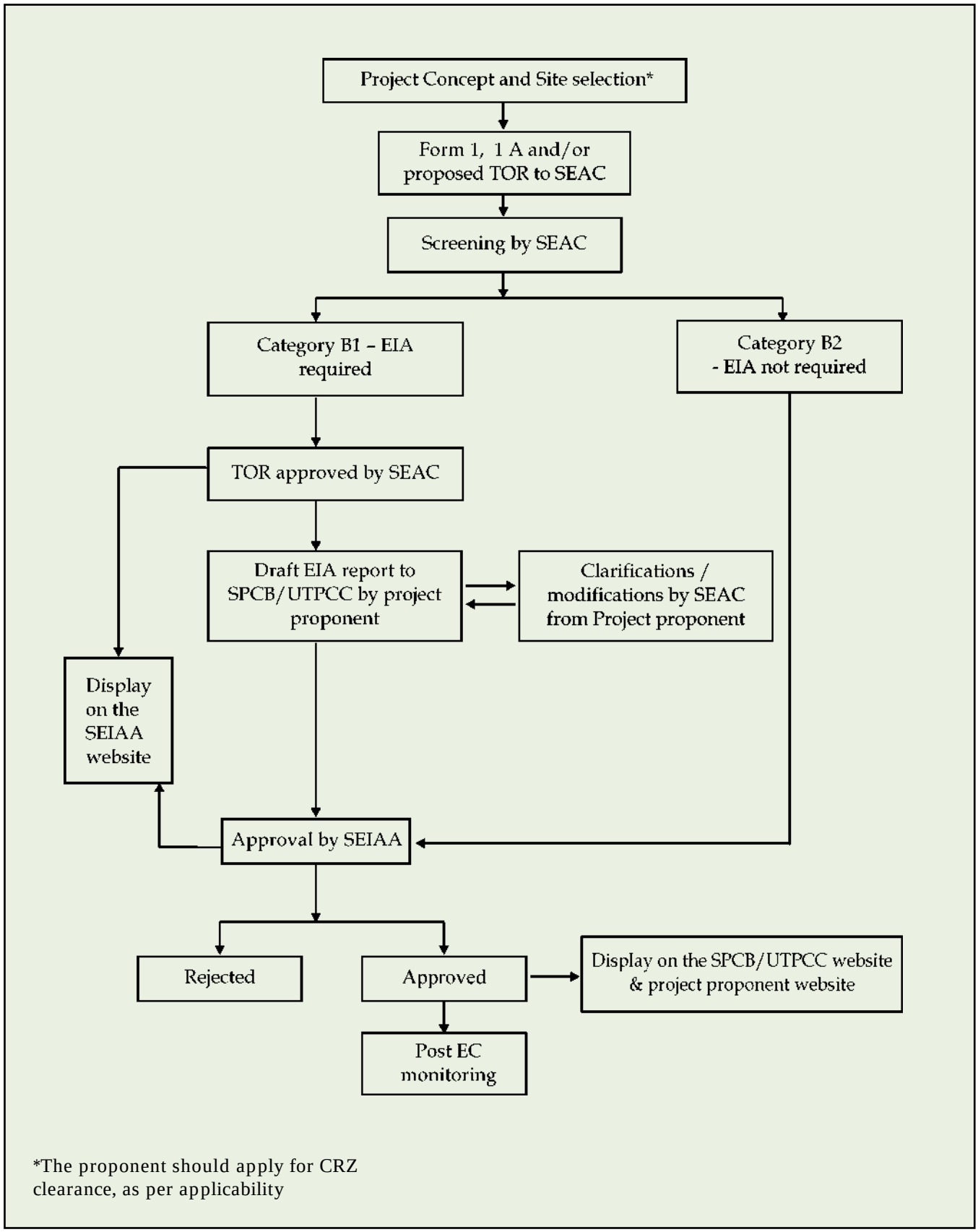


Figure 1.1: Prior Environmental Clearance Process for Category B Projects

The projects requiring an Environmental Impact Assessment report termed Category 'B1' and remaining projects termed Category 'B2' and will not require an Environment Impact Assessment report. For categorization of projects into B1 or B2 except item 8 (b), the Ministry of Environment and Forests should issue appropriate guidelines from time to time. All projects and activities listed as Category 'B' in Item 8 of the Schedule (Construction / Township / Commercial Complexes / Housing) shall not require scoping and will be appraised on the basis of Form 1/ Form 1A and the conceptual plan.

- The projects involving clearance under Coastal Regulation Zone Notification, 1991 shall submit with the application a CRZ map duly demarcated by one of the authorized agencies, showing the project activities, w.r.t. C.R.Z (at the stage of TOR) and the recommendations of the State Coastal Zone Management Authority (at the stage of EC). Simultaneous action shall also be take to obtain the requisite clearance under the provisions of the CRZ notification, 1991 for the activities to be located in the CRZ
- 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 (at the stage of EC)
- All correspondence with the Ministry of Environment & Forests including submission "of application for TOR/Environmental Clearance, subsequent clarifications, as may be required from time to time, participation in the EAC meeting on behalf of the project proponent shall be made by the authorized signatory only. The authorized signatory should also submit a document in support of his claim of being an authorized signatory for the specific project"

Ref:- EIA notification - Amendment 2009

1.3 Terms of Reference (TOR)

The terms of reference (TOR) pertinent to preparation of EIA study reports for building construction, township and area development projects is attached as Annexure 1 to this EIA guidance Manual. TOR relevant to individual projects is to be added by the proponent and should be submitted with the application along with 'Form 1' and 'Form 1A' and the State Level Expert Appraisal Committee. The issues are addressed separately for building construction projects and townships and area development projects.

1.4 Validity of Environmental Clearance

The prior environmental clearance granted is valid for a period of five years. The regulatory authority concerned may extend this validity period by a maximum period of five years provided an application is made to the regulatory authority by the applicant within the validity period, together with an updated Form 1, and Supplementary Form 1A, for construction projects or activities (item 8 of the schedule)

1.5 Post Environmental Clearance Monitoring

For 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 environmental clearance and the details of MoEF website where it is displayed.

The Project management shall submit half-yearly compliance reports in respect of the stipulated prior environmental clearance terms and conditions on 1st June and 1st December of each calendar year. All such reports shall be public documents.

1.6 Transferability of Environmental Clearance

A prior environmental clearance granted for a specific project or activity to an applicant may be transferred during its validity to another legal person entitled to undertake the project or activity on application by the transferor or the transferee with a written "no objection" by the transferor, to, and by the regulatory authority concerned, on the same terms and conditions under which the prior environmental clearance was initially granted, and for the same validity period.

1.7 Generic Structure of Environmental Impact Assessment Document

In terms of the EIA notification of the MoEF dated 14th September 2006, the generic structure of the EIA document should be as under:

- Introduction
- Project Description
- Description of the Environment
- Anticipated Environmental Impacts & Mitigation Measures
- Analysis of Alternatives (Technology and site)
- Environmental Monitoring Programme
- Additional Studies
- Project Benefits
- Environmental Management Plan
- Summary & Conclusion
- Disclosure of Consultants engaged

1.8 Identification of Project Proponent

Profile of the project proponent, contact address with e-mail, fax, phone number etc should be furnished. All correspondence with MoEF shall be made by the authorized signatory only. The authorized signatory should also submit a document in support of his claim of being an authorized signatory for the specific project

1.9 Brief Description of Project

In this section details of the project nature, size, location and its importance to the country and the region are to be included. Project site description; survey / khasra nos, village, tehsil, district, state & extent of the land, latitude & longitude of the boundaries are to be furnished.

Description of existing national and international environmental laws / regulations on the proposed activity is to be brought out clearly. If there are any notified restrictions / limitations from environmental angle, issued by the district administration, State or Central government, the same should be furnished. Details of litigation(s) pending against the project / proposed site and or any direction passed by the court of law against the project, if any, should be stated.

In case of expansion / modernization of the project, the environmental compliance status for the existing project should be furnished for the following:

- Status of Environmental Clearance and compliance for the terms & conditions for the existing project
- Validity of the Air & Water Consent orders, and Hazardous Waste Authorization (HWA) from SPCB / PCC for existing project
- Notices / directions issued by the regulatory agencies under section 33(A) of the Water Act, 1974 as amended, under section 31(A) of the Air Act 1981 as amended and any directions issued under the provisions of the E (P) Act, 1986 during the last one year

PROJECT DESCRIPTION

2

2.0 General

The description of the project to be given in this chapter of the EIA study report should be reasonably adequate to understand the likely overall impact of the project construction and operational phases on various facets of environment.

2.1 Description of the Project

Location (use maps showing general location, specific location, project boundary and project site layout).

Essential Toposheets / Maps to be Provided with TOR application

A map of the study area 2 km from the boundary of the project area, delineating the major topographical features such as land use, drainage, locations of habitats, major constructions including roads, railways, pipelines, industries if any in the area are to be mentioned.

A map covering aerial distance of 15 kms from the boundary of the proposed project area delineating environmental sensitive areas as specified in Form I of EIA notification dated 14th Sept. 2006. In the same map the details of environmental sensitive areas present within a radial distance of 1 Km from the project boundary should be specifically shown.

Remote Sensing Satellite Imagery

Land use map of the study area in 1:10,000 scale based on high resolution satellite imagery delineating the forest, agricultural land, water bodies, settlements, and other cultural features.

Digital Elevation Model / Contour Map

Contour map on 1:10000 scale for the study area showing the various proposed break-up of the land.

Description of the project site, geology, topography, climate, transport and connectivity, demographic aspects, socio, cultural and economic aspects, villages, settlements should be given.

Details of environmentally sensitive places, land acquisition, rehabilitation of communities / villages, present status of such activities are to be mentioned. .

Historical data on climate conditions such as wind pattern, history of cyclones, storm surges, earth quake etc., for the last 25 years are to be given. An analysis and interpretation of the data has to be given by the project proponent.

Detailed layout plan of proposed project development, communication facilities, access / approach roads, landscape, sewage disposal facilities, and waste disposal etc; to be given. Layout plan of proposed development of built up areas with covered construction such as buildings, recreational facilities, DG set rooms, water supply installations etc; are to be given. Requirement of natural resources and their sources are to be detailed out.

Litigations if any: In some of the states, there may be some litigation in process between public / State Govt. agencies / other industries and the project proponent or other projects relevant to the project proposed. In such cases, court rulings / directions on the matter may be mentioned. These may be studied and highlighted in the project report to avoid loss of time and money in planning the project.

2.2Site Selection

Apart from the issues addressed in Section A of this manual the following are to be ensured.

Proposed land use must conform to the approved Master Plan / Development plan of the area. If there is no approved Plan, consent from appropriate authority should be taken and should be submitted for Environment clearance. If the area is outside municipal limits / outside planning area, full justification for the proposed development should be provided.

Sites for new townships should conduct an analysis of the cultural and historical conditions, the urban context considerations, availability of water and other critical infrastructures like electricity, roads with adequate width and capacity and environmental considerations including ecosystems and diversity .

The landuse zoning has to be consider with special reference to the natural hazard prone areas identified.

Land Use Zoning in Natural Hazard Prone Areas

Town and country planning has developed regulations for zones identified as natural hazard zones in India. These include earthquake, floods, hilly terrains etc.

The regulations for Land Use Zoning for Natural Hazard Prone Areas are to be notified under section

1) u / s 73(f) of Model Town & Country Planning Act, 1960; OR
2) u / s 143(f) of Model Regional and Town Planning and Development Law; OR
3) u / s 181(f) of Model Urban & Regional Planning and Development Law (Revised) of UDPFI Guidelines

As may be applicable in the states under the existing provisions of Town and Country Planning legislation as and when Master Plan / development Plan of different cities / towns / areas are formulated.

The purpose of the land use zoning is for development of particular area to serve the desired purpose efficiently and to preserve its character.

Identification of Natural Hazard Prone Areas

Earthquake Prone Areas

a. Intensities of VII or more on Modified Mercalli or MSK intensity scale are considered moderate to high. areas under seismic zones III, IV and V as specified in IS 1893. Therefore, all areas in these three zones will be considered prone to earthquake hazards.

b. In these zones the areas which have soil conditions and the level of water table favourable for liquefaction or settlements under earthquake vibrations will have greater risk to buildings and structures which will be of special consideration under Land Use Zoning.

c. Under these zones, those hilly areas which are identified to have poor slope stability conditions and where landslides could be triggered by earthquake or where due to prior saturated conditions, mud flow could be initiated by earthquakes and where avalanches could be triggered by earthquake will be specially risk prone.

d. Whereas, earthquake hazard prone areas defined in 'a' above are identified on the map given in IS 1893 to small scale and more easily identified in the larger scale state wise maps given in the Vulnerability Atlas of India, the special risky areas as defined in 'b' and 'c' above, have to be determined specifically for the planning area under consideration through special studies to be carried out by geologists and geo-technical engineers.

e. If an active fault trace is identified by GSI (Geological Survey of India), a structure for human occupancy should not be placed over the fault trace and must be set back by a minimum of 15 m on either side of fault trace..

Cyclone Prone Areas

a. Areas prone to cyclonic storms are along the sea coast of India where the cyclonic wind velocities of 39 meter per second or more are specified in the Wind Velocity Map given in IS 875 (part 3) to a small scale and easily identified in the Vulnerability Atlas of India where the Maps are drawn state wise on a larger scale.

b. In these cyclone prone areas, those areas which are likely to be subjected to heavy rain induced floods or to flooding by sea-water under the conditions of storm surge, are specially risky due to damage by flood flow and inundation under water.

c. Whereas, areas under 'a' are easily identified, those with special risk as under 'b' have to be identified by special contour survey of the planning area under consideration and study of the past flooding and storm surge history of the area. These studies may have to be carried out through the Survey of India or locally appointed survey teams, and by reference to the Central Water Commission, Government of India and the department of the State or U.T dealing with the floods.

Flood Prone Areas

a. The flood prone areas in river plains (unprotected and protected by bunds) are indicated in the Flood Atlas of India prepared by the Central Water Commission and reproduced on larger scale in the statewise maps in the Vulnerability Atlas of India.

b. Besides the above areas, other areas can be flooded under conditions of heavy intensity rains, inundation in depressions, backflow in drains, inadequate drainage, failure of protection works, etc.

c. Whereas, the flood prone areas under 'a' are identified on the available maps as indicated, the areas under 'b' have to be identified through local contour survey and study of the flood history of the planning area. Such studies may be carried out through Survey of India or local survey teams, and by reference to the Central Water Commission and the departments of the state or U.T dealing with the floods.

Land Slide Prone Areas

a. While it is known that most hilly areas are prone to landslides / landslips, the susceptibility of the various areas to landslide varies from very low to very high. Landslide zoning naturally requires mapping on large scale. Normally medium scale of 1:25000 is at least chosen.

In preparation of the landslide zone map, two types of factors are considered important as listed here below:

1. *Geological/Topographic Factors/Parameters*
   - Lithology
   - Geological Structures / Lineaments
   - Slope-dip (bedding, joint) relation
   - Geomorphology
   - Drainage
   - Slope angle, slope aspect and slope morphology
   - Land use
   - Soil texture and depth
   - Rock weathering

2. *Triggering Factors*
   - Rainfall
   - Earthquake
   - Anthropogeny

b. Whereas the factors listed under geological / topographic parameters have been considered as basic inputs for the landslide potential model, the three triggering factors namely, rainfall, earthquake and anthropogeny were considered external factors which trigger the occurrence of a landslide.

c. Whereas, the landslide prone areas under 'a' are available for some parts of the country on the maps given in Landslide Hazard Zonation Mapping in the Himalayas of Uttranchal and Himachal Pradesh States using Remote Sensing and GIS Techniques, pub. By National Remote Sensing Agency, Department of Space, Government of India, Hyderabad and Landslide Hazard Zonation Atlas of India – Landslide Hazard Maps and Cases Studies prepared by Building Materials & Technology Promotion Council, Ministry of Urban Development & Poverty Alleviation, Govt. of India, the risky areas in other parts of the country have to be determined specially for the planning areas under consideration through special studies to be carried out by the State / UT governments and the concerned Competent Authorities.

Land Use Zoning of Flood Prone Areas :

(a) Preparation of Flood Contour Maps

The following actions should be taken to prepare the flood contour maps by taking up special studies / surveys as found necessary in the Development Area:

i. Prepare detailed contour plan of the area liable to flood on a scale of 1 in 15000 or larger scale showing contours at interval of 0.3 to 0.5 metre;

ii. Fix reference river gauges or maximum flood levels due to heavy rains with respect to which the areas are likely to be inundated; Demarcate areas liable to flooding by *floods in rivers* of return periods of 5, 25, 50 and 100 years or by *excessive rainfall* of return period of 5, 10, 25, and 50 years;

iii. Mark on the maps the submersion contours for these flood stages.

(b) Regulation for Land Use Zoning

i. Installations and Buildings of Priority 1 should be located in such a fashion that the area is above the levels corresponding to a 100 year flood or the maximum observed flood levels whichever higher. Similarly they should also be above the levels corresponding to a 50-year rainfall flooding and the likely submersion due to drainage congestion;

ii. Buildings of Priority 2 should be located outside the 25 year flood or a 10 year rainfall contour, provided that the buildings if constructed between the 10 and 25 year contours should have either high plinth level above 25 year flood mark or constructed on columns or stilts, with ground area left for the unimportant uses;

iii. Activities of Priority 3 viz. play grounds, gardens and parks etc. can be located in areas vulnerable to frequent floods.

Planning in Hill Areas

In order to ensure environmentally sound development of hill towns, the following restrictions and conditions may be proposed for future activities.

An integrated development plan should be prepared taking into consideration environmental and other relevant factors including ecologically sensitive areas, hazard prone areas, drainage channels, steep slopes and fertile land.

Water bodies including underground water bodies in water scares areas should be protected. Where cutting of hill slope in an area causes ecological damage and slope instability in adjacent areas, such cuttings shall not be undertaken unless appropriate measures are taken to avoid or prevent such damages.

No construction should be ordinarily undertaken in areas having slope above 30^0 or areas which fall in landslide hazard zones or areas falling on the spring lines and first order streams identified by the State Government on the basis of available scientific evidence.

Construction may be permitted in areas with slope between 10º to 30º or spring recharge areas or old landslide zones with such restrictions as the competent authority may decide.

These criteria are to be taken into consideration for a specific site and wherever applicable.

2.3 Manpower Requirement

The proponent should indicate the requirement of various categories of manpower such as skilled, semi-skilled, unskilled workers, technicians, engineers, managers during the construction phase.

The proponent should give the details of compliance of Acts related to employees' service and their welfare measure as per the provisions of government of India. This is because the building and other construction works is characterized by its casual nature, temporary relationship between employer and employee, uncertain working hours, lack of basic amenities and inadequacy of welfare facilities.

The following are the Acts for compliance by proponent regarding Manpower employment. The proponent should follow any later modification or Revisions for these Acts automatically

- Minimum Wages Act 1948,
- Contract Labour (Regulation & Abolition) Act1970
- Inter-State Migrant Workmen (Regulation of Employment & Conditions of Services) Act 1979
- The Building and other construction workers (Regulation and Employment of Service) Act, 1996
- The Building and other construction workers Welfare Cess Act 1996.

2.4 Project Implementation Schedule

The proponent should also submit the detailed project implementation schedule bar chart, CPM / PERT chart etc., duly bringing out interrelationship of major activities.

DESCRIPTION OF THE ENVIRONMENT

3

3.0 General

Environment facets to be considered in relation to townships and area development are: (a) land (b) air (c) noise (d) water (e) biological (f) socio-economic and (g) solid waste management. Hence it is necessary to ascertain the baseline data of these environmental facets.

Study Area

In the case of townships projects, EIA guidelines are specifically mentioned in Form 1A of EIA notification 2006. The following details are to be given:

1. Site development area
2. Area with angular distance of 2kms surrounding the site.

The project study area comprises the site earmarked for building construction with specified surrounding area. The baseline data collection / monitoring should be from primary and secondary sources and field monitoring studies. When secondary data is used source of data is to be mentioned clearly. The period of study for collecting primary data would be one season other than the monsoon season.

3.1 Land Environment

Existing status of baseline conditions of land use can be determined by studying the changes in the land use pattern in the past 10yrs by collecting data from secondary sources such as census records, agricultural census and land records. The land use pattern covering forest land, total irrigated land, non-irrigated land, cultivable waste, are to be calculated and given as a map (Annexure 2).

Soil formation is influenced mainly by climate, geology, relief and other biotic interactions. The soil characteristics in the project area which would affect the agricultural and afforestation potential of the area need to be studied. Particle size scale is to be given based on the texture analysis. Soil porosity and SAR ratios are important and are to be assessed for all locations. The samples are to be collected and analyzed as per CPCB norms (Annexure 3). The hydraulic conductivities in soil are important for building construction activities and are given in Annexure 4. The rating chart for the soil test values for primary nutrients is given in Annexure 4. The physical and chemical properties of soil are to be analysed and presented as given in Table 3.1 and 3.2

3.2 Water Environment

The physiography of the land will control the drainage pattern in the region. The drainage pattern in the area is to be drawn. Hydro-geological settings and the ground water levels are to be examined and presented. Ground water, surface water and waste water generated in the study area is to be collected as per CPCB norms (Annexure 3) and examined for physico- chemical, heavy metals and bacteriological parameters. The drinking water and fresh water standards are given in Annexure 5. These projects crate a continuous demand on the water resources. The format for

ground water quality data presentation is given in Table 3.3 and Table 3.4. The amount of water demand can be calculated based on the occupancy of the building and the per capita consumption (Annexure 6) as given by BIS for different categories.

Total quantity of water used= Occupancy x Quantity (LPCD)

Similarly the format in which the data for surface water quality is to be presented is shown in Table 3.5 and Table 3.6.

3.3 Air Environment

The climatic data procured from secondary sources is very important for identifying the season and period of monitoring primary data. The climatic data can help in using suitable building technologies and energy conservation measures.

The methodology to be adopted for collection of climatic data specific to the site is to compile the mean monthly normals of atmospheric parameters, form previous 10yrs data recorded by the nearest IMD station. Wind Roses for each month giving the wind direction speed are to be collected and presented. Most probable wind speed class and wind direction at the nearest IMD site is to be estimated from this.

Baseline data of air pollutant parameters extending an area of 2 Km from the project should be monitored at a number of locations. Description of baseline data of ambient air parameters namely RSPM, nitrogen dioxide, sulphur dioxide, and carbon monoxide are to be collected. One season data is to be monitored other than monsoon as per the CPCB Norms. Sampling locations are to be located as per CPCB norms. The ambient air quality standards are given in Annexure 7. Number and locations of Ambient Air quality monitoring (AAQM) stations are decided based on the nature of project, meteorological conditions, Topography, selected pollution pockets in the area and likely impact areas. The parameters measured, frequencies of sampling, technique to be as prescribed by CPCB are given in Annexure 3. The monitoring locations for air quality are to be given as shown in Table 3.7 and data should be represented as shown in Table 3.8. The monitoring locations are also to be shown on the area map.

3.4 Noise Environment

Construction equipment and road traffic are the major sources of noise. Baseline data of noise at the project area and the neighbourhood habitat areas is to be ascertained. Daytime and nighttime data should be collected and presented as shown in Table 3.9 the parameters, frequencies of sampling are shown in Annexure 3 and the standards for noise are given in Annexure 8.

3.5 Biological Environment

Baseline data from field observations for various terrestrial and aquatic systems are to be generated. Wild life sanctuaries and National parks location within 10km radius from project boundary are identified based on secondary data. Primary data on survey of the wild animals and birds in the study area is collected and identified with the classification into various schedules taken from secondary data.

3.6 Socio-economic Environment

Baseline data on the socio economic environment in the study area is to be collected. The issues to be focused include demographic structure, economic activity, education, literacy profile, land use, health status and infrastructure resources. Primary data through designed questionnaires from the house hold survey within the study area is collected and from secondary sources and represented as shown in Table 3.10 and 3.11. The demographic details consisting of population distribution, Average household size, population density, sex ratio, social structure and literacy levels within project study area are concluded from this data collected.

3.7 Solid Waste

Present data available on solid waste generated in the area are to be collected. If possible the present quantities of wastes – hazardous household wastes, electronic wastes, biomedical and non-hazardous generated in the study are to be collected and presented.

ANTICIPATED IMPACT AND MITTIGATION MEASURES

4.0 Introduction

Impacts can be classified in the presentation as direct, indirect and cumulative impacts. These can be further subdivided for convenience and clarity to positive and negative impacts, random and predictable impacts, local and widespread impacts, temporary and permanent impacts, long term and short term impacts. The report should preferable cover the impacts as discussed above. Suitable avoidance / mitigation methods can be given for each of the alternatives provided. The most feasible one can be chosen by the project proponent.

Prediction of Impact during Construction Phases

The activities that take place during construction phases of the project are leveling of site, construction and erection of buildings etc., and associated equipments in operation. The potential primary and secondary impacts on the environment, their prediction, significance and mitigation are to be discussed.

Prediction of Impact During Operational Phases

The potential significant impacts are on topography, land use, soil quality, ambient air quality, noise levels, traffic densities, water resources, water quality, biological environment, demography and socio- economics. During construction and operational phase of the project, various activities may have impact on some or other environmental parameters. Various environmental attributes are to be studied during these phases for their overall impact on the surrounding environment. The guidance for assessment and impact is given in Annexure 9.

4.1 Land Environment

Anticipated Impact

Impacts due to activity have to be identified that are caused. Some of the impacts could be

- Compaction of soils by earth moving equipment
- Erosion and modification of surface
- Over exploitation of agricultural soils due to future development in a zone sensitive to erosion
- Irreversible salinization and acidification of mangrove swamp soils

Mitigation Measures

Soil erosion is an important parameter which needs to be addressed during the construction phase. Some of the mitigation measures include:

- The environmental impact of soil erosion can best be mitigated by removing vegetative cover only from the specific site on which construction is to take place and by disturbing the vegetation in adjacent areas as little as possible. Land clearing activities should be kept to the absolute minimum and use crushed stone rather than asphalt or concrete for surfacing parking areas should be attempted.

- Evolve strategies to stockpile top soil and reuse later for landscaping purpose
- Adopt measures such as temporary and permanent seeing, mulching, early dikes, silt fencing, sediment traps and sediment basins.
- Open areas can be landscaped
- Paved areas can be installed with permeable paving.
- Impermeable surfaces direct all runoff towards storm water collection pits.
- Disturbing the existing vegetation and natural contour of the land as little as possible can mitigate increases in surface runoff. Vegetation along watercourses should not be cleared indiscriminately. Neither should potholes or swamps be drained unless absolutely necessary for successful completion of the activity.
- Construction, land management, or mining activities that result in the soil being laid bare could be scheduled in such a way that some type of vegetative cover appropriate to the site could be established prior to the onset of intense rain or windstorms. If grass is to be seeded, mulch of straw will help to protect the soil from less extreme erosive forces until vegetative and root development begins.
- Natural drainage patterns can often be maintained by preparing sodden waterways or installing culverts.
- Steep slopes can be terraced, thereby effectively reducing the length of slope.
- Check dams built near construction sites can reduce the quantity of eroded soil particles reaching free-flowing streams or lakes.
- Use of “floating” foundations and height restrictions in earthquake zones and increased foundation height, wall strength, and roof support in areas periodically subject to cyclones can reduce the hazards.
- All forms of temporary structures should be avoided from the flood plain, and all permanent structures should be raised to a height above the level which flood waters can be expected to reach once every 100 years (100-year flood).
- Installation of underground drainage structures helps to reduce sediment loads
- Engineering plans can be drawn to reduce the area of earth cuts on fills below what might otherwise be acceptable, provide physical support for exposed soil or rock faces, concentrate or distribute – as appropriate the weight loading of foundations to areas or state better able to support that weight,
- restricting the number, frequency and area of movement of heavy machinery
- Compatibility between adjacent land uses can best be assured by providing a green belt between the proposed activity and nearby properties where any significant degree of incompatibility is likely to result.

Natural Topography

It is essential to avoid disturbance to the site by retaining the natural topography of the site or design the landscape with at least 15% to 25% of the site area. For credit purposes it should be noted that the parking areas, walkways etc landscaping over built structures such as roofs, basement etc will not be considered. Similarly potted plants also will not be considered.

- turf design on site so as to conserve water

- design landscape to ensure minimum consumption of water – i.e. drought tolerant species
- reduce the demand for irrigation water through water efficient management techniques
- turf and each type of bedding area may be segregated into independent zones based on watering needs.

4.2 Water Environment

Construction Phase

The construction phase would involve water requirements for the following activities

- site preparation: Involves levelling for infrastructure development and removal of vegetation. Water is required for dust settlement, consolidation, compaction and curing.
- Construction of building infrastructure involves water for construction activities and domestic and other water requirements for labour and staff onsite.
- The period of this activity is the be mentioned

Impact Prediction

- Use of large quantities of water in curing
- Use during the operational phase by residence for routine activities

Mitigation Measures

Measures for reducing water demand during construction

To avoid wastage of curing water, following guidelines are to be followed:

- Curing water should be sprayed on concrete structures; free flow of water should not be allowed for curing.
- After liberal curing on the first day, all concrete structures should be painted with curing chemical to save water. This will stop daily water curing hence save water.
- Concrete structures should be covered with thick cloth / gunny bags and then water should be sprayed on them. This would avoid water rebound and will ensure sustained and complete curing.
- Ponds should be made using cement and sand mortar to avoid water flowing away from the flat surface while curing.
- Water ponding should be done on all sunken slabs, this would also highlight the importance of having an impervious formwork.

Some of the common practices and devices that can save water are:

Monitoring water use: Use of water meter conforming to ISO standards should be installed at the inlet point of water uptake and at the discharge point to monitor the daily water consumption.

Use of water saving devices / fixtures: About 40% of all water used indoors is in the bathroom and toilets and more than 10% of that used is in the kitchen. The conventional fixtures used in toilets use water at the rate of 12-15 litres per flush. The opportunity to lower the consumption through Low flow flushing systems, Sensor based fixtures, Waterless urinals, Tap aerators etc can be encouraged to reduce the water usage.

Installation of dual pipe plumbing for using recycled water / rain water can reduce usage of potable water considerably. There can be two lines, one supplying fresh water for drinking, cooking and bathing etc and other for supply of recycled water for flushing, landscape irrigation, car washing, thermal conditioning etc.

The quantity of ground water usage and waste water generated during both the phases is to be estimated based on the population, reuse and recycle activities planned. Based on the quantification of waste water, the treatment plants should be suitably designed.

In townships and area development projects, it is expected that all the buildings are connected by sewers. Treatment plants normally used for building sewage are based on biological processes. In addition, artificial wetlands or reed bed systems for waste water treatment based on the use of deep – rooted plants can also be used at decentralized level. Aerobic treatment systems, anaerobic treatment systems, Root zone treatment system, Decentralized Wastewater Treatment Systems" which includes Primary treatment: sedimentation and floatation, Secondary anaerobic treatment in fixed-bed reactors: baffled upstream reactors or anaerobic filters, Tertiary aerobic treatment in sub-surface flow filters and Tertiary aerobic treatment in polishing ponds are some of the methods for treatment of the waste waters generated in the township. The effluent discharge standards are shown in Annexure 10.

Rainwater Harvesting

It is essential to provide rain water harvesting or storage systems to capture atleast 50% of the runoff volumes from the roof surfaces. In coastal areas where the groundwater table is shallow and water percolation is limited collection tanks may be provided. Given below are some details of run off coefficients from different surfaces.

Run off Coefficients for Typical Surface Types

Surface Type	Runoff Coefficient
Roofs conventional	0.70 to 0.80
Roofs inclined	0.85 to 0.95
Concrete / Kota Paving	0.60 to 0.70
Gravel	0.50 to 0.60
Brick Paving	0.75
Vegetation	
1%–3%	0.20
3%–10%	0.15
> 10%	(more the vegetation cover – less the runoff coefficient) 0.10
Turf slopes 0%–1%	0.25
1%–3%	0.35
3%–10%	0.40
> 10%	0.45

- The rainwater harvesting structure is to be designed based on the sub-surface characteristics. The factors to be considered include weathering, fractures and joints for rocky sites and thickness of aquifer for sedimentary sites.
    - Rainwater harvesting structures must be kept a safe height above the highest level of ground water table in order that the ground water quality is safeguarded. Depending on the certainty of information about the highest level of ground water table and the trend of rise of ground water table, this gap may be from 3 to 5 metres.
    - The intensity of peak hourly rainfall and peak daily rainfall should be based on observations made by Indian Meteorological Department rather than inferred from annual rainfall.
    - The peak hourly rainfall should be adopted for calculating the components for recharging groundwater, and peak daily rainfall should be adopted for calculating the capacity of storage tank.
    - Only the terrace runoff may be considered for storage and reuse after pre-treatment and disinfection.

Types of Structures Include :

- Recharge pits, Recharge trenches, Recharge shaft
- Trench with recharge well, Shaft with recharge well
- Recharge through abandoned hand pumps, abandoned tube well
- Recharge well
- Percolation tank
- Check dam
- Sub-surface dyke
- Roof top rain water harvesting

It is important that roof top structures to capture rainwater include in their design flushing arrangements so as to let out impurities such as paper wastes, leaves, bird droppings etc. The runoff from rainwater harvesting structures is to be treated depending upon its source. For example:

a. The runoff from terrace and ground surface should always be segregated and given appropriate pre-treatment before recharging ground water.

b. Runoff from parking areas must also be treated for removal of oil and grease.

c. Activated carbon filter should be included in the pre-treatment of runoff from lawns and landscaped areas for arresting pesticides.

In designing the ground water recharge structures following points should be taken into consideration:

1. Annual rainfall, peak intensity and duration of each storm
2. Type of soil and subsoil conditions and their permeability factor : Infiltration rates of soil and hydraulic conductivities of water transmission are required to be considered while

constructing recharge systems. Normally hydraulic conductivities (K- values) of various soils in m / day , which can serve the purpose of assessing the final infiltration rates of soils These can be used in the absence of measured values of soils under recharge. K values need to be measured for a particular site for efficient results. As mentioned earlier the specific yields for different formations and porosities of soil are given in Annexure 4.2 and 4.3 respectively.

The main site conditions to be assessed in case of (surface / subsurface) storage structures are:

- Availability of suitable catchments (Rooftops are usually recommended as against surface catchments in this case as quality control measures can be relatively easier to apply and monitor).
- Foundation characteristics of soil near the house
- Location of trees
- Estimated runoff to be captured per unit of the catchment
- Availability and location of construction material (MoRD, GoI, 2004)

4.3 Air Environment

Anticipated Impact

Construction phase would involve site clearances and preparation, infrastructure development, building construction and other related activities and

Operational phase would involve emission from vehicular movement and diesel generators, and negligible emissions from sewage and solid waste handling and disposal.

The building material carrying vehicles as well as the construction machinery generate emissions and pollute the environment. Dusts include brick and silica dusts, wood dust from joinery and other woodworking and from earthmoving and other vehicle movements within the site. Asbestos-containing dust especially during the demolition of buildings is very harmful. It is a difficult task to separate these wastes. Construction machineries pose a special threat to air quality. It is estimated that construction machineries emit toxic pollutants and are sources of fine particulate matter (PM2.5, which lodges deeply in the human lung) and oxides of nitrogen (NOx), a key ingredient in the formation of ground-level ozone and urban smog.

Mitigation Measures

The mains concerns during demolition activities are the emissions generated by the vehicles and the machineries. Air Pollution may be caused by areas or point sources such as cities, industrial areas, factories or by linear sources such as highways. Vegetation buffers can minimize the build–up of pollution levels in urban areas by acting as pollution sinks.

- Wind erosion is a serious problem in areas where the ground is virtually bare and devoid of vegetation. Vegetation methods are found to be most effective in the form of windbreaks and shelterbelts.
- A dense belt provides greater shelter immediately to leeward but the sheltered area is not as extensive as when a more permeable zone of vegetation is provided.
- Plants are good absorbers of sulphur dioxide. Parks with trees have an SO_2 level lower than city streets.

- Heavy roadside planting in the form of shelterbelts can result in reduction in airborne lead
- Complete dust interception can be achieved by a 30 m belt of trees. Even a single row of trees may bring about 25 percent reductions in airborne particulate.
- Evergreen trees are found to be more effective.
- The species chosen must be resistant to pollutants, particularly in the early stages of their growth (Annexure 11).

Mitigation Measures for Dust Control

Adopting techniques like, air extraction equipment, and covering scaffolding, hosing down road surfaces and cleaning of vehicles can reduce dust and vapour emissions. Measures include appropriate containment around bulk storage tanks and materials stores to prevent spillages entering watercourses.

The other measures to reduce the air pollution on site are:

- On-Road- Inspection should be done for black smoke generating machinery.
- Promotion of use of cleaner fuel should be done.
- All DG sets should comply emission norms notified by MoEF/ CPCB.
- Vehicles having pollution under control certificate may be allowed to ply.
- Use of covering sheet to prevent dust dispersion at buildings and infrastructure sites, which are being constructed.
- Use of covering sheets should be done for trucks to prevent dust dispersion from the trucks, implemented by district offices.
- Paving is a more permanent solution to dust control, suitable for longer duration projects. High cost is the major drawback to paving.
- Locally found gravel may be applied to access roads as it adds a protective layer over the exposed soil and helps control dust generation in some situations. It is important that gravel contain a minimal percentage of fines and clean gravel be added periodically, as the fines migrate to the surface and create dust.
- Reducing the speed of a vehicle to 20 kmph can reduce emissions by a large extent. Speed bumps are commonly used to ensure speed reduction. In cases where speed reduction cannot effectively reduce fugitive dust, it may be necessary to divert traffic to nearby paved areas.

Material storages / warehouses – Care should be taken to keep all material storages adequately covered and contained so that they are not exposed to situations where winds on site could lead to dust / particulate emissions. Fabrics and plastics for covering piles of soils and debris is an effective means to reduce fugitive dust. However, these materials can be costly and are subject to degradation from the sun, weather, and human contact. Straw and hay can also be used to cover exposed soil areas, although they can be disturbed by wind and vehicles.

4.4 Noise Environment

Anticipated Impact

During the construction phase of the site, the following source of noise pollution is expected:

- Construction equipment

During operational phase the following sources of noise pollution is expected:

- Diesel generator operations
- Increase in transport noise from within the site from near by roads.

Mitigation Measures

There are two ways of applying controls or measures. The first is to plan so as to keep the noise at a distance. Under this aspect comes the separation of housing from traffic noise by interposing buffer zones, and the protection of schools and hospitals by green belts, public gardens, etc. The second is the principle of shading or screening. This consists of deliberately interposing a less vulnerable building to screen a more vulnerable one or by providing a solid barrier such as a wall between the source and the location to be protected.

Setting up the barriers: National Building Code 2005 suggests that design solutions such as barrier blocks should be used to reduce external LA10 noise levels to at least 60-70dB(A) at any point 1.0 m from any inward looking façade. Green belts and landscaping could act as an effective means to control noise pollution. In case of railway tracks, a minimum distance of 50m to 70m may be provided between the buildings and the tracks. Thick belts of planting greater than 30 meters are useful for cutting the noise levels from road traffic. Strong leafy trees may be planted to act as noise baffles. Shrubs and creepers may also be planted for additional protection between tree trunks; artificial mounds and banks should be formed where practicable. As little hard paving and as much grass as possible may be used. The creation of green belt is particularly advisable on the perimeter of aerodromes, along railway lines and arterial roads, through or past built up areas and adjoining industrial zones.

Control of noise from road traffic: Trees with heavy foliage planted on both sides of carriage way help slightly muffle the noise provided; the foliage extends for a considerable distance of 30m or above. The codes to be referred for noise control and maintaining minimum standards are given in Annexure 8.

4.5 Biological Environment

The mitigation measures should be suggested that will help in reducing the impact on terrestrial ecology and aquatic ecology. Massive plantation, landscaping are to be ensured in the new construction areas. Also trees, plants should be identified for specific areas so that the plants survive in these conditions. The details of the drought resistant species are given in Annexure 11.

4.6 Socio- economic

Anticipated Impacts

The impact on the socio-economic status of the people in the area is to be studied and detailed out. Positive impacts could include job creation, preservation of environment, infrastructure development and benefits to local population by way of job opportunities. Long term impacts include aspects of demography, aesthetics, and archeological sites. Negative impacts include impacts on cultural aspects and well being.

Township and area development projects could create a severe social impact. Some of these could include increase in noise and interference with existing access to habitation, storm water drainage and enjoyment of open space. Unhygienic site sanitation facilities cause damage to environment and to health of the construction workers.

Mitigation Measures

The objective is to ensure health and safety of the workers during construction, with effective provisions for the basic facilities of sanitation, drinking water, safety of equipments or machinery etc. Following are some of the recommendations to be followed:

- Comply with the safety procedures, norms and guidelines (as applicable) as outlined in the document Part 7 Constructional practices and safety, 2005, National Building code of India, Bureau of Indian Standards
- Provide clean drinking water to all workers
- Provide adequate number of decentralized latrines and urinals to construction workers.
- Guarding all parts of dangerous machinery.
- Precautions for working on machinery.
- Maintaining hoists and lifts, lifting machines, chains, ropes, and other lifting tackles in good condition.
- Durable and reusable formwork systems to replace timber formwork and ensure that formwork where used is properly maintained.
- Ensuring that walking surfaces or boards at height are of sound construction and are provided with safety rails or belts.
- Provide measures to prevent fires. Fire extinguishers and buckets of sand to be provided in the fire-prone area and elsewhere.
- Provide sufficient and suitable light for working during night time.

4.7 Solid Waste

The construction phase waste will comprise of excavated and demolition material while operational phase waste may comprise of domestic, commercial and biomedical wastes, depending upon the type of the project. The different types of wastes need to be handled as per their needs and regulatory requirements. It is not possible to dispose off all type of wastes onto the land and has to be dealt with depending upon their type and characteristics. Building construction leads to generation of sand, gravel, concrete, stone, bricks, wood, metal, glass, polythene sheets plastic, paper etc. as waste.

Type of wastes, which are generated, can be classified into four categories.

1. Construction or demolition waste, i.e., massive and inert waste
2. Municipal waste, i.e., biodegradable and recyclable waste
3. Hazardous waste,
4. E-waste

The waste characterization in constructional stage should be estimated by reviewing other similar already existing projects and given in tabular form. Similarly wastes generated in operational phase should be estimated and classified as

- biodegradable

- recyclable
- inert
- hazardous

and quantified for percentage composition estimation.

Construction and Demolition Waste Management

The construction and demolition waste includes debris, concrete (often recycled and reused at the site), steel and other metals, pallets, packaging and paper products, fluorescent tubes, wood beams, joists, studs, baseboards, cabinets and cupboards, railings, brick, doors and casings, interior windows, bathroom fixtures, light fixtures, ceiling grid and tile, furnishings, replant trees, shrubs. Orderly deconstruction is the proper measure for reuse of the demolished matter. In contrast to demolition, where buildings are knocked down and materials are either land filled or recycled, deconstruction involves carefully taking apart portions of buildings or removing their contents with the primary goal being reuse. It can be as simple as stripping out cabinetry, fixtures, and windows, or manually taking apart the building frame. Gross segregation of construction and demolition wastes into roadwork materials, structural building material, salvaged building parts and site clearance wastes is necessary. Additional segregation is required to facilitate reuse/ recycling.

Waste recycling plans should be developed for construction and demolition projects, prior to beginning construction activity. The plans should identify wastes to be generated, and designate handling, recycling and disposal method to be followed. Handling of waste material requires special precautions such as personal protective equipment and special procedures to prevent the injury. Developers must operate safe methods for waste collection, storage, and disposal operations in a manner to protect the health and safety of personnel, minimize environmental impact and promote material recovery and recycling.

Solid Waste During Operational Phase

Adequate provision should be made for storage of solid waste and for easy access to the dustbins;

- for labours from source to the place of storage, and
- from the place of storage to a collection point specified by the waste collection authority and/or contractor
- Three colours of wheeled bins: - dark grey for inert waste, green for wood and ply waste and blue for hazardous waste can be used.

A minimum of 4% of the total site area should be allocated for storage and pre treatment of the waste. This storage area should be covered and the pollutants from the waste should not affect the surrounding.

Access To and From Bin Storage Areas

Wheeled bins should be made access with ramps. To ensure this vehicle access, paths should be paved and at least 1.2 metres wide with a maximum gradient of 1 in 10. The surface of the path should be smooth, continuous and hardwearing. Ramped kerbs should be provided where the path meets the highway, and bins should not have to pass across designated parking spaces.

Where collection vehicles have to enter developments, there should be sufficient space on paved roads with turning circles for easy circulation. This ensures the refuse vehicles to enter the vicinity of the site without being prevented from doing so by cars parked close to the entrance. Vehicles should never have to reverse onto or from a highway to make a collection. Roadways used by refuse vehicles must be designed to withstand a laden weight of not less than 28 tonnes.

Municipal Solid Waste Management

Waste generated by users- Domestic wastes food leftovers, vegetable peels, plastic, house sweepings, clothes, ash, etc. commercial waste generally comprises of paper, cardboard, plastic, wastes like batteries, bulbs, tube lights etc.

Three-bin system is a good option for segregation at household level. Storage facilities should be created and established by taking into account quantities of waste generation in a given area and the population densities. A storage facility should be so placed that it is accessible to users, within a radius of 25 meter from the source. Local authorities should provide different coloured bins for different categories of waste. Adequate provision should be made for storage of solid waste.

Three colours of wheeled bins: - dark grey for non-recyclable waste, green for kitchen food / compostable garden waste and blue for paper (generally used for flats, schools, offices etc). In addition, boxes must be provided for the collection of other recyclable materials; a green box is used for paper and a black box is used for cans and plastic collections. Individual properties should be allocated a 20-litter bin although for single-family occupancy. Boxes should have lids. Flats and multi-storeyed buildings should have bulk dustbin type container, with a general guide of one 1100 litre bin being adequate for every 60 units, for smaller blocks. The one to five ratio outlined above could be increased or decreased according to the number or properties with greater or less than two bedrooms per unit. The ratio of approx one paper bin to three residual waste bins is only a guide. Waste and Cleansing Section can advise on individual cases.

Hazardous Waste Management

Products, such as paints, cleaners, oils, batteries, and pesticides that contain potentially hazardous ingredients require special care when you dispose of them. Improper disposal of household hazardous wastes can include pouring them down the drain, on the ground, into storm sewers, or in some cases putting them out with the trash.

Hazardous wastes from construction and demolition activities are centering oil, formwork oil, tar and tar products (bitumen, felt, waterproofing compounds, etc.), wood dust from treated wood, lead containing products, chemical admixtures, sealants, adhesive solvents, Explosives and related products and equipment used in excavation, acrylics, and silica, etc. The dustbins for these wastes should be made of durable materials like metal or even masonry if the projects spans for more than a year.

List of Hazardous wastes from construction projects

- Asbestos products – insulation, tiles etc
- Fuels and Heating oils and other volatile / flammable liquids such as coolants, grease etc.
- Centering oil, formwork oil
- Tar and Tar products (bitumen, felt, water proofing compounds etc.)

- Wood Dust
- Lead containing products
- Chemicals , admixtures, sealants, adhesives solvents etc.
- Paints, pigments, dyes and primers
- Carbon black
- Pesticides
- Tarpaulin
- Explosives and related products and equipment used in excavations
- Product packaging (cement bags, cartons, containers, plastic covers etc.)
- Plastics, Acrylics, Silica, PVC
- Fluorescent Lamps Intact and Crushed, Halogen Lamps, Arc Lamps, UV Lamps, High Pressure Sodium Lamps, , Neon Lamps, Incandescent Lamps.
- Mercury Containing Lamps and Tubes, Mercury Vapour Lamps, Mercury Containing Devices – Mercury switches, relays, regulators, thermostats, thermometers, manometers and debris containing mercury
- All types of Batteries
- Electronic Ballasts, PCBs, Transformers, capacitors, switchgear, Lead Cable, Oil filled / gel filled cables
- Electronic Waste– computer products, circuit boards, CRTs, electronic parts, solder dross, weld waste.

Due to the characteristics, the wastes generated from the healthcare establishments are also hazardous in nature. Biomedical wastes have to be dealt with as per the Biomedical Wastes (Handling & Management) Rules, 2000.

- Lead based paints and other hazardous materials may be removed from the structure prior to deconstruction or demolition activities to minimize special handling and disposal requirements for the construction and demolition waste. These activities must be conducted by qualified personnel using appropriate health and safety procedures in accordance with the regulatory requirements.
- Isolated storage for hazardous wastes released from the whole site should be provided on site.
- Source segregation of similar wastes is highly recommended.
- Installation of fire extinguisher is mandatory near storage of hazardous wastes.

E-waste Management

Collection and Storage

Various types of electrical and electronic wastes generated in the building, which includes PC in case of offices and homes, Xerox machine components from office and shops, should be collected separately for transportation to the authorized recyclers approved by the state / Central pollution control boards. There should also be provision for storage of these wastes in the building before transportation.

5

ALTERNATIVE TECHNOLOGIES

5.0 General

The use of modern building material, energy conservation methods and transporation methods along with traffic regulations within the area is to be given in this chapter

5.1 Building Materials

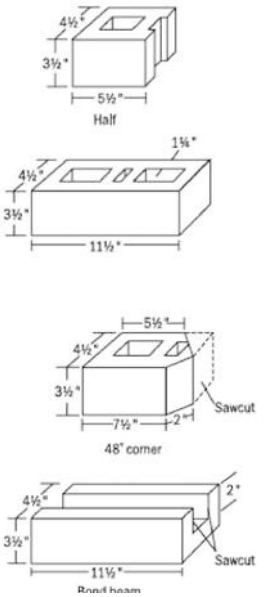
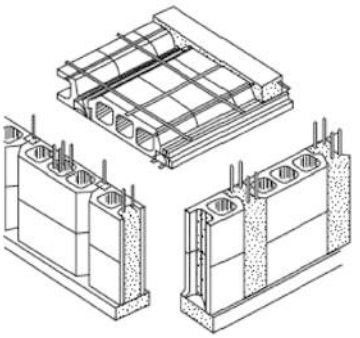
Use of alternative technologies for each component of the buildings of envelope, superstructure, finishes and the road and surrounding areas are discussed in detail (NBCode 2007). Some them are given below:

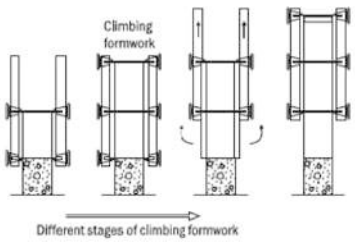
- Brick and block products with waste and recycled contents such as fly ash (waste from coal burning plants), blast furnace slag, sewage sludge, waste wood fibre etc.
- Fly ash based lightweight aerated concrete blocks can be used for walls.
- Perforated bricks can be used for wall structures.
- Brick panel with joists, Filler slab roofing, brick funicular shell roofing, RCC channel units, micro-concrete roofing tiles are some of the alternative techniques for roofing.

Some of the alternate materials for openings in construction are:-

- Use of precast thin lintels, use of ferrocement-sunshade cum lintel etc.
- Use of renewable timber for doors and windows
- Use of steel manufactures from recycled content
- Aluminum from verified recycled content
- Saw dust based doors and window frames
- Ferrocement shutters, PVC doors and windows, Rice husk boards, Natural fibre- reinforced polymer composite door panels
- Bamboo based products, bamboo strips boards.
- Alternatives for finishes include Fly ash, Ceramic tiles, Terrazzo floors

The use of the alternatives for building materials will help reduce the use of non-renewable resources and impact on natural resources. The materials used should be mentioned specifically in the EIA report. Alternative options in building materials are summarized below.

	Conventional Materials	Alternate
Wall 	Clay bricks with cement mortar	*Earth blocks*- Earth blocks stabilized with 5%–15% of cement are good choice for low cost, low-rise construction in hot-humid climates. Brick and block products with waste and recycled contents such as fly ash (waste from coal burning plants), blast furnace slag, sewage sludge, waste wood fibre, rice husk ash, etc. Concrete blocks using lime or waste wood fiber provide reduction of waste and saves energy. Fly ash can be used to replace about 15% to 35% of the total cementitious material. The slag content can be used to replace the same between 20% and 25%. *Fly ash-based lightweight aerated concrete blocks*- Fly ash is a waste product of thermal power plant. Fly ash-based lightweight aerated concrete blocks are manufactured for walling and roofing purposes by mixing fly ash, quick lime, or cement and gypsum with a foaming agent like aluminium powder. *Fal-G (Fly ash, lime, and gypsum)*- Fal-G products are manufactured by binding fly ash, lime, and calcined gypsum (a by-product of phosphogypsum or natural gypsum).
Roof 	The conventional material used for roofing is RCC, as it is suitable for longer spans. The constituents of RCC, i.e, cement, sand, aggregate and steel all are energy intensive materials and high-embodied energy content.	Use of lightweight synthetic aggregate- The example is fly ash based aggregate, which is suitable for manufacture of brick, blocks, and is good substitute for clinker and natural aggregates. Pre-cast / aerated cellular concrete walling blocks and roofing slabs- These are manufactured by the aerated cellular concrete manufacturing process. When used in multi- storied structures, they reduce the weight, resulting in a more economical design. They have high rating to fire resistance and provide better insulation.

	Conventional Materials	Alternate
Superstructure  	Structural frame of building comprises of footing, columns, beams and lintels, over which the envelope of building is supported.	Ferro cement- The composite Ferro cement system is simple to construct and is made of Ferro cement—a rich mortar reinforced with chicken or / and welded wire mesh. Metals- A variety of metals are used in buildings, but the major building material used structurally is steel. Steel has a high-embodied energy and recyclable content, as well as scrap value. Aluminium forms the second most common material used for roofing sheets, window frames, and cladding systems, which has the highest recyclable content. Use of fly ash and / or blast furnace slag concrete -The amount of cement used in concrete can be reduced by replacing a portion of the cement with coal fly ash (waste material from coal burning power plants) and / or GGBF (ground-granulated blast furnace) slag in conventional mixes. Recycled aggregates Recycled aggregates- Crushed concrete, brick, glass, or other masonry waste can also be used in conventional mixes. Lightweight concrete- Aluminium powder when added to lime reacts and form hydrogen bubbles, and a lightweight cementitious material (high strength to weight ratio and an insulation value of R-10 in a 20.32-cm thick wall) is formed which could be used in conventional mixes.

	Conventional Materials	Alternate
Roads and open spaces	This part of housing units consists of compound walls, grills, roads, sidewalks, parking lots, drains, curbs, landscaped areas, street furniture, tree covers, flowerbeds	Permeable paving- Permeable (porous) paving should be used to control surface water runoff by allowing storm water to infiltrate the soil and return to the ground water. Gravel/crusher fines- Loose aggregate material used to cover pedestrian surfaces. Porous asphalt (bituminous concrete)- A porous asphalt layer constructed with "open- graded" aggregate (small fines removed), which leaves voids between the large particles unfilled by smaller fine. Porous Concrete- A concrete mix without the fine aggregate, and with special additives for strength. Permeable paving is not intended to replace standard impervious paving, but to limit the use of impermeable paving to heavy traffic areas.
Roads and open spaces		Use of grass pavers on the road, parking and pedestrian areas is a solution to reduce the heat island effect.
Use of Bamboo in Road construction		Bamboo has been used for road reinforcements in Orissa, which has proved its credibility.
Use of bamboo fence instead of steel grills		Use of steel in fencing, grills, tree covers, and benches and even in streetlights can be easily replaced by bamboo.

Natural hazard prone areas

Areas likely to have moderate to high intensity of earthquake, or cyclonic storm, or significant flood or inundation, or land slides/ mud flows / avalanches etc are identified as risk zones. The structural design of foundation, elements of masonry, timber, plain concrete, reinforced concrete, pre-stressed concrete, and structural steel should conform to the general structural safety of the National Building code (Annexure 12)

Green Buildings

The appearance of a Green Building will be similar to any other building. However, the difference is in the approach, which revolves round a concern for extending the life span of natural resources;

provide human comfort, safety and productivity. This approach results in reduction in operating costs like energy and water, besides several intangible benefits. Some of the salient features of a Green Building are:

- Minimal disturbance to landscapes and site condition
- Use of Recycled and Environmental Friendly Building Materials
- Use of Non-Toxic and recycled / recyclable Materials
- Efficient use of Water and Water Recycling
- Use of Energy Efficient and Eco-Friendly Equipment
- Use of Renewable Energy
- Indoor Air Quality for Human Safety and Comfort
- Effective Controls and Building Management Systems

Issues in Green Building

Energy Efficiency and Renewable Energy

- Building orientation to take advantage of solar access, shading, and natural lighting
- Effects of micro-climate on building
- Thermal efficiency of building envelope and fenestration
- Properly sized and efficient heating, ventilating, and air-conditioning (HVAC) system
- Alternative energy sources
- Minimization of electric loads from lighting, appliances, and equipment
- Utility incentives to offset costs

Direct and Indirect Environmental Impact

- Integrity of site and vegetation during construction
- Use of integrated pest management
- Use of native plants for landscaping
- Minimization of disturbance to the watershed and additional non-point-source pollution
- Effect of materials choice on resource depletion and air and water pollution
- Use of indigenous building materials
- Amount of energy used to produce building materials

Resource Conservation and Recycling

- Use of recyclable products and those with recycled material content
- Reuse of building components, equipment, and furnishings
- Minimization of construction waste and demolition debris through reuse and recycling
- Easy access to recycling facilities for building occupants
- Minimization of sanitary waste through reuse of graywater and water-saving devices
- Use of rainwater for irrigation

- Water conservation in building operations
- Use of alternative wastewater treatment methods

Indoor Environmental Quality

- Volatile organic compound content of building materials
- Minimization of opportunity for microbial growth
- Adequate fresh air supply
- Chemical content and volatility of maintenance and cleaning materials
- Minimization of business-machine and occupant pollution sources
- Adequate acoustic control
- Access to daylight and public amenities

Community issues

- Access to site by mass transit and pedestrian or bicycle paths
- Attention to culture and history of community
- Climatic characteristics as they affect design of building or building materials
- Local incentives, policies, regulations that promote green design
- Infrastructure in community to handle demolition-waste recycling
- Regional availability of environmental products and expertise

Building Green concentrates on one key aspect of the greening process: the use of plants on and around urban buildings. Green buildings and greenspaces together define an integrated approach to plant life in cities that is central to any green programme. Trees and shrubs can help reduce overall energy use in buildings. The amount of energy saved depends on the building type, choice of tree species, positioning around the building and the prevailing climate.

Balconies and small terraces have become standard architectural features for multiple dwelling developments. The balcony garden is a natural development of the balcony's role as a link between interior and exterior environments.

Green walls - Modern cities provide enormous areas of wall space, in many cases stretching high above the street. Not all of this space is appropriate for growing plants, but much of it is – certainly much more than has been utilised in recent years.

Roofs present by far the most significant opportunities for the greening of buildings. Many cities have millions of sqmts of unused and unattractive roofs. They represent enormous wasted opportunities for improving the quality of city life. Some of the advantages for green roof include:-

- protection of roof surface from ultra-violet radiation and mechanical damage
- thermal insulation
- acoustic insulation
- lower maintainance costs for roofing materials
- reduction of stormwater runoff

- gardens for inhabitants of buildings
- masks ugly rooftops
- complements building forms
- absorption of CO_2, some air pollutants and dust

GRIHA, an acronym for Green Rating for Integrated Habitat Assessment, is the National Rating System of India. It is a green building 'design evaluation system', and is suitable for all kinds of buildings in different climatic zones of the country (*www.mnre.gov.in and* www.grihaindia.org). The basics benefits of following GRIHA rating system are

- Up to 30% reduction in energy consumption
- Limited waste generation due to recycling
- Less consumption of water
- Reduced pollution load & liability

The details for developing greening of roofs are given in Annexure 20.

5.2 Energy Conservation

There is a need adopt energy efficient technologies for conservation of energy. This section discusses some important recommendations of the energy conservation building code and the National building code 2005 on energy conservation.

The building form can affect the solar access of the building. The compactness of the building is measured using a ratio of surface area to volume. *Compactness = S/V, wh*ere, S = Surface area and V = volume. The orientation of the building is also an important fact with regard to energy conservation in the building. The building envelope for all air conditioned buildings / spaces are to comply with the ECBC code (www.beeindia@nic.in). Roofs and opaque walls should comply with the maximum assembly U factor or the minimum insulation R-value as given in Table 5.1 and Table 5.2 respectively.

Table 5.1 Roof Assembly U-factor and Insulation R-value Requirements

Climate Zone	24-Hour use buildings Hospitals, Hotels, Call Centers etc.		Daytime use buildings Other Building Types	
	Maximum U-factor of the overall assembly (W/ m2-°C)	Minimum R-value of insulation alone (m2-°C/W)	Maximum U-factor of the overall assembly (W/ m2-°C)	Minimum R-value of insulation alone (m2-°C/W)
	Composite	U-0.261	R-3.5	U-0.409 R-2.1
	Hot and Dry	U-0.261	R-3.5	U-0.409 R-2.1
	Warm and Humid	U-0.261	R-3.5	U-0.409 R-2.1
	Moderate	U-0.409	R-2.1	U-0.409 R-2.1
	Cold	U-0.261	R-3.5	U-0.409 R-2.1

Source: ECBC Code 2005

Table 5.2 Opaque Wall Assembly U-factor and Insulation R-value Requirements

Climate Zone	Hospitals, Hotels, Call Centers (24-Hour)		Other Building Types (Daytime)	
	Maximum U-factor of the overall assembly (W/m2-°C)	Minimum R-value of insulation alone (m2-°C/W)	Maximum U-factor of the overall assembly (W/m2-°C)	Minimum R-value of insulation alone (m2-°C/W)
Composite	U-0.352	R-2.35	U-0.352	R-2.35
Hot and Dry	U-0.369	R-2.20	U-0.352	R-2.35
Warm and Humid	U-0.352	R-2.35	U-0.352	R-2.35
Moderate	U-0.431	R-1.80	U-0.397	R-2.00
Cold	U-0.369	R-2.20	U-0.352	R-2.35

The concept of passive solar design emphasizes architectural design approaches that minimize building energy consumption by integrating conventional energy-efficient devices, such as mechanical and electrical pumps, fans, lighting fixtures, and other equipment, with passive design elements, such as building siting, an efficient envelope, appropriate amounts of fenestration, increased daylighting design, and thermal mass. The basic idea of passive solar design is to allow daylight, heat, and airflow into a building only when beneficial.

Passive building design starts with consideration of siting and daylighting opportunities and the building envelope; then building systems are considered. Almost every element of a passive solar design serves more than one purpose. Landscaping can be aesthetic while also providing critical shading or direct air flow. Window shades are both a shading device and part of the interior design scheme. Masonry floors store heat and also provide a durable walking surface. Sunlight bounced around a room provides a bright space and task light.

Components of Solar Techniques

	Advanced Solar Passive Techniques	
	Passive heating : Heat storage modulates the excess and deficit in solar gain over the daily cycle	Spontaneous warming effect resulting from the absorption of solar radiation. The temperature rise this induces leads to heat flow from the affected surface to other surfaces and indoor air, as well as to heat storage within the building structure.
	Passive heating *Direct gain method*:	Glazed windows are located to face the south (in the northern hemisphere) to receive maximum sunlight in winter. To reduce heat losses during the night these windows are often double-glazed and have insulating curtains. Some examples of thermal storage materials are concrete, bricks, stone, and water.
	Passive heating : *Indirect gain :*	thermal storage wall is placed between the glazing and habitable space. This prevents solar radiation from directly entering the living space.

	Passive heating : *Trombe wall* :	A trombe wall is a thick solid wall with vents at its lower and upper ends.
	Passive heating : Solar chimneys :	This system is a kind of modified trombe wall that is incorporated into the roof. A solar chimney is essentially a collector panel with minimum thermal inertia on the south face (in the northern hemisphere) of the building.
	Passive heating: Sunspaces / solaria :	It essentially consists of a greenhouse constructed on the south side of the building with a thick mass wall linking the two.
	Passive Cooling: Evaporative cooling :	Passive cooling systems rely on natural heat sinks to remove heat from a building. They derive cooling directly from evaporation, convection radiation without using any intermediate electrical devices.
	Passive Cooling:	The evaporative cooling with increase in moisture content of the air is called direct evaporative cooling and when there is no increase of moisture content it is called indirect cooling.
	Passive Cooling: Indirect evaporative cooling systems :	The most commonly used system is a desert cooler, which comprises water, evaporative pads, a fan and a pump.
	Passive Cooling: Roof sprays:	External cooling through humidification can be achieved by keeping the surfaces of roofs moist using sprays or a lawn sprinkler. The surface temperature can be reduced significantly, but large amounts of water are used.
	Passive Cooling: Roof Pond:	A water body covering the roof functions similarly to a soil cover, it minimizes the diurnal temperature range. It is a technically demanding and expensive solution.
	Radiative cooling:	Nocturnal cooling: Night sky cooling can use very low-energy passive systems and can be very effectively used for office buildings, institution, residential buildings.
	Ground cooling:	Heat dissipation to the ground can be achieved by conduction or by convection.
	Ground cooling strategies : Earth berm structure :	Underground structures in contact with the earth are benefited by the huge thermal mass of the adjacent ground and are thus not affected by hot days or chilly nights.
	Ground cooling strategies : Geothermal cooling or earth-air tunnel systems :	Hot summer air is passed through a buried pipe and as it passes through there is an exchange of heat between the air and the surrounding earth. Hence, during the summer, the air gets cooled up and during the winter it gets heated up. This air is circulated to

		the living spaces where it takes up the humidity and cools the structure by convection.
	Ground cooling strategies : Ventilation *strategies*:	Chimneys Chimney or stacks can be used to provide high -level ventilation outlet devices. Wind towers Wind towers are generally used in hot and dry climates for cooling.

Day-lighting brings light into a building interior and distributing it in a way that provides more desirable and better quality illumination than artificial light sources. This reduces the need for electrical light sources, thus cutting down on electricity use and its associated costs and pollution. The general day-lighting principles include:-

- Avoid direct sunlight on critical tasks and excessive brightness.
- Bring the daylight in at a high location.
- Filter the daylight.
- Bounce daylight off of surrounding surfaces.
- Integrate daylight with other building systems and strategies.

Energy efficient lighting design focuses on methods and materials that improve quality of lighting (Annexure 13). The general lighting systems need to comply with the ECBC code and apply to the following:-

(a) Interior spaces of buildings,

(b) Exterior building features, including facades, illuminated roofs, architectural features, entrances, exits, loading docks, and illuminated canopies, and,

(c) Exterior building grounds lighting that is provided through the building's electrical service.

Exceptions to above:

(a) Emergency lighting that is automatically off during normal building operation and is powered by battery, generator, or other alternate power source; and,

(b) Lighting in dwelling units except for dwelling units where the developer is providing lighting fixtures inside the units (however, common area lighting of residential complexes fall under purview of the code)

Solar photovoltaic systems (SPV) can be used as it is direct conversion of sunlight into electricity and could be a viable option. Street lighting, fixed type solar lighting system are some applications of SPV systems. The recommended values for illuminance is given in Annexure 14.

A new lighting technology in the form of Light Emitting Diodes is also available nowadays. These are solid light bulbs, which are extremely energy efficient. An LED lamp generally lasts about 10 times longer than CFLs and about 130 times more than an ordinary Incandescent lamp. Certified Emissions Reductions (CERs) on the basis of the CO emissions reductions that would occur because of the low electricity consumption of CFLs compared to incandescent bulbs.

5.3 Transportation

Road network: A well-planned road network both within the township and connecting to the nearest highway or main road need to be established so that proper communication links are established.

Some of the factors are important and must be taken into the consideration, while planning, are the movement of heavy traffic loads and operation of construction machinery. Construction machinery due to its operation produces smoke, dust and noise and vibration. Road design should be done with due consideration for environment, and safety of the people residing or working near the roads.

Transportation system is dependent on a number of factors, like design of the engine of the vehicles, traffic rules and regulations, which are not under our control. However the Hierarchy of roads, Road geometry and traffic calming, Entry and exit points, Parking norms can be planned.

Hierarchy in roads should be adopted to segregate the traffic according to the size, frequency and density of traffic. Arterial roads meant for intra-urban through traffic with intersection spacing of 500m, sub-arterial roads meant for intra-urban through traffic with frontage access, no standing vehicles having high cross traffic, high capacity intersections and minimum roadway intersection spacing 300 m. Collector Streets for collecting and distributing traffic from and to local streets and also for providing access but no parked vehicles and having heavy cross traffic and minimum roadway intersection traffic spacing 150 m. Local Streets for access to residence, business or other abutting property, having necessary parking and pedestrian movement (Annexure 18). Design considerations for roads of different hierarchy are given below

Design Considerations for Roads of Different Hierarchy

Type of Road	Design speed	Right of way
Arterial	80 kph	50-60m
Sub-arterial	60 kph	30-40 m
Collector street	50 kph	20– 30 m
Local Street	30 kph	10-20 m

Source: UDPFI guidelines volume i august 1996

Traffic calming is required in school, hospital zones. The tools of traffic calming include:-

1. Installation of speed humps by raising the surface of the street in certain spots.
2. Narrowing the street to give drivers the feeling they are in a crowded place, which will make them slow down and totally or partially blocking half the entrance to a side street so drivers cannot turn in but still can come out.
2. Speed tables, build outs, etc.
3. Space for vehicles at the entrance gate for checking before entry.

The entry and exit points design is very important as it should not disturb the existing traffic. Sufficient parking provisions are to be made. Visitors parking should not disturb the traffic of surrounding area. Additional space should be left for the lanes as per the design of existing road, surrounding the site. The standard spacing for car parking are given in Annexures 19.1 and 19.2.

Parking facilities for visitors

- For individual homes it is necessary to provide 1 visitor car park
- For multi dwelling units it is necessary to provide an additional 10% parking area over and above the normal parking requirements
- Design of the building is to ensure that adequate parking provisions are made to cater to the occupants as well as visitors
- The parking provisions should take into consideration the two wheelers and four wheelers. It is also desirable to design parking facilities with basement / stilts parking to reduce the heat island effect. When inevitable the surface parking planned should cover issues to address heat island effect.
- It is also desirable to have electric charging facility for vehicles which could cater for both two and four wheelers.

ENVIRONMENTAL MONITORING PROGRAM

6.0 General

This includes the technical aspects of monitoring the effectiveness of mitigation measures (including measurement methodologies, data analysis, reporting schedules, emergency procedures, detailed budget and procurement schedules). The details include summary matrix of environmental monitoring, during construction and operation stage; requirement of monitoring facilities; frequency, location, parameters of monitoring; compilation and analysis of data; comparison with base line data and compliance to accepted norms and reporting system and plantation monitoring programme.

The description of the monitoring programme should include:

(a) A technical plan which spells out in detail the methodologies for measurement, the required frequencies of measurement, the planned location of measurement, data storage and analysis, reporting schedules and emergency procedures, and

(b) Detailed budgets and procurement schedules for, necessary equipment and supplies, technical and administrative manpower.

The environmental monitoring includes

- Air pollution
- Noise level monitoring
- Water quality monitoring and ground water level monitoring
- Maintenance of rainwater harvesting pits and other water conservation methods used are to be done regularly.

The entire data is to be furnished to the regulatory agencies.

7

ADDITIONAL STUDIES

7.0 General

This chapter covers the risk assessment and disaster management plan. Apart from these, R & R Action Plan and Natural Resource Conservation plan are also included in this chapter.

7.1 Risk Assessment and Disaster Management Plan (DMP)

Emergency prevention through good design, operation, maintenance and inspection are essential to reduce the probability of occurrence and consequential effect of such eventualities. The overall objective of the Emergency Response Plan ERP is to make use of the combined resources at the site and outside services to achieve the following:-

- Localize the emergency
- Minimize effects on property and people
- Effective rescue and medical treatment
- Evacuation

Major hazards identified include:-

- Hazards pertaining to fires in buildings
- Fire in diesel storage areas, garbage storage and disposal area
- Earthquakes
- LPG gas leak
- Flooding from natural and man-made causes
- Electrical accidents

7.2Natural Resource Conservation

Plan of action for conservation of natural resources and recycle waste materials due to the project activity in the construction and operational phase of the project is to be discussed.

7.3R&R Action Plan

Detailed R&R Plan with data on the existing socio-economic status of the population in the study area and broad plan for resettlement of the displaced population, site for the resettlement colony, alternative livelihood concerns / employment for the displaced people, civil and housing amenities being offered, etc and the schedule of he implementation of the project specific R&R Plan if any is to be given. Details of provisions (capital & recurring) for the project specific R&R Plan .

National Policy on Resettlement and Rehabilitation for project affected families-2003 (published in the gazette of India, extraordinary part-i, section 1, no- 46, dated 17th February, 2004)gives the details of the national R&R policy.

8

PROJECT BENEFITS

8.0 General

This chapter should include benefits accruing to the locality, neighborhood, region and nation as a whole. It should bring out details of benefits by way of:

- Improvements in the physical infrastructure of project, ancillary industries that may come up on account of the project.
- Improvements in the social infrastructure like roads, railways, townships, housing, water supply, electrical power, drainage, educational institutions and hospitals etc.
- Employment potential skilled; semi-skilled and unskilled labour both during construction and operational phases of the project with specific attention to employment potential of local population as well as necessity for imparting any specialized skills to them to be eligible for such employment in the project on a long term basis i.e., during operational and maintenance stages of the project

ENVIRONMENTAL MANAGEMENT PLAN

9.0 General

Environmental Management Plan (EMP) deals with mitigation of unavoidable or residual impacts. The Environmental Management Plan (EMP) is needed to ensure that the mitigation measures specified in the EIA will actually be complied with when the project is approved for implementations. The administration of EMP may be required the establishment of an Environmental management cell to house monitoring staff after the closure of the EIA office. Funding to cover the costs of establishing and operating an appropriate Environmental Management Cell to administer the EMP should be guaranteed in the basic project budget.

The EIA report should include a description of the administrative aspects of ensuring that mitigative measures are implemented and their effectiveness monitored after approval of EIA. The facilities to be included are:

- Water supply and management: A well-planned and sustainable water management system is to be built within the township, providing round the clock water supply to residents. This also reduces dependence on municipal water supply.
- Electricity supply and management: Although an integrated township depends on a public or private utility supplier for basic power supply, it has to have adequate, back-up power for both homes and common areas during temporary or scheduled power cuts or disruptions by the utility supplier.
- Infrastructure maintenance: Proper and regular maintenance of roads, pathways, parks, electrical and plumbing infrastructure, children play areas and common areas including community centre is essential for a well-developed integrated township.
- Provision of Effective Controls and Building Management Systems such as Automatic Fire Alarm and Fire Detection and Suppression System etc. must be ensured. Adequate access to fire tenders should be provided.
- Provisions should be kept for the integration of solar water heating system and other energy conservation methods.
- Plan and design of green belt to mitigate dust, noise and odour near sources of air pollution (DG sets) and meteorology.
- Plan of maintenance for rainwater harvesting structures in the project area (taking into consideration the groundwater storage, ground water table and soil permeability).

The waste treatment facilities to be included are:

- Sewage treatment plant has been designed to treat the wastewater from the building. The wastewater be treated to tertiary level and after treatment, reused for flushing of toilets in apartment building, horticulture and air conditioning.
- Grey water treatment: Grey water is the wastewater that comes from clothes washers, bathtub, showers, bathroom wash basins, kitchen sinks and dish washers. It is that waste

water that is not contacted with toilet waste. This treated grey water can be used for landscaping, flushing requirements etc. It is essential to provide on-site grey water treatment system to treat atleast 50% of the water generated in the building to standards suitable for flushing and landscaping.

- Treated wastewater reused for landscaping, car washing etc. and partly discharged. Treated sewage should conform to E(P) Rules. Sewage Treatment Plants and monitored on a regular basis
- Spent oil from DG Sets should be stored in HDPE drums in isolated covered facility and disposed off as per the Hazardous Wastes (Handling & Management) Rules, 2003. Spent oil from DG Sets should be disposed off through registered recyclers only.
- Management of increment in storm water run off caused due to the built up and paved surfaces created in the township
- Root zone treatment provides an opportunity to treat waste water in a decentralised manner. Similarly, vessel-type converters can treat bio-degradable solid wastes in small space and relatively free from odour.

The environmental management plan should clearly mention the landscaping and the tree plantation to be taken up in the area. Also the parks and gardens if any to be developed are to be mentioned. The total number of plantations to be developed in the area are to be mentioned.

The plans to be adopted for handling of the domestic wastewaters and the solid waste management plan are to be detailed out.

10

SUMMARY AND CONCLUSIONS

10.0 General

The summary should be a clear presentation of the critical facts that make up each issue, and the resolution of the issues. Whenever possible, the summary should make use of base maps, tables and figures. Information should be condensed into succinct, but meaningful presentations. It must be able to stand alone as a document.

The summary should highlight the significance of the baseline data collected, impacts identified and the proposed environmental monitoring systems during the construction and operational phases of the project.

It should necessarily cover and brief the following chapters of the full EIA report and address the following:-

- Introduction
- Project description & Project benefits
- Environmental Examination
- Additional Studies
- Environmental Management Plan and Post Project Monitoring Program
- Environmental Risk Assessment (ERA) and Disaster Management Plan (DMP)

The following should be highlighted in the EIA report

- Public health and safety issues related to the project;
- The socio-economic impacts of the project;
- New building technologies to be implemented
- Energy conservation measures to be implemented
- Statement of overall impact of the construction activity on the environment.

DISCLOSURE OF CONSULTANT ENGAGED

11.0 General

The EIA consultants shall have accreditation with Quality Control of India (QCI)/ National Accreditation Board of Education and Training (NABET) as per office memorandum dated 2nd December 2009 of MoEF. This chapter shall include the names of the consultants engaged with their brief resume and nature of consultancy rendered. The consultants shall include the copy of the accreditation certificate and data provided by the other organizations/ laboratories including their status of approvals etc.

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GLOSSARY

- "Built Up Area (BUA)" means the gross permissible built up area of a Township.
- "Township" means an integrated development of a contiguous land parcel which contains within itself requisite physical and social infrastructure, with access to off site physical and social infrastructure and fulfils all conditions laid down under this policy.
- "Ancillary Housing" means housing developed principally to support the workforce of an economic activity developed within the Township.
- "On-site Physical Infrastructure" means all the on site services such as roads including approach Roads, Street lights, Water supply system, Sewerage system, Storm water drainage system, Electrical Network, Communication Network, Sewage Treatment Plants, Percolation Wells, Solid Waste Disposal system, Common Effluent Treatment Plants (CETP), spaces for Informal Services etc. as provided for in Schedule
- "On-site Social Infrastructure" means all the on site amenities supportive to the resident population as per the prevailing norms such as Nursery, Crèche, Primary school, Composite School, Dispensary, Polyclinic, Community Hall, Library, Convenience Shopping, Playfields, Parks, Police station, Public parking, Bus station, Fire station, Post office etc, EWS Housing for the informal service providers of the Township, all the components necessary to facilitate barrier free accessibility for the Senior citizens and Physically challenged persons as prescribed by the concerned GDCRs and land reservations for social infrastructure requisite on the macro scale to be handed over to the local Authority as may be prescribed by the Authority.
- "Scale Category (SC)" means Township categories based on the scale of land area, BUA and investment as defined in the Policy.
- "Use Category (UC)" means Township categories based on the predominant activity as defined in the Policy.
- "Vulnerable Area" means areas where development of Townships will be subject to compliance to norms for mitigation of potential hazards and their impacts.
- "Developer" means a Company, a Government Corporation, a group of Companies in Joint Venture, undertaking the development of the Township.
- "Facility Management Services" means the services offered by a private sector, public sector, joint sector or consortium for the Operation & Maintenance of all on site physical and social infrastructure.

TABLES

Table 3.1 Physical Properties of Soil

Station Code	Colour	Texture	Water Holding capacity (%)	Porosity (%)	Sand (%)	Salt (%)	Bulk Density gm / cc	Permeability ml

Table-3.2 Chemical Properties of Soil

Parameters	Samples					
pH						
Potassium						
Sodium						
Sodium Absorption Ratio						
Cation exchange capacity						

Table 3.3 Description of Ground Water Sampling Locations

Station No.	**Location**	**Distance & Direction from project area**	**Project area / study area**	**Environmental Setting**

Table 3.4 Analysis of Ground Water

S. No	**Parameters**	**Unit**	**Result**			**Standards**
			GW1	GW2	GW3	

Table 3.5 Description of Surface Water Sampling Locations

Station No.	Location	Distance & Direction from project area	Project area/ study area	Environmental Setting

Table 3.6 Analysis of Surface Water

S. No	Parameters	Unit	Result			Standards
			SW1	SW2	SW3	

Table No. 3.7 Description of Ambient Air Quality Monitoring Stations

Station No.	Location	Distance & Direction from project area	Project area / study area	Environmental Setting

Table-3.8 Analysis of Ambient Air Quality

Monitoring Station Category (R,I,S)	Category of Station	Min.	Max.	Mean	95 Percentile	Min.	Max.	Mean	95 Percentile	Min.	Max.	Mean	95 Percentile	Min.	Max.	Mean	95 Percentile	Min.	Max.	Mean	95 Percentile

R - : Residential Are
I - : Industrial Area
S - : Sensitive Area

Table No. 3.9 Description of Noise Monitoring Stations

S. No	Locations	Class*	Average Day noise level (dBA)	Average Night noise level (dBA)	Day time (6.00 A.M. to 10.00 P.M)	Day time (10.00 P.M. to 6.00 A.M)	Remarks
					Standard (L_{eq} in dBA)	Standard (L_{eq} in dBA)	

*Industrial area / Commercial area / Residential area / Silence zone

Table 3.10 Demographic Profiles of the Villages in the Study Area

Sl. No.	Demographic Feature	Study Area	Share in total Population (%)
1.0	Total Population		
2.0	Households		
3.0	Occupation		

Table 3.11 Other Infrastructural Facilities Available in the Study Area

Sr. No.	Name of the village	DWF	Tp	W	T	TW	HP	R	C	L	S	O	PO	TO	PT	P	B	RS	NW	CB	CoB

Note:

DWF : Drinking Water Facility
Tp : Tap
W : Well
T : Tank
TW : Tube Well
HP : Hand Pump
R : River
C : Canal
L : Lake
S : Spring
O : Others
PO : Post Office
TO : Telegraph Office
PT : Post & Telegraph Offices
P : Phone
B : Bus
RS : Railway Service
NW : Navigable Waterways
CB : Commercial Bank
CoB : Co-operative Bank

ANNEXURES

Annexure 1

Terms of Reference (TOR) For Environmental Impact Assessment of Building, Construction and Township and Area Development Projects

Objective

Terms of Reference (TOR) for preparation of Environmental Impact assessment (EIA) and Environmental Management Plan for building construction projects (=1,50,000 sq .mtrs) township and area development projects (= 50 ha) as per the EIA notification, 2006 has been devised to improve the quality of the reports and facilitate the decision making transparent and easy. TOR will help the project proponents and consultants to prepare report with relevant project specific data, which are easily implementable. As per the EIA notification 2006, schedule item 8 corresponds to Building construction projects / area development projects and townships. The details of the categories mentioned in the given schedule are as follows:

Project or Activity		Category with threshold limit – B Category	General Conditions
8	**Building /Construction projects/Area Development projects and Townships**		
8(a)	Building and Construction	=20000 sq.mtrs and <1,50,000 sq.mtrs.	"Any project or activity specified in Category of built-up area# 'B' will be treated as Category projects 'A' if located in whole or in part within 10 km from the boundary of: (i) Protected areas notified under the Wildlife (Protection) Act, 1972; (ii) Critically polluted areas as identified by the Central Pollution Control Board from time to time; (iii) Eco-sensitive areas as notified under section 3 of the Environment (Protection) Act, 1986, such as, Mahabaleswar Panchangi, Matheran, Pachmarhi, Dahanu, Doon Valley and (iv) inter-state boundaries and international boundaries Provided that the requirement regarding distance of 10km of the inter-state boundaries can be reduced or completely done away with by an agreement between the respective states or U.Ts sharing the common boundary in the case the activity does not fall within 10 kilometers of the areas mentioned at item (i), (ii) and (iii) above
8(b)	Townships and Area Development projects.	Covering an area = 50 ha and or built up area =1,50,000 sq .mtrs ++	
#(built up area for covered construction; in the case of facilities open to the sky, it will be the activity area)			
++All projects under Item 8(b) shall be appraised as Category B1			

EIA clearance is required in the case of the following:-

a. Building construction projects (=1,50,000 sq .mtrs)

b. Township and area development projects (= 50 ha)

Accordingly the TOR to address the above two aspects of item 8(b) of the EIA notification 2006 are covered in this document. The TORs are given in two subsections (I) and (II) in which subsection (I) deals with building construction projects (=1,50,000 sq .mtrs) and subsection (II) deals with township and area development projects (= 50 ha).

I. Building and Constructions projects(=1,50,000 sq .mtrs)

General Information :

Building and construction projects as per the EIA notification of 2006 are under category 'B' covering built up area =1,50,000 sq .mtrs. All projects and activities listed as Category 'B' in Item 8 of the Schedule (Construction / Township / Commercial Complexes / Housing) do not require scoping and will be appraised on the basis of Form 1 / Form 1A and the conceptual plan. All projects in this category will be appraised as Category B1. An application seeking prior environmental clearance in all cases should be made in the prescribed Form 1 and Supplementary Form 1A, after the identification of prospective sites for the project to which the application relates, before commencing any construction activity, or preparation of land, at the site by the applicant. The applicant should submit along with the application, in addition to Form 1 and the Supplementary Form 1A, a copy of the conceptual plan.

1.0 Introduction

Profile of the project proponent, name and contact address, implementing organization, organizational chart, project consultants etc., should be mentioned clearly.

Land description- plot/ survey numbers, village, tehsil, district, state and area of the land must be mentioned clearly.

Description of Centre/State/Local regulations and standards applicable for townships and area development projects should be discussed.

Any litigation(s) pending against the proposed project and / or any directions or orders passed by any court of law/any statutory authority against the project is to be detailed out.

2.0 Project Description

Goal and objectives of the proposed project, significance of the project both at local and regional level, relevance of the project in light of the existing development plans of the region are to be mentioned clearly. Background information and overall scenario of the proposed activity in the Indian Context, procedures adopted for selection, Criteria for selection of the site for the proposed activity, such as environmental, socio-economic, minimization of impacts, ecological sensitivity, Impact of existing activities on the proposed activity, etc. should be spelt out. Resource and manpower requirements have to detailed. Time frame for project initiation, implementation and completion should be detailed.

- Total site area
- Total built up area (provide area details) and total activity area
- Source of water and consumption
- Source of power and requirement
- Source of Power
- Connectivity to the city center, utilities and transportation networks community facilities
- Parking requirements

- Type of building material to be used
- Environmental liability of the site
- Existing structure / type of material – demolition debris etc.

Essential Toposheets / Maps to be Provided with TOR Application

A map of the study area 500meters from the boundary of the project area, delineating the major topographical features such as land use, drainage, locations of habitats, major constructions including roads, railways, pipelines, industries if any in the area are to be mentioned.

A map covering aerial distance of 15 kms from the boundary of the proposed project area delineating environmental sensitive areas as specified in Form I of EIA notification dated 14th Sep 06. In the same map the details of environmental sensitive areas present within a radial distance of 1 Km from the project boundary shall be specifically shown

Remote Sensing Satellite Imagery

Land use map of the study area in 1: 10,000 scale based on high resolution satellite imagery delineating the forest, agricultural land, water bodies, settlements, and other cultural features.

Digital Elevation Model / Contour Map

Contour map on 1:10000 scale for the study area showing the various proposed break-up of the land.

Description of the project site, geology, topography, climate, transport and connectivity, demographic aspects, socio, cultural and economic aspects, villages, settlements should be given.

Details of environmentally sensitive places, land acquisition, rehabilitation of communities / villages, present status of such activities are to be mentioned. .

Historical data on climate conditions such as wind pattern, history of cyclones, storm surges, earth quake etc., for the last 25 years are to be given.

Detailed layout plan of proposed project development, communication facilities, access / approach roads, landscape, sewage disposal facilities, and waste disposal etc; to be given. Layout plan of proposed development of built up areas with covered construction such as DG Set rooms, Administrative buildings, Utilities such as Main and Stand By Power, Water supply installations etc; to be given.

Requirement of natural resources and their sources are to be detailed out.

Site Selection and Planning

The environmental impacts of construction and operation are established during the early phases of site selection and planning. Planning, site selection and design form an important stage in the development of these projects and will determine their environment impact(s)

Some Important factors for development, which should be addressed, are: -

- Status of ownership of land

- The boundaries of the project area
- A map that identifies the locations of all proposed development activities; and
- A map and photo mosaic showing the area proposed to be disturbed in relation to existing topographic features, township grids, wetlands and water bodies.
- Proximity to local communities;
- Proximity to sensitive surface or ground water bodies
- Compatibility with local building regulations
- Exiting drainage pattern
- Any forest-cover within the proposed developmental area.

3.0 Description of the Environment

Environmental data to be considered in relation to township development would be: (a) land (b) ground water, surface water (c) air (d) biological environment (e) noise (f) socio economic environment.

Study Area:

Map of the study area clearly delineating the location of various monitoring stations (air / water / soil and noise) superimposed with location of habitats are to be shown. Monitoring should be done as per CPCB guidelines. Primary data should be collected for one season except rainy season. Monitoring of the parameters should be carried out within the study area.

3.1 Land Environment

The first feature which should influence the development of a new project is the existing land use pattern of the neighbourhood of the project, whether the proposed development conforms to the development for that area or not. Study of land use pattern, habitation, cropping pattern, forest cover, environmentally sensitive places etc, employing remote sensing techniques and ground truth and also through secondary data sources.

Geographical latitude and microclimatic factors such as solar access and wind loads have a major impact. The following parameters have to be addressed under the baseline data for land environment.

a. Topography

Slope form

Landform and terrain analysis

b. Soil

Type and characteristics

Porosity and permeability

Sub-soil permeability

Inherent fertility

3.2 Water Environment

Identify Project activities, including construction phase, which may affect surface water or groundwater. Estimate water intake requirements and identify the source of water to be used. Describe how water will be taken from the surface water / river and conveyed to the site. Ground water budgeting has to be provided. Rainwater harvesting has to be detailed out.

Baseline water quality from all sources such as ground water, municipal water, surface water need to be determined and compared to the water quality norms prescribed for drinking water and State PWD specifications for construction water. Quantity of wastewater is to be provided.

3.3 Air Environment

Climatological data is to obtained from nearest India Meteorological Department (IMD) station for one full year. Micro meteorological data consisting of wind speed, wind direction, temperature, cloud cover, (amount and height), humidity, inversions, rainfall (peak and average vdaily rainfall) and wind rose patterns, from primary and secondary sources in the study area.

Baseline data of air pollutant parameters extending an area of 500meters from the project should be monitored at a number of locations. Description of base line data of ambient air parameters namely RSPM, nitrogen dioxide, Sulphur dioxide, and carbon monoxide are to be collected. One season data is to be monitored other than monsoon as per the CPCB Norms. Sampling locations are to be located as per CPCB norms.

3.4 Noise Environment

Construction equipment and road traffic are the major sources of noise. Baseline data of noise at the project area and the neighbourhood habitat areas is to be ascertained. Daytime and nighttime data should be collected.

3.5 Biological Environment

Baseline data on the flora and fauna for the study area is to be detailed out. An inventory map is to be prepared along with a description of the existing terrestrial, wetland and aquatic vegetation. If there are any rare and endangered species in the study area they are to be clearly mentioned.

3.6 Socio Economic Environment

Baseline data should include the demography, settlements, existing infrastructure facilities in the proposed area.

3.7 Solid Waste

Solid wastes from construction sector can be categorized into two phases i.e. during construction & during operation. Details of the following are to be given:

- Construction or demolition waste, i.e., massive and inert waste
- Municipal waste, i.e., biodegradable and recyclable waste
- Hazardous waste
- E-waste

Details of authorized municipal solid waste facilities, biomedical treatment facilities and hazardous waste disposal facilities in the area should be included.

4.0 Anticipated Environmental Impacts and Mitigation Measures:

4.1 *Land Environment*

Anticipated Impacts:

Some of the anticipated impacts, which need to be addressed, are

- Impact on the natural drainage system and soil erosion.
- Loss of productive soil and impact on natural drainage pattern.
- Study of the problem of land slides and assessment of soil erosion potential and the impact

Mitigation Measures :

Proper mitigation measures have to be suggested.

- If the topsoil is proposed to be preserved, the details relating to the quantity of topsoil stored, demarcated area on plan where it is stored along with preservation plan is to be given
- Details of soil erosion plan are to be given.

4.2 Air Environment

Anticipated Impact :

Impacts on air quality during the construction and operation phase should be predicted. The existing surrounding features of the study area and impact on them should be addressed separately. It is necessary to predict the following if any

- Prediction of point source emissions
- Prediction of air emissions from the vehicles during the construction and operation phases.

Mitigating Measures :

Mitigative measures are to be proposed during the construction stage as well as the operational stage of the project. Some measures to be listed include: -

- Mitigative measures during construction phase due to reduce the emissions during loading, un-loading, transportation and storage of construction materials.
- Greenbelt development.
- Dust mitigation

4.3 Noise Environment

Impact of project construction / operation on the noise on account of construction equipment and road traffic is to be studied.

Anticipated Impact:

- Noise due to demolition / construction activities
- Impact due to present and future transportation activities
- Impact of noise due to work at night.

Mitigating Measures :

- Site plan and details for construction management showing the layout of noise and dust barriers should be given

4.4 Water Environment

Impact of construction and operational phases on the surface and ground water on account of the building construction is to be estimated.

Anticipated Impact:

- Impact of water withdrawal on surface water is to be given
- Impact on ground water potential is to be detailed
- Waste water generation

Mitigating measures:

Prediction of ground water contamination and suggested mitigating measures to minimize the pollution level

- Hydrogeological information should be clearly detailed.
- Details of water conservation within the buildings
- Details of rainwater harvesting to recharge the ground water

4.5 Biological Environment

Impact of project during construction and operational phases on the biological environment on account of project activity is to be detailed.

Anticipated Impact:

Impact of construction activity on flora and fauna is to be given.

Mitigating measures :

- Tree survey plan showing protected / preserved / transplanted / removed trees are to the given.
- Proposed landscape plan with details about species that are to be planted are to be given

4.6 Socio Economic Environment

Anticipated Impact:

Predicted impact on the communities of the proposed activity is to be given. Impact on surroundings on socio-economic status is to be detailed.

Mitigation Measures:

Mitigation measures to reduce adverse effects are to be given.

4.7 Solid Waste and Environment

Anticipated Impact:

Impact of the project during construction and operational phases for generation of waste is to be assessed.

Mitigation Measures :

Options for minimization of solid waste and environmentally compactable disposal are to be given. Management and disposal of temporary structures, made during construction phase are to be addressed. Mitigation measures for handling biomedical wastes, e-wastes, municipal solid waste are to be detailed.

5.0 Specific Studies

Describe the project energy requirements, infrastructure requirements needed for this activity. Discuss the steps taken to integrate the needs of other stakeholders into the location and design of access infrastructure to reduce and manage overall environmental impacts from resource development.

5.1 Building Material and Technologies

- Detail the types of materials use in each component part of the building and landscape(envelope, superstructure, openings, and roads and surrounding landscape).
- Detail out the plans and sections of buildings showing use of new technologies and non-conventional methods
- Detail out the plans and sections of building using new construction techniques

5.2 Energy Conservation

- Use of alternate renewable resources such as solar / wind power etc is to be discussed.
- Discuss the options considered for supplying the power required for the Project and the environmental implications, including opportunities to increase the energy efficiency of the Project;
- Details of U &R values are to be given
- Details of the renewable energy systems (sizing and design), building costs and integration details are to be provided

5.3 Transport

- Estimate any environmental implications from transportation (rail, road) related emissions associated with the construction and operational phases and suggest suitable options
- Provide a site plan showing the details of connectivity existing and proposed road and rail transport.
- Provide a site plan showing buildings, roads, and open spaces, confirming the hierarchy of roads as per the rules given by UDPFI guidelines.

- Discuss the impact of increased vehicle traffic and requirements for access improvements on roads in the site development area as a result of the Project, considering other existing and planned developments and operations in the region including what measures will be taken to reduce traffic and enhance vehicle safety on external roads;
- Discuss any expected change in traffic volume by Average Annual Daily Traffic (AADT) and any seasonal variability in traffic volume (include mitigation measures) prior to construction, during construction and at full site operation;

6.0 Environmental Monitoring Program

- Frequency, location, parameters of monitoring
- Compilation and analysis of data and reporting system

7.0 Additional Studies

7.1 Risk Assessment (ERA) and Disaster Management Plan (DMP):

Discuss emergency plans for any environmental risks and such as earthquakes

- Types of Emergency; internal and external origin
- Emergency evacuation plan
- Emergency Procedures
- Helipad facilities for buildings with height beyond 60mts

7.2 Natural Resource Conservation

Plan of action for conservation of natural resources and recycle waste materials due to the project activity in the construction and operational phase of the project is to be discussed.

8.0 Project Benefits

This section details out the improvements in physical infrastructure, social infrastructure if any. Also it details out any employment potential and other benefits that are accrued if the project is taken up.

9.0 Environmental Management Plan (EMP)

Detailed EMP may be formulated to mitigate the residual impacts which should inter alias include the impact due to change in land use; due to loss of agricultural land and grazing land besides other impacts of the projects. Budgeting of the EMP may be included in EIA. The EIA should discuss in detail the following aspects:

- Sewage treatment plant has been designed to treat the wastewater from the building. The wastewater be treated to tertiary level and after treatment, reused for flushing of toilets in apartment building and gardening.
- Treated wastewater reused for landscaping, car washing etc. and partly discharged. Treated sewage should conform to E(P) Rules. Sewage Treatment Plants and monitored on a regular basis

- Spent oil from DG Sets should be stored in HDPE drums in isolated covered facility and disposed off as per the Hazardous Wastes (Handling & Management) Rules, 2003. Spent oil from DG Sets should be disposed off through registered recyclers only.
- Provision of Effective Controls and Building Management Systems such as Automatic Fire Alarm and Fire Detection and Suppression System etc. must be ensured. Adequate access to fire tenders should be provided.
- Provisions should be kept for the integration of solar water heating system and other energy conservation methods.

10.0 Summary & Conclusion (Summary EIA)

This document should summarize the significant findings of the study. The summary must describe each significant environmental issue and its resolution in sufficient detail so that its importance and scope, as well as the appropriateness of the approach taken to resolve it are well understood. Wherever possible, the summary should make use of base maps, tables and figures given in the report. The following should be addressed in the summary if applicable: -

- Potential interruption or limitation of accesses to dwellings, businesses or productive resources either permanently or temporarily;
- Encroachment or reduction of green areas, parks, and other recreational areas;
- Demolition of buildings high architectural or historical value;
- Potential deterioration of urban quality and property value in the immediate vicinity of the works or deterioration of unique architectural characteristics in the neighbourhood;

11.0 Disclosure of Consultant Engaged

This chapter shall include the names of the consultants engaged with their brief resume and nature of consultancy rendered.

Enclosures

Conceptual plan / Questionnaire / Photos

II. Township and Area Development Projects (= 50 ha)

General Information

Township and area development projects as per the EIA notification of 2006 are under category 'B' covering an area = 50 ha. All projects and activities listed as Category 'B' in Item 8 of the Schedule (Construction / Township / Commercial Complexes / Housing) do not require scoping and will be appraised on the basis of Form 1 / Form 1A and the conceptual plan. All projects in this category will be appraised as Category B1. An application seeking prior environmental clearance in all cases should be made in the prescribed Form 1 and Supplementary Form 1A, after the identification of prospective sites for the project to which the application relates, before commencing any construction activity, or preparation of land, at the site by the applicant. The applicant should submit along with the application, in addition to Form 1 and the Supplementary Form 1A, a copy of the conceptual plan.

1.0 Introduction

Profile of the project proponent, name and contact address, implementing organization, organizational chart, project consultants etc., should be mentioned clearly.

Land description- plot/ survey numbers, village, tehsil, district, state and area of the land must be mentioned clearly.

Description of Centre/State/Local regulations and standards applicable for townships and area development projects should be discussed.

Any litigation(s) pending against the proposed project and / or any directions or orders passed by any court of law/any statutory authority against the project is to be detailed out.

2.0 Project Description

Goal and objectives of the proposed project, significance of the project both at local and regional level, relevance of the project in light of the existing development plans of the region are to be mentioned clearly. Background information and overall scenario of the proposed activity in the Indian Context, procedures adopted for selection, Criteria for selection of the site for the proposed activity, such as environmental, socio-economic, minimization of impacts, ecological sensitivity, Impact of existing activities on the proposed activity, etc. should be spelt out. Resource and manpower requirements have to detailed. Time frame for project initiation, implementation and completion should be detailed.

Essential Toposheets / Maps to be Provided with TOR Application

A map of the study area 2 km from the boundary of the project area, delineating the major topographical features such as land use, drainage, locations of habitats, major constructions including roads, railways, pipelines, industries if any in the area are to be mentioned.

A map covering aerial distance of 15 kms from the boundary of the proposed project area delineating environmental sensitive areas as specified in Form I of EIA notification dated 14th Sep 06. In the same map the details of environmental sensitive areas present within a radial distance of 1 Km from the project boundary shall be specifically shown

Remote Sensing Satellite Imagery

Land use map of the study area in 1: 10,000 scale based on high resolution satellite imagery delineating the forest, agricultural land, water bodies, settlements, and other cultural features.

Digital Elevation Model / Contour Map

Contour map on 1:10000 scale for the study area showing the various proposed break-up of the land.

Description of the project site, geology, topography, climate, transport and connectivity, demographic aspects, socio, cultural and economic aspects, villages, settlements should be given.

Details of environmentally sensitive places, land acquisition, rehabilitation of communities / villages, present status of such activities are to be mentioned. .

Historical data on climate conditions such as wind pattern, history of cyclones, storm surges, earthquake etc., for the last 25 years is to be given.

Detailed layout plan of proposed project development, communication facilities, access / approach roads, landscape, sewage disposal facilities, and waste disposal etc; to be given. Layout plan of proposed development of built up areas with covered construction such as DG Set rooms, Administrative buildings, Utilities such as Main and Stand By Power, Water supply installations etc; to be given.

Requirement of natural resources and their sources are to be detailed out.

Site Selection and Planning

The environmental impacts of construction and operation are established during the early phases of site selection and planning. Planning, site selection and design form an important stage in the development of these projects and will determine their environment impact(s)

Some Important factors for development, which should be addressed, are: -

- Status of ownership of land
- The boundaries of the project area
- A map that identifies the locations of all proposed development activities; and
- A map and photo mosaic showing the area proposed to be disturbed in relation to existing topographic features, township grids, wetlands and water bodies.
- Proximity to local communities;
- Proximity to sensitive surface or ground water bodies
- Compatibility with local building regulations
- Exiting drainage pattern
- Any forest-cover within the proposed developmental area.

3.0 Description of the Environment

Environmental data to be considered in relation to township development would be: (a) land (b) water (c) air (d) biological environment (e) noise (f) socio-economic environment.

Study Area :

Map of the study area clearly delineating the location of various monitoring stations (air / water / soil and noise) superimposed with location of habitats are to be shown. Monitoring should be done as per CPCB guidelines. Primary data should be collected for one season except rainy season. Monitoring of the parameters should be carried out within the study area.

3.1 Land Environment

The first feature which should influence the development of a new project is the existing land use pattern of the neighbourhood of the project, whether the proposed development conforms to the development for that area or not.

Study of land use pattern, habitation, cropping pattern, forest cover, environmentally sensitive places etc, employing remote sensing techniques and ground truth and also through secondary data sources.

Geographical latitude and microclimatic factors such as solar access and wind loads have a major impact. The following parameters have to be addressed under the baseline data for land environment.

a. Topography

Slope form

Landform and terrain analysis

b. Soil

Type and characteristics

Porosity and permeability

Sub-soil permeability

Inherent fertility

3.2 Water Environment

Identify Project activities, including construction phase, which may affect surface water or groundwater. Estimate water intake requirements and identify the source of water to be used. Describe how water will be taken from the surface water / river and conveyed to the site. Ground water budgeting has to be provided. Rainwater harvesting has to be detailed out.

Baseline water quality from all sources such as ground water, municipal water, surface water need to be determined and compared to the water quality norms prescribed for drinking water and State PWD specifications for construction water. Quantity of wastewater is to be provided.

3.3 Air Environment

Climatological data is to obtained from nearest India Meteorological Department (IMD) station for one full year. Micro meteorological data consisting of wind speed, wind direction, temperature, cloud cover, (amount and height), humidity, inversions, rainfall (peak and average daily rainfall) and wind rose patterns, from primary and secondary sources in the study area.

Baseline data of air pollutant parameters extending an area of 2kms from the project should be monitored at a number of locations. Description of base line data of ambient air parameters namely RSPM, nitrogen dioxide, Sulphur dioxide, and carbon monoxide are to be collected. One season data is to be monitored other than monsoon as per the CPCB Norms. Sampling locations are to be located as per CPCB norms.

3.4 Noise Environment

Construction equipment and road traffic are the major sources of noise. Baseline data of noise at the project area and the neighbourhood habitat areas is to be ascertained. Daytime and nighttime data should be collected.

3.5 Biological Environment

Baseline data should include list of dominant, rare, endangered, threatened, endemic and indicator species and species abundance and distribution of biological species of study area. An inventory map is to be prepared along with a description of the existing terrestrial, wetland and aquatic vegetation. Include any rare vascular and non-vascular plant species and rare plant communities in the study area. Details for fauna and flora to be included are:

- General type and dominant species
- Densities and distributions
- Habitat value
- Historically important specimen
- Rare and Endangered species (location, distribution and conditions)
- Specimen of scientific or aesthetic interest

3.6 Socio Economic Environment

Baseline data at the project area should include the demography, particularly on settlements, existing infrastructure facilities in the proposed area and area of impact due to the proposed activity. Present employment and livelihood of these populations, awareness of the population about the proposed activity should also be included.

3.7 Solid Waste

Solid wastes from construction sector can be categorized into two phases i.e. during construction & during operation. Details of the following are to be given:

- Construction or demolition waste, i.e., massive and inert waste
- Municipal waste, i.e., biodegradable and recyclable waste

- Hazardous waste
- E-waste

Details of authorized municipal solid waste facilities, biomedical treatment facilities and hazardous waste disposal facilities in the area should be included.

4.0 Anticipated Environmental Impacts and Mitigation Measures:

4.1 Prediction of Impacts:

This should describe the likely impact of the project on each of the environmental parameters, methods adopted for assessing the impact such as model studies, empirical methods, reference to existing similar situations, details of mitigation, methods proposed to reduce adverse effects of the project, best environmental practices, conservation of natural resources; environmental management plan; post project environmental monitoring programme including budgeting for the expenditure proposed in the project cost.

4.2 Land Environment

Anticipated Impacts:

Some of the anticipated impacts, which need to be addressed, are

- Estimation of anticipated impacts on the surrounding land use pattern, on infrastructure like housing, road net work, environmentally sensitive places etc,
- Impact on the public utilities arising out of the utilities for the project activities.
- Impact on the natural drainage system and soil erosion.
- Loss of productive soil and impact on natural drainage pattern.
- Study of the problem of land slides and assessment of soil erosion potential and the impact
- Impact of construction activity on the fertility status of soil in the study area
- Prediction of ground water pollution due to seepage of pollutants through soil column

Mitigation Measures:

Proper mitigation measures have to be suggested.

Improved road network infrastructure to handle the increase in traffic

- Selection of suitable local plant species for greenbelt development in and around the sites.
- Top soil conservation plan and its re-utilization depending on its quality

4.3 Water Environment

Impact of construction and operational phases on the surface and ground water on account of the township is to be estimated.

Anticipated Impacts:

- Impact on water sources due to shifting of watercourses, if any
- Impact of water withdrawal on surface water / ground water resources. Impact on exploitation of surface / ground water

- Waste water generation
- Information regarding how the waste water is to be disposed off

Mitigating Measures:

Prediction of ground water contamination and suggested mitigating measures to minimize the pollution level

- Water conservation within the buildings
- Rainwater harvesting to recharge the ground water
- Water conservation in landscape
- Adequate measures to be adopted for water conservation during construction and operation stage.

4.4 Air Environment

Anticipated Impacts:

Impacts on air quality during the construction and operation phase should be predicted. The existing surrounding features of the study area and impact on them should be addressed separately. It is necessary to predict the following if any

- Prediction of point source emissions
- Prediction of air emissions from the vehicles during the construction and operation phases.

Mitigating Measures:

Mitigative measures are to be proposed during the construction stage as well as the operational stage of the project. Some measures to be listed include: -

- Mitigative measures during construction phase due to reduce the emissions during loading, un-loading, transportation and storage of construction materials.
- Mitigative measures to reduce the point source emissions.
- Greenbelt development.
- Dust mitigation
- Estimate any environmental implications from transportation (rail, road) related emissions associated with the construction and operational phases and suggest suitable options
- Operation of DG sets

4.5 Noise Environment

Impact of project construction / operation on the noise on account of construction equipment and road traffic is to be studied.

Anticipated Impacts:

- Noise due to demolition / construction activities
- Impact due to noise levels generated by existing
- Impact due to present and future transportation activities

- Operation of DG sets
- Impact of noise due to work at night.

Mitigating Measures:

Identification and adoption of mitigating measures for noise abatement including noise barriers for point sources and line sources as also measures to minimize effect of vibrations due to demolition and while new construction

4.6 Biological Environment

Impact of project during construction and operational phases on the biological environment on account of project activity is to be detailed.

Anticipated Impacts:

- Impact of construction activity on fauna
- Pre- and post- topography, soil and parent material conditions and their contribution to flora and fauna and
- Aquatic and terrestrial ecosystem diversity.

Mitigating Measures :

- Mitigating measures to compensate the loss of vegetation cover / providing green belt development
- Regeneration / Restoration of rare plants of economic importance including medicinal plants species which require protection and conservation
- Identification of measures through scientific conservation plan for protection and conservation of flora, fauna including wildlife, migratory avi-fauna, rare, endemic and endangered species and medicinal plants etc.

4.7 Socio Economic Environment

Anticipated Impacts:

Predicted impact on the communities of the proposed activity is to be given. Impact on surroundings on socio-economic status is to be detailed. Present status of housing, public utilities, commercial structures, transportation. Impact of the project in construction and operational phases on socio cultural aspects is to be assessed.

Mitigation Measures:

Mitigation measures to reduce adverse effects are to be given.

4.8 Solid Waste and Environment

Anticipated impacts

Impact of the project during construction and operational phases for generation of waste is to be assessed.

Mitigation Measures:

Mitigation measures to reduce adverse effects. Options for minimization of solid waste and environmentally compactable disposal are to be given. Management and disposal of temporary structures, made during construction phase are to be addressed. Mitigation measures for handling biomedical wastes are to be detailed.

5.0 Specific Studies

Describe the project energy requirements, associated infrastructure and other infrastructure requirements.

Discuss the steps taken to integrate the needs of other stakeholders into the location and design of access infrastructure to reduce and manage overall environmental impacts from resource development;

5.1 Building Material and Technologies

Anticipated issues and concerns

- High consumption of resources
- High transportation cost

Alternate methods

- Re-use of debris at existing site
- Use of Ready-Mix concrete
- Use of ash-based bricks and flyash should be explored to the maximum extent possible.
- Construction should conform to the requirements of local seismic regulations.

5.2 Energy Conservation

- Explore use of alternate renewable resources such as solar / wind power etc is to be discussed.
- Discuss the options considered for supplying the power required for the Project and the environmental implications, including opportunities to increase the energy efficiency of the Project;
- Details of U &R values are to be detailed

5.3 Transport

a) Include a map showing transportation access to the site from highways;

b) Discuss how public access to, or within the project area managed during the construction phases of the Project;

c) Discuss the impact of increased vehicle traffic and requirements for access improvements on roads in the site development area as a result of the Project, considering other existing and planned developments and operations in the region including what measures will be taken to reduce traffic and enhance vehicle safety on external roads;

d) Discuss any expected change in traffic volume by Average Annual Daily Traffic (AADT) and any seasonal variability in traffic volume (include mitigation measures) prior to construction, during construction and at full site operation;

e) Distance to the main access road along with the width of the roads are to be given

5.4 Strom Water Management

Storm water management plan should be implemented so as to prevent sudden discharge of excessive volumes of storm water to the receiving waters thus reducing the shock load on municipality drainage system, and impact on receiving water body are to be detailed out.

6.0 Environmental Monitoring Program

- Frequency, location, parameters of monitoring
- Summary matrix of environmental monitoring, during construction and operation stage
- Requirement of monitoring facilities
- Compilation and analysis of data and reporting system

7.0 Additional Studies

7.1 Risk Assessment (ERA) and Disaster Management Plan (DMP):

Discuss emergency plans for any environmental risks and such as earthquakes

- Types of Emergency; internal and external origin
- Emergency evacuation plan
- Emergency Procedures
- Helipad facilities for buildings with height beyond 60mts

7.2 Natural Resource Conservation

Plan of action for conservation of natural resources and recycle waste materials due to the project activity in the construction and operational phase of the project is to be discussed.

7.3 R&R Action Plan

Detailed R&R plan with data on the existing socio-economic status of the population in the study area and broad plan for resettlement of the displaced population, site for the resettlement colony, alternative livelihood concerns / employment for the displaced people, civil and housing amenities being offered, etc and the schedule of the implementation of the project specific R&R Plan if any is to be given. Details of provisions (capital & recurring) for the project specific R&R Plan

8.0 Project Benefits

This section details out the improvements in physical infrastructure, social infrastructure if any. Also it details out any employment potential and other benefits that are accrued if the project is taken up.

9.0 Environmental Management Plan (EMP)

- Administrative and technical set up for management of environment
- In built mechanism of self monitoring of compliance of environmental regulations
- Institutional arrangements proposed with other organizations / Govt. authorities for effective implementation of environmental measures proposed in the EIA

- Safe guards / mechanism to continue the assumptions / field conditions made in the EIA, for arriving the site suitability
- Provision of Effective Controls and Building Management Systems such as Automatic Fire Alarm and Fire Detection and Suppression System etc. must be ensured. Adequate access to fire tenders should be provided.
- Provisions should be kept for the integration of solar water heating system and other energy conservation methods.

Detailed EMP may be formulated to mitigate the residual impacts which should inter alias include the impact due to change in land use; due to loss of agricultural land and grazing land besides other impacts of the projects. Budgeting of the EMP may be included in EIA. The EIA should discuss in detail the following aspects:

Sewage Treatment Plan

- Sewage treatment plant has been designed to treat the wastewater from the township. The wastewater be treated to tertiary level and after treatment, reused for flushing of toilets in apartment building and gardening.
- Treated wastewater reused for landscaping, car washing etc. and partly discharged. Treated sewage shall conform to E(P) Rules. Sewage Treatment Plants and monitored on a regular basis

Emission from Diesel Generator (DG) Set

- The stack height and emissions from D.G. sets should conform to the norms of Central Pollution Control Board. The certification of space design for DG sets done by competent authority.

Solid Waste Management

- Spent oil from DG Sets should be stored in HDPE drums in isolated covered facility and disposed off as per the Hazardous Wastes (Handling & Management) Rules, 2003. Spent oil from DG Sets should be disposed off through registered recyclers only.

10.0 Summary & Conclusion (Summary EIA)

This document should summarize the significant findings of the EIA report. The summary must describe each significant environmental issue and its resolution in sufficient detail so that its importance and scope, as well as the appropriateness of the approach taken to resolve it are well understood. Wherever possible, the summary should make use of base maps, tables and figures given in the report. The following should be addressed in the summary if applicable: -

- The need for resettlement of families / if any agriculture / the presence of squatters or any other land titling conflicts;
- Potential interruption or limitation of accesses to dwellings, businesses or productive resources either permanently or temporarily;
- Encroachment or reduction of green areas, parks, and other recreational areas;
- Demolition of buildings high architectural or historical value;

- Potential deterioration of urban quality and property value in the immediate vicinity of the works or deterioration of unique architectural characteristics in the neighbourhood;

11.0 Disclosure of Consultants Engaged

This chapter shall include the names of the consultants engaged with their brief resume and nature of consultancy rendered.

Enclosures

Conceptual plan / Questionnaire / Photos

Annexure 2

Land use / land cover classification system

Level -I	Level -II	Level -III
1. Built – up land	1.1. Built –up land	1.1.1. Urban (towns & cities)
2. Agricultural land	2.1. Crop land	2.1.1. Irrigated crop land
	(i) kharif (ii) rabi (iii) double cropped	2.1.2. Unirrigated crop land
	2.2. Fallow	2.2.1. Fallow
	2.3. Plantation	2.3.1. Types of plantation, casuarina, coconut, tea etc.
3. Forest	3.1 evergreen / semi-evergreen	3.1.1. Dense / closed 3.1.2. Open
	3.2. Deciduous	
	3.3. Degraded scrub land	
	3.4. Forest blank	3.4.1. Degraded forest
		3.4.2. Forest blank
	3.5. Forest plantation 3.6. Mangrove	3.5.1. Types of plantation eg. teak, sal etc.
4. Wastelands	4.1. Salt affected land	
	4.2. Water logged land	
	4.3. Marshy / swampy land	
	4.4. Gullied / ravinous land	
	4.5. Land with or without scrub	
	4.6. Sandy area (coastal & desertic)	Minimum mappable unit IS 2.25 hectares on 1:50,000 scale
	4.7. Barren rocky / stony waste / sheet rock areas	
5. Water bodies	5.1. River / stream	
	5.2 Lake / reservoir / tank / canal	
6. Others	6.1. Shifting cultivation	6.1.1. Current
		6.1.2. Old / abandoned
	6.2.grassland / grazing land	6.2.1. Grassland / grazing land
	6.3. Snow covered / glacial area	6.3.1. Snow covered / glacial area
	6.4. Mining area	6.4.1. Mining dumps

Note: Land use / Land cover categories at different levels and corresponding scales for mapping are as follows:

Level – I – categories – 1:1000,000 scale
Level – II – categories – 1:250,000 scale
Level – III – categories – 1:50,000 scale and 1:25,000 scale

(Sources: Description and classification of land use / land cover : NRSA – TR – LU & CD – 01 –90)

Annexure 3

Sampling, Frequency & Method of Baseline Environment Monitoring

Attributes	Sampling		Measurement Method	Remarks
A. Air Environment	Network	Frequency		
Meteorological ▸ Wind speed ▸ Wind direction ▸ Maximum temperature ▸ Minimum temperature ▸ Relative humidity ▸ Rainfall ▸ Solar radiation ▸ Cloud cover ▸ Adiabatic Lapse Rate	1 site in the project area	1 hourly continuous	Mechanical / automatic weather station Max / Min Thermometer Hygrometer Rain gauge As per IMD specifications As per IMD specifications Mini Sonde / SODAR	IS 5182 Part 1-20 Site specific primary data is essential Secondary data from IMD CPCB guidelines
Pollutants ▸ SPM	Nos. of sampling location to be decided	24 hourly twice a week	As per CPCB guidelines	Monitoring Network ▸ Minimum one locations in upwind side, two sites in downwind side / impact zone
▸ RSPM		@4 hourly. Twice a week, One non monsoon season		▸ All the sensitive receptors need to be covered for core zone and buffer zone
▸ SO_2		8 hourly, twice a week		
▸ NO_x				
▸ Hourly equivalent noise levels	Identified study area	Once in season	Noise level meter	IS:4954-1968 as adopted by CPCB
C. Water				
Parameters for water quality ▸ pH, temperature, turbidity, magnesium hardness, total alkalinity, chloride, sulphate, nitrate,		▸ Set of grab samples for ground and surface water	Samples for water quality should be collected and analysed as per : IS : 2488 (Part 1-5) methods for sampling and testing of Industrial effluents	

fluoride, sodium, potassium, salinity ▸ Total nitrogen, total phosphorus, DO, BOD,COD ▸ Heavy metals ▸ Total coliforms, faecal coliforms ▸ Phyto plankton			▸ Standard methods for examination of water and wastewater analysis published by American Public Health Association.	
D. Land environment				
Soil ▸ Organic Matter ▸ Texture ▸ pH ▸ Electrical conductivity ▸ Permeability ▸ Water holding capacity ▸ Porosity	Sample from villages (soil samples be collected as per BIS specifications)	***One season***	Collected and analysed as per soil analysis reference	Analysis be done as per BIS specifications

Adopted from: EIA manual 2001, Ministry of Environment and Forests, New Delhi

Annexure 4

Annexure 4.1 Hydraulic Conductivities of Soil

S No.	Soils	K- values (m / day)
1	Clay surface	0.01-0.2
2	Deep clay layer	10^{-8}- 10^{-2}
3	Loam	0.1-10
4	Fine sand	1-5
5	Medium sand	5-20
6	Coarse sand	20-100
7	Gravel	100-1000
8	Sand and gravel	5-100
9	Clay, sand & gravel	0.001-0.1

Source: MoWR, GoI, 2004, pg. 15, 84

Annexure 4.2 Specific Yield of Different Formation

	Yield (%)
Sand :	10-30
Gravelly Sand (coarse sand) :	15-30
Sand and Gravel :	15-25
Sand stone coarse-grained :	10-15
Sand stone fine–grained :	5-15
Thick plastic clay :	3-5
Weathered rock :	2-5
Clay :	1-10
Fractured and jointed rock :	0.50-5

Annexure 4.3 Typical Porosities of soil

Soil Texture	Porosity
Sandstone	0.19
Sandy loam sub soil	0.36
Sandy loam plough layer	0.42
Clay loam subsoil	0.44
Recently ploughed clay loam	0.58

Source: Manual on norms and standards for EC of large construction projects-MoEF

Annexure 4.4 Rating Chart for Soil Test Values of Primary Nutrients

Nutrient	Rating*			Recommended test**
	Low	Medium	High	
Organic carbon Available nitrogen alkaline KMnO4 N (Kg/ha)	<0.50	0.50-0.75	>0.75	Colorimetric method; Datta et al
Available phosphorus Olsen's P (Kg/ha)	<280	281-560	>560	Kjeldahl apparatus
Available potassium Ammonium Acetate-K (Kg/ha)	<10 <120	11-25 121-280	>25 >280	Olsen method Ammonium acetate extraction method
*Subject to minor variation as per local conditions. **Tests to be performed at ICAR (Indian Council of Agricultural Research)–accredited laboratory.				

Source: Singh D, Chhoker, P K and Pandey, R N. 2000. Soil plant water analysis: a methods manual. New Delhi: Indian Agricultural Research Institute, 160 pp.

Annexure 5.1

Criteria for Raw Water Used for Organized Community Water Supplies (Surface and Ground Water) Primary Parameters

	Parameters	Range/Limiting Value		Note
		Use with only disinfection	Use after conventional treatment	
1.	pH	6.5 to 8.5	6.0 to 9.0	To ensure prevention of corrosion in treatment plant and distribution system and interference in coagulation and chlorinating.
2.	Colour Pt. scale Hz Units	< 10	< 50	Color may not get totally removed during treatment
3.	Suspended Solids mg/l	< 10	< 50	High SS may increase the cost of treatment.
4.	Odour, dilution factor	< 3	< 10	May not be tackled during treatment.
5.	DO, (%saturation)	90-100	80-120	May imply higher chlorine demand.
6.	BOD, mg/l	< 3	< 5	Same as above.
7.	TKN, mg/l	< 1	< 3	Same as above.
8.	Ammonia, mg/l	< 0.05	< 1	Same as above.
9.	Faecal coliform MPN/100 ml	< 200	< 2000	Not more than 20% samples show greater than limit.
10.	EC, µm/hos/cm	< 2000	< 2000	High conductivity implies dissolved high solids making water unpalatable.
11.	Chloride, mg/l	< 300	< 300	May cause physiological impact and unpalatable taste.
12.	Sulphates, mg/l	< 250	<250	May cause digestive problems
13.	Phosphates, mg/l	< 0.7	< 1.0	May interfere with coagulation
14.	Nitrate, mg/l	< 50	< 50	May cause methamoplobinemea
15.	Fluoride, mg/l	< 1.0	< 1.5	Higher value shall cause fluorosis and lower value shall carries.
16.	Surfactants, mg/l	< 0.2	< 0.2	May impair treatability and cause foaming.

Additional Parameters for Periodic Monitoring (Seasonal – Only to be done when there are known natural or anthropogenic sources in the upstream catchment region likely or apprehended to contribute or other well founded apprehensions)

Parameters	Desirable	Acceptable	Note
Dissolved Iron mg/l	< 0.3	< 0.5	Affect taste and cause stains
Copper, mg/l	—	< 1.0	May cause live damage
Zinc, mg/l	—	< 5.0	Cause bitter stringent taste
Arsenic, mg/l Cadmium, mg/l	< 0.01 < 0.001	< 0.05 < 0.005	Cause hyperkeratosis & skin cancer Toxic
Total Chromium, mg/l	< 0.05	< 0.05	Toxic
Lead, mg/l	< 0.05	< 0.05	Physiological abnormality
Selenium, mg/l	< 0.01	< 0.01	Toxic symptoms similar to arsenic
Mercury, mg/l	< 0.005	<0.0005	Carcinogenic and poisonous
Phenols, mg/l	< 0.001	< 0.001	Toxic and cause taste and odour problem
Cyanides, mg/l	< 0.05	< 0.05	Physiological abnormality
PAH, mg/l	< 0.0002	< 0.0002	Carcinogenic
Total Pesticides, mg/l	< 0.001	< 0.0025	Trend to bioaccumulates & carcinogenic

(Source: Ecological Impact Assessment Series: EIAS/03/2002-03 Published by CPCB)

Annexure 5.2 Use Based Classification of Surface Waters in India

Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional disinfection	A	1. Total Coliforms OrganismMPN/100ml shall be 50 treatment but after or less 2. pH between 6.5 and 8.5 3. Dissolved Oxygen 6mg/l or more 4. Biochemical Oxygen Demand 5 days 20oC 2mg/l or less
Outdoor bathing (Organized)	B	1. Total Coliforms Organism MPN/100ml shall be 500 or less 2. pH between 6.5 and 8.5 3. Dissolved Oxygen 5mg/l or more 4. Biochemical Oxygen Demand 5 days 20oC 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	1. Total Coliforms Organism MPN/100ml shall be 5000 or less 2. pH between 6 to 9 3. Dissolved Oxygen 4mg/l or more 4. Biochemical Oxygen Demand 5 days 20oC 3mg/l or less
Propagation of Wild life and Fisheries	D	1. pH between 6.5 to 8.5 2. Dissolved Oxygen 4mg/l or more 3. Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	1. pH between 6.0 to 8.5 2. Electrical Conductivity at 25oC micro mhos/cm Max.2250 3. Sodium absorption Ratio Max. 26 4. Boron Max. 2mg/l

(Source: Guidelines for Water Quality Management –CPCB 2008)

Annexure 6

Water Requirements for Different Types of Buildings

Sl. No	Type of Building	Consumption (liters/day)
i)	Factories with bath rooms	45 per head
ii)	Factories without bath rooms	30 per head
iii)	Hospital (including laundry):	
	a) Number of beds not exceeding 100	340 per head
	b) Number of beds exceeding 100	450 per head
iv)	Nurses' homes and medical quarters	135 per head
v)	Hostels	135 per head
vi)	Hotel (up to 4 star)	180 per head
vii)	Hotel (5 star and above)	320 per head
viii)	Offices	45 per head
ix)	Restaurants	70 per seat
x)	Cinemas, concert halls and theaters	15 per seat
xi)	Schools	
	a) Day schools	45 per head
	b) Boarding schools	135 per head

In addition, water demand of visitors to these building is considered as 15 LPCD
Source: National Building Code, 2005

Annexure 7

National Ambient Air Quality Standards (NAAQS)

S. No	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Residential, Rural and other areas	Ecologically sensitive area (notified by central government)	Methods of measurement
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur dioxide (SO_2), µg/m^3	Annual* 24 hours**	50 50	20 80	-Improved West & Gaeke -Ultraviolet fluorescence
2	Nitrogen Dioxide (NO_2), µg/m^3	Annual* 24 hours**	40 30	80 80	-Modified Jacob & Hochheiser (Na-Arsenite) -Chemiluminescence
3	Particulate Matter (Size less than 10m) or PM_{10}µg/m^3	Annual* 24 hours**	60 100	60 100	- Gravimetric - TOEM - Beta attenuation
4	Particulate Matter (Size less than 2.5m) or $PM_{2.5}$µg/m^3	Annual* 24 hours**	40 60	40 60	- Gravimetric - TOEM - Beta attenuation
5	Ozone (O_3) µg/m^3	8 hours** 1 hour**	100 180	100 180	- UV photometric - Chemiluminescence - Chemical method
6	Lead (Pb) µg/m^3	Annual* 24 hours**	0.50 1.0	0.50 0.50	-AAS/ICP method after sampling on EPM 2000 or equivalent filter paper -ED-XRF using Teflon filter
7	Carbon Monoxide (CO) mg/ m^3	8 hours** 1 hour**	02 04	02 04	-Non Dispersive Infra Red (NDIR) spectroscopy
8	Ammonia (NH_3) µg/m^3	Annual* 24 hours**	100 400	100 400	- Chemiluminescence - Indophenol blue method
9	Benzene (C_6H_6) µg/m^3	Annual*	05	05	-Gas chromatography based continuous analyzer -Adsorption and Desorption followed by GC analysis

10	Benzo(a)Pyrene (BaP)–particulate phase only, ng/m^3	Annual*	01	01	-Solvent extraction followed by HPLC /GC analysis
11	Arsenic (As) ng/m^3	Annual*	06	06	-AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni) ng/m^3	Annual*	20	20	-AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals

** 24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note:

Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation

(Source: National Ambient Air Quality Standards, CPCB Notification dated 18th November 2009)

Annexure 8
Ambiant Noise Standards

Area Code	Category of Area	Noise Levels Db(A) eq	
		Day Time	Night Time
A	Industrial Area	75	70
B	Commercial	65	55
C	Residential	55	45
D	Silence	50	40
*#Day – 6 AM – 10 PM, Night 10 PM – 6 AM; Silence zone is not less than 100 m from around hospitals, schools, courts, religious places.			

Source: National Pollution Regulations In India, CPCB, Pollution Control Law Series: PCL/06/2001-02

The IS standards for noise abatement include :

- IS-4954-1968 for Noise abatement in town planning recommendations
- IS-3098-1980 for Noise emitted by moving road vehicles, measurement
- IS-10399-1982 for Noise emitted by stationary road vehicles, methods of measurement
- IS-6098-1971 for Air borne noise emitted by rotating electrical machinery
- IS-4758-1968 for Noise emitted by machines

Annexure 9
List of Critically Polluted Areas as Identified by CPCB

S. No.	Critically Polluted Industrial Area and CEPI	Industrial Clusters/Potential Impact Zones
1	Ankleshwar (Gujarat) *CEPI-88.50* (*Ac_Wc_Lc*)	GIDC Ankleshwar and GIDC, Panoli
2	Vapi (Gujarat) *CEPI-88.09 (Ac_Wc_Lc)*	GIDC Vapi
3	Ghaziabad (Uttar Pardesh) *CEPI-87.37* (*Ac_Wc_Lc*)	**Sub-cluster A** • Mohan nagar Industrial area • Rajinder nagar Industrial area • Sahibabad Industrial area **Sub-cluster B** • Pandav nagar Industrial area • Kavi nagar Industrial area • Bulandshahar Road Industrial area • Amrit nagar • Aryanagar Industrial area **Sub-cluster C** • Merrut road Industrial area **Sub-cluster D** • Loni Industrial area • Loni Road Industrial area • Roop Nagar Industrial area **Sub-cluster E** • Hapur Road Industrial area • Dasna • Phikua **Sub-cluster F** (other scattered Industrial areas) • South side of GT road • Kavi Nagar • Tronica city • Anand Nagar • Jindal Nagar • Prakash Nagar • Rural Industrial estate
4	Chandrapur (Maharashtra) *CEPI-83.88* (*Ac_Wc_Lc*)	Chandrapur (MIDC Chandrapur, Tadali, Ghuggus, Ballapur)
5	Korba (Chhatisgarh) *CEPI-83.00* (*Ac_Ws_Lc*)	a) Industrial areas and their townships of NTPC, BALCO, CSEB (East) & CSEB (West) b) Korba town
6	Bhiwadi (Rajassthan) *CEPI-82.91* (*Ac_Wc_Ls*)	a) RIICO Industrial areas Phase I to IV b) Bhiwadi town c) Other surrounding industrial areas: Chopanki, Rampura Mundana, Khuskhera Phase I to III.
7	Angul Talcher (Orissa) *CEPI-82.09* (*Ac_Wc_Lc*)	a) MCL Coal Mining Area, Angul – Talcher region b) Industrial Area (60 km x 45 km) Following blocks of Angul District: - Kohina block - Talcher block - Angul block - Chhendipada block - Banarpal block And Odapada block of Dhenkamal District
8	Vellore (North Arcot) (Tamilnadu) *CEPI-81.79 (Ac_Wc_Lc)*	Ranipet, SIPCOST Industrial Complex
9	Singurauli (Uttar Pradesh) *CEPI-81.73* (*Ac_Wc_Ls*)	Sonebhadra (UP) • Dala-Tola • Obra • Renukoot • Anpara • Renusagar • Kakri • Dudhichuwa • Bina • Khadia • Shakti Nagar • Rihand Nagar • Bijpur Sigrauli (Madhya Pradesh) Vindhyachal Nagar and Jayant, Nigahi, Dudhichua, Amlohri & Jhingurdah townships

S. No.	Critically Polluted Industrial Area and CEPI	Industrial Clusters/Potential Impact Zones
10	Ludhiana (Punjab) *CEPI-81.66* (*Ac_Wc_Ls*)	Ludhiana Muncipal limits covering industrial clusters: • Focal Point Along with NH_I_Tota Eight Phase • Industrial Area-B-From Sherpur chowk to Gill road & Gill road to Miller Kotla road (left Side of Road) • Mixed Industrail Area – Right side of Gill road • Industrial area – C (near Jugiana Village) • Industrial Area A & Extension: Area between old GT Road and Ludhiana by pass road • Industrial Estate : Near Dholwal chowk • Mixes Industrial Area (MIA) Miller gunj • MIA-By pass road • Bahdur Industrial Area • Tejpur industrial Complex.
11	Nazafgarh drain basin, Delhi *CEPI-79.54* (*As_Wc_Lc*)	Industrial areas : Anand Parvat, Naraina, Okhla and Wazirpur
12	NOIDA (Uttar Pradesh) *CEPI-78.90* (*Ac_Wc_Lc*)	Territorial jurisdiction of : • Noida Phase - 1 • Noida Phase - 2 • Noida Phase – 3 • Surajpur Industrial Area • Greater Noida Industsrial Area • Village-Chhaparaula
13	Dhanbad (Jharkhand) *CEPI-78.63* (*Ac_Ws_Lc*)	Four blocks of Dhanbad district: • Sadar (Dhanbad Municipality) • Jharia (Jharia Municipality, Sindri Industrial Area) • Govindpur (Govindpur Industrial Estate) • Nirsa
14	Dombivalli (Maharashtra) *CEPI-78.41*(*Ac_Wc_Ls*)	MIDC Phase-I, Phase-II
15	Kanpur (UttarPradesh) *CEPI-78.09* (*Ac_Wc_Ls*)	• Industrial areas: • Dada Nagar • Panki • Fazalganj • Vijay Nagar • Jajmau
16	Cuddalore (Tamilnadu) *CEPI-77.45* (*As_Wc_Lc*)	SIPCOT Industrial Complex, Phase I & II
17	Aurangabad (Maharashtra) *CEPI-77.44* (*Ac_Wc_Ls*)	MIDC Chikhalthana, midc Waluj, MIDC Shendra, and Paithan Road industrial area
18	Faridabad (Haryana) *CEPI-77.07* (*Ac_Ws_Lc*)	• Sector 27 - A, B, C, D • DLF Phase – 1, Sector 31, 32 • DLF Phase – 2, Sector 35 • Sector 4, 6, 24, 25, 27, 31, 59 • Industrial area Hatin • Industrial Model town Ship
19	Agra (Uttar Pradesh) *CEPI-76.48* (*As_Wc_Ls*)	Nunihai Industraial Estate, Rambag Nagar, UPSIDC Industrial Area, and Runukata Industrial Area
20	Manali (Tamilnadu) *CEPI-76.32* (*Ac_Ws_Ls*)	Manali Industrial Area
21 22	Haldia (West Bengal) *CEPI-75.43* (*As_Wc_Ls*) Ahmedabad (Gujarat) *CEPI-75.28* (*Ac_Ws_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 Haldia Municipa Area & Sutahata Block-I and II • GIDC Odhav • GIDC Naroda
23	Jodhpur (Rajasthan) *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 Tanwda & Salawas. • Jodhpur city
24	Greater Coach (Kerala) *CEPI-75.08* (*As_Wc_Ls*)	Eloor-Edayar Industrail Belt, Ambala Mogal Industrial areas
25	Mandi Gobind Garh (Punjab) *CEPI-75.08* (*Ac_Ws_Lc*)	Mandi Govindgarh municipal limit and Khanna area
26	Howrah (West Bengal) *CEPI-74.84* (*As_Ws_Lc*)	a) Liluah-Bamangachhi Region, Howrah b) Jalah Industrial Complex-1, Howrah
27	Vatva (Gujarat) *CEPI-74.77* (*Ac_Wc_Ls*)	GIDC Vatva, Narol Industrial Area (Villages Piplaj, Shahwadi, Narol)

S. No.	Critically Polluted Industrial Area and CEPI	Industrial Clusters/Potential Impact Zones
28	Ib Valley (Orissa) *CEPI-74.00* (*Ac_Ws_Ls*)	Ib Valley of Jharsuguda (Industrial and Mining area)
29	Varansi-Mirzapur (Uttar Pradesh) *CEPI-73.79* (*As_Wc_Ls*)	• Industrial Estate, Mirzapur • Chunar • Industrial Estate, Chandpur Varanasi • UPSIC, Industrial Estate, Phoolpur • Industrial Area, Ramnagar, Chandaull
30	Navi Mumbai (Maharashtra) *CEPI-73.77* (*Ac_Ws_Ls*)	TTC Industrial Area, MIDC, Navi Mumbai (including Blocks-D, C, EL, A, R, General, Kalva)
31	Pali (Rajasthan) *CEPI-73.73* (*As_Wc_Ls*)	a) Existing industrial areas: Mandia Road, Puniyata Road, Sumerpur b) Pali town
32	Mangalore (Karnataka) *CEPI-73.68* (*Ac_Ws_Ls*)	Baikampady Industrial Area
33	Jharsuguda (Orissa) *CEPI-73.34* (*Ac_Ws_Ls*)	Ib Valley of Jharsuguda (Industrial and Mining area)
34	Coimbatore (Tamil Nadu) *CEPI-72.38* (*Ac_Ws_Ln*)	SIDCO, Kurichi Industrial Clusters
35	Bhadravati (Karnataka) *CEPI-72.33* (*Ac_Ws_Ln*)	KSSIDC Industrial Area Mysore Paper Mill & VISL Township Complex
36	Tarapur (Maharashtra) *CEPI-72.01* (*Ac_Ws_Ls*)	MIDC Tarapur
37	Panipat (Haryana) *CEPI-71.91* (*As_Ws_sc*)	Panipat Municipal limit and its industrial clusters
38	Indore (Madhya Pradesh) *CEPI-71.26* (*As_Ws_Ls*)	Following 09 industrial areas: • Sanwer Road • Shivaji Nagar • Pologround • Laxmibai Nagar • Scheme No. 71 • Naviakha, • Pipliya • Palda • Rau • Indore city • Other surrounding industrial areas : Manglia, Rajoda, Barlal, Asrawad, Tejpur Gadwadi
39	Bhavnagar (Gujarat) *CEPI-70.99* (*As_Ws_Ls*)	GIDC Chitra, Bhavnagar
40	Vishakhapatnam (Andhra Pradesh) *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 direcdtion)
41	Junagarh (Gujarat) *CEPI-70.82* (*As_Ws_Ls*)	Industrial Areas: • Sabalpur • Jay Bhavani • Jay Bhuvneshwari • GIDC Junagarh (I&II)
42	Asansole (West Bengal) *CEPI-70.20* (*As_Ws_Ls*)	Burnpur area surrounding IISCO
43	Patancheru- -Bollaram (Andhra Pradesh) *CEPI-70.07* (*As_Ws_Ls*)	Industrial Area: • Patancheru • 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.

Aggregated Comprehensive Environmental Pollution Index (CEPI) scores of 70 and above are considered as critically polluted industrial clusters/ areas.

Source: Ecological Impact Assessment Series: EIAS/5/2009-10
Details of Critically Polluted Industrial Areas and Clusters/ Potential Impact Zone in terms of the Office Memorandum no. J-11013/5/2010-IA.II(I) dated 13.1.2010

Annexure 10

General Standards for Discharge of Effluents

S. No	Parameter	Standards			
		Inland surface water	Public sewers	Land for irrigation	Marine coastal areas
		(a)	(b)	(c)	(d)
1	Color & odour				
2.	Suspended solids mg/l, Max	100	600	200	1. For process waste water-100 2. For cooling water effluent 10% above total suspended matter of effluent
3	Particle size of suspended solids	Shall pass 850 Micron IS sieve	—	—	1. Floatable solids max. 3 mm 2. Settleable solids max. 850 microns
4	pH Value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
5	Temperature	Shall not exceed 5^0 C above the receiving water temperature	—	—	Shall not exceed 5^0 C above the receiving water temperature
6	Oil and grease mg/l Max.	10	20	10	20
7	Total residual chlorine mg/l Max.	1.0	—	—	1.0
8	Ammonical Nitrogen (as N), mg/l Max.	50	50	—	50
9	Total Kjeldahl nitrogen (as NH_3), mg/l Max.	100	—	—	100
10	Free ammonia (as NH_3), mg/l Max.	5.0	—	—	5.0
11	Bio-chemical oxygen demand (3 days at 27^0 C), mg/l max.	30	350	100	100

12	Chemical oxygen demand, mg/l max.	250	—	—	250
13	Arsenic (as As), mg/l max.	0.2	0.2	0.2	0.2
14	Mercury (as Hg), mg/l max.	0.01	0.01	—	0.01
15	Lead (as Pb), mg/l max.	0.1	1.0	—	2.0
16	Cadmium (as Cd), mg/l max.	2.0	1.0	—	2.0
17	Hexavalent chromium (as Cr +6), mg/l max.	2.0	1.0	—	2.0
18	Total chromium (as Cr), mg/l max.	2.0	2.0	—	2.0
19	Copper (as Cu), mg/l max.	3.0	3.0	—	3.0
20	Zinc (as Zn), mg/l max.	5.0	15	—	15
21	Selenium (as Se), mg/l max.	0.05	0.05	—	0.05
22	Nickel (as Ni), mg/l max.	3.0	3.0	—	5.0
23	Cyanide (as CN), mg/l max.	0.2	2.0	0.2	0.2
24	Fluoride (as F), mg/l max.	2.0	15	—	15
25	Dissolved phosphates (as P), mg/l max.	5.0	—	—	—
26	Sulphide (as S), mg/l max.	2.0	—	—	5.0
27	Phenolic compounds (as C_6H_5OH), mg/l max.	1.0	5.0	—	5.0
28	Radio active materials:	10^{-7}	10^{-7}	10^{-7}	10^{-7}
	a. Alpha emitter micro curie/ml				
	b. Beta emitter micro curie/ml	10^{-6}	10^{-6}	10^{-6}	10^{-6}

29	Bio-assay test	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent
30	Manganese (as Mn), mg/l	2	2	—	2
31	Iron (as Fe), mg/l	3	3	—	3
32	Vanadium (as V), mg/l	0.2	0.2	—	0.2
33	Nitrate nitrogen, mg/l	10	—	—	20
* These standards shall be applicable for industries, operations or processes other than those industries, operations or process for which standards have been specified of the Environment Protection Rules, 1989					

Source: G.S.R 422 (E) dated 19.05.1993 and G.S.R 801 (E) dated 31.12.1993 issued under the provisions of E (P) Act 1986

Annexure 11
Drought Resistant Species

Tree species	Common Name	Tree species	Common Name
Prosopis cineraria	Khejri	Azadirachta indica	Neem
Capparis deciduas	Kiari , Caperbrush	Diospyros melanoxylon	Tendu
Tamarix aphylla		Ougeinia oojeinensis	
Acacia tortillas		Commiphora caudata	
Zizyphus nummularia	Jungli Ber	Bauhinia variegata	Kachnar
Prosopis juliflora	Kikar	Eucalyptus tereticornis	
Tecomella undulata	Rugtora / Wavy leafed Tufmella	Pongamia Pinnata	Karanj
Colophospermum mopane		Casia siamea	
Salvadora oleoides		Anacardium occidentale	Cashew
Acacia aneura		Holoptelia integrifolia	
Parkinsonia aculeate		Acacia catechu	Katha
Dichrostachys cineraria		Boswellia serrata	Lobaw
Acacia holosericea		Butea monosperma	Palash
Borassus flabellifera	Tar	Cassea fistula	Amaltas
Grewia tenax	Falsa	Albizia amara	
Commiphora wightii	Guggal	Dalbergia latifolia	Eastern Rose wood
Acacia seyal		Erythrina Indica	Coral Tree
Eucalyptus camaldulensis	Eucalyptus	Ficus bengalensis	Banyan
Hardwickia binnata		Ficus religiosa	Peepal
Pithecelobium dulce	Jungle Jalebi	Santalum album	Sandal
Celtis australis		Syzgium cuminii	Clove
Acacia albida		Terminalia alata	
Albizia lebbek	Shirish	Madhuca latifolia	Mahua
Acacia nilotica	Babul	Acacia auriculiformis	
Acacia ferruginea		Terminalia bellirica	Harad
Casuarina equisetifolia	Jhar	Dendrocalamus strictus	Lathi Baans
Leucaena leucocephala	Subabul	Moringa oleifera	Drumstick
Melea azedirach		Terminalia arjuna	Arjun
Sesbania grandiflora			
Tamarindus indica	Imli		
Wrightia Tinctoria			
Morus indica / alba	Mulberry		
Ailanthus excelsa			

Source : Manual on norms and standards for EC of large construction projects-MoEF

Annexure 12

For General Structural Safety

1. IS: 456:2000 “Code of Practice for Plain and Reinforced Concrete
2. IS: 800-1984 “Code of Practice for General Construction in Steel
3. IS: 801-1975 “Code of Practice for Use of Cold Formal Light Gauge Steel Structural Members in General Building Construction
4. IS 875 (Part 2):1987 Design loads (other than earthquake) for buildings and structures Part2 Imposed Loads
5. IS 875 (Part 3):1987 Design loads (other than earthquake) for buildings and structures Part 3 Wind Loads
6. IS 875 (Part 4):1987 Design loads (other than earthquake) for buildings and structures Part 4 Snow Loads
7. IS 875 (Part 5):1987 Design loads (other than earthquake) for buildings and structures Part 5 special loads and load combination
8. IS: 883:1966 “Code of Practice for Design of Structural Timber in Building
9. IS: 1904:1987 “Code of Practice for Structural Safety of Buildings: Foundation”
10. IS1905:1987 “Code of Practice for Structural Safety of Buildings: Masonry Walls
11. IS 2911 (Part 1): Section 1: 1979 “Code of Practice for Design and Construction of Pile Foundation Section 1

    Part 1: Section 2 Based Cast-in-situ Piles

    Part 1: Section 3 Driven Precast Concrete Piles

    Part 1: Section 4 Based precast Concrete Piles

    Part 2: Timber Piles

    Part 3 Under Reamed Piles

    Part 4 Load Test on Piles

For Cyclone/Wind Storm Protection

12. IS 875 (3)-1987 “Code of Practice for Design Loads (other than Earthquake) for Buildings and Structures, Part 3, Wind Loads”
13 IS Guidelines for improving the Cyclonic Resistance of Low rise houses ad other building

For Earthquake Protection

14 IS: 1893-2002 “Criteria for Earthquake Resistant Design of Structures (Fifth Revision)”

15 IS:13920-1993 “Ductile Detailing of Reinforced Concrete Structures subjected to Seismic Forces - Code of Practice”

16 IS:4326-1993 “Earthquake Resistant Design and Construction of Buildings - Code of Practice (Second Revision)”

17 IS:13828-1993 “Improving Earthquake Resistance of Low Strength Masonry Buildings - Guidelines”

18 IS:13827-1993 “Improving Earthquake Resistance of Earthen Buildings - Guidelines”,

19 IS:13935-1993 “Repair and Seismic Strengthening of Buildings - Guidelines”

For Protection of Landslide Hazard

20 IS 14458 (Part 1): 1998 Guidelines for retaining wall for hill area: Part 1 Selection of type of wall.

21 IS 14458 (Part 2): 1997 Guidelines for retaining wall for hill area: Part 2 Design of retaining / breast walls

22 IS 14458 (Part 3): 1998 Guidelines for retaining wall for hill area: Part 3 Construction of dry stone walls

23 IS 14496 (Part 2): 1998 Guidelines for preparation of landslide – Hazard zonation maps in mountainous terrains: Part 2 Macro-zonation

Note 1 : Whenever an Indian Standard including those referred in the National Building Code or the National Building Code is referred, the latest revision of the same shall be followed except specific criteria, if any, mentioned above against that code.

Note 2: Codal Provisions / Guidelines Pertaining To Protection For Cyclone Or Landslide Hazard Can Be Omitted Whenever Not Applicable.

Annexure 13

Annexure 13.1 Interior lighting power

Space Function LPD (W / m2) Space Function LPD (W / m2)			
Space Function	LPD (W/m^2)	Space Function	LPD (W/m^2)
Office-enclosed	11.8	Library	
Office-open plan Conference / Meeting / Multipurpose	11.8 14.0	Card File & Cataloging Stacks	11.8 18.3
Classroom / Lecture / Training	15.1	Reading Area	12.9
Lobby	14.0	Hospital	
For Hotel	11.8	Emergency	29.1
For Performing Arts Theater	35.5	Recovery	8.6
For Motion Picture Theater	11.8	Nurse Station	10.8
Audience / Seating Area	9.7	Exam Treatment	16.1
For Gymnasium	4.3	Pharmacy	12.9
For Exercise Center	3.2	Patient Room	7.5
For Convention Center	7.5	Operating Room	23.7
For Religious Buildings	18.3	Nursery	6.5
For Sports Arena	4.3	Medical Supply	15.1
For Performing Arts Theater	28.0	Physical Therapy	9.7
For Motion Picture Theater	12.9	Radiology	4.3
For Transportation	5.4	Laundry – Washing	6.5
Atrium-first three floors	6.5	Automotive – Service Repair	7.5
Atrium-each additional floor	2.2	Manufacturing	
Lounge / Recreation	12.9	Low Bay (<8m ceiling)	12.9
For Hospital Area	8.6 9.7	High Bay (>8m ceiling) Detailed Manufacturing	18.3 Dining 22.6
For Hotel	14.0	Equipment Room	12.9
For Motel	12.9	Control Room	5.4
For Bar Lounge / Leisure Dining	15.1	Hotel / Motel Guest Rooms	11.8
For Family Dining	22.6	Dormitory – Living Quarters	11.8
Food Preparation	12.9	Museum	
Laboratory	15.1	General Exhibition	10.8
Restrooms	9.7	Restoration	18.3
Dressing / Locker / Fitting Room	6.5	Bank Office – Banking Activity Area	16.1

Corridor / Transition	5.4	Religions Buildings	
For Hospital	10.8	Worship-pulpit, choir	25.8
For Manufacturing Facility	5.4	Fellowship Hall	9.7
Stairs-active	6.5	Retail	
Active Storage	8.6	Sales Area	18.3
For Hospital	9.7	Mall Concourse	18.3
Inactive Storage	3.2	Sports Arena	
For Museum	8.6	Ring Sports Area	29.1
Electrical / Mechanical	16.1	Court Sports Area	24.8
Workshop	20.5	Indoor Field Area	15.1
Sleeping Quarters	3.2	Warehouse	
Convention Center – Exhibit Space	14.0	Fine Material Storage	15.1
Medium / Bulky Material Storage	9.7	Parking Garage – Garage Area	2.2
		Transportation	
		Airport – Concourse	6.5
		Air / Train / Bus – Baggage Area	10.8
		Terminal – Ticket Counter	16.1

Source: Manual on norms and standards for EC of large construction projects-MoEF

Annexure 13.2 Exterior Building Lighting Power

Exterior Lighting Applications	Power Limits
Building entrance (with canopy)	13 W / m^2 (1.3 W / ft^2) of canopied area
Building entrance (without canopy)	90 W / lin m (30 W / lin f) of door width
Building exit	60 W / lin m (20 W / lin f) of door width
Building facades	2 W / m^2 (0.2 W / ft^2) of vertical facade area

Source: Manual on norms and standards for EC of large construction projects-MoEF

Annexure 14

Recommended Values of Illuminance for Some Common Activities as Recommended by National Building Code 2005

Sl. No.	Type of interior or activity	Range of service Illuminance in Lux limitation	Quality class of direct glare	Remarks
1	Commerce			
1.1	Offices			
1.1.1	General Offices	300-500-700	1	
1.1.2	Deep plan general offices	500-750-1000	1	
1.1.3	Computer work stations	300-500-750	1	
1.1.4	Conference rooms, executive offices	300-500-750	1	
1.1.5	Computer and data preparation rooms	300-500-750	1	
1.1.6	Filing rooms	200-300-500	1	
1.2	Drawing offices			
1.2.1	General	300-500-750	1	
1.2.2.	Drawing boards	500-750-1000	1	
1.2.3	Computer aided design and drafting	-	-	Special lighting is required
1.2.4	Print rooms	200-300-500	1	
1.3	Banks and building societies			
1.3.1	Counter office area	300-500-750	1	
1.3.2	Public area	200-300-500	1	
2	Retailing			
2.1	Small shops with counters	300-500-750	1	The service illuminance should be provided on the horizontal plane of the counter. Where wall displays are used, a similar illuminance on the wall is desirable.
2.2	Small service shops with Island Displays	300-500-750	1	
2.3	Supper markets, Hyper Markets			
2.3.1	General	300-500-750	2	
2.3.2	Checkout	300-500-750	2	

Sl. No.	Type of interior or activity	Range of service Illuminance in Lux limitation	Quality class of direct glare	Remarks
2.3.3	Showroom for large objects, for example, cars, furnitures.	300-500-750	1	
2.3.4	Shopping precincts and arcades	100-150-200	2	
3	Places of Public Assembly			
3.1	Public rooms, village halls, worship halls	200-300-500	1	
3.2	Concert Halls, Cinemas and Theaters			
3.2.1	Foyer	150-200-300	-	
3.2.2	Booking Office	200-300-500	-	Local or localized lighting may be appropriate
3.2.3	Auditorium	50-100-150	-	Dimming facilities will be necessary. Special lighting of the aisles is desirable.
3.2.4	Dressing rooms	200-300-500	-	Special mirror lighting for make up may be required.
3.2.5	Projection room	100-150-200	-	
3.3	Churches			
3.3.1	Body of church	100-150-200	2	
3.3.2	Pulpit, lectern	200-300-500	2	Use local lighting
3.3.3	Choir stalls	200-300-500	2	Local lighting may be appropriate.
3.3.4	Alter, communion table, chancel	100-150-200	2	Additional lighting to provide emphasis is desirable
3.3.5	Vestries	100-150-200	2	
3.3.6	Organ	200-300-500	-	
3.4	Hospitals			
3.4.1	Anaesthatic rooms			
3.4.1.1	General	200-300-500	-	
3.4.1.2	Local	750-1000-1500	-	
3.4.2	Consulting area			
3.4.2.1	General	200-300-500	-	
3.4.2.2	Examination	750-1000-1500	-	
3.4.3	Corridors			

Sl. No.	Type of interior or activity	Range of service Illuminance in Lux limitation	Quality class of direct glare	Remarks
3.4.3.1	General	100-150-200	-	
3.4.4	Ward corridors			
3.4.4.1	Day, screened from bays	150-200-300	-	
3.4.4.2	Day, open to natural light	150-200-300 (Total)		
3.4.4.3	Morning/ Evening	100-150-200	-	
3.4.4.4	Night	5-10	-	
3.4.5	Cubicles			
3.4.5.1	General	200-300-500	-	
3.4.5.2	Treatment	750-1000-1500	-	
3.4.6	Examination			
3.4.6.1	General	200-300-500		
3.4.6.2	Local inspection	750-1000-1500		
3.4.7	Intensive therapy			
3.4.7.1	Bed head	30-50		
3.4.7.2	Circulation between bed ends	50-100-150		
3.4.7.3	Observation	200-300-500	-	
3.4.7.4	Local Observation	750-100-1500		
3.4.7.5	Staff base (day)	200-300-500		
3.4.7.6	Staff base (night)	30		
3.4.8	Laboratories			
3.4.8.1	General	200-300-500	-	
3.4.8.2	Examination	300-500-750	-	
3.4.9	Nurse's station			
3.4.9.1	Morning/day/evening	200-300-500	-	
3.4.9.2	Night desks	30	-	
3.4.9.3	Night, medical trolleys	50-100-150	-	
3.4.10	Operating Theatres			
3.4.10.1	General	300-500-750		
3.4.10.2	Local	10000 to 50000	-	Special operating lights are used
3.4.11	Pathology departments			
3.4.11.1	General	200-300-500		
3.4.11.2	Examination	300-500-750		

Sl. No.	Type of interior or activity	Range of service Illuminance in Lux limitation	Quality class of direct glare	Remarks
3.4.11.3	Pharmacies	200-300-500		
3.4.11.4	Reception/ enquiry	200-300-500		
3.4.11.5	Recovery rooms	200-300-500		
3.4.12	Ward-circulation			
3.4.12.1	Day	50-100-150		
3.4.12.2	Morning / Evening	50-100-150		
3.4.12.3	Night	3-5		
3.4.13	Ward-bed head			
3.4.13.1	Morning/ Evening	30-50		
3.4.13.2	Reading	100-150-200		
3.4.14	Night			
3.4.14.1	Adult	0.1-1		
3.4.14.2	Pediatric	1		
3.4.14.3	Psychiatric	1-5		
3.4.14.4	Watch	5		
3.4.15	X-Ray areas			
3.4.15.1	General	150-200-300		
3.4.15.2	Diagnostic	150-200-300		
3.4.15.3	Operative	200-300-500		
3.4.15.4	Process dark room	50		
3.4.16	Surgeries			
3.4.16.1	General	150-200-300		
3.4.16.2	Waiting rooms	100-150-200		
3.4.17	Dental Surgeries			
3.4.17.1	Chair	Special lighting		
3.4.17.2	Laboratories	300-500-750	-	
3.4.18	Consulting Rooms			
3.4.18.1	General	200-300-500		
3.4.18.2	Desk	300-500-750	-	
3.4.18.3	Examination Couch	300-500-750	-	
3.4.18.4	Ophthalmic Walls and near –vision charts	300-500-750	-	
3.5	Hotels			

Sl. No.	Type of interior or activity	Range of service Illuminance in Lux limitation	Quality class of direct glare	Remarks
3.5.1	Entrance Halls	50-100-150		
3.5.2	Reception, cashier's and	200-300-500 porter's desk	-	Localised lighting may be appropriate
3.5.3	Bars, Coffee base, dining rooms, grill rooms, restaurants, lounges	50-200		The lighting should be designed to create an appropriate atmosphere.
3.5.4	Cloak Rooms, baggage rooms	50-100-150	3	
3.5.5	Bed Rooms	30-50-100	-	Supplementary local lighting at the bed head, writing table should be provided.
3.5.6	Bathroom	50-100-150	-	Supplementary local lighting near the mirror is desirable
3.5.7	Food preparation and stores, cellars, lifts and corridors	-	-	See 'General Building Areas'
3.6	Libraries			
3.6.1	Lending Library			
3.6.1.1	General	200-300-500	1	
3.6.1.2	Counters	300-500-750	1	Localised lighting may be appropriate
3.6.1.3	Bookshelves	100-150-200	2	The service illuminance should be provided on the vertical face at the bottom of the bookstack.
3.6.1.4	Reading Rooms	200-300-500	1	
3.6.1.5	Reading Tables	200-300-500	1	Localised lighting may be appropriate
3.6.2	Catalogues			
3.6.2.1	Card	100-150-200	2	
3.6.2.2	Microfiche / Visual display units	100-150-200	2	
3.6.3	Reference Libraries			
3.6.3.1	General	200-300-500	1	
3.6.3.2	Counters	300-500-750	1	Localised lighting may be appropriate

Sl. No.	Type of interior or activity	Range of service Illuminance in Lux limitation	Quality class of direct glare	Remarks
3.6.3.3	Bookshelves	100-150-200	2	The service illuminance should be provided on a vertical surface at the foot of the bookshelves.
3.6.3.4	Study tables, carrels	300-500-750	1	
3.6.3.5	Map room	200-300-500	1	
3.6.4	Display and exhibition areas			
3.6.4.1	Exhibits insensitive to lights	200-300-500	-	
3.6.4.2	Exhibit sensitive to light, for example, pictures, prints, rare books in archives	50 to 150	-	
3.6.5	Library Workrooms			
3.6.5.1	Book repair and book binding	300-500-750	2	
3.6.5.2	Catalogue and sorting	300-500-750	2	
3.6.5.3	Remote book stores	100-150-200	3	
3.7	Museums and Art Galleries			
3.7.1	Exhibits insensitive to light	200-300-500	-	
3.7.2	Light sensitive exhibits for example, oil and temper paints, undyed leather, bone, ivory, wood etc.	150	-	This is the maximum illuminance to be provided on the principal plane of the exhibit.
3.7.3	Extremely light sensitive exhibits, for example, oil and temper paints, undyed leather, bone, ivory, wood, etc.	50	-	This is the maximum illuminance to be provided on the principal plane of the object.
3.8	Sports Facilities Multi purpose sports halls	300-750	-	The lighting system should be sufficiently flexible to provide lighting suitable for the variety of sports and activities that take place in sports halls. Higher illuminance of 1000-2000 lux would be required for television coverage.

Sl. No.	Type of interior or activity	Range of service Illuminance in Lux limitation	Quality class of direct glare	Remarks
4	Education			
4.1	Assembly Halls			
4.1.1.	General	200-300-500	3	
4.1.2.	Platform and stage	-	-	Special lighting to provide emphasise and to facilitate the use of the platform / stage is desirable.
4.2	Teaching spaces General	200-300-500	1	
4.3	Lecture Theatres			
4.3.1	General	200-300-500	1	
4.3.2	Demonstration benches	300-500-750	1	Localised lighting may be appropriate
4.4	Seminar rooms	300-500-750	1	Localized lighting may be appropriate
4.5	Art rooms	300-500-750	1	
4.6	Needlework Rooms	300-500-750	1	
4.7	Laboratories	300-500-750	1	
4.8	Libraries	200-300-500	1	
4.9	Music Rooms	200-300-500	1	
4.10	Sports Halls	200-300-500	1	
4.11	Workshops	200-300-500	1	
5	General Building Areas			
5.1	Entrance			
5.1.1	Entrance halls, lobbies, waiting rooms	150-200-300	2	
5.1.2	Enquiry desks	300-500-750	2	Localised lighting may be appropriate.
5.1.3	Gatehouses	150-200-300	2	
5.2	Circulation areas			
5.2.1	Lifts	50-100-150	-	
5.2.2	Corridors, passageways, stairs	50-100-150	2	
5.2.3 5.3	Escalators, travelators Medical and First aid centers	100-150-200		

Sl. No.	Type of interior or activity	Range of service Illuminance in Lux limitation	Quality class of direct glare	Remarks
5.3.1	Consulting rooms, treatment rooms	300-500-750	2	
5.3.2	Rest rooms	100-150-200	1	
5.3.3	Medical stores	100-150-200	1	
5.4	Staff Rooms			
5.4.1	Changing, locker and cleaners rooms, cloakrooms, lavatories	50-100-150	-	
5.4.2	Rest rooms	100-150-200	1	
5.5	Staff Restaurants			
5.5.1	Canteens, cafeterias, dining rooms, mess rooms	150-200-300	2	
5.5.2	Servery, vegetable preparation, washing-up area	200-300-500	2	
5.5.3	Food Preparation and cooking	300-500-750	2	
5.5.4	Food stores, cellars	100-150-200	2	
5.6	Communications			
5.6.1.	Switchboard rooms	200-300-500	2	
5.6.2	Telephone apparatus rooms	100-150-200	2	
5.6.3	Telex room, post room	300-500-750	2	
5.6.4	Reprographic room	200-300-500	2	
5.7	Building Services			
5.7.1	Boiler houses			
5.7.1.1	General	50-100-150	3	
5.7.1.2	Boiler Front	100-150-200	3	
5.7.1.3	Boiler Control Room	200-300-500	2	Localized lighting of the control display and the control desk may be appropriate
5.7.1.4.	Control rooms	200-300-500	2	Localized lighting of the control display and the control desk may be appropriate

Sl. No.	Type of interior or activity	Range of service Illuminance in Lux limitation	Quality class of direct glare	Remarks
5.7.1.5	Mechanical Plant room	100-150-200	2	
5.7.1.6	Electrical power supply and distribution rooms	100-150-200	2	
5.7.1.7	Store rooms	50-100-150	3	
5.8	Car Parks			
5.8.1	Covered Car Parks			
5.8.1.1	Floors	5-20	-	
5.8.1.2	Ramps and Corners	30	-	
5.8.1.3	Entrances and exits	50-100-150	-	
5.8.1.4	Control booths	150-200-300	-	
5.8.1.5	Outdoor Car Parks	5-20	-	

Source: Manual on norms and standards for EC of large construction projects-MoEF

Annexure 15

Air Conditioning, Heating and Mechanical Ventilation in Various Places

Sl. No (1)	Category (2)	Inside design conditions		
		Summer (3)		Winter(4)
1	Restaurants	DB 23 TO 26ºC RH 55 TO 60%		DB 21 TO 23ºC RH not less than 40 %
2	Office buildings	DB 23 TO 26ºC RH 50 TO 60%		DB 21 TO 23ºC RH not less than 40 %
3	Radio & Television Studio	DB 23 TO 26ºC RH 45 TO 55%		DB 21 TO 23ºC RH 40 to 50 %
4	Departmental stores	DB 23 TO 26ºC RH 50 TO 60%		DB 21 TO 23ºC RH not less than 40 %
5	Hotel guest rooms	DB 23 TO 26ºC RH 50 TO 60%		DB 23 TO 24ºC RH not less than 40 %
6	Class rooms	DB 23 TO 26ºC RH 50 TO 60%		DB 23 TO 24ºC RH not less than 40 %
7	Auditoriums	DB 23 TO 26ºC RH 50 TO 60%		DB 23 TO 24ºC RH not less than 40 %
8	Recovery rooms		DB 23 TO 26ºC RH 50 TO 60%	
9	Patient rooms		DB 23 TO 26ºC RH 50 TO 60%	
10	Operation theaters		DB 17 TO 27ºC RH 45 TO 55%	
11	Museums and libraries		DB 20 TO 22ºC RH 40 TO 55%	
12	Telephone terminal rooms		DB 22 TO 26ºC RH 40 TO 50%	

Source: Table-2 of Part 8 Building services – section 3 – Air conditioning, heating and mechanical ventilation of National Building Code – 2005

Annexure 16

Outdoor Conditions Source

Station	cooling DB/MCWB						cooling WB/MCDB						Heating DB/MCWB					
	0.4%		1.0%		2.0%		0.4%		1.0%		2.0%		99.6%		99.0%			
	DB	MCWB	DB	MCWB	DB	MCWB	WB	MCDB	WB	MCDB	WB	MCDB	DB	MCWB	DB			
MCWB																		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		
Ahmedabad	42.3	24.1	41.2	23.5	40.0	24.3	28.7	34.3	28.2	33.6	27.8	33.1	11.5	9.0	12.9	9.8		
Akola	43.4	24.0	42.2	23.3	41.0	23.6	27.6	37.8	26.7	34.4	26.1	33.5	12.7	10.3	13.9	10.6		
Allahabad	43.7	23.4	42.2	23.5	40.8	22.7	28.8	33.0	28.4	32.8	28.0	32.6	7.9	7.0	9.1	8.3		
Amritsar	41.6	23.2	40.3	24.6	38.9	24.4	29.3	34.8	28.8	34.8	28.4	33.4	2.7	2.3	4.0	3.5		
Aurangabad	40.3	22.1	39.3	22.9	38.3	21.3	26.3	36.2	25.3	33.1	24.7	31.4	10.6	8.2	12.0	9.1		
Banglore	34.7	19.6	34.0	19.6	33.1	19.2	23.5	28.9	22.9	28.2	22.5	27.7	14.9	13.0	15.7	13.8		
Barmer	43.1	24.2	42.0	23.6	41.0	23.3	28.5	37.9	27.8	35.3	27.2	33.3	9.5	5.1	10.7	5.5		
Belgaum	36.5	19.4	35.7	19.6	34.7	19.2	24.3	29.2	23.8	29.5	23.2	28.2	13.2	11.3	14.3	12.2		
Bhagalpur	42.4	26.8	40.7	27.4	38.9	25.6	30.0	37.1	29.6	36.4	29.2	35.2	11.4	10.3	12.6	12.4		
Bhopal	41.7	22.0	40.5	21.7	39.3	21.3	26.0	31.0	25.6	30.3	25.2	29.9	9.8	6.8	11.0	8.0		
Bhubaneshwar	38.9	25.5	37.6	26.6	36.3	26.3	29.4	35.2	28.9	33.3	28.5	32.7	14.4	13.1	15.4	14.0		
Bikaner	44.8	22.4	43.4	22.4	42.0	23.1	28.5	34.6	27.9	33.1	27.3	34.7	3.8	2.2	5.3	3.1		
Chennai	38.4	26.2	37.3	26.7	36.3	26.4	29.1	33.8	28.6	33.2	28.1	31.9	19.5	20.2	18.7	19.3		
Chitradurg	36.6	18.8	35.8	19.0	35.0	19.6	23.9	28.9	23.5	28.2	23.2	28.5	15.4	12.5	16.4	13.3		
Dehradun	37.8	23.5	36.3	23.9	34.8	22.8	27.0	31.3	26.5	30.1	26.0	29.8	5.9	5.0	6.8	5.8		
Dibrugarh	34.0	27.4	33.2	26.8	32.3	26.7	28.3	32.6	27.8	31.8	27.4	31.3	7.5	7.2	8.7	8.4		
Gorakpur	41.1	26.2	40.3	26.0	39.1	26.4	29.9	35.2	29.7	35.5	29.4	34.7	7.9	7.5	9.0	8.4		
Guwahati	34.4	26.9	33.4	27.3	32.7	26.8	28.8	32.4	28.3	31.8	27.9	31.5	10.2	9.8	11.3	10.8		
Gwalior	43.9	23.0	42.5	22.9	41.3	23.5	27.9	32.9	27.6	32.4	27.3	32.7	4.9	3.8	6.4	5.3		
Hissar	44.7	26.5	43.3	25.8	41.7	27.9	30.1	40.2	29.9	39.0	29.4	36.8	5.0	4.2	6.1	5.2		
Hyderabad	40.4	22.5	39.2	22.5	38.2	22.4	25.6	33.7	25.2	32.4	24.8	32.0	14.4	12.4	15.5	12.9		
Imphal	31.1	23.3	30.2	23.5	29.6	22.9	25.0	29.5	24.6	28.6	24.3	28.3	3.9	3.6	5.0	4.6		
Indore	41.1	20.7	40.4	20.6	38.9	21.0	25.7	31.0	25.2	30.0	24.8	29.8	8.2	5.0	9.7	6.5		
Jabalpur	42.6	22.7	41.2	23.2	39.8	22.5	26.8	31.8	26.4	32.0	26.0	31.2	7.8	6.7	9.3	7.6		
Jagdelpur	39.4	22.3	38.6	22.5	37.4	22.4	26.4	32.4	25.9	31.8	25.4	30.7	8.9	7.9	10.1	8.7		
Jaipur	42.8	22.5	41.4	22.6	39.4	22.6	27.4	33.1	27.0	32.1	26.6	31.7	6.4	4.5	8.0	5.8		
Jaisalmer	43.7	23.7	42.5	23.1	41.4	23.5	27.7	34.8	27.3	34.5	26.9	34.4	5.0	2.5	6.5	3.7		
Jamnagar	37.1	24.4	36.1	25.6	35.3	25.1	29.2	33.0	28.4	32.5	27.9	32.0	10.0	8.6	11.7	10.5		
Jodhpur	42.0	23.2	40.8	23.0	39.6	22.7	28.0	35.4	27.4	33.7	26.9	33.8	7.5	4.3	8.7	5.4		
Jorhat	34.4	28.2	33.6	27.7	32.9	27.3	28.7	32.7	28.3	32.1	28.0	31.8	9.6	9.0	10.6	10.1		
Kolkata	37.2	25.4	36.2	26.1	35.2	26.5	29.5	34.3	29.0	33.4	28.6	32.7	12.0	10.9	13.1	12.9		
Kota	43.5	23.0	42.4	22.6	41.2	22.6	27.3	35.2	26.8	33.0	26.5	31.8	9.9	6.7	10.8	7.6		
Kurnool	41.6	23.2	40.3	24.6	38.9	24.4	29.3	34.8	28.8	34.8	28.4	33.4	2.7	2.3	4.0	3.5		
Lucknow	42.0	24.2	40.8	24.8	39.3	24.5	28.8	33.3	28.4	32.4	28.0	32.2	7.5	6.8	8.4	7.7		
Manglore	33.9	24.4	33.9	24.0	33.4	24.2	27.1	31.0	26.7	31.0	26.4	30.7	19.7	17.0	20.5	18.1		
Mumbai	35.3	22.8	34.3	23.3	33.5	24.0	27.9	31.8	27.5	31.3	27.2	31.1	16.5	13.9	17.8	14.8		
Nagpur	43.8	23.6	42.6	23.9	41.4	23.6	27.3	31.2	26.6	33.2	26.2	31.9	11.5	9.4	12.8	10.2		
Nellore	40.4	27.8	39.0	28.1	37.8	27.2	30.0	37.1	29.4	35.4	28.8	34.0	19.4	18.3	20.2	19.3		
New Delhi	41.8	23.6	40.6	23.8	39.4	23.5	28.4	33.3	28.0	33.3	27.6	32.7	6.0	5.2	7.1	6.3		
Panjim	34.0	24.8	33.5	25.2	33.0	25.2	27.7	32.3	27.4	31.5	27.0	30.9	19.6	17.8	20.3	18.7		
Patna	40.7	23.4	39.5	23.7	38.0	24.7	29.0	33.9	28.6	33.1	28.3	32.6	8.0	7.6	9.2	8.6		
Pune	38.4	20.5	37.4	20.4	36.3	20.6	24.8	30.9	24.4	30.6	24.0	29.6	9.2	8.0	10.3	9.2		
Raipur	43.6	23.3	42.2	23.3	40.8	23.0	27.1	31.8	26.8	32.0	26.5	31.2	11.3	9.9	12.6	10.4		
Rajkot	40.8	23.1	39.9	23.8	38.9	23.4	28.1	33.9	27.6	33.3	27.1	32.3	10.9	6.5	12.2	7.7		
Ramgundam	43.4	25.6	42.2	25.1	40.7	25.8	28.3	37.3	27.9	35.6	27.4	34.4	12.5	11.2	13.7	12.5		
Ranchi	38.9	22.1	37.7	21.8	36.4	21.5	26.2	31.7	25.6	30.4	25.2	29.2	9.1	7.2	10.4	8.3		
Ratnagiri	34.1	22.4	33.4	23.2	32.8	23.6	27.6	31.1	27.3	30.8	27.0	30.2	18.3	14.9	19.2	16.5		

Annexure 16

Outdoor Conditions Source

Station	cooling DB/MCWB						cooling WB/MCDB						Heating DB/MCWB				
	0.4%		1.0%		2.0%		0.4%		1.0%		2.0%		99.6%		99.0%		
	DB	MCWB	DB	MCWB	DB	MCWB	WB	MCDB	WB	MCDB	WB	MCDB	DB	MCWB	DB		
MCWB																	
1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16	17
Ratnagiri	34.1	22.4	33.4	23.2	32.8	23.6	27.6	31.1	27.3	30.8	27.0		30.2	18.3	14.9	19.2	16.5
Raxaul	38.6	23.1	36.9	24.5	35.5	24.6	28.9	33.0	28.4	32.0	28.1		31.8	7.5	7.3	8.5	8.2
Saharanpur	41.3	23.8	39.6	24.6	38.1	24.0	28.5	33.6	28.1	32.9	27.8		32.5	1.7	1.5	3.0	2.7
Shilong	24.2	19.7	23.5	19.4	22.8	18.9	20.7	23.3	20.3	22.7	19.9		22.2	-1.0	-1.1	0.1	-0.5
Sholapur	41.1	21.6	40.1	21.6	39.1	21.2	26.6	32.6	25.8	32.1	25.1		31.5	16.3	12.4	17.2	12.5
Sundernagar	36.1	19.1	34.6	19.9	33.1	19.4	25.2	30.1	24.8	29.2	24.4		28	1.8	1.3	2.8	2.2
Surat	38.4	22.7	36.9	23.9	35.7	23.4	28.3	32.4	27.9	31.7	27.6		31.4	14.8	12.6	16.2	12.5
Tezpur	34.2	27.4	33.3	26.5	32.5	27.1	28.9	32.8	28.4	31.8	28.0		31.4	10.5	10.0	12.4	10.9
Trichirapalli	39.6	24.6	38.7	25.1	37.8	24.9	27.7	34.5	27.2	33.7	26.9		33.3	19.3	18.2	20.1	18.7
Thiruvanatha-puram	33.9	26.0	33.4	26.1	32.9	25.9	27.7	32.4	27.4	31.9	27.0		31.0	21.6	20.1	22.2	20.8
Veraval	35.2	23.9	33.8	23.5	32.8	26.6	29.1	32.3	28.7	31.6	28.4		31.1	14.3	10.1	15.6	12.3
Visakhapatanam	36.4	26.5	35.6	27.3	35.0	27.1	29.2	33.8	28.8	33.0	28.4		32.5	15.4	14.9	16.8	16.2

NOTE: Abbreviations used:
DBT – Dry-bulb temperature
WBT - Wet-bulb temperature
MCDB – Mean coincidental dry-bulb temperature
MCWB – Mean coincidental wet -bulb temperature

Source: Table-3 of Part 8 Building services – section 3 – Air conditioning, heating and mechanical ventilation of National Building Code – 2005

Annexure 17

Minimum Air Requirements for Ventilation of all Common Areas and Commercial Facilities

Sl. No	Application	Estimated Maximum occupancy	Outdoor air requirement		Remarks
		Persons / m2	I / s / person	(I / s) / m^2	
1	2	3	4	5	6
1	**Commercial dry cleaner**	30	15		
2		***Food and Beverage Service***			
	Dinning rooms	70	10		
	Cafeteria, fast food	100	10		
	Bars. Cocktail lounges	100	15		Supplementary smoke equipment may be required.
	Kitchen (cooking)	20	8		Make up air for food exhaust may require more ventilating air. The sum of the outdoor air and transfer air of acceptable quality from adjacent spaces shall be sufficient to provide an exhaust rate of not less than 27.5 m2 / h / m2 (7.51 / sm2)
3	**Hotels, Motels, Resorts, Dormitories**				Independent of room size
	Bed rooms	15			
	Living rooms			15	
	Baths			18	Installed capacity for intermittent use.
	Lobbies	30	8		
	Conference rooms	50	10		
	Assemble rooms	120	8		
	Dormitory sleeping areas	20	8		See also food and beverage services, merchandising, barber and beauty shops, garages, offices.
	Office space	7	10		Some office equipment may require local exhaust

Sl. No	Application	Estimated Maximum occupancy	Outdoor air requirement		Remarks
		Persons / m2	I / s / person	(I / s) / m^2	
1	2	3	4	5	6
	Reception areas Telecommunication centers and data entry areas	60 60	8 10		
	Conference rooms	50	10		
4	**Public Space** Corridors and utilities			0.25	
	Public restrooms / s / we or urinal		25		Normally supplied transfer air
	Lockers and dressing rooms			2.5 recommended	Local mechanical exhaust with no re-circulations
	Elevators			5.0 transfer air	Normally supplied by
	Retail stores, sales				
	floor and show				
	rooms floors				
	Basement and street	30		1.50	
	Upper floors	20		1.00	
	Storage rooms	15		0.75	
	Dressing rooms	1.00			
	Malls and arcades	20		1.00	
	Shipping and				
	receiving	10		0.75	
	Warehouse	5		0.25	
	Smoking lounge	70	30		Normally supplied by transfer air, local mechanical exhaust, exhaust with no recirculation recommended
5	**Specialty shops**				
	Barber shop	25	8		
	Beauty parlour	25	13		
	Florists	8	8		Ventilation to optimize growth may dictate requirements

Sl. No	Application	Estimated Maximum occupancy	Outdoor air requirement		Remarks
		Persons / m2	I / s / person	(I / s) / m^2	
1	2	3	4	5	6
	Clothiers, furniture			1.50	
	Hardware, drugs, fabric	8	8		
	Supermarkets	8	8		
	Pet shops				
6	**Sports & amusement** Spectator areas	150	8		When internal combustion engines are operated for maintance of playing surface, increased ventilation rates may be required
	Game rooms	70	13		
	Ice arenas (playing areas)				
	Swimming pools (pool and deck area)			2.50	Higher values may be required for humidity control
	Playing floors (gymnasium)	30	10		
	Ballrooms & discos	100	13		
	Bowling alleys (seating area)	70	13		
7	**Theatre** Ticket booths	60	10		
	Lobbies	150	10		Special ventilation will be needed to eliminate special stage effects (for example. Dry ice vapors mists.etc)
	Auditorium	10	8		
	Stages, studies	70	8		
8	**Transportation** Waiting rooms	100	8		
	Platforms	100	8		Ventilation within vehicles may require special consideration
	Vehicles	150	8		

Sl.No	Application	Estimated Maximum occupancy	Outdoor air requirement		Remarks
		Persons / m2	I / s / person	(I / s) / m^2	
1	2	3	4	5	6
9	**Workrooms** Meat processing	10	8		Spaces maintained at low temperature at (-10o f to +50o F or –23 to +10 C) are not covered by these requirements unless the occupancy is continuous; ventilation from adjoining space is permissible. When the occupancy is intermittent. Infiltrations will normally exceed the ventilation requirements
	Photo studio	10	8		
	Darkrooms	10	2.50		
	Pharmacy	20	8		
	Bank vaults	5	8		
	Duplicating,				
	Printing	2.50			Installed equipment shall incorporate positive exhaust and control (as required) of undesirable contaminates (toxic and otherwise)
	Education Classrooms	50	8		
	Laboratories	30	10		Special contaminant control systems may be required for process or functions including laboratory animal occupancy.
	Training shop	30	10		
	Music rooms	50	8		
	Libraries	20	8		
	Lock rooms	2.50			
	Corridors	2.50			
	Auditoriums	150	8		

Sl.No	Application	Estimated Maximum occupancy	Outdoor air requirement		Remarks
		Persons / m2	I / s / person	(I / s) / m^2	
1	2	3	4	5	6
11	**Hospital, Nurses and convalescent homes** Patient rooms	10	13		Special requirements or codes provisions and pressure relationships may determine minimum ventilation rates and filter efficiency.
	Medical procedure	20	8		
	Operating rooms	20	15		
	Procedure recovery and ICU	20	8		Greening contaminants may require higher rates.
	Autopsy			2.50	Air shall not be re-circulated into other spaces.
	Physical therapy	20	8		
	Correctional cells	10	10		
	Dinning halls	100	8		
	Guard stations	40	8		

- This table prescribes supply rates of acceptable outdoor air required for acceptable indoor air quality. These values have been chosen to dilute human bioeffluents and other contaminants with an adequate margin of safety and to account for health variations among people and varied activity levels.
- Net occupiable space

Source: Table-4 Part 8 Building Services – Section 3 – Air conditioning, heating and mechanical ventilation of National Building Code – 2005.

Annexure 18
Space Standards for Footpath

Capacity (Persons)		Required width of footpath (m)
All in one direction	In both directions	
1220	800	1.5
2400	1600	2.0
3600	2400	2.5
4800	3200	3.0
6000	4000	4.0

Source: UDPFI Guidelines volume 1 August 1996

Annexure 19.1

Space standards for Car Parking

S.No	Use / Use Premises	Equivalent car spaces (ECS) per 100 sq mt of floor area 0.50 – 1.50
1	Residential Group housing, plotted housing (plots above 250 sq.mt) and mixed use	
2.	Commercial	
	i. Wholescale trade and freight complex (including parking for loading and unloading	1.50 – 2.50
	ii. City centre, district centre, hotel, cinema and others	1.00 – 2.00
	iii. Community centre, local shopping centre, convenience shopping centre	0.50 – 1.50
3	Public and semi-public facilities	
	i. Nursing home, hospitals, (other than government), social cultural and other institutions, government and semi-government offices	0.50 – 1.50
	ii. Schools, college and university, government hospitals	0.25 – 0.75
4	Industrial Light and service industry, flatted group industry, extensive industry	0.50 – 1.00

Note:

1. For the provision of car parking spaces, the space standards shall be as under:

i) For open parking 18.0 sq.mt. per equivalent car space.

ii) For ground floor covered parking 23.0 sq.mt. per equivalent car space.

iii) For basement 28.0 sq.mt. per equivalent car space.

2. In the use premises, parking on the above standards may be provided on the ground floor, or in the basement (where the provision exists).

3. In case of organized centers like strict centre and community centre to meet with the above demand of parking, additional underground space (besides the basement) may be provided below the piazzas or pedestrian or open spaces but within the setback lines.

4. Plots forming part of any commercial development, basement(s) maximum equivalent to the plot area within the building envelope line, may be permitted for parking and services such as electric substation with specifications and approval, installation of electrification for fire fighting equipment with the approval and any other services with appropriate approval.

Annexure 19.2
Area requirements for parking

Sl No.	Occupancy	One Car parking Space for Every				
		Populaton less than 50 000	Population between 50 000 to 200 000	Population between 200 000 to 1 000 000	Population between 1 000 000 to 5 000 000	Population above 5 000 000
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)a)	Residential			a) 2 tenements having built-up area 101 to 200 m^2	I tenement of 100 m^2 built up area	1 tenement of 75 m^2 built up area
b)	Lodging establishments, tourist homes and hotels, with lodging accommodation	12 guest rooms	8 guest rooms	4 guest rooms	3 guest rooms	2 guest rooms
ii)	Educational			70 m^2 area or fraction thereof of the administrative office area and public service areas	50 m^2area or fraction there of of the administrative office area and public service areas	35 m^2 area or fraction thereof of the administrative office area and public service reas
(iii)	Institutional (Medical)	20 beds (Private)	15 beds (Private)	10 beds (Private)	5 beds (Private)	2 beds (Private)
		30 beds	25 beds (Public)	15 beds (Public) (Public)	10 (Public)	5 beds
(iv)	a) Assembly halls, cinema theatres	20 seats	80 seats	25 seats	15 seats	10 seats
	b) Restaurants	60 seats	40 seats	20 seats	10 seats	5 seats
	c) Marriage Halls, community halls	600 m^2 plot area	400 m^2 plot area	200 m^2 plot area	50 m^2 plot area	25 m^2 plot area
	d) Stadia and exhibition center	240 seats	160 seats	50 seats	30 seats	20 seats
a)v)	Business Offices and firms for private business	300 m^2 area or fraction thereof	200 m^2 area or fraction thereof	100 m^2 or fraction thereof	50 m^2 area or fraction thereof	25 m^2 area or fraction thereof
b)	Public or semi-public offices thereof	500 m^2 area or thereof	300 m^2 area or fraction thereof	200 m^2 area or fraction thereof	100 m^2 area or fraction thereof	50 m^2 area or fraction

Sl No.	Occupancy	One Car parking Space for Every				
vi)	Mercantile (See Note 2)	300 m^2 area or fraction thereof	200 m^2 area or fraction thereof	100 m^2 area or fraction thereof	50 m^2 area or fraction there of	25 m^2 area or fraction thereof
vii)	Industrial	400 m^2 area or fraction thereof	300 m^2 area or fraction thereof	200 m^2 area or fraction thereof	100 m^2 area or fraction thereof	50 m^2 area or fraction thereof
viii)	Storage			500 m^2 area or fraction thereof	250 m^2 area or fraction thereof	125 m^2 area or fraction thereof

Source: National Building Code of India, 2005

Annexure 20

Step-By-Step Guide To Greening An Existing Roof

1. Designing

Planning and Design

- contact local planning authority if necessary
- contact experts as needed
- calculate
- loadbearing capacity
- angle and aspect of roof
- area of roof
- strength and durability of existing waterproofing
- draw roof to scale, including various extensions, ducts, chimneys etc.
- make planting plan, including consideration of sunlight, sheltered areas, areas visible from ground level
- select roof seals, drainage method, and possible subsidence preventions for roofs > 20º
- calculate soil and plant needs

Preparation

- identify possible sites for obtaining 'threatened' turf
- obtain quotes for materials, and professional and contractors fees where necessary
- order materials

2. Installing

Setting up the framework

- position clamps and connectors
- install timbers at eaves and batons to prevent soil slippage
- construct border drainage

Sealing the roof

- clean the roof
- prepare all technical fittings
- lay first layer of protection foil and seal all edges
- lay second layer of protective fleece
- weigh down with stones

Putting in a Drainage Layer

(for flat roofs 0º-5º)

- install drain plates
- cover with fleece layer
- install clay layer for 0º roof
- cover with filter layer
- check border drainage

3. Greening

Laying the soil

- mix materials (topsoil, sand, clay aggregate etc.)
- lift soil to roof (using soil bags, hoists, cranes as necessary)
- lay even depth of soil and rake to smooth out surface

Planting

- collect turves and purchase plants
- roll out turf perpendicular to ridge
- bed in additional plants
- sow with wildflower seed mix for dry conditions, rake in
- water well
- plant self-clinging climbers at base of chimneys, ducts etc. to cover vertical surfaces

Maintenance

- water well for initial few weeks, then water only during periods of severe drought
- remove tree seedlings occasionally

Annexure 21

Rain water run-off for different roof top areas

Rain Fall in mm	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
Roof Top Area m^2																				
20	2	3	5	6	8	10	11	13	14	16	18	19	21	22	24	26	27	29	30	32
30	2	5	7	10	12	14	17	19	22	24	26	29	31	34	36	38	41	43	46	48
40	3	6	10	13	16	19	22	26	29	32	35	38	42	45	48	51	54	58	61	64
50	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80
60	5	10	14	19	24	29	34	38	43	48	53	58	62	67	72	77	82	86	91	96
70	6	11	17	22	28	34	39	45	50	56	62	67	73	78	84	90	95	101	106	112
80	6	13	19	26	32	38	45	51	58	64	70	77	83	90	96	102	109	115	122	128
90	7	14	22	29	36	43	50	58	65	72	79	86	94	101	108	115	125	134	144	154
100	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144	152	160
110	9	18	26	35	44	53	62	70	79	88	97	106	114	123	132	141	150	158	167	176
120	10	19	29	38	48	58	67	77	86	96	106	115	125	134	144	154	163	173	182	192
130	10	21	31	42	52	62	73	83	94	104	114	125	135	146	156	166	177	187	198	208
140	11	22	34	45	56	67	78	90	101	112	123	134	146	157	168	179	190	202	213	224
150	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240
200	16	32	48	64	80	96	112	128	144	160	176	192	208	224	240	256	272	288	304	320
250	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400
300	24	48	72	96	120	144	168	192	216	240	264	288	312	336	360	384	408	432	456	480
400	32	64	96	128	160	192	224	256	288	320	352	384	416	448	480	512	544	576	608	640
500	40	80	120	160	200	240	280	320	360	400	440	480	520	560	600	640	680	720	760	800
1000	80	160	240	320	400	480	560	640	720	800	880	960	1040	1120	1200	1280	1360	1440	1520	1600
2000	160	320	480	640	800	960	1120	1280	1440	1600	1760	1920	2080	2240	2400	2560	2720	2880	3040	3200
3000	240	480	720	960	1200	1440	1680	1920	2160	2400	2640	2880	3120	3360	3600	3840	4080	4320	4560	4800

Source: Manual on norms and standards for EC of large construction projects-MoEF

Questionnaire
for
Environmental Impact Assessment of

BUILDING CONSTRUCTION

Questionnaire for Environmental Impact Assessment of Building and Construction Projects

Note 1: All information to be given in the form of Annexures should be properly numbered and form part o this proforma
Note 2: No abbreviations to be used – Not available or not applicable should be clearly mentioned

I. General Information

1.1 Name of the project :

(a) Name of the authorized signatory :

(b) Mailing Address :

E-mail :

Telephone :

Fax No. :

(c) Does the proposal relate to new project / expansion / modernization :

1.2 Site Information

(a) Project Site :

Village(s)	Tehsil	District	State

(b) Geographical information

- Latitude :
- Longitude :
- Total area envisaged for setting up of project (in ha) :
- Nature of terrain (hilly, valley, plains, coastal plains etc) :
- Nature of soil (sandy, clayey, sandy loam etc) :
- Seismic zone classification :
- Does the site falls under CRZ classification? :
- Land usage of the proposed project site :

1.3 Environmental sensitivity details within 10 km from the boundary of the project for applicability of "General Condition (GC)" as per EIA notification dated 14.9.2006 and amendments as on date

S.No	Item	Name	Aerial Disance (in Km)
1	Protected areas notified under the wild life (Protection) Act, 1972		
2	Critically polluted areas as identified by the CPCB		
3	Eco-sensitive areas as notified unedr section 3 of the E (P) Act 1986		
4	Inter-state boundaries and international boundaries		

1.4 Environmental sensitivity areas as mentioned at column 9(III) of EIA Notification 2006

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, resting, migration etc		
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	Defense installations		
8	Densely populated for 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, land slides, erosion, flooding or extreme or adverse climatic conditions)*		

*** 0.5 km from Railway lines/National / State Highway should be maintained**

Description of the flora / vegetation in the project area

Description of fauna (non-domesticated) in the project area

1.5 Baseline data

Meteorological Data

Ambient Air Quality Data

Water Quality Data

Human Settlement

	With in the project site	With in 1 km from the project boundary
Population*		
No. of villages		
Number of households		
village-wise		

1.6 Current Land Use of the Proposed Project Site Area(in ha) :

Level –I
1. Built – up land
2. Agricultural land
3. Forest
4. Wastelands
5. Water bodies
6. Others
Total

2. Land Use Plan:

2.1 Does the proposed project conform to the approved land use all over the site? (To be certified by the concerned Department of State Government).

Yes ☐ No ☐

If not, clearly indicate which of the stretches are not as per approved land use.

2.2 Project Site Preparation:

Is the proposed project located in low- lying area?

Yes ☐ No ☐

Level before filling (above MSL in m) ☐

Level after filling (above MSL in m)

Details of fill material required: ☐

Quantity of Fill material required (in cu.m) / / / ☐

Source ☐

Gradient Details: ☐

2.3 Would the above filling result in complete / partial filling of water bodies

2.4 Does the site involve stripping? ☐

Yes ☐ No ☐

If yes, provide the following details:

1. Size of the area to be stripped ☐
2. Location, ☐

3. Soil Type,
4. Volume and quantity of earth to be removed,
5. Location of dump site,
6. Proposal for utilisation of removed topsoil.

2.5 Does it involve cutting?

Yes ☐ No ☐

If yes , please furnish the following details:

1. Size of the area to be cut,
2. Depth of cut,
3. Location,
4. Soil Type,
5. Volume and quantity of earth and other material to be removed
6. Location of dump site.

2.6 Does the site preparation require cutting of trees?

Yes ☐ No ☐

If yes, please furnish the following details:

1. How many trees are proposed to be cut?
2. Species of the above trees
3. Are there any protected / endangered species?

Yes ☐ No ☐

If yes, please provide details.

2.7 In case the site covers a flood plain of a river , please furnish:

1. detailed micro- drainage,
2. Flood passages,
3. Flood periodicity in the area.

2.8 Does the proposed project involve construction on any sandy stretch?

Yes ☐ No ☐

If yes, please furnish details ☐

Height (above MSL in metres) ☐

2.9 Does the project involve extraction of sand, levelling or digging of sandy stretches within 500 metres of high tide line?

Yes ☐ No ☐

If yes, mention the activity involved and area.

1. Stretch ☐
2. Area (sq. metre) ☐

2.10 Does the project involve any dredging?

Yes ☐ No ☐

2.11 Whether there will be any change in the drainage pattern after the proposed activity?

Yes ☐ No ☐

If yes, what are the changes?

A. What is the maximum extent? ☐

B. Is any additional area to be flooded? ☐

3. Raw Material Required During Construction :

S. No.	Item	Quantity (Tonnes)	Mode of transport	Source
1)	Bricks			
2)	Sand			
3)	Cement			
4)	Metal			
5)	Diesel			
6)	Others			

4. Water Required for Construction and Operational Phases:

4.1 Water Requirement

Water Requirement (cu.m / day)					
S. No.	Purpose	Average demand	Peak demand	Source	Type - Treated / untreated / Recycled
1.	Construction				

2.	Air Pollution reduction (dust suppression etc,)				
3.	Domestic purposes				
4.	Others				
	Total				

4.2 Source of Raw Water Supply During Construction Phase

	Source of Raw Water Supply during construction phase	
S.No	Source	Cu.m / day
1	Sea	
2	River	
3	Water body	
4	Ground water	
5	Municipal water supply	
6	Others	

4.3 Water Supply During Operational Phase

Water Supply during operational phase		
S.No	Source	Cu.m / day
1	Sea	
2	River	
3 4	Water body Ground water	
5	Municipal water supply	
6	Others	

4.4 Sewage, Collection, Treatment and Disposal

Sewage, Collection Treatment and Disposal		
S.No	Item	Quantity / day
1	Mode of collection of domestic effluent	
a.	Surface drains	
b.	Underground	
C	System and capacity	
2.	Mode of treatment	
a.	Septic tank and filters (capacity)	
b.	Biological treatment capacity	
c.	Others	
3.	Mode of disposal	

a.	Soakpits	
b.	Disposal to local sewer	
C.	water bodies	
d.	Others	

5. Energy Consumption:

- Hydrocarbons, Yes _____ No _____
- gas, Yes _____ No _____
- electricity and Yes _____ No _____
- any other non-conventional energy source Yes _____ No _____

6. Power Distribution in the Region

Power system		
S.No	Item	Remarks
	Source and power supply capacity	
	Distribution system at present	
	Alternate supply if any	
	In case of DG set (Fuel type)	

7. State the impacts predicted on the quality and quantity of Transport linkages:

a. Road _____

b. Rail _____

c. Water _____

d. Air _____

e. Others _____

8. Impact of the Developmental activity on surroundings

Impact of the new development on the surrounding areas		
S.no	Item	Impact
1	Traffic management at peak hours	
2	Buffer zone planned, if so, details	
3	Provision of service roads	
4	Measures proposed to regulate unplanned slums, shops, etc.	
5	Others	

9. Landscaping / Tree Plantation

S.No	Phase	Areas / no. with reference to total project area
1	Total area of project	
2	Area planted during construction phase	
3	Area to be planted during operational phase	
4	No. of trees already planted	
5	No. of trees proposed to be planted	
6	Parks and gardens to be developed	
7	impacts from proposed landscaping	
8	special features of proposed landscape design	

10. Special features in development / construction

S.No	Phase	Areas / no. with reference to total project area
1	Greening of supply chain	
2	Flyash utilization	
3	Green rating	
4	Intelligent building	
5	Timber-free construction	
6	energy efficiency for lighting & ventilation	
7	measurable impacts on human health	
8	Impact on heat islands and inversions	

11 Environmental Management Plan

11.1. Details of Pollution Control Systems :

	Existing	Proposed
Air		
Water		
Noise		
Solid Waste		

11.2. Expenditure on Environmental Measures :

S. No		Capital cost		Annual recurring cost	
		Existing	Proposed	Existing	Proposed
1	Pollution control (provide break-up separately)				
2	Pollution monitoring				

	(provide break-up separately)		
3	Fire fighting & emergency handling		
4	Green Belt		
5	Training in the area of environment & occupational health		
6	Others (specify)		

11.3. Details of organizational set up/cell for environmental management and monitoring:

11.4. Details of community welfare/peripheral development programmes envisaged/being undertaken by the project proponent:

12. Compliance with environmental safeguards (for existing units)

a. Status of the compliance of conditions of Environmental Clearance issued by MoEF, if any enclosed — Yes ☐ No ☐

b. Status of compliance of 'Consent to Operate' issued by SPCB, if any, enclosed — Yes ☐ No ☐

Date : .....

Name and Signature of the Competent Officer / authority

E-mail:

Phone and Fax nos:

Given under the seal of organization on behalf of whom the applicant is signing

Note:

The project authorities are earnestly advised in their own interest to provide complete information

on points, which they think are relevant to their proposal. Non-supply of required information may result in considerable delay in according environmental clearance.

All correspondence with MoEF shall be made by the authorized signatory only. The authorized signatory should also submit a document in support of his claim of being an authorized signatory for the specific project (refer notification No. SO. 3067 (E) dated 1st December 2009)

Questionnaire
for
Environmental Impact Assessment of

TOWNSHIPS
AND
AREA DEVELOPMENT PROJECTS

Questionnaire for Environmental Impact Assessment of Townships and Area Development Projects

Note 1: All information to be given in the form of Annexures should be properly numbered and form part o this proforma

Note 2: No abbreviations to be used – Not available or not applicable should be clearly mentioned

I. General Information

1.1 Name of the project :

(a) Name of the authorized signatory :

(b) Mailing Address :

E-mail :

Telephone :

Fax No. :

(c) Does the proposal relate to new project / expansion / modernization :

1.2 Site Information

(a) Project Site :

Village(s)	Tehsil	District	State

(b) Geographical information

- Latitude :
- Longitude :
- Total area envisaged for setting up of project (in ha) :
- Nature of terrain (hilly, valley, plains, coastal plains etc) :
- Nature of soil (sandy, clayey, sandy loam etc) :
- Seismic zone classification :
- Does the site falls under CRZ classification? :
- Land usage of the proposed project site :

1.3 Environmental sensitivity details within 10 km from the boundary of the project for applicability of "General Condition (GC)" as per EIA notification dated 14.9.2006 and amendments as on date

S.No	Item	Name	Aerial Disance (in Km)
1	Protected areas notified under the wild life (Protection) Act, 1972		
2	Critically polluted areas as identified by the CPCB		
3	Eco-sensitive areas as notified unedr section 3 of the E (P) Act 1986		
4	Inter-state boundaries and international boundaries		

1.4 Environmental sensitivity areas as mentioned at column 9(III) of EIA Notification 2006

Sl. 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, resting, migration etc		
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	Defense installations		
8	Densely populated for 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, land slides, erosion, flooding or extreme or adverse climatic conditions)		

*** 0.5 km from Railway lines/National / State Highway should be maintained**

Description of the flora / vegetation in the project area

Description of fauna (non-domesticated) in the project area

1.5 Baseline data

Meteorological data

Ambient air quality data

Water quality data

Human Settlement

	With in the project site	With in 1 km from the project boundary
Population*		
No. of villages		
Number of households village-wise		

1.6 Current land use of the proposed project site Area(in ha) :

Level –I
1. Built – up land
2. Agricultural land
3. Forest
4. Wastelands
5. Water bodies
6. Others
Total

2. Land use plan :

2.1 Does the proposed project conform to the approved land use all over the site? (To be certified by the concerned Department of State Government).

Yes ☐ No ☐

If not, clearly indicate which of the stretches are not as per approved land use.

2.2 Project Site Preparation:

Is the proposed project located in low- lying area?

Yes ☐ No ☐

Level before filling (above MSL in m) ☐

Level after filling (above MSL in m)

Details of fill material required: ☐

Quantity of Fill material required (in cu.m) / / /

Source

Gradient Details:

2.3 Would the above filling result in complete / partial filling of water bodies

2.4 Does the site involve stripping?

Yes ☐ No ☐

If yes, provide the following details:

1. Size of the area to be stripped
2. Location,
3. Soil Type,
4. Volume and quantity of earth to be removed,
5. Location of dump site,
6. Proposal for utilisation of removed topsoil.

2.5 Does it involve cutting?

Yes ☐ No ☐

If yes , please furnish the following details:

1. Size of the area to be cut,
2. Depth of cut,
3. Location,
4. Soil Type,
5. Volume and quantity of earth and other material to be removed
6. Location of dump site.

2.6 Does the site preparation require cutting of trees?

Yes ☐ No ☐

If yes, please furnish the following details:

1. How many trees are proposed to be cut?
2. Species of the above trees

3. Are there any protected / endangered species?

Yes ☐ No ☐

If yes, please provide details. ☐

2.7 In case the site covers a flood plain of a river , please furnish:

1. detailed micro- drainage,
2. Flood passages,
3. Flood periodicity in the area.

2.8 Does the proposed project involve construction on any sandy stretch?

Yes ☐ No ☐

If yes, please furnish details
Height (above MSL in metres)

2.9 Does the project involve extraction of sand, levelling or digging of sandy stretches within 500 metres of high tide line?

Yes ☐ No ☐

If yes, mention the activity involved and area.

1. Stretch
2. Area (sq. metre)

2.10 Does the project involve any dredging?

Yes ☐ No ☐

2.11 Whether there will be any change in the drainage pattern after the proposed activity?

Yes ☐ No ☐

If yes, what are the changes?

A. What is the maximum extent?

B. Is any additional area to be flooded?

3. Details of New Town

- Provide a Key map showing the location of the New Town
- Area of the New Town.
- Population (Dwelling units).
- Township density:
  - gross density
  - net density

- Provide a land use map of the proposed town giving the break up of area and percentages under different land use types
- Total number of houses to be constructed and percentage of the demand which these will satisfy.
- House types-Areas / Income levels.
- Attach master plan for the New Town, indicating sectors / neighborhoods with densities / population and amenities provided.

4. Details of facilities provided in the New Town

4.1 Residential

i. Type of development
   - low rise / high rise / medium rise / mixed.
   Specify the number of storeys in each case.

ii. Population in each of the neighborhood sectors.

iii. Density, plot size, floor area ration, site coverage

iv. Development controls , if any

4.2 Commercial

i. Hierarchy of commercial activities and approximate population served by each.

ii. Types and numbers of commercial establishments

iii. Extent of commercial activities in the formal sector / informal sector

4.3. Educational: No. Areas

a. Nursery school

b. Primary school

c. Higher secondary school

d. College

e. Technical / Vocational Training Institutes

4.4. Health No. Areas

a. Dispensaries

b. Health Clinics

c. Nursing Homes (No. of beds)

d. Bio-medical waste management

4.5. Parks, Playgrounds: No. Areas

a. Totlots

b. Cluster Open spaces

a. Neighborhood open spaces.

b. Sector open spaces

c. Open spaces at town level

4.6. Recreational:

a. Area and percentage of open spaces under recreation

b. Cinema Hall

c. Swimming pools

d. Water-based recreation

e. Others

4.7. Other facilities No

a. Post Office

b. Bank

c. Telephone Booth

d. Milk Booth

e. Police Station

f. Any other, specify

4.8. Infrastructural Facilities :

Transport

a. Mode of travel from residence to work place

b. Mode of travel to surrounding areas

c. Mode of travel within the town.

5. Phase wise development of the New Town

1. Provide a phase wise breakup of area, population and facilities planned.
2. Indicate the time lag between the phases
3. Densities at different phases of town development
4. Future development envisaged

6. Impact of the new Town on Surrounding Areas

1. Proposed land use plan for peripheral area, if any
2. Is there a buffer zone planned around the new town? Details thereof.
3. What are the activities that are likely to come up in the surrounding areas relating to the demand of the proposed new town during the construction phase (stone quarrying, manufacturing of lime, bricks, extraction of timber, etc)
4. Agencies and the measures proposed to regulate development in the periphery.

Proposed institutional set up

a. Management of the town –

Name of the authority and functions.

b. Association of residents, if any

7. Raw material required during construction:

S. No.	Item	Quantity (Tonnes)	Mode of transport	Source
1)	Bricks			
2)	Sand			
3)	Cement			
4)	Metal			
5)	Diesel			
6)	Others			
7)				

8. Water required for construction and operational phases:

8.1 Water requirements

Water Requirement (cu.m / day)					
S. No.	Purpose	Average demand	Peak demand	Source	Type - Treated / untreated / Recycled
1.	Construction				
2.	Air Pollution reduction (dust suppression etc,)				
3.	Domestic purposes				
4.	Others				
	Total				

8.2 Sources of raw water supply during construction phase

Source of Raw Water Supply during construction phase		
S.No	Source	Cu.m / day
1	Sea	
2	River	
3	Water body	
4	Ground water	
5	Municipal water supply	
6	Others	

8.3 Sources of water supply during operational phase

Water Supply during operational phase		
S.No	Source	Cu.m / day
1	Sea	
2	River	
3	Water body	
4	Ground water	
5	Municipal water supply	
6	Others	

8.4 Sewage, collection, treatment and disposal

Sewage, Collection Treatment and disposal		
S.No	Item	Quantity / day
1	Mode of collection of domestic effluent	
a.	Surface drains	
b.	Underground	
c.	System and capacity	
2.	Mode of treatment	
a.	Septic tank and filters (capacity)	
b.	Biological treatment capacity	
c.	Others	
3.	Mode of disposal	
a.	Soakpits	
b.	Disposal to local sewer	
c.	water bodies	
d.	Others	

8.5 Water Harvesting and Recharging Scheme

8.6 Storms water drainage

a. Collection

b. Disposal

c. Treatment, if any

9.Energy Consumption :

- Hydrocarbons, Yes _____ No _____
- gas, Yes _____ No _____
- electricity and Yes _____ No _____
- any other non-conventional energy source Yes_____ No_____

10. Power distribution in the region

Power system		
S.No	Item	Remarks
	Source and power supply capacity	
	Distribution system at present	
	Alternate supply if any	
	In case of DG set (Fuel type)	

11. State the impacts predicted on the quality and quantity of Transport linkages:

1. Road
2. Rail
3. Water
4. Air
5. Others

12. Impact of the Developmental activity on surroundings

Impact of the new development on the surrounding areas		
S.No	Item	Impact
1	Traffic management at peak hours	
2	Buffer zone planned, if so, details	
3	Provision of service roads	
4	Measures proposed to regulate unplanned slums, shops, etc.	
5	Others	

13. Is the new town population likely to utilize any of the facilities in the surrounding region? Specify the extent of use in each case:

a. Education

b. Health

c. Transport

d. Commerce

e. Recreation

f. Others

14. Landscaping / Tree Plantation

S.No	Phase	Areas / no. with reference to total project area
1	Total area of project	
2	Area planted during construction phase	
3	Area to be planted during operational phase	
4	No. of trees already planted	
5	No. of trees proposed to be planted	
6	Parks and gardens to be developed	
7	impacts from proposed landscaping	
8	special features of proposed landscape design	

15. Other information

(i) Measures proposed for construction labour – their living requirement, health and hygienic conditions, sewage treatment and disposal arrangements etc.

(ii) Measures proposed to counter encroachments in and near the new town.

(iii) Housing of construction workers in the different construction phases and the amenities provided for them. What is the future of such Housing?

(iv) How are the service population proposed to be accommodated in the new town? What percentage of service population has been catered to?

(v) How are the informal sector population proposed to be accommodated in the New Town in regard to their living and working.

(vi) Does the New Town intend to provide services and amenities (ex Education, Health, Recreation, etc) to population living in the surrounding areas? Specify the type of services and approximate number of people likely to utilize these services.

(vii) How are the running costs of the town proposed to be met? Mention the approximate amount and percentage of total - by residents, town authorities and others

(viii) Proposed employment prospects within the New Town to dependents of the employees other than jobs in the agency building the New Town.

(ix) Any other relevant information

Describe in detail the manner in which the promoters of new town will interact with the township management, township population and township amenities on a day-to-day and month-to-month basis.

16 Environmental Management Plan

16.1. Details of Pollution Control Systems:

	Existing	Proposed
Air		
Water		
Noise		
Solid Waste		

16.2. Expenditure on environmental measures:

S. No		Capital cost		Annual recurring cost	
		Existing	Proposed	Existing	Proposed
1	Pollution control (provide break-up separately)				
2	Pollution monitoring (provide break-up separately)				
3	Fire fighting & emergency handling				
4	Green Belt				
5	Training in the area of environment & occupational health				
6	Others (specify)				

16.3. Details of organizational set up/cell for environmental management and monitoring:

16.4. Details of community welfare/peripheral development programmes envisaged/being undertaken by the project proponent:

17. Compliance with environmental safeguards (for existing units)

a. Status of the compliance of conditions of Environmental Clearance issued by MoEF, if any enclosed — Yes ☐ No ☐

b. Status of compliance of 'Consent to Operate' issued by SPCB, if any, enclosed — Yes ☐ No ☐

Date .....

Name and Signature of the

Competent Officer / authority

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