DRAFT EIA GUIDANCE MANUAL –
Asbestos Based Industries

जहाँ है हरियाली ।
वहाँ है खुशहाली ॥

Ministry of Environment & Forests
GOVERNMENT OF INDIA, NEW DELHI

Environmental Impact Assessment Guidance Manual for
Asbestos Based Industries

Administrative Staff College of India
Bellavista, Khairatabad, Hyderabad, AP, India
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Index

Contents	Page No
i. Foreword	(to be given later)
ii. Acknowledgments	(to be given later)
iii. Core Committee	5
iv. Peer Committee	6
v. Project team	7
vi. About the manual	8
1. Introduction	
1.0 Preamble	10
1.1 General information on asbestos based industries	10
1.2 Environmental clearance process	11
1.3 Terms of Reference (TOR) for preparation of EIA report for asbestos based industries	14
1.4 Validity of environmental clearance	14
1.5 Post environmental clearance monitoring	14
1.6 Transferability of environmental clearance	15
1.7 Generic structure of environmental impact assessment document	15
1.8 Identification of the project and project proponent	15
1.9 Brief description of the project	15
2. Project description	
2.0 General	17
2.1 Description of the project	17
2.2 Capacity of the project	18
2.3 Disposal of waste including hazardous waste	18
2.4 Manpower requirement	18
2.5 Use of public infrastructure	18
2.6 Project implementation schedule	18
3. Analysis of alternatives (Technology)	
3.0 General	19
4. Description of the environment	
4.0 Study area	20
4.1 Land environment	20
4.2 Meteorological data	21
4.3 Air environment	21
4.4 Water environment	22
4.5 Noise environment	22
4.6 Biological environment	22

4.7 Solid waste management 23
4.8 Socio-economic environment 23

5. Anticipated environmental impacts and mitigation measures
5.0 General 24
5.1 Land/soil environment 24
5.2 Air environment 25
5.3 Water environment 28
5.4 Solid waste management 28
5.5 Noise environment 30
5.6 Biological environment 31
5.7 Socio-economic environment 31

6. Environmental Monitoring Programme
6.0 General 32

7. Additional studies
7.0 General 33
7.1 Items identified by the proponent 33
7.2 Items identified by the regulatory authority 33
7.3 Items identified by the public and other stakeholders 33
7.4 Employee education 33
7.5 Occupational health 35
7.6 Workplace monitoring 36
7.7 Risk assessment 37

8. Project benefits
8.0 General 39

9. Environmental cost benefit analysis
9.0 General 40

10. Environmental Management Plan (EMP)
10.0 General 41
10.1 Components of EMP 41
10.2 Self assessment-Environment control status 41
10.3 Environmental cell 41

11. Summary & conclusion (Summary EIA)
11.0 General 42

12. Disclosure of consultants engaged
12.0 General 43

List of Tables

Description of Ambient air quality monitoring stations

Ambient air quality monitoring results

Description of ground water sampling locations

Description of surface water sampling locations

Description of noise monitoring stations

Annexure

1. Terms of Reference (TOR) of Asbestos based industries
2. Land use/land cover classification system
3. Air quality network requirements
4. National ambient air quality standards (NAAQS)
5. Ambient air quality standards in respect of noise
6. Illustrative types of socio economic impacts
7. Minimum stack height for dispersal of sulphur dioxide
8. General standards for discharge of effluent
9. Static Monitoring
10. General Process flow diagram of chrysotile cement pipe manufacturing plant
11. General Process flow diagram of friction products
12. General Process flow diagram in industrial textile plants
13. Good Practices in hood design
14. Good practices in debagging
15. Bureau of Indian Standards related to Asbestos
16. Dust Sampling record

Questionnaire

Abbreviations

ASCI	Administrative Staff College of India
AC	Asbestos Cement
BSI	Biological Survey of India
BIS	Bureau of Indian Standards
BOD	Biological Oxygen Demand
CPCB	Central Pollution Control Board
CRZ	Coastal Regulation Zone
COD	Chemical Oxygen Demand
DG	Diesel Generator
DM	District Magistrate
DC	District Collector
Dy.Com	Deputy Commissioner
db	Decibels
DMP	Disaster Management Plan
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EC	Environmental Clearance
EAC	Expert Appraisal Committee
E (P) Act	Environmental Protection Act
GoI	Government of India
HW	Hazardous Waste
IAA	Impact Assessment Authority
IMD	Indian Meteorological Department
ISO	International Organization for Standardization
MoEF	Ministry of Environment and Forestry
µg	Micro Grams
NO_X	Oxides of Nitrogen
NRC	Noise Reduction Coefficient
NEERI	National Environmental Engineering Research Institute
NAAQS	National Ambient Air Quality Standards
PPE	Personal Protection Equipment
pH	Hydrogen Ion Concentration
RSPM	Respirable Suspended Particulate Matter
R & R	Resettlement & Rehabilitation
SEIAA	State level Environmental Impact Assessment Authority
SEAC	State level Expert Appraisal Committee
SO_2	Sulphur Dioxide
STC	Sound Transmission Coefficient
TOR	Terms of Reference
TSDF	Treatment Storage & Disposal Facility
UTPCC	Union Territory pollution Control Committee
WHO	World Health Organization
WII	Wildlife Institute of India
ZSI	Zoological Survey of India

Core Committee

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About the Manual

Environmental Impact Notification S.O.1533 (E), dtd.14th September 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 Govt. of India

Submission of EIA report is a statutory requirement for obtaining prior environmental clearance under EIA Notification 2006, for scheduled developmental projects. While carrying out EIA studies for developmental projects, some difficulties have been encountered in implementing EIA procedures and in the appropriate shaping of projects. These problems include:

- Insufficient awareness of project proponent and stake holders
- Difficulty in accessing the latest technical information on EIA
- Lack of appropriate environmental data/ information required for EIA; and
- Inadequate awareness of the potential impacts of development project on the environment within the general public.

The format for EIA manual approved by the MoEF existing hitherto is common for all the sectors of infrastructure and industrial development projects. In order to more comprehensively cater to the needs of each of the sectors of development, it was considered necessary by the MoEF to make available technical EIA guidance manuals for each of the development sector exclusively. Accordingly, among others, the sector specific Terms of Reference (TOR) & developmental activity specific guidance manual for the asbestos based industries is prepared by the Administrative Staff College of India (ASCI), Hyderabad.

This technical EIA guidance manual for asbestos based industries accordingly addresses the related environmental concerns duly taking into consideration the requirements of all. While the proponent and the consultant need guidelines for preparing the EIA report, public needs information on possible environmental impacts of a project, in particular the impact on their livelihood. The reviewers and sanctioning authorities make use of this report including the checklist and the questionnaire to ensure that the impacts of the project on the environment are fully assessed and required mitigation measures are proposed, in the Environmental Management Plan (EMP), by the proponent in order to consider grant of prior Environmental Clearance for the project or otherwise.

To ensure effective utilization by all the stakeholders, this manual is divided in to twelve chapters bringing out the EIA process in chronological order.

***Chapter 1*:** This chapter contains the general information on asbestos based industries major sources of environmental impacts and details of the environmental clearance process.

***Chapter 2*:** This chapter contains the description of the project, such as the type of project, need for the project, project location, project layout, cargo handling methods, utilities and services, and the project implementation schedule, estimated cost of development etc

***Chapter 3*:** This chapter gives details of various alternatives both in respect of location of site and technologies to be deployed, in case the initial scoping exercise considers such a need.

***Chapter 4*:** This chapter forms the heart of the manual, since it is in this chapter that the proponent shall give the comprehensive data on the existing and additional data collected by him on the baseline environmental data in the study area as well as in the surrounding area that is likely to be affected by the proposed activity.

***Chapter 5*:** This chapter describes the anticipated impacts on the environment and mitigation measures. The method of assessment of impacts including studies carried out, modeling techniques adopted to assess the impacts where pertinent shall be elaborated in this chapter. It shall give the details of the impacts on the baseline parameters, both during the construction and operational phases and suggests the mitigation measures to be implemented by the proponent.

***Chapter 6*:** This chapter covers on Environmental Monitoring Program. It shall also include the technical aspects of monitoring the effectiveness of mitigation measures (including measurement methodologies, data analysis, reporting schedules, emergency procedures, detailed budget & procurement schedules).

***Chapter 7*:** This chapter shall 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. These studies may be suggested either by the proponent itself or the regulatory authority or by any other stakeholders, including during the public consultation process.

Chapter 8: This chapter shall 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*:** This chapter shall cover on Environmental Cost Benefit Analysis of the project.

Chapter 10: This chapter shall 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 provision made towards the same in the cost estimates of project construction and operation.

Chapter 11: This chapter forms 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 shall explain how the adverse effects are proposed to be mitigated.

***Chapter 12**:* This chapter shall include the names of the consultants engaged with their brief resume and nature of consultancy rendered

CHAPTER 1

Introduction

1.0 Preamble

Environment plays a vital role in overall development of the country. Recognizing the importance of environmental protection and sustainable development, the Ministry of Environment and Forest, Government of India had formulated policies and procedures governing the industrial and other developmental activities to prevent indiscriminate exploitation of natural resources and to promote integration of environmental concern in developmental projects.

Environmental Impact Assessment is a planning tool now generally accepted as an integral component of sound decision-making. The purpose of Environmental Impact Assessment 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 allows 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.

The Ministry of Environment & Forest has made environmental clearance (EC) for certain developmental projects mandatory through its notification issued on 27.01.1994 under the provisions of Environment (Protection) Act, 1986. The process of conducting public hearing has also been made mandatory for certain developmental projects through its notification issued on 10.04.1997.

Keeping in view the experience gained in the environmental clearance process over the past decade and the demands from various stakeholders, the MoEF in terms of the notification dated 14.09.2006, directed that the required construction of new projects or activities or expansion or modernization of existing projects or activities listed in the schedule to this notification shall be undertaken in any part of India only after the prior environmental clearance from the Central Government/ SEAC. The categorization of the developmental projects / activities is specified in the EIA notification 2006. This notification has brought out structural changes in the clearance mechanism by decentralizing certain developmental activities based on its impact potential to the State Government and the Union Territory Administration. The EC clearance process for new projects will comprise of a maximum of four stages – Screening, Scoping, Public Consultation & Appraisal. Due to introduction of *Scoping Concept,* early consultation between the project developer and Impact Assessment Authority (IAA) will take place in a structured way. This will reduce the risk of disagreement about impact assessment methods after submission of EIA. It helps to focus resources on the important issues for decision-making and avoids wasted effort on issue of little relevance.

1.1 General information on asbestos based industries

Asbestos is naturally occurring hydrated mineral silicate that crystallizes in fibrous form (Mossman et al., 1990b). Mineralogically asbestos can be classified into two major groups; the Serpentine, which includes the most abundant variety of asbestos i.e. Chrysotile and the

Amohibole which include Amosite, Crocidolite and Termolite etc. Even though the use of asbestos was known to medevial India, it was commercially exploited only since the beginning of this centuary. Asbestos is attractive in a broad variety of industrial applications because of its resistance to heat and chemicals, high tensile strength, and lower cost compared to man-made minerals. At the peak of its demand, about 3,000 applications or types of products were of asbestos-based. Asbestos is used for the manufacture of a variety of asbestos-based products mainly as asbestos-cement (AC) sheets, AC pipes, brake shoes, brake linings, clothes and ropes. Now only a few industries remain that use asbestos fibres. AC industry is by far the largest user of asbestos fibre worldwide accounting for about 95% of all uses. Asbestos is also incorporated into cement construction materials (roofing, shingles, and cement pipes), friction materials (brake linings and clutch pads), jointing and gaskets, asphalt coats and sealants and other similar products. Asbestos in air at work environment is a major cause of adverse effects on health of industrial workers (CPCB 2008).

In India present use of asbestos is limited to use of chrysotile only and hence this manual covers only this variety of asbestos. This manual is not covered when asbestos is co-contaminant in various mining activities. The conclusion of various scientific findings suggests that the key element of concern is control of work place exposure by proper work practices and engineering controls and monitoring. Continued health surveillance will add to further reinforcement to controlled usage theory.

To address this, effective government policy and regulations are important, but self-regulation by the project proponent, including the adoption of good management practices during planning, design and operations, will significantly help to ensure sustainable development. The key principles as elaborated below are developed to increase understanding and recognition of actions necessary to minimize the impacts due to asbestos based industries. The preparation of EIA report and implementation of EMP are essential to effectively manage the adverse effects.

1.2 Environmental clearance process

In terms of the 14th September 2006 notification of the MoEF, asbestos based products are classified as category – A projects and the authority for approval of TOR & issue / reject of Environmental Clearance (EC) is Ministry of Environment & Forests (MoEF), Government of India (GoI) on the recommendations of Expert Appraisal Committee (EAC).

The Environmental Clearance process for asbestos based products will comprise of a maximum of three stages. These stages in sequential order:

Stage (1)- Scoping

'Scoping' refers to the process by which the EAC, determine detailed and comprehensive TOR addressing all relevant environmental concerns for the preparation of an EIA report in respect of the project or activity for which prior environmental clearance is sought. The EAC shall determine the TOR on the basis of information furnished in the prescribed application Form 1 including TOR proposed by the applicant, a site visit by a sub-group of EAC only if considered necessary by the EAC and other information that may be available with the EAC

Stage (2)- Public consultation

"Public consultation" refers to the process by which the concerns of local affected persons and others who have plausible stake in the environmental impacts of the project or activity are ascertained with a view to taking into account all the material concerns in the project or activity design as appropriate.
After completion of the public consultation, the applicant shall address all the material environmental concerns expressed during this process, and make appropriate changes in the draft EIA and EMP. The final EIA report, so prepared, shall be submitted by the applicant to the concerned regulatory authority for appraisal. The applicant may alternatively submit a supplementary report to draft EIA and EMP addressing all the concerns expressed during the public consultation

Stage (3)- Appraisal

Detailed scrutiny by the EAC of the application and other document like the final EIA report, outcome of the public consultations including public hearing proceedings, submitted by the applicant to the regulatory authority concerned for grant of EC

Flow-chart depicting these stages in obtaining the prior environmental clearance for asbestos based industries projects is presented in **Figure 1.1**

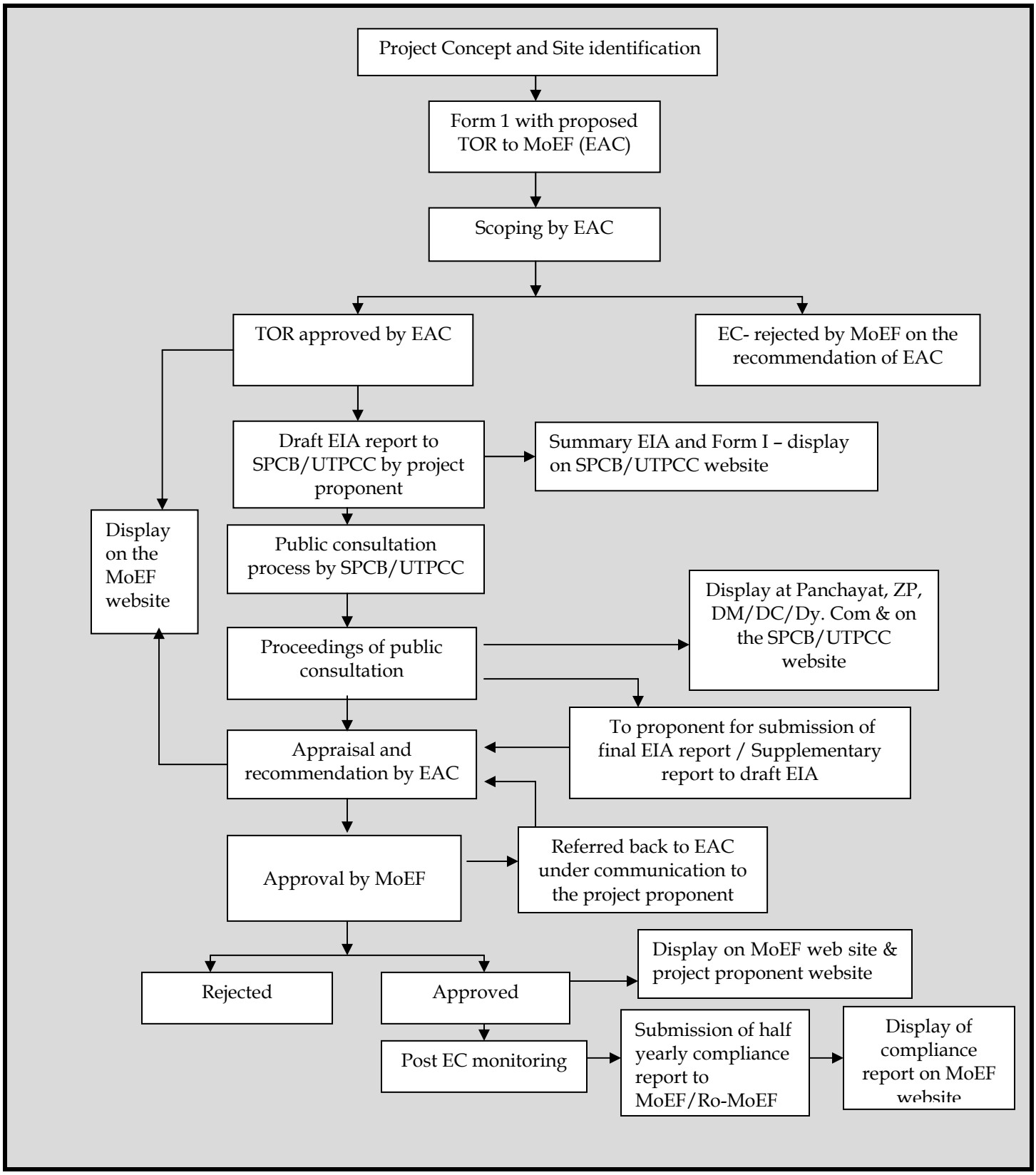


Figure 1.2: Prior Environmental Clearance process for Asbestos Based Industries

- 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"

1.3 Terms of Reference (TOR) for preparation of EIA report for asbestos based industries

Terms of Reference (TOR) for the asbestos based industries is prepared and attached as "**Annexure I"** to this document. In addition, the proponent is required to identify specific issues, if any, pertinent to the project and include those issues also in the TOR for preparation of EIA and EMP report upon approval of the TOR by the Expert Appraisal Committee.

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.

1.5 Post environmental clearance monitoring

It shall be mandatory for the project proponent to make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominently advertising it at least in two local newspapers of the district or state where the project is located and in addition, this shall also be displayed in the project proponent's website permanently.

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 shall be as under:

- Introduction
- Project Description
- Analysis of Alternatives (Technology& Site)
- Description of the Environment
- Anticipated Environmental Impacts & Mitigation Measures
- Environmental Monitoring Program
- Additional Studies
- Project benefits
- Environmental Cost Benefit Analysis
- EMP
- Summary & Conclusion
- Disclosure of Consultants engaged

1.8 Identification of project and project proponent

The details of the project and the Proponent along with details of their address for communication / contact shall be clearly mentioned in the introduction of the EIA report.

1.9 Brief description of project

Brief details of the project nature, size, location and its importance to the country and the region shall also be included in the introduction chapter of the EIA report.

Details of the project nature, size, location and its importance to the country and the region are to be included. Project site description- survey/ village, tehsil, district, state & extent of the land, latitude & longitude of the boundaries should be furnished.

Description of existing 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.

Any other local/state regulations concerning the establishment of the industrial unit on conversion of land use, the same should be adopted as per the procedures.

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 conditions compliance for the existing project as per the applicability
- Validity of the water consent, air consent and HW authorization for existing project
- Standards and compliance of conditions
- 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, under the provisions of the E (P) Act 1986 during the last one year

Details of the scope of study in terms of Terms of Reference approved by the Expert Appraisal Committee and the details of regulatory scoping carried out should be mentioned in the introduction chapter.

CHAPTER 2

Project Description

2.0 General

The description of the project to be given in this chapter of the EIA study report shall 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

Description of the project shall be brief but elaborate enough to assess the impact of the project location on the environment. Therefore these brief details should include:

- The location of the project with longitude, latitude, revenue village, tehsil, district and state
- Type of the project – new, expansion and/or modernization
- Each of the projects using asbestos is different and hence a clear description of the particular industry proposed is to be given
- The description should contain raw material and storage facilities at peak capacity, process description by way of process flow diagram. The potential release of dusts in general and asbestos in particular is to be given along with a brief mention of mitigation measures
- Project description should compare competing technologies, if any, and the reasons for selecting present technology
- Evaluation of safety measures adopted should include receipt, storage and handling of all raw materials
- Project description should include the safeguards provided in the design and selection of the equipment and process
- Land requirement – status of land acquisition, total land requirement, built-up area and provision for green belt area
- If it is located in notified industrial area/estate, relevant documents should be submitted
- Land ownership status/lease dead agreement details should be submitted

Essential maps to be provided

- A map specifying locations of the state, district and project location
- A map of covering aerial distance of 15KMs from the proposed project location delineating environmental sensitive areas as specified in Form 1 of EIA notification dated 14th Sep 06.
- Land use map of 5 KM from of the boundary of the project site to 1:25,000 based on recent satellite imagery
- Layout plan to a scale of 1:5000 scale for the proposed development covering administrative and operational buildings, storage yards, township, green belt development etc, boundaries of proposed activity with latitude and longitude is to be submitted.

2.2 Capacity of the project

The proponent shall furnish the manufacturing capacity at peak load on annual basis and on daily basis. All inputs requirement including ancillary inputs are to be given to estimate their impacts on the environment. Receipt and storage of raw materials and other inputs at peak capacity is to be furnished.

2.3 Disposal of waste including hazardous waste

Details of waste generated during operation of the project including hazardous wastes as well as the disposal methods proposed is to be elaborated in the EIA report

2.4 Man power requirement

The proponent shall indicate the requirement of various categories of manpower such as skilled, semi-skilled, unskilled workers, technicians, engineers, mangers and other professionals for both construction phase and operational phases

2.5 Use of public infrastructure

The proponent shall furnish the details of the usage of public infrastructure such as road network, power, housing, water etc.

2.6 Project implementation schedule

The proponent shall submit the project implementation schedule bar chart etc.,

CHAPTER 3

Analysis of alternatives (Technologies)

3.0 General

In case, the scoping exercise results in need for consideration of alternative technologies on account of predicted environmental impacts, the details of such alternatives considered should be included in this chapter

These details shall comprise

- Description of various alternatives like layouts or technologies studied
- Description of each alternative
- Summary of adverse impacts of each alternative
- Mitigation measures for different technologies considered and
- Selection of technology

CHAPTER 4

Description of the Environment

4.0 Study area

The chapter on environmental baseline data should include baseline data of all the pertinent parameters of environment. As a primary requirement of EIA process, the proponent should collect primary baseline data in the project area as well as the area falling within 1 km from the proposed project boundary and secondary data should be collected with in 15 kms aerial distance for the parameters as specifically mentioned at column 9 (III) of form I of EIA notification 2006. Details of secondary data, the method of collection of secondary data, meteorological data of nearest station of IMD along wind rose and proposed monitoring locations shown on the study area should be furnished. Similarly the proposed locations of monitoring stations of water, air, soil, noise etc should be shown on the study area map

The study areas mentioned in this document should be considered for guidance purpose but the exact study area for different environmental attributes (water, air, noise, soil etc) is to be submitted considering the proposed activities & location, along with proper reasoning, for review and approval by the expert appraisal committee.

4.1 Land environment

Land use of the proposed project site and the adjacent areas is to be ascertained from the existing approved master plans if any and from the revenue records. The environmental sensitivity areas as mentioned at column 9 (III) of form I of EIA notification 2006, covering the following with in an aerial distance of 15 kms should be furnished along with the aerial distance from the project boundary

- Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value
- Areas which are important or sensitive for ecological reasons – wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests
- Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration
- Inland, coastal, marine or underground waters
- State, national boundaries
- Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas
- Defense installations
- Densely populated or built-up area
- Areas occupied by sensitive man-made land uses *(hospitals, schools, places of worship, community facilities)*
- Areas containing important, high quality or scarce resources *(groundwater resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)*
- Areas already subjected to pollution or environmental damage *(those where existing legal environmental standards are exceeded)*

- Areas susceptible to natural hazard, which could cause the project to present environmental problems *(earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions)*

Study of the land use pattern, habitation, cropping, forest cover, environmentally sensitivity areas etc, should be done with the help of latest remote sensing map and also through the secondary data sources. The land –use/ land cover classification as per **Annexure 2** should be followed.

Soil data including type, classification, characteristics etc are important from engineering considerations for design of structures etc. Baseline data of the soil ascertained by way of soil investigations carried out is to be provided. Field surveys usually involve a combination of hand auger boring and drilling over the site in a systematic grid pattern, with more focus on specific areas of interest. Soil surveys should consider both the physical and engineering properties of the soil. Zeolite formation if any in the existing project area should be specifically stated.

Soil data in the proposed green belt area to ascertain the suitability for development greenbelt and for rain water harvesting should be covered

4.2 Meteorological data

Meteorological data covering wind speed, wind direction, rainfall, relative humidity and temperature for at least 10 year period should be presented from the nearest meteorological station**.** Recording of velocity and direction of wind at the project site should be obtained by installing continuous and self-recording anemometer. The data collected should be correlated with the data available from the nearest IMD. From the data so obtained, monthly and yearly wind roses should be prepared.

4.3 Air environment

Baseline data of the ambient air for the parameters – RSPM, No_x and asbestos fibres should be generated at the project site and within 1km from the project boundary. One station should be located in the up-wind/non- impact/non-polluting area as a control station.

Measurement of concentration of fibrous material should be done by phase contrast optical microscope of 400 magnifications at outer limits of the project and within 1km from the project boundary.

Note: This method cannot distinguish between asbestos fibre and other mineral and natural fibres. So it is an assumption that all fibres counted are not necessarily asbestos fibres. While this assumption may be useful for workplace measurements while measuring at boundary walls this cannot be true. Hence it is necessary to compare measurements for one season before plant installation and compare with figures while the plant is in operation.

Measurement of SO_2 and NO_X in the ambient air should be done in case a boiler or dryer is used. The 24-hour air quality monitoring is to be done at each of selected locations for a minimum of 4 times on alternative days other than monsoon. The number of monitoring stations should be selected based on the general criteria as mentioned in the **Annexure 3** duly giving consideration to the sensitive environmental receptors in the study area. The National Ambient Air Quality Standards are given in **Annexure 4.**

Location of ambient quality monitoring station should be presented in **Table 1** and the monitoring results should be presented in **Table 2**.

4.4 Water environment

This section should document the baseline scenarios of the water environment in the study area and at the project site. Details of surface water bodies within the project site and within 1km from the boundary of the project should be documented along with their present usage. Monitoring of water quality within 1km for relevant parameters should be done. The samples should be collected and analyzed as per the standard procedures. The description of the water sampling locations should be given in **Table 3 & 4.**

4.5 Noise environment

Hourly monitoring of noise levels (leqs) should be recorded for 24 hours by using noise level meter for 15 minutes during each hour. The noise levels at the project boundary and the study area especially at nearest habitation is to be monitored. The noise monitoring locations should be given in **Table 5.**

Noise standards have been designated for different types of land use i.e. residential, commercial, industrial areas and silence zones as per the Noise Pollution (Regulation and Control) Rules, 2001 notified by Ministry of Environment and Forests **(Annexure 5).**

4.6 Biological environment

Details on secondary data on the existing flora and fauna in the study area as well as 15 km from its boundary, carried out by an university/institution under the relevant discipline (such as BSI, ZSI, WII, etc) should be included in the list of flora and fauna along with classification as per schedule given in the Wild Life Protection Act, 1972 (for fauna) and in the Red Book Data (flora) and a statement clearly specifying whether the study area forms a part of an ecologically sensitive area or migratory corridor of any endangered fauna.

4.7 Solid waste management

Type and quantity of solid waste generated during the construction and operational stages is to be quantified. In case of expansion of the unit, the solid waste generated category wise should be furnished. For disposing asbestos waste material the norms notified under Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008 and the recommendations as per IS: 11768 – 1986 (Reaffirmed 2005) is to be followed.

- All asbestos waste must be kept in closed containers before its transportation to the disposal point so that no asbestos dust is emitted into the environment during transportation
- Final covering of asbestos waste, other than high-density waste, shall be to a minimum depth of 2m
- The asbestos waste including the used bag filters should be disposed at an approved TSDF

Details of authorized hazardous waste disposal facilities should be ascertained and this will help the project proponent to ascertain the availability of common TSDF.

4.8 Socio economic environment

Baseline data in the study area particularly on human settlements, health status of the communities, existing infrastructure facilities should be collected through secondary sources. Present employment and livelihood of these populations, awareness of the population about the proposed project should be collected. **Annexure 6** gives the illustrative types of socio-economic impacts for reference.

CHAPTER 5

Anticipated Environmental Impacts and mitigation measures

5.0 General

The aim is to ensure that potential environmental problems are foreseen and avoided at an early stage in planning cycle so as to pre-empt problems. The EIA mechanism shall be applied to the project in the following order of priority:

- **Avoid** adverse environmental impacts
- **Minimize** and control adverse environmental impacts
- **Mitigate** adverse environmental impacts

5.1 Land/ Soil Environment

Potential Impacts

- Impact due to change in land use from non- industrial purpose to industrial purpose
- Impact due to in compatible land development with the surrounding land use- present use & future use
- Impact on surface streams in the project area
- Impact due to induced development in the surrounding area due to establishment of the project
- Impact due on road traffic in the surrounding areas due to vehicle traffic for transportation of raw material and finished products
- Impact due to water usage on the existing water resources/users

Mitigation Measures

- Selection of site duly meeting the land use pattern and compatible with the already developed activities in the surrounding environment
- Integration with the local land use for achieving compatibility with future developments in the surrounding areas
- Adoption of suitable schemes for not disturbing the schemes in the project area
- Notifying to the local authority about the restrictions in the development of sensitive receptors in the immediate surroundings like hospitals, schools, house etc
- Development of green belt with suitable plant varieties as per CPCB guidelines
- Strengthening of approach roads and parking facilities to mitigate the traffic congestion
- Conservation of water by adopting rain water harvest system (depending upon the site suitability)
- Possibility of utilizing alternative building materials such as fly ash and solar energy for lighting purposes

5.2 Air Environment

Potential Impacts

- Key element that is to monitor and draw mitigation plan is asbestos in the air environment. Breathing of asbestos of dimensions of biological importance has possibility of creating occupational disease when the exposure level exceeds the permissible standards
- Impacts during construction and operational stages
- Impacts during transportation of asbestos material, storage of raw material, transfer of raw material and manufacturing process
- Identification of air pollutants, their load with and without control systems
- Impact due to fugitive asbestos emissions in the work area and in the ambient area
- Impact due to point source of emissions on the ambient environment

Mitigation Measures

- Mitigation measures for packing, transport and storage of asbestos (BIS code of practices IS: 12079-1987)

Asbestos fibres should always be packed in impermeable woven and coated or lined polythene or polypropylene bags
Plastic material used for bags should incorporate an ultra- violet inhibitor to protect the bags from sunlight and thus prevent deterioration during trans- shipment
All bags should be printed with the pictorial warning sign and precautionary notice as given in IS: 12081(Part 2)-1987
Hooks and other sharp equipment should not be used on bags or unit loads

- Provision of air pollution control system to comply the emission standards of 0.2 fibre/cc for asbestos fibre and 2 mg/Nm^3 for total dust. Provisions of interlocking of air pollution control equipment with the manufacturing process should be provided.
- Engineering controls to comply the asbestos fibre concentration at work place of 1 fibre/cc as per the provisions of Factories Act
- Provision of local exhaust ventilation systems [BIS code of practices IS 12080-1987(Reaffirmed 2001)]
- Provision of minimum stack height for boiler/drier for dispersal of sulphur dioxide as per standards notified vide G.S.R No. 176 (E) dated 02.04.1996 **(Annexure 7)**

- Arrangements shall be made to prevent asbestos dust discharged from the local exhaust ventilation system being drawn into the air of any workroom
- For efficient operation, local exhaust ventilation system shall be located as close as possible to the source of dust emission by the use of captor hoods, booths or enclosures
- The local exhaust ventilation systems shall be designed to collect and remove all dust-laden air
- Opening in the enclosures shall be as small as possible while still allowing access to the necessary work operation
- It is essential to exercise periodical checks on the exhaust system so as to ensure its proper functioning
- Checks on the performance of an exhaust system shall be made by comparing the static pressure readings at points in the system with the readings recorded at the same points upon commissioning
- Exhaust ventilation system shall be examined and inspected at least once in every seven days and shall bee thoroughly examined and tested by a competent person at least once in a year. Any defect found by such examinations or tests shall be rectified forthwith. A report of the results of such examination and particulars of repairs or alterations carried out shall be properly maintained

- Provision for control of emissions of asbestos dust in the manufacturing process [BIS code of practice IS: 11770 (Part 1-1987 for Asbestos cement products), IS: 11770 (Part 2-2006 for friction materials and IS: 11770 (Part 3-1987 (reaffirmed 2001) for Non-cement asbestos products)]

- Dust suppression and collection system proposed to meet the standards is to be explained
- Asbestos cement products – engineering controls shall include wetting, mechanical handling, ventilation and redesign of the process to eliminate, contain or collect asbestos dust
- Friction material – engineering control measures should be devised to prevent the emission of asbestos dust into the work place
- Non-cement asbestos products other than friction materials - engineering controls shall include mechanical handling, ventilation and redesign of the process to eliminate, contain or collect asbestos dust emission

- The work premises shall be kept free from asbestos waste and dust. All plant, machinery, exhaust ventilation equipment and all the internal surfaces of the building shall be kept free from dust. Vacuum cleaning equipment or other dustless methods, such as wetting before and during sweeping, should be used for this purpose. Cleaning should be done in accordance with the provisions laid (BIS code of practices IS: 11767-1986)
- When portable vacuum cleaners are used, special exhaust filters are needed to avoid discharge of fibre along with air into work area

Dust control engineering

Explanatory Note

Records and documentation should be maintained
Manufacturing operations concerned with the handling or processing of asbestos or asbestos containing products, including major changes of working
Air filtration devices of the plant together with their characteristics and maintenance history
The allocation of all types of personal respiratory protective equipment
The maintenance procedure of non-disposable personal respiratory and other protective equipment

Assessment

	Yes	No
• Are all workplaces concerned with the handling of asbestos or asbestos containing products identified?	☐	☐
• Are the individual air capacities of the dust filtration devices recorded?	☐	☐
• Do they meet the original designed criteria?	☐	☐
• Are the personal respirators (fitted with replaceable filters) available for special purposes such as maintenance of machines and filter devices?	☐	☐
• Is there a maintenance procedure associated with this equipment?	☐	☐
• Is the bag or bin below the filters well sealed to the discharge chute?	☐	☐

Raw material receipt & storage

Explanatory notes

- All stages in the delivery, storage and transfer of asbestos can give rise to dust release
- Procedures and methods ensuring safe handling of the bags are to be developed. Asbestos shall only be supplied in impervious bags

Assessment

	Yes	No
• Are palletized asbestos bags adequately wrapped with plastic film?	☐	☐
• Is each bag labeled according to national and international regulations and recommendations?	☐	☐
• Is the information on the label given in English or in the language(s) of the country of destination?	☐	☐

5.3 Water Environment

Potential Impacts

- Water requirement during the construction stage and operation stage and its impact on the source of water supply. Pre treatment requirement, if any is to be discussed and its impact on the environment
- Quantification and characteristics of domestic and industrial effluent generated

Mitigation Measures

- Methods proposed to reduce the water requirement by adoption of cleaner production practices
- Water harvesting proposals to recharge the ground water, depending on the site suitability
- Treatment proposed for domestic, and industrial effluents, if any to meet the standards for disposal. General standards for discharge of effluents are given at **Annexure 7**.

For asbestos cement products water is carried in product used for hydration and also gets evaporated. This forms almost 30% of product and hence no liquid effluent is expected for disposal. Generally, there is no requirement of water in the process for other products. These aspects are to be specifically addressed in the EIA report specific to the project.

5.4 Solid waste management

Production of asbestos or asbestos-containing materials may generate the following category of hazardous waste as notified under Hazardous waste (Management, Handling and Transboundary movement) Rules, 2008

- Asbestos-containing residues
- Discarded asbestos
- Dust/particles from exhaust air

(Including used filter bags)

The best way to achieve to tackle the solid waste is by following **waste avoidance**. The most desirable method of controlling waste is to minimize the amount of waste that is generated. This can be generally done by adopting choosing a process or operation that reduces generation of waste and or recycling of the waste. The steps taken to reduce the waste generation in the specific project is to be stated. Plan of action to reuse the waste to the specific project is to be stated

Characterization and quantification of the waste left after reuse, if any with plan of action to reduce the mass or to reduce the hazardous nature. Personal Protection Equipment (PPE) including the masks used during the industrial operation is also contaminated with asbestos fibres. Specific method of disposal/categorization should be made. It is suggested that these waste may be treated as hazardous waste and should adopt proper disposal practices.

Asbestos cement products – Broken pieces and off-cuts of asbestos-cement material should be recycled where practical or collected and disposed off in a manner, which does not generate dust. Loose swarf and dust collected from fabrication process can be recycled or wetted. Wet waste from asbestos cement operation can be pressed into cakes that reduce volume considerably. The waste is to place in sealed impermeable bags before disposing at secured landfill. The details of the on-site/off-site secured landfill facility are to be covered in the report. In the event of disposal in an on-site facility, such facility should have proper approval under the provisions of Hazardous Material (Management, Handling and Transboundary Movement) Rules 2007.

Grinding waste from brake linings and textile wastes: Treatment proposed such as locking in cement fly ash binder before disposing at secured landfill

Plan of action to comply the provisions of Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008 and as recommend in BIS code of practices IS: 11768-1986(reaffirmed 2005)

- Provision of closed containers for asbestos waste before it is transported to the disposal point so that no asbestos dust is emitted into the environment during the transportation
- The disposal of waste is to carried out at sites approved under the provisions of HW Rules
- When deposited, all waste other than high-density waste shall be covered with earth to an acceptable depth of 250mm minimum as soon as possible. No asbestos waste other than high-density waste shall be left uncovered at the end of a working day
- Final covering of asbestos waste other than high density waste, shall be to a minimum depth of 2 meters
- If wet waste is deposited, it shall be covered in the same way as dry waste to prevent the escape of asbestos dust on drying out
- The disposal sites for asbestos waste shall be clearly demarcated and public entry shall be restricted
- If contractor is employed for waste disposal, the relevant requirements for the standards shall be incorporated in the contract
- Workers employed in collection, transport or disposal of asbestos waste who may be at risk of exposure to airborne asbestos, should be provided with suitable protective clothing and respiratory equipment
- Vehicles used for transport of asbestos waste should be cleaned thoroughly by means of vacuum cleaner or other dustless methods, before it is used for other purposes.

Explanatory notes

Technologies for recycling of waste in part or in full are being developed/developed?

Assessment

	Yes	No
Does the industrial process allow asbestos containing waste to be recycled? If yes, which types of waste are proposed to recycle?	☐	☐

- Empty bags
- Dust
- Sludge
- Crushed dry waste

Do you proposed to monitor the annual amount of asbestos containing Waste (Empty bags, dust, off cuts, broken pieces, rejects, sludge, etc) and maintain a record of their relative proportion of product to waste?	☐	☐

5.5 Noise Environment

Potential Impacts

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:

- Due to operation of the machinery and or DG sets
- Due to noise generated by large trucks for transportation of materials

Mitigation measures

- Engineering controls proposed to reduce the noise levels by sound absorbing materials of higher Noise Reduction Coefficient (NRC) using enclosure of restraining with higher Sound Transmission Coefficient (STC)
- Silencer for equipments such as diesel sets and air displacement equipments
- Select machinery with specification to meet ambient noise standards as notified in G.S.R 1063 (E) dated 26.12.1989 by MoEF, GoI
- Provision of mandatory acoustic enclosure /acoustic treatment of room for stationary DG sets (5KVA and above). The acoustic enclosure/acoustic treatment of the room should be designed for minimum 25 dB (A) insertion loss for meeting the ambient noise standards, whichever is on the higher side. The DG set should also be provided with proper exhaust muffler with insertion loss of minimum 25 dB (A)

5.6 Biological environment

Potential impacts

Impact of construction and operational activity on flora and fauna. Loss of natural resources, economically important plants, medicinal plants and threat to rare, endemic and endangered species.

Mitigation Measures

Mitigative measures should be proposed during the construction stage as well as operational stage of the project for all the identified impacts, if they are specific to the project location. Identification of measures through scientific conservation plan for protection and conservation of flora, fauna including wild life, migratory avifauna, rare, endemic and endangered species and medicinal plants etc can be drawn.

5.7 Socio economic environment

- Local procurement of inputs, changes in existing living patterns, economic value addition of project, revenue contribution to government and local bodies, local area development activities, employment generation – direct, indirect, social contribution resulting from projected activity, effect on quality of life in neighborhood in 5kms zone
- Socio-economic survey conducted and the analysis to identify areas of corporate contribution to improve quality of life
- Issues raised during public hearing can also indicate the areas identified for improvement

CHAPTER 6

Environmental Monitoring Programme

6.0 General

This chapter shall cover the technical aspects of monitoring the effectiveness of mitigation measures (including measurement methodologies, data analysis, reporting schedules, emergency procedures, budget & procurement schedules). It shall also 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

Work place air quality monitoring and personal exposure sampling is to be implemented as per BIS code of practices recommended in IS: 11450-1986. Proposal specific to the project should be furnished.

The standard method specified in ISO 10397:1993 (E), using a fibre count technique, for the assessment of fibre concentrations in flowing gas streams in ducts, chimneys or flues from industrial processes using asbestos should be followed.

Control initiatives

List out data from BIS codes of practice, CPCB publication, other government studies and data related to asbestos health control objectives that would be implemented at appropriate place in EIA

It shall also cover different statutory returns/ compliance reports to be submitted such as:

- Submission of half yearly compliance report in respect of the stipulated prior environmental clearance terms and conditions in hard and soft copies to the regulatory authority concerned, on 1st June and 1st December of each calendar year
- Submission of environmental statement for the financial year ending 31st March to the concerned state pollution control board on or before 30th September every year
- Submission of annual returns in Form 4 as per Hazardous Waste (Management, Handling and Transboundary movement) Rules, 2008 on or before 30th June
- Format for maintaining records of hazardous waste in Form 3 as per Hazardous Waste (Management, Handling and Transboundary movement) Rules, 2008
- Submission of Water Cess returns in Form 1 as per Rule 4 (1) of Water (Prevention & Control of Pollution) Cess Rules 1978 on or before the 5th of every calendar month

CHAPTER 7

Additional Studies

7.0 General

TOR to be adopted for asbestos based industries projects as commonly applicable is prepared and attached to this manual as **Annexure 1.** It may however, be necessary consider specific issues as applicable to individual projects. The proponent or the regulatory authority may either identify such issues during the scoping process or other stakeholders including the public during public consultation. The EIA report and EMP should therefore address such issues also

7.1 Items identified by the proponent

The proponent may be able to identify issues beyond those included in the common TOR as may be specifically considered by him important from environmental point of view. In such cases the proponent shall include such issues as additional studies under TOR and pursue them in the EIA study after the regulatory authority approves TOR.

7.2 Items identified by the regulatory authority

During the scoping process, the regulatory authority may direct specific issues, beyond those is included in the TOR proposed by the proponent, as may be specifically considered important from environmental point of view. In such cases the proponent should pursue those issues as additional studies in the EIA report after the regulatory authority approves TOR.

7.3 Items identified by the public and other stakeholders

After completion of the public consultation, the applicant shall address all the material environmental concerns expressed during the process, and make appropriate changes in the draft EIA and EMP. The final EIA report, so prepared, shall be submitted by the applicant to the concerned regulatory authority for appraisal. The applicant may alternatively submit a supplementary report to draft EIA and EMP addressing all the concerns expressed during the public consultation. A statement of the issues raised by the public and the comments of the applicant shall also be prepared in the local language and in English and annexed to the proceedings.

7.4 Employee education

Employees should be informed of the need to take precautions and use all protective measures to control dust in working environment. They should also be advised consequences of ignoring these precautions. Proper usage of personal protective equipment to the employee engaged in handling asbestos is to be explained (BIS code of practices IS: 12078-1987) and special emphasis should be given in the EMP

Pictorial warning signs and precautionary notices for asbestos and products containing asbestos are to be made [BIS code of practices IS: 12081 (Part-I) – 1987 (Reaffirmed 1997)]. All workplaces

where asbestos dust may cause a hazard is to be clearly indicated as an asbestos dust exposure area through the use of a well-displayed sign, which identifies the hazard and the associated health effects

Employee should be trained in fibre handling, handling finished products and in spill management. Written policies, procedures and measures should be disseminated throughout the different departments of the plant and workers should be trained with regard to their implementation. The employee should be educated about the safety features incorporated by written literature with pictorial and color-coded signs so that they will not by pass protection and also be confident of their health when controls are in place.

Product dispatch

Explanatory notes

- Asbestos products, or when appropriate, packages of products, have to be labeled or marked as per regulations

Assessment

	Yes	No
• Are all your products effectively labeled?	☐	☐
• Does the label provide adequate information on the product as required by national regulations?	☐	☐

Product safety

Explanatory note

- Friable asbestos containing products should not be for use other than industry, where control norms are applicable
- In case of locked in or bound products it is necessary that the presence of asbestos in the product is notified and simple instruction for construction and usage of products is made available with product

Assessment

	Yes	No
• Is plan of action prepared for the product safety [BIS code of practices IS: 11769 -Part I (All products)/ IS: 11769 -Part II (Filtration material)/IS: 11769- Part III (Others)]	☐	☐

Assessment

	Yes	No
• Proposed to maintain record of education and training activities	☐	☐
• Proposed to provide with an information booklet on the risk related to Asbestos & recommendations to protect themselves from undue exposure	☐	☐
• Does the plant have its own individual training programme for the employees?	☐	☐

7.5 Occupational health

The occupational health surveillance program is to address pre employment health examination and periodic health examination. Every employee on his appointment for a job with a possibility of exposure to airborne asbestos shall get the pre-employment medical examination done within stipulated days of his employment, by the employer. Scheme for health surveillance shall include exposure data at each pertinent work place, periodical examination of workers, X-ray examination for radiological changes, lung function test for restrictive disorder and clinical examination for early detection of signs of asbestosis. These tests are to be recorded for pre-employment, periodic surveillance and at cessation of employment as per the concerned state government regulations. Occupational health surveillance is to be carried out by occupational physician or chest physician trained in occupational medicine. The occupational health surveillance program is to be drawn for all the employees potentially exposed to asbestos dust and it is to be provided free of cost.

The medical records is to be maintained and stored for period of 15 years following the termination of employment or for 40 years after first day of employment, whichever is later. The medical records is to be maintained covering the details of pre-employment examination, the periodical medical examinations, medical examination done at other times, if any and the medical examinations conducted at cessation of employment and further follow-up examinations, where done. The records shall also be maintained of the individual employee's occupational exposure profile to asbestos, specific work practices, and preventive measures prescribed, if any.

The occupational health surveillance program is to address the following aspects

- Pre-employment medical examination
- Periodic medical examination
- Medical employment at cessation of employment
- Maintenance of medical records and
- Health education

Scheme for occupational health monitoring is to be prepared in detail [BIS code of practices IS: 11451-1986 (Reaffirmed 2005) (Recommendations for safety health requirements relating to occupational exposure to asbestos)]

Occupational health surveillance

Assessment

	Yes	No
• Does the occupational health professional of the plant responsible for counting of fibre take part in national or international training?	☐	☐
• Are new or re-employed workers submitted to medical exams prior to working in the plant?	☐	☐
• Are temporary workers submitted to medical screening?	☐	☐
• Is there a register of individual health records (subject to professional confidentiality)?	☐	☐
• Are the workers made aware of the results from their own medical examinations?	☐	☐
• Are the occupational health services of the plant made aware of the workers dust exposure results? Do they carry out regular visit of the plant?	☐	☐

7.6 Work place monitoring

The key element of concern is control of work place exposure by proper work practices and engineering controls and their monitoring. Continued health surveillance will add to further reinforcement to controlled usage theory. Activities in the process with potential for release of asbestos into the environment are to be identified with the help of detailed process flow diagram. Engineering controls are to be prepared for all identified workplaces to reduce the exposure to less than permitted levels.

Sampling frequency is to be determined depending upon locations and previous dust concentrations recorded. Sampling frequency is to be increased at locations where dust concentrations exceed the exposure limit, so that appropriate engineering controls are planned. Sampling shall also be carried out after structural modification of the plant or any changes made in the process of product manufacture. However, the following general guidelines can be considered while preparing workplace-monitoring schedule.

- Once in a month where asbestos dust concentration is likely to exceed prescribed exposure limit occasionally
- Once in three months where asbestos dust concentration is likely to be between exposure limit and action level
- Once in every 6 to 12 months where asbestos dust concentration is below action level, and
- Once in every 12 months at all work spots where there is asbestos exposure irrespective of dust concentration

The scheme for implementation of work place monitoring on the lines of IS: 11450: 2006 (Recommendations for safety and health requirements relating to occupational exposure to asbestos) and IS: 11451-1986 (Reaffirmed 2005) (Method for determination of airborne asbestos fibre concentration in work environment by light microscopy membrane filter method) should be prepared along with the infrastructure and manpower requirements

Dust Monitoring

Explanatory notes

- The register shall cover all potentially expose workers and be compatible with the national regulations
- It shall be integrated to personnel and medical record systems
- Workers shall be give free access to information related to dust monitoring
- Monitoring of the work place shall cover

➢ Personal samplings of workers, including
Maintaining activities (machines, dust collectors and filtration systems, housekeeping and work practice)-waste disposal practices

➢ Static sampling, where appropriate

➢ Monitoring shall be fully quality –assured in all of its aspects

Assessment

	Yes	No
• Is a dust exposure record of different places is taken regularly?		
• Is a register maintained at the plant location?		
• Are the national regulations and procedures known?		
• Is the air monitoring carried out according to formal strategy?		
• Does the person in charge of counting air samples competent?		
• Are the workers informed of the workplace dust monitoring results?		
• What is periodicity of counting?		

7.7 Risk assessment

Although asbestos industry will not cause any disastrous emergencies, control measures due to accidental discharge, spillages of asbestos during transportation, storage and manufacturing process is to be assessed.

In case any damaged bag is found during handling, the same shall be repaired by pasting adhesive tapes or by stitching the damaged area in such a way as to avoid escape of fibre into the atmosphere

Dropping or dragging of finished product shall be avoided. The spill management scheme by vacuum cleaning, wet mopping, sealing and re-bagging is to be drawn for identified areas of accidental discharge and to be communicated to the concerned

Actions to be taken in the event of accidental spillage should be made known to the drivers of vehicles carrying asbestos waste in writing and also carried in the vehicle so that in the event of accident making the driver incapable of action, the rescue or fire brigade team will know about the actions to be taken

Emergency management

Explanatory notes

A system of preventative maintenance should be established to minimize emergency events Typical unexpected situations comprise

- Failure of dust collection and/or filtration device
- Accidental spillage of asbestos or dust containing asbestos
- Failure of the ducted extraction network

Well-controlled storage and dispensing of fibres are essential to avoid unexpected exposure during handling. Clear instructions should be given to those entering the area

Assessment

	Yes	No
• Has the company plans to design a formal and written emergency plan related to health risks?		
• Are the potentially major dust sources clearly identified?		
• Is a visual inspection of the dust control systems regularly planned?		
• Are there individual instructions or procedures to deal with accidental failures of the dust collection network planned?		
• Is an annual engineering check of the technical preventive equipment planned?		
• Is a permanent record of the maintenance activities planned?		
• Is a responsible designated person to carry out inspection of the asbestos bags planned?		

CHAPTER 8

Project benefits

8.0 General

This chapter shall include the improvements in physical infrastructure and social infrastructure

- Improvements in the physical infrastructure by way addition of project infrastructure, ancillary industries that may come up on account of the project
- Improvements in the social structure like roads, educational institutions, hospitals, township etc
- Employment potential – skilled, semiskilled 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

CHAPTER 9

Environmental cost benefit analysis

9.0 General

If recommended by the Expert Appraisal Committee at the scoping stage this chapter shall include the environmental cost benefit analysis of the project

CHAPTER 10

Environmental Management Plan

10.0 General

The objective of Environmental Management Plan is to…

- Ensure the mitigation measures are implemented
- Establish systems and procedures for this purpose
- Monitor the effectiveness of mitigation measures and
- Take any necessary action when unforeseen impacts occur

10.1 Components of EMP

The EMP should contain the following:

- Summary of potential impacts & recommended mitigation measures. Allocation of resources and responsibilities for plan implementation
- Administrative and technical setup for management of environment
- 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
- Environmental specifications for contractors should cover the required safeguards during the design and construction stage

10.2 Self assessment - Environmental control status

- Approach towards voluntary compliance should be explained

ISO 14001, ISO 18001

- Approach towards integration of environmental issues into company structure?

Procedural manuals, advisory literature, role of officials

- Defined review mechanism should be discussed

Systems for review, presentation, allocation of funds

10.3 Environmental cell

It is desirable for the proponent to set up a separate environmental cell to oversee implementation of the EMP and evaluate the results of monitoring. Survey and analysis to be carried out periodically

CHAPTER 11

Summary and conclusions

11.0 General

Summary EIA shall be a summary of the full EIA report condensed to ten A-4 size pages at the maximum. It should necessarily cover in brief the following chapters of the full EIA report.

- Introduction
- Project description
- Description of the environment
- Anticipated environmental impacts & mitigation measures
- Additional studies
- Project benefits
- Important Aspects of the Environmental Management Plan and
- Important Aspects of the Environmental Monitoring Programme
- Disclosure of consultants engaged

CHAPTER 12

Disclosure of consultants engaged

12.0 General

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

Tables

Table No. 1 Description of ambient air quality monitoring stations

Station No.	Location	Distance & Direction from project area	Zone (Project area/ study area)	Remarks

Table No. 2 Ambient air quality-monitoring results

Parameter	Particulate Matter ($PM_{2.5}$)**			Particulate Matter (PM_{10})**			Asbestos fibres***			Nox**			SO_2**			CO**		
Monitoring Station & Category*	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean

- *Industrial,Residential, Rural and other areas/ecologically sensitive area (notified by Central Government)
- ** micro grams per M^3
- *** fibre/cc

Table No. 3 Description of ground water sampling locations

Station No.	Location	Distance & Direction from project area	Zone (Project area/ study area)	Remarks
GW				

Table No. 4 Description of surface water sampling locations

Station No.	Location	Distance & Direction from project area	Zone (Project area/ study area)	Remarks
SW				

Table No. 5 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

Annexures

Annexure 1

Terms of Reference (TOR)
For Environmental Impact Assessment of Asbestos based Industries

Objective

Terms of Reference (TOR) for preparation of Environmental Impact Assessment (EIA) and Environmental Management Plan for Asbestos and asbestos based products as per the EIA notification, 2006 has been devised to improve focus of the reports to specified sector and to facilitate the decision making transparent and easy. The TOR will help the project proponents to prepare report with relevant project specific data and easily interpretable information. TOR for Asbestos based products project is expected to cover all environmental related features.

General Information

Asbestos is common term used for various types of naturally occurring mineral fibres of Magnesium silicate. Key element related to the sector is health effects of Asbestos related issues. EIA report should provide latest scientific reports on these issues particularly related to the type of Asbestos used and the type of industry. Every chapter should contain information relevant to use of asbestos and explain the regulatory approach and adequacy of measures proposed to address the issue. To minimize the adverse effects that may be created by the project, techniques of EIA become necessary.

All projects of Asbestos milling and asbestos based products are classified as category-A projects as per the EIA Notification, 2006.

The EIA-EMP report should be based on highest achievable i.e., peak rated capacity of the project in terms of Asbestos fibre handling, technology, equipment, manpower, resource use, land requirement etc.
The report should be based on generic structure given in Appendix III to the EIA notification 2006 for the project. The report should incorporate the page numbers of various chapters, sections and sub-sections, tables, appendices, drawings and figures etc., with titles shall be clearly indicated under the heading contents.

1.0 Introduction

This chapter should cover the following:

- Purpose of the project, brief description of the project, project name, nature, size, its importance to the region and the country
- Profile of the project proponent, name and contact address with e-mail, organizational chart, project consultants etc., should be mentioned
- Land description – plot/survey/ village, tehsil, district, state & extent of the land should be mentioned clearly

- The proponent should confirm that the project meets the central/state/local environmental regulations and standards applicable for asbestos based industries
- 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
- In case of expansion/ modernization of the project, the environmental compliance status for the existing project should be explained

2.0 Project description

This chapter should cover the following:

- Broader details of the basic activities. Type of the project – new/expansion/modernization
- Magnitude of operation giving the production quantities, energy requirements, area of buildings for operation, storage etc. This should include location of any ancillary operations and associated activities. Type of fibres used (Asbestos and others) and preference of selection from techno-environmental angle should be furnished
- As asbestos is used in several products and as the level of precautions differ from milling to usage in cement products, friction products gasketing, textiles and also differ with the process used, it is necessary to give process description and reasons for the choice for selection of process
- Technology adopted, flow chart, process description and layout marking areas of potential environmental impacts
- Land acquisition and rehabilitation - present status of such activities should be discussed.
- National standards and codes of practice in the use of asbestos particular to the industry should be furnished
- In case of newly introduced technology, it should include the consequences of any failure of equipment/ technology and the product on environmental status.
- Manpower requirement at different stages of the project and time frame
- Estimated cost: capital/operational cost. State specifically, the cost for environmental issues (capital and operational cost)

Essential topo sheet/maps to be provided with TOR application

- A map specifying locations of the state, districts and project location
- A map of covering aerial distance of 15KMs from the proposed project location delineating environmental sensitive areas as specified in Form 1 of EIA notification dated 14th Sep 06
- Land use map of 5 KM from of the boundary of the project site to 1:25,000 based on recent satellite imagery
- Layout plan to a scale of 1:5000 scale for the proposed development covering administrative and operational buildings, storage yards, township, green belt development etc, boundaries of proposed activity with latitude and longitude is to be submitted

3.0 Analysis of alternatives (Technology & Sites)

In case, the scoping exercise results in need for alternatives this chapter shall include:

- Description of various alternatives like locations or layouts or technologies studied
- Description of each alternative
- Summary of adverse impacts of each alternative
- Selection of alternative

4.0 Description of the Environment

Study area

The chapter on environmental baseline data should include baseline data of all the pertinent parameters of environment. As a primary requirement of EIA process, the proponent should collect primary baseline data in the project area as well as the area falling within 1 km from the proposed project boundary and secondary data should be collected with in 15 kms aerial distance as specifically mentioned at column no 9(iii) of Form I of EIA Notification 2006. The study areas mentioned in this document shall be considered for guidance purpose only. The exact study area for different environmental attributes (water, air, noise, soil etc) is to be submitted considering the proposed project activity and location, with proper reasoning, for review and approval by the expert appraisal committee.

TOR application should contain details of secondary data; the source of secondary data, meteorological data of nearest station of IMD along with wind roses and proposed monitoring locations should be marked on the study map. Similarly the proposed locations of monitoring stations of water, air, soil, noise etc shall be shown on the study area map. One season monitoring data excluding monsoon should be collected. Period/date of data collection should be clearly indicated. The proposed monitoring stations of water, air, soil, noise etc should be shown on the study area map

4.1 Land Environment

- Data of the land and its availability and justification of the proposed area
- Study of land use pattern, habitation, forest cover, surface water bodies, fauna and flora, environmentally sensitive places etc. by using recent satellite imagery or through secondary data sources
- Baseline data of soil at the project site and within 1Km of boundary should be included. Soil data should be generated to ascertain suitability for development of greenbelt and rainwater harvest structures
- Road/rail connectivity and suitability for transporting the raw material and finished product should be discussed
- Strom water drainage system of the area should be discussed

4.2 Air Environment

- Climate and meteorology (temperature, relative humidity and rainfall). Indicate the nearest IMD meteorological station from which climatological data have been obtained
- Wind rose (Wind directions and speeds, 24 hourly data)
- Description of ambient air parameter within 1km from the project boundary in relation to the discharges anticipated should be covered. One station should be in the up-wind/non-impact/non-polluting area as a control station. Measurements of RSPM, NOx and asbestos fibre as per CPCB procedures should be done. Measurement of SO_2 and NOx in case a boiler or dryer is used should be taken up
- Measurement of concentration of fibrous material by phase contrast optical microscopy at outer limits of factory and within 1 KM from the project boundary in downward wind direction should be done
- 24-hour air quality monitoring, during non-rainy days, at selected locations for a minimum of 4 times should be carried out.
- In case of expansion and modernization existing records of stack emission and particulate matter should be furnished

4.3 Water Environment

- Water requirement during construction and operational stages from various activities should be furnished. Wastewater generation during the construction and operational stages with a suitable flow chart should be furnished.
- Information on surface water bodies and ground water table along with present use should be furnished. Locations of monitoring stations should be shown on a scale map. Criteria for selecting the locations for monitoring stations should be discussed
- Suggested parameters for monitoring: pH, TSS, TDS, oil & grease, BOD, COD, sulphates, sulphides
- Water quality within 1Km from the project boundary should be monitored

4.4 Noise

Note noise levels at outer limits of the project boundary and within 1km from the project boundary especially at habitation should be monitored during daytime and nighttime

4.5 Biological Environment

Details on secondary data on the existing flora and fauna in the study area, carried out by an university/institution under the relevant discipline (such as BSI, ZSI, WII, etc) shall be included in the list of flora and fauna along with classification as per schedule given in the Wild Life Protection Act, 1972 (for fauna) and in the Red Book Data (flora) and a statement clearly specifying whether the study area forms a part of an ecologically sensitive area or migratory corridor of any endangered fauna.

4.6 Socio-economic environment

Present employment on livelihood of these populations, awareness of the population about the proposed activity is to be included. Settlements, health status of the communities, existing infrastructure facilities within the study area should be covered.

4.7 Solid waste

Type and quantity of solid waste generated during the construction and operational stages. Details of authorized municipal solid facilities/HW waste disposal facilities, if the project is proposing to dispose the solid waste with these facilities. Include methodology for safe storage practices, disposal of used asbestos bags and used filter bags of asbestos.

5.0 Anticipated Environmental Impacts and Mitigation Measures

This chapter should describe the likely impacts of the project during its construction and operational phases, on each of the environmental parameters, methods adopted for assessing the impact, reference to existing similar situations, reference to previous studies, details of mitigation methods proposed to reduce adverse effects of the project, best environmental practices and conservation of natural resources.

5.1 Land Environment

Anticipated impacts

Impact of the project on the land requirement/use pattern should be assessed. Prediction of impact on the existing infrastructures like road network, housing, ground water/surface water etc. loss of productive soil and impact on natural drainage pattern. The immediate surroundings may have a greater impact. The existing surrounding features up to 1 Km and impact on them should be addressed

Mitigation Measures

Proper mitigation measures should be covered. Some examples include: Selection of suitable local plant species for green belt development in and around the site, improved road network to handle the increase in traffic and truck parking arrangements, usage of alternative building materials such as fly-ash. Rainwater harvesting systems

5.2 Air Environment

Anticipated Impacts

All relevant aspects having significant adverse effect on air environment should be identified. Identification of fugitive emissions during material transport, transfer, storage, manufacturing process etc. and the impacts should be assessed. Details of stacks, nature of pollutant discharge, pollution load with and with out control systems should be assessed

Mitigation Measures

- Provision of air pollution control equipment used to comply with the emission standards of 0.2 fibre/ cc for asbestos fibre and 2 mg/Nm3 for total dust.
- Provision of control systems and establish management practices to comply the asbestos fibre concentration at work place of 1 fibre/ cc, as per the factories act
- Number of stacks, location and type of pollutant present in the discharge
- Impact on environment using approved air dispersion modeling with controls
- Methods employed for reduction of fugitive emissions where asbestos fibres and other raw materials are stored and handled
- Material transfer points should be connected to dust extraction system
- Floor cleaning by vacuum cleaner/ Minimization of manual handling of asbestos

5.3 Water environment

Anticipated impacts

Quantity and characteristics of trade effluent and domestic effluent and its impact on the environment should be assessed

Mitigation Measures

Methods proposed to reduce consumption by re-usage should be covered. Treatment methods proposed to treat the effluent to comply the norms and point of final disposal. Energy efficient systems proposed for treating the liquid waste. Best practices for house keeping maintenance. Water harvesting proposal to recharge underground water

5.4 Noise

Anticipated Impact

Impacts due to the operation of machinery and DG sets should be assessed

Mitigation Measures

- Engineering controls proposed to reduce the noise levels by sound absorbing materials of higher NRC using enclosure of restraining material with higher STC
- Noise from the DG set should be controlled by providing an acoustic enclosure or by treating the room acoustically
- Environmental specifications for contractors and equipment purchase to meet the noise standards
- The ambient air quality standards in respect of noise as notified under Environment (Protection) Act, 1986 should be complied at the boundary of the project

5.5 Biological Environment

Anticipated Impacts

- Impact on flora and fauna due to air emissions, noise and vibration, vehicular movement, waste water discharges, changes in land use, township etc

Mitigation Measures

- Identification of sensitive areas in the early planning stage around the site so that alternative site can be examined
- Green belt development

5.6 Socio- economic Environment

Anticipated Impacts

- Positive and negative impact on present status of livelihood in the area
- Impact on heritage/historical sites in the study area
- Impact on the cropping pattern and crop productivity with in 2 km
- Impact on community resources such as grazing land
- Displacement of human settlement from project area
- Revenue contribution to government/local bodies and local area development activities

Mitigation Measures

- Rehabilitation plan for land oustees and displaced people
- Training to locals for employment in the project
- Employment opportunity and access to other amenities such as education, health care facilities for local people
- Socio-economic survey conducted and the analysis to identify areas of corporate contribution to improve quality of life

5.7 Solid waste Environment

Anticipated Impacts

- Anticipated waste per unit of production- hazardous, non-hazardous should be assessed
- Impact due to solid waste during handling, storage and transportation should be assessed

Mitigation Measures

- Steps to minimize the waste generation should be furnished
- Steps to maximize utilization by recycling or use in other products should be furnished
- Treatment of such waste to render them less harmful or non-hazardous and disposal by secured landfill should be furnished

6.0 Environmental Management Program

This chapter shall include details of mitigation measures to be followed. It shall include the technical aspects of monitoring the effectiveness of mitigation measures (including measurement methodologies, data analysis, reporting schedules, emergency procedures, detailed budget & procurement schedules)

Project Monitoring

- Safety audit of Engineering controls adopted and their effectiveness
- Method used for measuring stack emissions for asbestos fibres and particulate matter
- Proposed air quality monitoring, scheme for Asbestos exposures
- Frequency of air quality monitoring of stack emission, personal sampling, static background dust sampling and at project boundary
- Requirement of monitoring facilities
- Quantity and measurement of discharges and disposal of solid wastes and effluents if any and take steps to progressively recycle in any of products
- Plantation monitoring programme

Control Initiatives

List out data from BIS codes of practice, CPCB publication, other Government studies and data related to Asbestos-Health control objectives that would be implemented at appropriate place in EIA

7.0 Additional Studies

Specific condition/ Area	Study required
Scoping stage	Studies directed by the Expert Appraisal Committee while deciding the TOR for the project
Public consultation	Public consultation should be conducted as per the procedure laid down in EIA Notification 2006. The issues raised by the public and response of the project proponent should be furnished in a tabular form
Worker Education	Workers should be informed of the need to take precautions and use all protective measures to control dust in working environment. They should also be advised consequences of ignoring these precautions
Occupational health	Steps taken to follow factory rules for health monitoring of workers. Pre employment data, Periodical monitoring and at Cessation of employment Scheme as per IS: 11451 - 1986 History of exposure, X-ray of Chest PA, Lung function test, Clinical examination are identified for this health monitoring
Work place Health Monitoring	Specify activities in process with potential for release of asbestos into environment. Engineering controls at work place to reduce exposure to less than permitted levels. Equipment for fiber

	measurement of personal and site sampling. Dust measurement scheme identifying potential exposure sites as per the relevant BIS
Risk analysis and DMP	Although asbestos industry will not cause any disastrous emergencies, control measures due to accidental discharge, spillages of asbestos during transportation, storage and manufacturing process is to be discussed such as vacuum cleaning, wet mopping, sealing, re-bagging. The responsibilities and co-ordination during the emergencies is to be discussed

8.0 Project benefits

This chapter shall include the improvements in physical infrastructure and social infrastructure, if any. 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

9.0 Environmental Management Plan

- Administrative and technical set up for management of environment
- Summary matrix of EMP and costing of EMP, during construction and operation stage
- Institutional arrangements proposed with other organizations/Government authorities for effective implementation of environmental measures proposed in the EIA
- Safeguards/mechanism to continue the assumptions/field conditions made in the EIA for arriving the site suitability
- Air pollution equipment to meet standards under EP Act/ Factories act should be provided

10.0 Summary and conclusion (Summary EIA)

It shall be a summary of the full EIA report condensed to ten A4 size pages at maximum. It should cover in brief the chapters of full EIA report – Introduction / Project description/ Description of the environment/ Anticipated Environmental impacts and Mitigation measures/ Additional studies/ Environmental monitoring programme/ Project benefits/ Environment Management Plan/Disclosure of consultants engaged

11.0 Disclosure of consultants engaged

Area of consultancy and relevant resume of consultant for Environmental issues and Occupational health issues. Competency and experience of project proponent or the consultant to control schemes for environmental safety should be furnished

Enclosures

Feasibility report / Form I / Photos of proposed project site, impact area

Annexure 2

Land use / land cover classification system

S. No	Level –I	Level-II
1.	Built up land	1.1 Built up land
		1.2 Road
		1.3 Railway
2.	Agricultural Land	2.1 Cropland
		2.2 Fallow (Residual)
3.	Forest	3.1 Evergreen/Semi-evergreen forests
		3.2 Deciduous forest
		3.3 Degraded/Scrub Land
		3.4 Forest blank
		3.5 Forest plantation
		3.6 Mangrove
		3.7 Cropland in Forest
4.	Waste land	4.1 Salt effected 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 Barren rocky/Stony waste/ sheetrock area
5.	Water Bodies	5.1 River/Stream
		5.2 Lake/Reservoir
		5.3 Tank/Canal
6.	Others	6.1 Grass land/Grazing land
		6.2 Shifting Cultivation
		6.3 Snow Cover/Glacial area

(Source: Draft National EIA guidance manual by NEERI)

Annexure 3

Air quality network requirements

Pollutant	Region population	Minimum No. Of Air quality monitoring stations
Particulate matter	Less than 100,000 100,000-1,000,000 1,000-001-5,000,000 Above 5,000,000	4 4+0.6 per 100,000 population 7.5+0.25 per 100,000 population 12+0.16 per 100,000 population
SO_2	Less than 1,00,000 1,00,001-5,00,000 5,00,001-10,00,000 Above 10,00,000	3 2.5+0.5 per 1,00,000 population 6+0.15 per 1,00,000 population 20
NO_2	Less than 1,00,000 1,00,000-5,00,000 Above 1,000,000	4 4+0.6 per 1,00,000 population 10
CO	Less than 1,00,000 1,00,000-5,00,000 Above 5,000,000	1 1+0.15 per 1,00,000 population 6+0.05 per 1,00,000 population
Region means the study area around the project boundary area decided in scoping Additional monitoring locations should be set up if sensitive sites such as places of archeological importance and biosphere reserves exist		

(Source: National Ambient Air Quality Series: NAAQMS/25/2003-04-CPCB)

Annexure 4

National Ambient Air Quality Standards (NAAQS)

S. No	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, 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 80	20 80	-Improved West & Gaeke -Ultraviolet fluorescence
2	Nitrogen Dioxide (NO_2), µg/m^3	Annual* 24 hours**	40 80	30 80	-Modified Jacob & Hochheiser (Na-Arsenite) -Chemiluminescence
3	Particulate Matter (Size less than 10µm) or PM_{10}µg/m^3	Annual* 24 hours**	60 100	60 100	- Gravimetric - TOEM - Beta attenuation
4	Particulate Matter (Size less than 2.5µm) 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 1.0	-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	Annual*	01	01	-Solvent extraction

	(BaP) – particulate phase only, ng/m^3				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 5

Ambient Air Quality Standards in respect of Noise

Area code	Category of area	Limits in db (A) Leq	
		Day time	Night time
A	Industrial area	75	70
B	Commercial area	65	55
C	Residential area	55	45
D	Silence zone	50	40

Note:

1. Day time shall mean from 6.00 a.m. to 10.00 p.m.
2. Night time shall mean from 10.00 p.m. to 6.00 a.m.
3. Silence zone is an area comprising not less than 100 meters around hospitals, educational institutions, courts, religious places or any other area, which is declared as such by the competent authority.
4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

* dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

A "decibel" is a unit in which noise is measured.

"A", in dB(A) L_{eq}, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

L_{eq}: It is an energy mean of the noise level over a specified period.

(Source: Noise pollution (Regulation and control) Rules, 2000)

Annexure 6

Illustrative types of socioeconomic impacts

Impact Area	Potential Changes
General Characteristics and trends in population of region	Increase or decrease in population
Migration trends in study area	Increase or decrease in migration trends
Population characteristics in study area, including distributions by age, sex, ethnic groups, educational level and family size	Increase or decrease in various population distributions, people relocations
Distinct settlement of ethnic groups or deprived economic/ minority groups	Disruption settlement patterns, people relocations
Economic history for the region	Changes in economic patterns
Employment pattern in study area, including occupational distribution and location and availability of work force	Increase or decrease in overall employment or unemployment levels and change in occupational distribution
Income levels and tends for study area	Increase or decrease in income levels
Land values in study area	Increase or decrease in land values
Housing characteristics in study area, including in types of housing and occupancy levels	Changes in types of hosing and occupancy levels
Health and social services in study area, including health, workforce, law enforcement, fire protection, water supply, wastewater treatment facilities, solid waste collection and disposal and utilities	Changes in demand on health and social services
Public and private educational resources in study area	Changes in demand on educational resources
Transportation systems in study area, including high way, rail, air and waterway	Changes in demand on transportation systems
Community cohesion, including organized community groups	Disruption of cohesion
Tourism and recreational opportunities in study area	Increase or decrease in tourism and recreational potential
Religious patterns and characteristics in study area	Disruption of religious patterns and characteristics
Areas of unique significance such as cemeteries of religious camps	Disruption of unique areas

(Source: Draft National EIA Guidance Manual-NEERI)

Annexure 7

The minimum stack-height of dispersal of sulphur dioxide

For the small boilers using coal or liquid fuels, the required stack height with the boiler shall be calculated by using the formula

$$H=14\ Q^{0.3}$$

Where: H - total stack height in meters from the ground level
Q - SO_2 emission rate in kg/hr

Note: 1. In no case the stack height shall be less than 11 meters
2. Where providing all stacks are not feasible using above formula the limit of 400mg/Nm^3 for SO_2 emission shall be met by providing necessary control equipment with a minimum stack height of 11 meters

(Source: G.S.R 176 (E) dated 02.04.1996)

Annexure 8

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 (5 days at 20^0 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:				
	a. Alpha emitter micro curie/ml	10^{-7}	10^{-7}	10^{-7}	10^{-7}
	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 9

Static Monitoring

Static monitoring is used for assessing the effectiveness of process control techniques, detecting sources of contamination, determining background fibre concentration, etc., and does not yield a measurement representative of personal exposure. Samples collected at fixed locations – for example, outside asbestos stripping and encapsulating and inside buildings or ships that contain asbestos are called static samples and form the basis of static monitoring. This type of sampling is often conducted where there are a high proportion of fibres other than the one of principal interest, or particles that conforms to the definition of fibre. Such interferences can cause problems in the interpretation of the results obtained by this method, which can be resolved only by obtaining information on fibre composition using other methods (e.g. Electron Microscopy)

The parameters and methodology specified for personal sampling generally apply to static monitoring. The main differences are indicated in the following discussion.

Sampling

Samples are taken at fixed locations. The sampling head should be mounted on a stand, usually 1-2 meters above floor level, with the cowl facing downwards, allowing free air circulation around the entry. It should be positioned with regard to local sources of dust or clean air. Cross-draughts of more than 1 $m.s^{-1}$ may reduce fibre collection.

Flow rate

The sampling flow rate should be in the range 0.5-16 litres.min^{-1}

Flow rates are usually higher for static sampling than for personal sampling. Over the range specified above, sampling efficiency (for chrysotile) has been found to be independent of flow rate.

Stop-counting rule

One hundred fibres should be counted, or 200 graticule areas inspected, whichever comes first. Fibres should, however, be counted in at least 20 graticule areas.

In many static-monitoring situations, it is necessary to inspect 200 graticule areas.

If static monitoring is used in making measurements of air-borne asbestos for the purposes of asbestos abatement, for example, and therefore comparisons are made with a clearance indicator, it may be unnecessary to evaluate 200 fields would indicate a concentration of 0.015 $fibres.ml^{-1}$ (and the clearance indicator is 0.010 $fibres.ml^{-1}$), it would be possible to report an enclosure as unsatisfactory as soon as a count of 30 fibres is obtained, even if only a few fields have been examined.

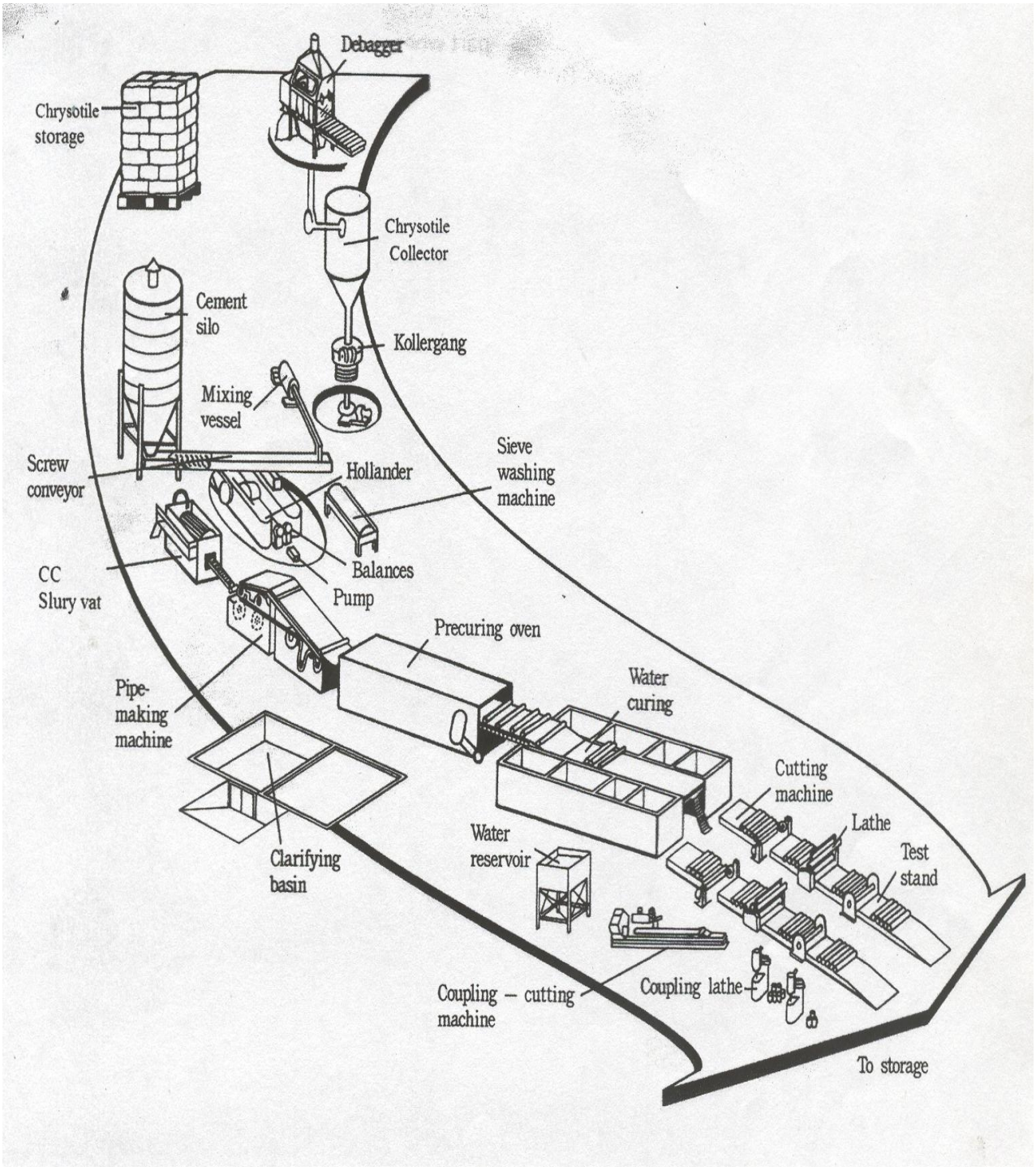
The stop-counting rule and minimum total sample volume are usually such that the number of fibres counted in the neighborhood of typical clearance indicators is below the lower limit of the

recommended density range for optimal accuracy and precision, or even below the detection limit of the method. Therefore, concentration estimates can often be only approximate. The detection limit depends on the sample volume and should be reported by the laboratory with its results. For example, the limit of detection, assuming a 480-litre sample, an effective filter area of 380mm^2 and 200 graticule areas examined, is 0.010 fibres.ml^{-1}. A counting result falling below this limit should not be reported literally, but simply as <0.010 fibres.ml^{-1}.

(Source: Determination of Airborne fibre membrane filter method –WHO Geneva 1997)

Annexure 10

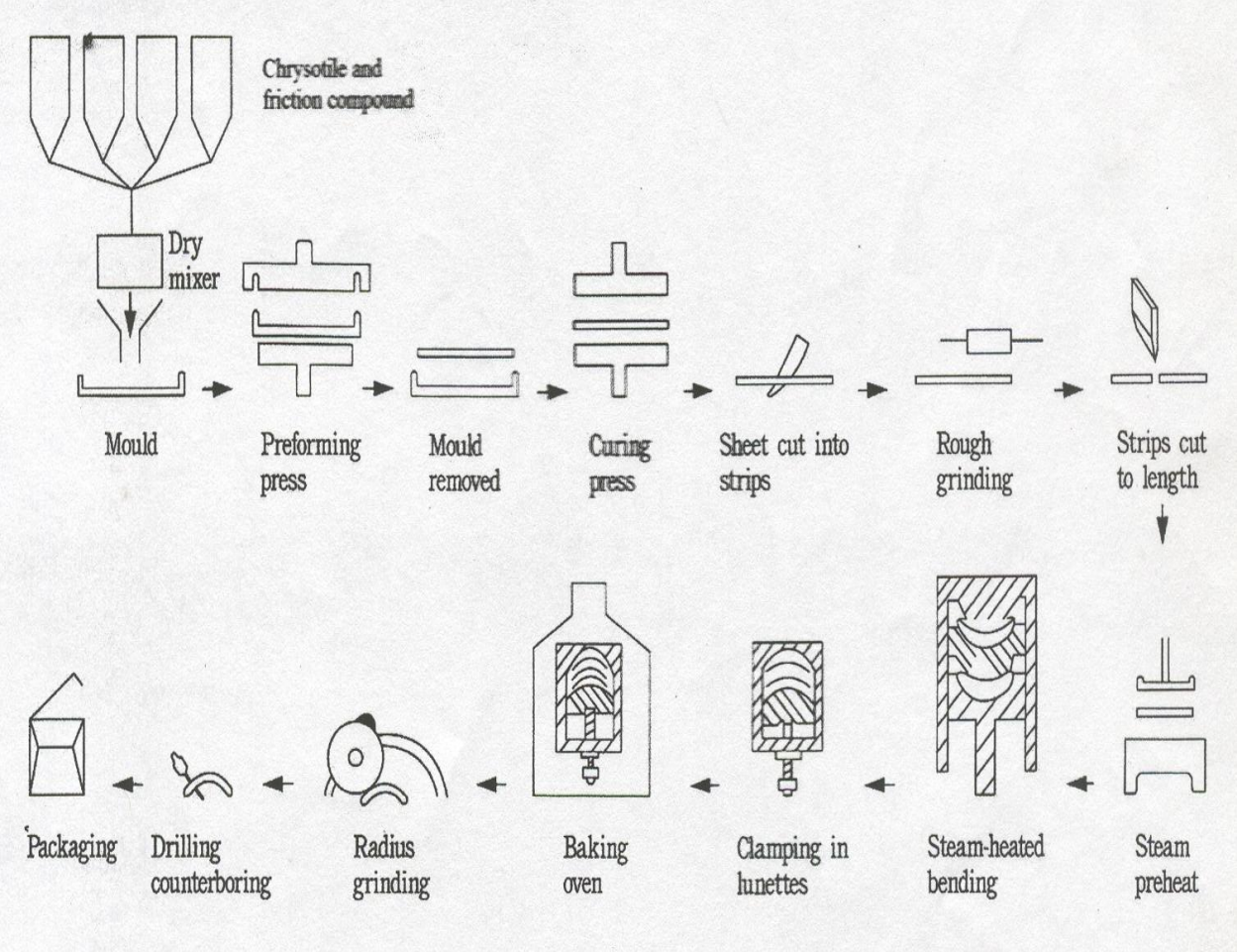
General process flow diagram of chrysotile cement pipe manufacturing plant



(Source: The basics of Chrysotile asbestos dust control (Fourth Edition 2008, The Chrysotile Institute) by Mr. Gordon M. Bragg)

Annexure 11

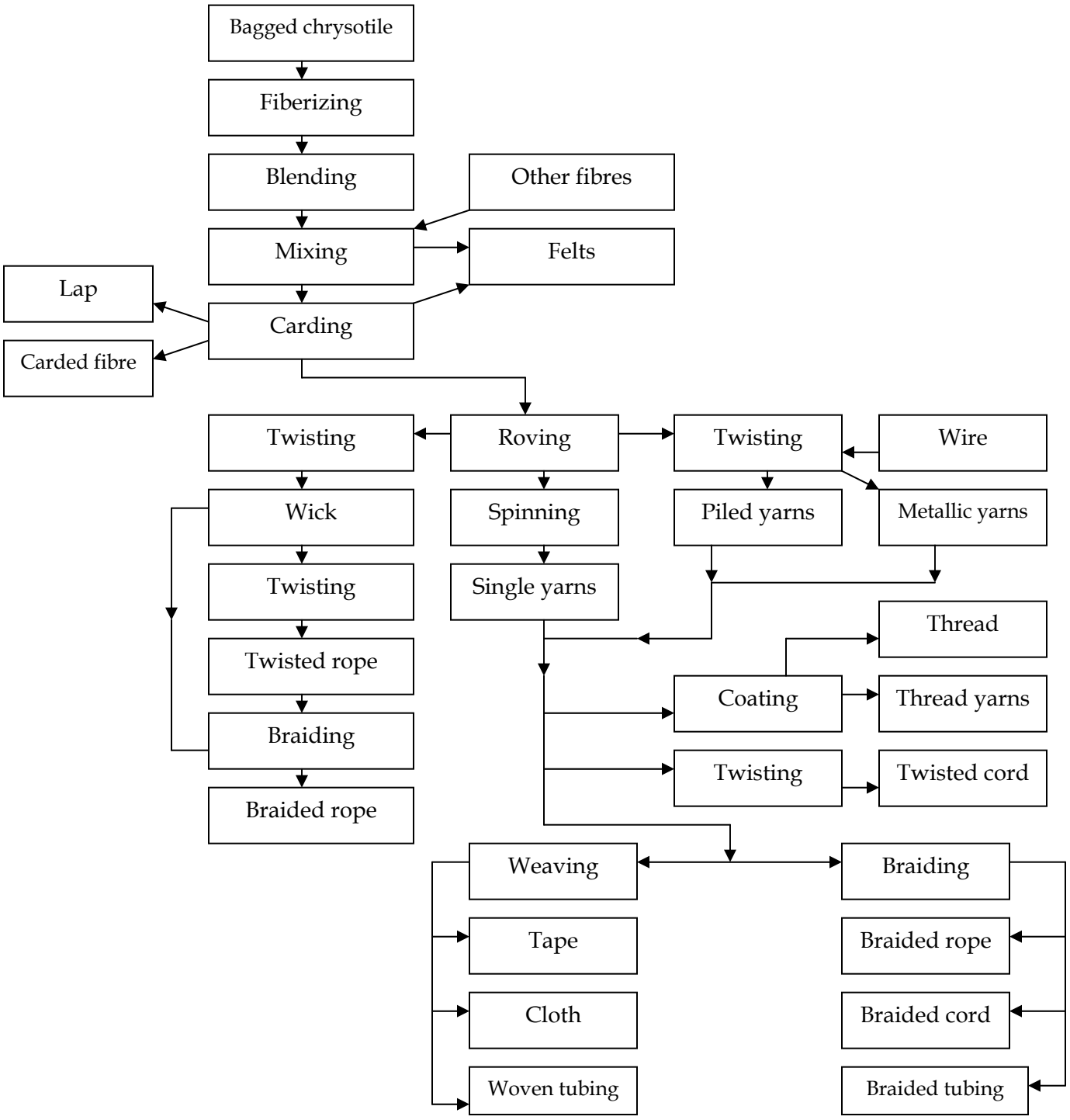
General process flow diagram of friction products



(Source: The basics of Chrysotile asbestos dust control (Fourth Edition 2008, The Chrysotile Institute) by Mr. Gordon M. Bragg)

Annexure 12

General process flow diagram in industrial textile plants



(Source: The basics of Chrysotile asbestos dust control (Fourth Edition 2008, The Chrysotile Institute) by Mr. Gordon M. Bragg)

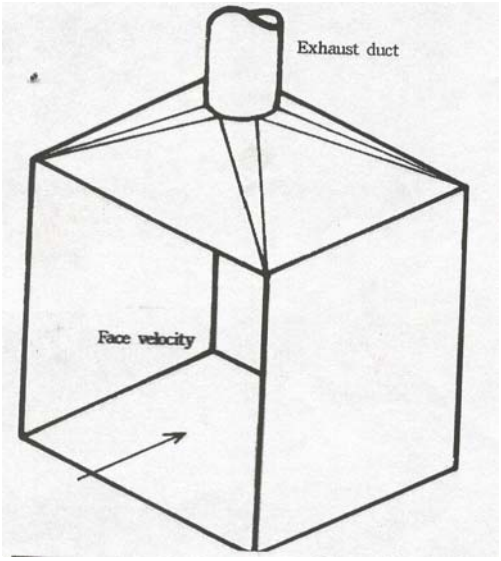
Annexure 13

Good practices of hood design

A basic exhaust hood is shown in figure. An exhaust hood controls the intake to the exhaust duct. This is necessary to overcome local air currents where dust or fumes are generated. The exhaust hood helps to maintain air speed, which drops off very quickly with simple openings. The air speed at the hood opening (face velocity) must be strong enough to overcome local air currents and to prevent dust particles within the hood from escaping. That is, the face velocity must be larger than the capture velocity.

The capture velocity or minimum airflow required to capture all dust is the beginning point in designing a ventilation system. The capture velocity will vary with the operation. The velocity at the face of the hood should be 1.0 to 1.25 meters per second (m/s). The controlling velocity at the furthest control point should be 0.25 to 0.30 m/s in a draft less environment, and 0.40 to 0.50 m/s in a very drafty environment.

In general, flanges on hoods improve the entry conditions and reduce the air drawn in from the relatively uncontaminated region, behind the hood. Improved entry conditions enable the hood intake to draw air from a larger effective area, lessen the entry pressure drop, and create a better velocity profile in front of the hood.



(Source: The basics of Chrysotile asbestos dust control (Fourth Edition 2008, The Chrysotile Institute) by Mr. Gordon M. Bragg)

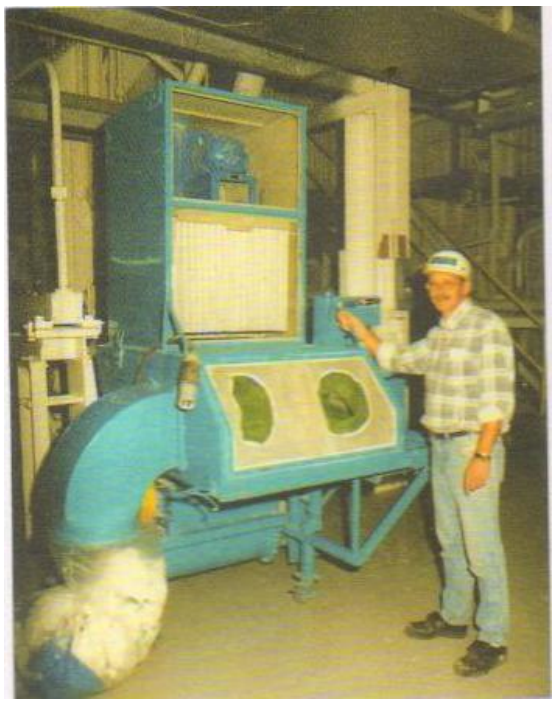
Annexure 14

Good practices in debagging

Figure shows the configuration of a bag opening workstation, which is fully hooded. The recommended face velocity is 1.25 m/s, which, for a 1.0m by 0.75m opening, would require a total flow of 0.94 m^3/s.

Enclosures for friction products require hooding in several locations. All moulding and pressing operations should be carried out under a hood that is ventilated. The design of the enclosure depends on the type of operation, but it should avoid interference with the operator.

Cutting, grinding and drilling require properly designed hoods similar to those for chrysotile cement. This means hoods fitting close to the point where the tool touches the material, together with high velocity/low volume vacuum attachments. Similarly, the despooling operation for yarn in the manufacture of clutch facings, for example, should be fitted with a hood and a partial curtain.



A Fully hooded bag-opening workstation

(Source: The basics of Chrysotile asbestos dust control (Fourth Edition 2008, The Chrysotile Institute) by Mr. Gordon M. Bragg)

Annexure 15

Bureau of Indian Standards related to Asbestos

Subject matter related to recommended code of practices	BIS Code
Method for determination of airborne asbestos fibre concentration in work environment by light microscopy	IS: 11450:2006
Recommendations for safety and health requirements relating to occupational exposure to asbestos	IS: 11451-1986 (Reaffirmed 2005)
Recommendations for control of emission of asbestos dust in premises manufacturing products containing asbestos (Asbestos cement products)	IS: 11770 (Part 1) – 1987
Recommendations for control of emission of asbestos dust in premises manufacturing products containing asbestos (Friction materials)	IS: 11770 (Part 2) – 2006
Recommendations for control of emission of asbestos dust in premises manufacturing products containing asbestos (Non-cement asbestos products other than friction materials)	IS: 11770 (Part 3) (Reaffirmed 2001) – 1987
Recommendations for cleaning premises and plants using asbestos fibres	IS: 11767 – 2005
Recommendations for disposal of asbestos waste material	IS: 11768 – 1986 (Reaffirmed 2005)
Guidelines for safe use of products containing asbestos (Asbestos cement products)	IS: 11769 (Part1) –1987
Guidelines for safe use of products containing asbestos (Friction materials)	IS: 11769 (Part2) –1986
Guidelines for safe use of products containing asbestos (Non-cement asbestos products other than friction materials)	IS: 11769 (Part3) –1986
Recommendations for personal protection of workers engaged in handling asbestos	IS: 12078 – 1987 (Reaffirmed 1997)
Recommendations for packaging, transport and storage of asbestos	IS: 12079-1987 (Reaffirmed 1997)
Recommendations for local exhaust ventilation systems in premises manufacturing products containing asbestos	IS: 12080 – 1987 (Reaffirmed 2001)
Recommendations for pictorial warning signs and precautionary notices for asbestos and products containing asbestos (Workplaces)	IS: 12081 (Part-1) – 1987
Recommendations for pictorial warning signs and precautionary notices for asbestos and products containing asbestos (Asbestos and its products)	IS: 12081 (Part-2) – 1987
Recommendations for the selection, use and maintenance of respiratory protective devices	9263 – 1980

Annexure 16

Dust Sampling Record (Example only)

Place of measurement ☐ Date ☐

Measuring point/Name ☐ .....
Code No. Text in clear

Dimension of workplace ☐ < 50m³ ☐ 50 m³ to 500 m³ ☐ 500 m³ to 5 000 m³ ☐ > 5 000 m³

Exhaust ventilation ☐ yes ☐ no

Situation representative ☐ yes ☐ no

Dust concentration ☐ above average ☐ below average

Visual impression ☐ good ☐ quite good ☐ bad

Number of employees working at this working place : .....

Respirators are worn ☐ yes ☐ no ☐ sometimes Type .....

Draught during measurement ☐ no ☐ yes .....

Measured in the dust-laden air flow ☐ yes ☐ no

Adjoining working places are influenced ☐ no ☐ yes Measuring point No. .....

Measurement was done ☐ personal ☐ static

Sampling device ☐ Atmospheric pressure ☐ mbar

Air flowrate ☐ time started ☐ time ended ☐

Sampling scheme used

Sample No.	Sampling time (min)	Total flow	Working phase	fibres/cm³
☐	.....	.....	.....	☐
☐	.....	.....	.....	☐
☐	.....	.....	.....	☐
☐	.....	.....	.....	☐
☐	.....	.....	.....	☐
☐	.....	.....	.....	☐
			Average value	☐

Harmful substances ☐ Chrysolite ☐ crocidolite ☐ Amosite

☐ ..... (other)

Other fibres ☐ Glassfibre ☐ Mineral wool ☐ ..... (other)

(Source: IS 11450: 2006)

Questionnaire

Questionnaire for environmental appraisal for asbestos based industries

Note 1 :	All information given in the form of annexure should be part of this file itself. Annexures as separate files will not be accepted.
Note 2 :	No abbreviation to be used – Not available or Not applicable should be clearly mentioned

I. General Information

a. Name of the Project :

b. Name of the project proponent :

c. Mailing Address :

E-mail :

Telephone :

Fax Number :

d. Does the proposal relate to new project/ expansion/modernization :

e. Plant capacity (TPA) :

Existing capacity: ☐

After expansion/modernization: ☐

f. Location

R.S. No. &Village	Tehsil	District	State

II. Site information

a. Latitude

b. Longitude

c. Total area envisaged for setting up of project (in ha)

d. Nature of terrain (hilly, valley, plains, coastal plains etc)

e. Nature of Soil (sandy, clayey, sandy loam etc.)

f. Seismic zone classification

g. Does the site falls under CRZ classification?

Yes ☐

No ☐

h. Land usage of the proposed project site

Notified industrial area/estate/ agricultural/forest/grazing/ waste land/ others (pl. specify)

i. Please indicate area earmarked for each of the following (in ha.)

i) Plant facilities	☐
ii) Storage (raw material)	☐
iii) Storage (finished product)	☐
iv) Storage (hazardous waste)	☐
v) Approach road (s)	☐
vi) Green belt	☐
vii) Others (please specify)	☐
Total	☐

III. Details of 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, foraging, resting, over wintering, migration		
4	Inland, coastal, marine or underground waters		
5	State, National boundaries		
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas		
7	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 within 1 km from the project boundary

Description of fauna (non-domesticated) within 1 km from the project boundary

IV. Meteorological Parameters

Based on nearest IMD data for at least 10 years period:

Temperature (in ^{0}C)

(a) Maximum_____ (b) Minimum_____ (c) Mean_____

Rain fall (in mm)

(a) Maximum_____ (b) Minimum_____ (c) Mean_____

Relative humidity (in %)

(a) Maximum_____ (b) Minimum_____ (c) Mean_____

Wind-rose pattern (16 points on compass scale)

Based on site specific monitored data:

Hour	Wind Speed in (Km/h)	Predominant wind direction	Ambient air temperature (in deg C)	Relative humidity (%)	Rainfall (mm)

V. Ambient Air Quality Data

a. Season and period for which monitoring has been carried out

b. Number of samples collected at each site

Date, Time & Location	24 hourly Concentration as monitored	Permissible Standard (As per EPA/SPCB consent)	Remarks (Name of the instrument and sensitivity)

VI. Raw material and Manufacturing Process

a) Raw materials requirement at peak rated capacity
b) Type of asbestos and its source of procurement
c) Brief description of the process with flow chart
d) Details of process technology know how/collaboration
e) Alternate technologies considered
f) Reasons for selecting the proposed technology on environmental considerations

VII. Air Emissions

S. No	Source of Emission	Pollutant (s)	Concentration in flue gas	Emission rate

Details of fugitive emissions (Indicate the points of fugitive emissions and quantities estimated)

VIII. Water Management

a) Source of water
b) Water requirement (KLD)
c) Waste water generation
d) Description of wastewater treatment plan with flow chart
e) Characteristics of waste water stream(s) before and after treatment

Waste stream & quantity (KLD)	Characteristics		Point of disposal
	Before	After	

f) Details of recycling mechanism/ methods proposed to reduce the water requirement by adoption of clean process technologies

IX. Solid Waste Management

Source	Categorization of waste	Qty (TPM)	Method of disposal
Asbestos containing residues			
Discarded asbestos and used filter bags			
Dust/particles from exhaust air			
PPE			
Raw water treatment plant			
ETP			
Others (Pl. Specify)			

a) What are the possibilities of recovery and recycling of wastes?

b) Possible users of Solid Waste (s)

X. Noise Pollution Control and Management

a. Source	
b. Level at Source (dB)	
c. Level at project boundary Capacity (dB)	
d. Abatement measures (give source-wise details)	

XI. Details of employee education planned towards safe handling of asbestos

XII. Occupational Health

a. What are the major occupational health and safety hazards anticipated? (Explain briefly)
b. What provisions have been made/propose to be made to conform to health/safety requirements? (Explain briefly)
c. Details of occupational health surveillance programme planned
d. Details of personal protective equipment provided to the workers
e. Details of measures for control of fugitive emission from different sources

XIII Details of work place monitoring planned

XIV. Emergency management to address failure of dust collection system, spillage of asbestos etc

XV. Environmental Management Plan

a. Details of Pollution Control Systems:

	Existing	Proposed
Air		
Water		
Noise		
Solid Waste		

b. 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)				

c. Details of organizational set up/cell for environmental management and monitoring:

d. Details of community welfare/peripheral development programmes envisaged/being undertaken by the project proponent:

e. Relevant BIS code of practices planned for implementation

BIS Code	Subject matter

XVI. Human Settlement

S. No		Aerial distance from the periphery of the site	
		Up to 500m from the periphery	500m to 1000m from the periphery
1	Population		
2	Number of Houses		
3	Present Occupational Pattern		

XVII. Details of Rehabilitation & Resettlement Plan (Wherever applicable)

XVIII 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

c. Latest 'Environmental Statement' enclosed — Yes ☐ ☐ No

XIX. Public Hearing details

a. Date of Advertisement:
b. Newspapers in which the advertisement appeared (with copies)
c. Date of Hearing
d. Panel Present
e. List of public present
f. Summary/details of public hearing report

S. No	Summary/details of public hearing Issues raised	Recommendation of panel	Response of Project Proponents

The data and information given in this proforma are true to the best of my knowledge and belief

Date:

Signature of the Applicant with Full name & address

Place:

Given under the seal of organization on behalf of whom the applicant is signing

List of documents to be attached with the questionnaire

- A map specifying locations of the state, district and project location
- A map covering aerial distance of 15kms from the project location delineating environmental sensitive areas as specified in Form I of EIA Notification dated 14th September 09
- Land use map of 5km from the project boundary of the project site to 1:25,000 based on recent satellite imagery
- Flow sheet of the process adopted indicating input/output, brief description of the process including technological and engineering details
- Mass balance for water used by the project in a flow chart
- Layout plan to a scale of 1:5000 scale for the proposed development covering administrative operational buildings, storage sheds, township, green belt etc
- Copy of advertisement issued in respect of public hearing
- In case of proposals for expansion copies of latest Consent/HWA from SPCB / PCC
- In case of expansion proposal copy of approval of factory inspector for the existing activity
- Copy of the application submitted to the State Government for the forest clearance in case diversion of forestland is involved
- Environmental statement for the previous two years in case of expansion of existing undertaking

Bibliography

- EIA Notification of MoEF, GoI – 14th September 2006 and 1st December 2009
- Human Health risk assessment studies in Asbestos based industries in India; Programme Objective Series; PROBES/123/2008-2009- CPCB
- Comprehensive industry document on asbestos products manufacturing industry; comprehensive industry document series; COINDS/58/1997-98-CPCB
- Pollution Control Acts, Rules and Notifications issued Thereunder; Pollution control law series-CPCB
- Guidelines for ambient air quality monitoring; National ambient air quality series; NAAQMS/25/2003-04-CPCB
- Guidelines for developing green belts; Programme objective series; PROBES/75/1999-2000-CPCB
- Guidelines for selection of site for land filling; Hazardous waste management series; HAZWAMS/23/2002-03- CPCB
- Guidelines for proper functioning and unkeep of disposal sites; Hazardous waste management series; HAZWAMS/32/2005-2006- CPCB
- Guidelines for transportation of hazardous wastes; Hazardous waste management series; HAZWAMS/33/2005-2006- CPCB
- Guidelines for conducting air quality modeling; Programme Objective series; PROBES/70/1997-98 - CPCB
- Environmental Health Criteria 203; Chrysotile Asbestos (http://www.who.int/en/)
- Investigation of chrysotile fibres in cement sample (http://www.hse.gov.uk/)
- Asbestos: The analysts' guide for sampling, analysis and clearance procedures (http://www.hse.gov.uk/)
- Asbestos essentials; A task manual for building, maintenance and allied trades on non-licensed asbestos work (http://www.hse.gov.uk/)
- Guideline for the Safe Control, Processing, Storing, Removing and Handling of Asbestos and Asbestos Containing Materials and Articles for the Southern African Power Pool (www.sapp.co.zw)
- Stationary source emissions – Determination of asbestos plant emissions – Method by fibre count measurement ISO 10397:1993(E) (http://www.iso.org.in)
- The basics of chrysotile asbestos dust control –Safe and responsible use-Chrysotile Institute Fourth Edition 2008–Mr.Gordon M.Bragg (www.**chrysotile**.com)
- Safe use of chrysotile Asbestos: Manual on Preventive and Control Measures (www.**asbestos**-institute.ca)
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