DERBA MIDROC CEMENT PLC.

Environmental and Social Impact Assessment

for Establishment of 5,600 tpd Greenfield Cement Project and Operation of Captive Mines near Derba Village, Oromiya Regional State,

December 2007

HOLTEC CONSULTING PRIVATE LIMITED

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ABBREVIATIONS

AfDB .....African Development Bank
AIDS .....Acquired Immunodeficiency Syndrome
ANFO.....Ammonium Nitrate Fuel Oil
ARCCH.....Authority for Research & Conservation of Cultural Heritage
BAT.....Best Available Technology
BC .....Before Christ
BOD.....Biological Oxygen Demand
CITES .....Convention on International Trade in Endangered Species
Cl .....Chlorine
cm.....Centimeter
CO .....Carbon Monoxide
CO_2.....Carbon Dioxide
COD.....Chemical Oxygen Demand
CSI.....Cement Sustainability Initiative
DBE .....Development Bank of Ethiopia
DG .....Diesel Generator
DMC .....Derba Midroc Cement
DMP.....Disaster Management Plan
E .....East
EA.....Environmental Assessment
EC.....Electrical Conductivity
EGS .....Ethiopian Geological Survey
EHS .....Environment, Health and Safety
EIB.....European Investment Bank
EMA.....Ethiopian Mapping Association
ENI.....Ethiopian Nutrition Institute
ESDPRP.....Ethiopian Sustainable Development & Poverty Reduction Programme
ESIA .....Environmental and Social Impact Assessment
ESMP .....Environmental and Social Management Plan
EPA .....Environmental Protection Authority
EPE .....Environmental Policy of Ethiopia
ESP .....Electrostatic Precipitator
EU.....European Union
F .....Fluorine
FDRE.....Federal Democratic Republic of Ethiopia
GDP.....Gross Domestic Product
GIIP .....Good International Industry Practice

GPS .....Global Positioning System
HAL.....Health Advisory Level
HC .....Hydro Carbons
HFO .....Heavy Fuel Oil
HIV.....Human Immunodeficiency Virus
HVAC.....Heating, Ventilation & Air Conditioning
IFC.....International Finance Corporation
ISC.....Industrial Source Complex
ITCZ.....Inter-Tropical Convergence Zone
IUCN.....International Union for Conservation of Nature
km.....Kilometer
m.....Meter
mio.....million
mm.....Millimeter
MCL .....Maximum Contaminant Level
MDG .....Millennium Development Goal
MIDROC .....Al-Muwakaba For Industrial Development and Overseas Commerce
MoH .....Ministry of Health
MoWR.....Ministry of Water Resources
MPN.....Most Probable Number
MSL .....Mean Sea Level
MW .....Mega Watt
N .....North
NCS .....National Conservation Strategy
NE.....Northeast
NMA.....National Meteorological Agency
NW.....Northwest
OD .....Operational Directive
OPC.....Ordinary Portland Cement
OSHA .....Occupational Safety and Health Administration
pa.....Per annum
PA.....Peasant Association
Pb .....Lead
PM .....Particulate Matter
PM_{10}.....Particulate Matter with diameter less than 10 micron
PPAH.....The Pollution Prevention and Abatement Handbook
PPC .....Portland Pozzolana Cement
PPE .....Personal Protective Equipment
RAP .....Resettlement Action plan
RBP .....Rapid Bioassessment Protocol

S .....South
SAR .....Sodium Adsorption Ratio
SD.....Sustainable Development
SE.....Southeast
STD .....Sexually Transmitted Disease
STP.....Sewage Treatment Plant
SW.....South West
t.....tonnes
TDS .....Total Dissolved Solids
TOR .....Terms of Reference
tpd.....Tonnes per day
TPM .....Total Particulate Matter
TSS.....Total Suspended Solids
UNESCO .....United Nations Educational, Scientific and Cultural Organisation
USEPA .....United States Environment Protection Agency
URTI .....Upper Respiratory Tract Infection
VOC.....Volatile Organic Compound
W .....West
WB.....World Bank
WBCSD .....World Business Council for Sustainable Development
WHO.....World Health Organisation
WWDSE .....Water Works Design & Enterprise Supervision

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EXECUTIVE SUMMARY

0.0 PREAMBLE

MIDROC (Al-Muwakaba For Industrial Development and Overseas Commerce) is a large company having many business interests in Ethiopia, Saudi Arabia and other countries.

DERBA MIDROC CEMENT PLC (DMC) is proposing to establish a green field cement plant of capacity 5,600 tonnes per day (tpd) of clinker (cement capacity of 7500 tpd) based on Derba limestone deposit in Ethiopia.

Ordinary Portland Cement (OPC) and Portland Pozzolana Cement (PPC) will be manufactured at the **DMC** Plant. Both the cements shall meet the requirements of Ethiopian National Standard No. EN-197. OPC shall be produced as per CEM-I - 42.5 grade and shall contain 95% clinker and 5% gypsum. PPC shall be produced as per CEM-II - 32.5 grade and shall contain 67% clinker, 28% pumice and 5% gypsum. The annual cement capacity of the plant shall be 2.46 million tonnes per annum.

DMC has retained **Holtec Consulting Private Limited (HOLTEC), India** as its consultant to prepare Environmental and Social Impact Assessment (ESIA), Environmental and Social Management Plan (ESMP) and Resettlement Action Plan (RAP) for the proposed integrated cement project, which includes the cement plant, captive raw material mines, proposed roads from the plant to the mines and from Derba village to the plant, belt conveyor from mines to plant, water pipeline and the power transmission lines.

0.1 LOCATION & ACCESSIBILITY

The cement plant is proposed to be located about 8 km from Derba village in Sululta Wereda in Shoa Zone of Oromiya Regional State. The proposed mining area is located within the Anda Weizero Peasant Association in Sululta Wereda, Shoa Zone of Oromiya Regional State and is about 7 km (crow fly distance) from the plant site.

The Derba Cement plant site is about 70 km from Addis Ababa the capital of Ethiopia. The coordinates and elevations of the plant and mining areas are given below.

Coordinates : Latitude : 09^{0} 27’28” to 09^{0} 28’25”’N

Longitude : 38^{0} 34’31” to 38^{0} 35’23” E

Elevation of Plant site : 2380 m to 2420 m above Mean Sea Level (MSL)

Elevation of Mining area : 1550 m to 1650 m above MSL

0.2 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

The ESIA study for the proposed Cement project has been carried out within the framework of local, national and international environmental regulations. The legislative framework applicable to the proposed project is governed by the Federal Democratic Republic of Ethiopia (FDRE), Africa Development Bank (AfDB), International Finance Corporation (IFC), European Investment Bank (EIB) and the Development Bank of Ethiopia (DBE).

0.2.1 REGULATORY FRAMEWORK OF FDRE

Ethiopia adopted its Constitution in 1995, which provides the basic and comprehensive principles and guidelines for environmental protection, and management in the country.

The FDRE consists of the Federal State and Regional States. Proclamation Nos. 33/ 1992, 41/ 1993 and 4/ 1995 define the duties and responsibilities of the Regional States which include planning, directing and developing social and economic development programs as well as protection of natural resources.

The Environment Protection Authority (EPA) has established an Environmental Impact Assessment system for Ethiopia including the preparation of Procedural and Sectoral Guidelines as a prerequisite for the approval of new development activities and projects.

"Environmental Protection Organs Establishment Proclamation (Proclamation no. 295 of 2002)" stipulates the need to establish a system that enables to foster coordinated but differentiated responsibilities among environmental protection agencies at Federal and Regional levels. The proclamation requires the establishment of Sectoral and Regional Environmental Units and agencies, respectively.

"Environmental Impact Assessment Proclamation (Proclamation no. 299 of 2002)" has made EA to be a mandatory legal prerequisite for the implementation of major development projects, programs and plans. This proclamation is a proactive tool and a backbone to harmonizing and integrating environmental, economic and social considerations into a decision making process in a manner that promotes sustainable development.

"Environmental Pollution Control Proclamation (Proclamation no. 300 of 2002)" is promulgated with a view to eliminate or, when not possible to mitigate pollution as an undesirable consequence of social and economic development activities. This proclamation is one of the basic legal documents, which need to be observed as corresponding to effective EA administration.

The EIA Process as applicable to development projects is detailed in the 'Environmental Impact Assessment Procedural Guidelines Series 1' of November 2003. As per Schedule I of the Guidelines, both cement plants as well as mining projects have significant environmental impacts, and, therefore, require a full EIA/ EA study.

The Derba Cement plant will be responsible for implementing environmental management plans at its facilities in coordination with the Federal EPA and the Regional EPA for Oromiya Region. The environmental performance of the project will be monitored on a regular basis through **DMC**'s own set up and through external/ third party audits.

0.2.1.1 Applicable Proclamations/ Guidelines

The Proclamations and EPA Guidelines applicable to the proposed cement project as well as the mining project at Derba are listed below:

Sn	Title	No.	Date of Issue
1	Environmental Impact Assessment Proclamation	299	31 Dec 2002
2	Environmental Pollution Control Proclamation	300	03 Dec 2002
3	Environmental Protection Organs Establishment Proclamation	295	31 Oct 2002
4	Expropriation of Landholdings for Public Purposes and Payment of Compensation Proclamation	455	15 Jul 2005
5	Rural Land Administration Proclamation	89	07 Jul 1997
6	Mining Regulations		20 Apr 1994
7	Mining Proclamation	52	23 Jun 1993
8	Solid Waste Management Proclamation	513	12 Feb 2007
9	Environmental Impact Assessment Procedural Guideline Series 1		Nov 2003
10	Draft EMP for the Identified Sectoral Developments in the Ethiopian Sustainable Development & Poverty Reduction Programme (ESDPRP)		May 2004
11	Environmental Impact Assessment Guideline for Mineral and Petroleum Operation Projects		Dec 2003
12	Investment Proclamation	280	02 Jul 2002
13	Council of Ministers Regulations on Investment Incentives and Investment Areas Reserved for Domestic Investors	84	07 Feb 2003
14	Investment (Amendment) Proclamation	373	28 Oct 2003

0.2.1.2 IFC/ World Bank Guidelines

The proposed cement project falls under Category A as per IFC's Performance Standards and its procedures for project appraisal. Category A projects are those with potential significant adverse social or environmental impacts that are diverse, irreversible or unprecedented.

The WB and IFC provide detailed guidelines for the EA process. As of April 30, 2007, new versions of the World Bank Group Environmental, Health and Safety Guidelines (EHS) are in use. The EHS Guidelines also include sector specific:

- EHS Guidelines for Cement and Lime Manufacturing
- EHS Guidelines for Construction Material Extraction

In addition, IFC's eight Performance Standards, viz., Social and Environmental Assessment and Management System; Labour and Working Conditions; Pollution Prevention and Abatement; Community Health, Safety and Security; Land Acquisition and Involuntary Resettlement; Biodiversity Conservation and Sustainable Natural Resource Management; Indigenous People; and Cultural Heritage, will be adhered to throughout the operation of the project.

0.2.1.3 African Development Bank Guidelines

As per the Environmental and Social Assessment Procedures of AfDB, the proposed cement project including its associated raw material mining operations and utility connections is classified as Category 1. The projects assigned to Category 1 require a full ESIA, including the preparation of an ESIA report and ESMP.

Category 1 projects are likely to have 'important adverse environmental and/ or social impacts that are irreversible, or to significantly affect environmental or social components considered sensitive by the Bank or the borrowing country. This category includes projects that may generate the most severe adverse environmental or social impacts such as, among others, direct pollutant discharges in the natural environment, large scale physical disturbance of the project site and its surroundings, significant migration or displacement of affected populations, significant changes in socio-cultural patterns, adversely affect vulnerable groups, destruction or degradation of substantial biological resources, significant increase in health and safety risks, or major changes in the hydrology or water quality.'

0.3 PROJECT DESCRIPTION

0.3.1 RAW MATERIALS

The raw material and fuel requirements for the proposed plant are to be met from different sources as given below.

Sn	Material	Source Locality	Distance from plant (km)	Remarks
Raw materials				
1	Limestone & Marl	Mugher	6.5	The crusher, located in the mine, would be connected to the plant by a 7 km long belt conveyor.
2	Clay	Mulu Seyo	18	Considered as a corrective.
3	Sand	Mugher	15	Considered as a corrective.
4	Basalt	Near Gimbichu	10	Considered as a corrective.
5	Gypsum	Mugher	15	Considered as an additive
6	Pumice	Dera Ararate/ Nazerat	125	Considered as an additive
Fuel				
1	HFO	Middle East	-	Transport by sea up to Djibouti port, land transport 925 km
2	Imported coal	South Africa	-	

0.3.1.1 Derba Limestone Deposit

The limestone deposit at present is accessible by a 12 km foot track from Derba Cement plant site. The deposit is surrounded by Mugher river and its tributaries. Due to the natural topography of the area, the limestone deposit lies in the valley (1550-1650 m above MSL) whereas the flat area where the plant is proposed to be located is at an altitude of 2380-2420 m above MSL. There is a sharp fall in elevation of approximately 800 to 850 m between the plant and the mining areas.

0.3.1.2 Other Raw Materials

Correctives Basalt, sandstone and clay are found in the immediate vicinity of the limestone deposit. Basalt occurs all over the top of the plateau as well as a hillock around the plant site. Sandstone occurs in the adjacent area and is currently being mined by Mugher Cement for supply to float glass industry. Clay occurs in pockets about 18 km from the plant site. Additive gypsum is interbedded with marl and occurs under the limestone formation. Pumice proposed to be used for PPC manufacture shall be brought from a distance of 125 km from the plant site.

Coal shall be imported from South Africa. It shall be transported by sea up to the nearest seaport at Djibouti and from Djibouti to the plant site by road.

0.3.1.3 Raw Mix and Plant Design

The proposed plant capacity of 2.46 million tones per annum of cement is primarily based on market considerations and the availability of raw materials. The proposed location enjoys the twin advantage of proximity to raw material sources as well as market offered by the Addis Ababa, which is the capital and largest city of Ethiopia. Addis Ababa is also an important trade center of East Africa.

DMC is expected to command a market share of around 37% in its 1st year of operation, which will increase to 41% in its 4th year of operation. The plant will achieve 100% capacity utilization in its 4th year of operations.

Assessment of sizing of the main plant machinery and storages has been carried out based on the international norms and practices adopted for sizing of similar plants.

The project envisages coal as the main fuel. The exploration for indigenous coal are still in initial stages, hence plant design is being based on Imported coal. However, as an emergency measure provision to use HFO is being kept in the plant, so that plant can be operated during emergencies.

For the sizing of raw material preparation and storage equipment, the following raw mix has been considered.

- Limestone and marl - 85%
- Basalt - 10 %
- Sandstone - 5%

0.3.1.4 Main Machinery

The following main machinery and storage capacity are proposed for the project:

Item	Description
Mix (Limestone/ Marl) Crushing	Impact 1,000 tph Feed size=1,500X1, 500X1, 200 mm Product Size < 75 mm, 95 %
Mix (Limestone/ marl) Pre-blending stockpile (Covered)	Circular stockpile 1 x 50,000 t capacity Stacker 1,250 tph Reclaimer 550 tph
Coal Crushing	Impact 400 tph Feed size= 500 x 500 x 500 mm Product Size < 50 mm, 95 %
Coal Pre-blending stockpile (Covered)	Circular stockpile 1 x 40,000 t capacity Stacker 500 tph Reclaimer 100 tph

Item	Description
Corrective & Additive Crusher	400 tph, Product size 95 % < 25 mm
Corrective & Additive (Covered) Storage	Basalt: 8,000 t Corrective Limestone: 6,000 t Gypsum: 2,500 t Pumice: 2 x 10,000 t Stacker: 500 tph Reclaimer: 2 x 200 tph
Raw Material Drying Grinding	VRM 1 X 420 tph Product Size <12% residue on 90 micron sieve Moisture < 1.0% ESP / bag house
Raw Mill Hoppers	Mixed raw materials : 800 t Corrective limestone : 200 t Basalt : 200 t
Raw Meal Blending & Kiln Feed	1 x 24,000 t
Preheater, Pre-calciner, Kiln, Cooler	5,600 tpd
Clinker Storage, RCC Construction	1 x 50,000 t
Cement Grinding System	2 x 185 tph ball mills for OPC and PPC
Cement Storage, RCC Construction	3 x 10,000 t Air Slides & Bucket elevator
Cement Despatch	6 x 120 tph single discharge, 8 spout roto packers 4 x 120 tph Bulk Loading 9 truck loaders
Fuel Storage & Firing	Storage Tank: 500 m^3 Day Oil Tank: 50 m^3

The manpower requirement for operation of the proposed plant is foreseen as 474. A broad break up is as follows:

- Top Management : 9
- Middle Management : 17
- Specialists/ Engineers : 26
- Supervisors : 35
- Labour : 387
- **Total : 474**

0.3.1.5 Utilities

The maximum power demand for the proposed plant is estimated at about 45 MVA. The power demand will be meet from the national grid. The main feeder line passes near Chancho, where a sub-station will be constructed and a power line drawn over 20 km.

Water supply will be met from ground water sources. Borewells will be located near Mulo Seya village around 16 km away and pipelines will be laid up to the plant. The total requirement of water for the project including drinking and sanitation is around 2,000 m^3/day.

A Sewage Treatment Plant (STP) to treat sewage effluent will be installed. The STP will cater to the plant and colony both and will have a capacity of 300 m^3/ day.

A residential colony to provide accommodation for plant personnel will be constructed. A total of 392 numbers of 4 different standard residential units will be constructed in two stages. The first stage envisages construction of 242 units and the second stage will have 150 units.

Other facilities in the colony include Kindergarten school, Elementary and High schools, amphitheatre, cafeteria and related facilities, supermarket and related facilities, swimming pool, stadium, tennis, basket ball and volley ball courts, auditorium, gymnasium, Health center, jogging area, etc.

0.3.2 ENVIRONMENT MANAGEMENT

0.3.2.1 Air Pollution

The plant is being designed taking cognizance of prevalent environmental laws and the importance attached to maintaining environmental standards. Efficient tapping of dust generating sources, their dedusting with efficient filters/ ESP and recycling the dust to the process is the prime objective. Primary dust sources of the manufacturing process are raw material, cement grinding, kiln exhaust gas and cooler gas and transfer points. To achieve the stipulated emission levels, bag filters will be used at all dust generating points including transfer towers. The emissions from stacks will be maintained at 25 mg/ Nm^3, which is below the IFC standard of 30 mg/ Nm^3 for kiln and 50 mg/ Nm^3 for other emission sources.

Besides arresting emission of dust, appropriate steps will be taken to arrest "generation of dust" e.g. no large drops, water spray controlled dust suppression system at unloading hoppers, discharge gate at reclaims of silos and totally enclosed operations for all belt conveyors, storages, etc. The packing plant and loading area will be enclosed with side cladding. Bag filters will also be provided at belt transfer points.

SO_2 pollution will be negligible as alkali available in the raw meal absorbs SO_2completely in the kiln. The SO_2 emissions will be maintained below 400 mg/ Nm^3 as specified by IFC.

In kiln, generation of NO_2 gases depends to a great extent on the core flame temperature and percentage excess air. Installation of a well-designed burner system using low quantity of primary air, therefore, will limit the core flame temperature to ensure a low value of NO_x. The NOx emissions will be below 600 mg/ Nm^3 as specified by IFC.

Generation of Carbon Monoxide (CO) emission will be negligible in view of the firing technique of keeping a positive oxygen balance.

The air pollution control equipment proposed to be installed and the emission details are summarized below.

Sn	Description	Stack Details											
		Control Equip.	Ht. (m)	Dia. (m)	Vel. (m/s)	Temp (0C)	Emission rate (g/s)			IFC Standard SPM (mg/Nm^3)	IFC standards		Design Cap. Particulate Matter (mg/Nm^3)
							SPM	SO_2	NOx		SOx (mg/Nm^3)	Nox (mg/Nm^3)	
1	Coal Crusher	Bag Filter	20.5	0.55	15.21	25	0.09	0	0	50	-	-	25
2	Kiln / Vertical Roller Mill	Bag House	113.5	4.7	9.71	94	2.35	33.67	134.69	30	400	600	25
3	Clinker Cooler	ESP	40	4.4	15.16	250	5.76	0	0	50	-	-	25
4	Cement Mill	Bag Filter	10	1.3	9.7	62	0.187	0	0	50	-	-	25
	Cement Mill	Bag Filter	10	1.3	9.7	62	0.187	0	0	50	-	-	25
	Cement Mill	Bag Filter	10	1.3	9.7	62	0.187	0	0	50	-	-	25
	O-Sapa	Bag Filter	42	2.3	12.9	40	0.821	0	0	50	-	-	25
	O-Sapa	Bag Filter	40	2.3	12.9	40	0.821	0	0	50	-	-	25
	O-Sapa	Bag Filter	40	2.3	12.9	40	0.821	0	0	50	-	-	25
5	Packing Plant	Bag Filter	10.3	0.75	12.40	25	0.14	0	0	50	-	-	25
	Packing Plant	Bag Filter	10.3	0.75	12.40	25	0.14	0	0	50	-	-	25
	Packing Plant	Bag Filter	10.3	0.75	12.40	25	0.14	0	0	50	-	-	25
	Packing Plant	Bag Filter	10.3	0.75	12.40	25	0.14	0	0	50	-	-	25
	Packing Plant	Bag Filter	10.3	0.75	12.40	25	0.14	0	0	50	-	-	25
	Packing Plant	Bag Filter	10.3	0.75	12.40	25	0.14	0	0	50	-	-	25
	Packing Plant	Bag Filter	8.5	0.6	9.08	25	0.06	0	0	50	-	-	25
	Packing Plant	Bag Filter	8.5	0.6	9.08	25	0.06	0	0	50	-	-	25
	Packing Plant	Bag Filter	8.5	0.6	9.08	25	0.06	0	0	50	-	-	25
	Packing Plant	Bag Filter	8.5	0.6	9.08	25	0.06	0	0	50	-	-	25
	Packing Plant	Bag Filter	8.5	0.6	9.08	25	0.06	0	0	50	-	-	25
	Packing Plant	Bag Filter	8.5	0.6	9.08	25	0.06	0	0	50	-	-	25
6	Coal Mill	Bag Filter	46	1.6	14.78	95.3	0.41	0	0	50	-	-	25
7	Correctives Crusher	Bag Filter	22	0.65	14.95	25	0.09	0	0	50	-	-	25

0.3.2.2 Water Pollution

No wastewater will be generated from cement plant process and cooling as the total water undergoes evaporation during the exchange of heat. The domestic wastewater mainly from toilets and kitchen will be let into the septic tanks and the overflow from the septic tanks will be connected to the wastewater collection mains. The proposed STP will be designed for hydraulic loading of 300 m^3/day.

No waste water will be discharged outside the plant premises.

0.3.2.3 Non Hazardous Waste

The main solid waste generated from the cement plant is cement dust collected from various pollution control devices. The dust collected in the air pollution control equipment in the cement plant will be recycled back to the process. Due to wear and tear, the refractory bricks will be replaced in the kiln section once in a year. These bricks due to their high recycling value will be disposed to outside agencies.

Solid waste is expected to be generated at the plant from regular road sweeping which comprises of a mixture of limestone dust, clay and soil. This material will be put in raw meal.

0.3.2.4 Hazardous Waste

The hazardous wastes generated from a cement plant mainly are:

- Waste oil and grease drained out of gearboxes and other equipment
- Scrapped automobile batteries

Waste oil will be stored in leak proof steel drums and sent to the "Spent Oil Storage Site". The waste oil drums shall be properly identified with label of what is contained both in local language (Amahrik/ Oromiya) and English. This waste will be sold off as per rules to the licensed vendors. The waste oil may also be disposed off by burning it in cement kiln under controlled conditions after seeking permission from the regulatory bodies.

0.4 ENVIRONMENT BASELINE

In order to assess the baseline environmental status in the study area around the proposed project area, a primary and secondary data collection programme has been undertaken during the period July-Aug 07. The environmental components studied include:

- Physical/ chemical components: Physiography, Geology, Geomorphology, Hydrometeorology, Hydrogeology, Surface and Ground water resources, Climatology, Meteorology, Ambient Air quality, Noise levels, and Soil quality.
- Land use, archeology and cultural heritage
- Biological environment: Flora and Fauna
- Socio-economic components: Demography, education system, agricultural system and livestock, transportation networks and other infrastructure like water supply, public services, health status and medical facilities.

0.4.1 TOPOGRAPHY & DRAINAGE

Topography of the project area and of the surroundings consists of plains, mountains and valleys. The drainage of the project area is governed by the catchments of Blue Nile River, particularly Mugher river, which is one of the tributaries of the Blue Nile. Mugher river flows west of the proposed plant site in a deeply incised valley, which is at an elevation about 800 m lower than the plant area.

0.4.2 CLIMATE

The climate of the area is characterized by two distinct seasonal weather patterns; the wet season extending from June to September, contributing about 70% of the annual rainfall, and the dry season which covers the period from October to May. The minimum and maximum temperature in the area vary from 9°C to 23.5°C. The average relative humidity during the year is 62%. The mean annual rainfall in the area is about 1158 mm.

0.4.3 HYDROLOGY

A detailed hydro-geological study has been carried out in the area. The groundwater recharge of the study area of 10 km radius around the plant and mining sites is estimated at 25 mio m^3/ year. The total existing abstraction in the area is 5.1 mio m^3/ year, which is only 20% of the available groundwater resources. The net available ground water in the area is 19.9 mio m^3/ year. Thus it is safe to extract water from the area to meet **DMC**'s total water requirement of 0.73 mio m^3/ year (~2000 m^3/ day).

0.4.4 WATER QUALITY

Surface water samples from three (3) rivers, three (3) springs and a river confluence and ground water samples from six borewells in the area have been analysed for their physico-chemical properties. All samples are within the stipulated WHO/ Ethiopian Drinking water Standards.

0.4.5 AMBIENT AIR QUALITY

The ambient air quality has been monitored at site and at various locations within the study area during the period August-September 2007. The average total particulate matter in the area varied from 42.5 –118.8 μg/ m^3, PM_{10} varied from 13.3-54.4 μg/ m^3, SOx varied from 19.5-24.4 μg/ m^3 and NOx varied from 6.3 –9.5 μg/ m^3 at the monitoring stations located at Plant site, mines, Derba & Lilo villages. All values are within the draft Ethiopian AAQ standards.

0.4.6 NOISE LEVELS

The noise levels were monitored at four locations within the study area during August-September 2007. The average daytime and night time noise levels have both been recorded as 42 dB(A) and are well within the IFC and draft Ethiopian standards.

0.4.7 ECOLOGY

0.4.7.1 Flora

A detailed ecology study has been carried out in the area during Aug-Sept 2007 and the vegetation composition, abundance, cover, and other relevant ecological information of the area has been collected. The study has covered both the core area, i.e., the plant and mining sites, as well as the buffer area, i.e., an area of 10 km radius around the plant and mining sites.

The area is rich in species composition though the abundance and distribution is highly influenced by anthropogenic factors such as crop cultivation, grazing, charcoal production and wood cutting for domestic uses. A total of 241 floral species belonging to 79 families have been recorded in the buffer zone. Most of these species are indigenous while a few others are exotic or naturalized. A total of 23 cultivated plant species and 60 medicinal plants were recorded in the buffer area. The plant species encountered include 15 endemic species of which 5 are highly endangered and 10 are of least concern as per Ethiopian statutes.

0.4.7.2 Fauna

Few fauna were observed in the core and buffer zones, as the area is highly impacted by deforestation and wildlife hunting. The fauna recorded in the buffer area include monkeys, baboons, hyenas, jackals, bush pig, serval, etc. There are no faunal species recorded from the Muger valley area that can be categorized as endangered, threatened or vulnerable. The species encountered are common forms that are observed in other parts of Ethiopia.

0.4.8 CULTURAL, HISTORICAL & ARCHAEOLOGICAL FEATURES

No visible archaeological remains, which have scientific, cultural, public, economic, ethnic and historic significances, have been observed in the area. The risk value of both the plant and the mining sites is very low, where no significant observable archaeological evidence

is found. The sites have no archaeological importance. However, a Chance Find protocol will nevertheless be prepared to cover any unexpected finds.

0.4.9 SOCIO-ECONOMIC SCENARIO OF THE AREA

A detailed socio-economic survey has been carried out in the 10 km area around the project site.

Demography

The Plant and Mining sites are located close to Becho Dibdibe and Gimbichu villages within Becho Kidane Mehret and Anda Weizero Peasant Associations (PAs) respectively. The demographic details of the three PAs, viz., Becho Kidane Mehret (Plant area), Handa Weizero (Mining area) and Derba Gulele Beresa (the closest habitation of Derba) are given below:

Sn	PA	Population			Number of Households			Avg. Family Size	Population Density (persons/ sq km)
		Male	Female	Total	Male	Female	Total		
1	Becho Kidane Mehret	804	872	1676	269	18	287	5.8	31.59
2	Anda Weizero	891	1611	2502	514	235	749	3.3	33.62
3	Derba Gulele Beresa	1825	2065	3890	1161	107	1268	3.1	147.46

The average population density is 71 persons/ sq km, which is, more than the national average of 50 persons/ km^2.

Females constitute 51.3% of the total population. Out of the total surveyed household heads (244) only 12.3% were female-headed households. The average family size in the project area is about 5.3. This is classified as a large family size, which usually indicates the characteristics of a poor family.

Residents of the project area are predominantly followers of the Orthodox Christian Religion (98.4%). The population of the project affected area is almost entirely of the Oromo ethnic group (97.5%) and Oromiffa is the major language spoken in the area. The Local Consultation is therefore carried out verbally and in Oromiffa language. The remaining 2.5% of the total households belong to Amhara ethnic group. None of the Project Affected Persons belong to ethnic minority groups.

Education

According to findings of the socio-economic survey, the overall literacy rate in the project area is very low. 81.5% of the surveyed household heads are illiterate whereas the remaining 18.5% are literate. Of this, less than a quarter of the household heads had formal education of which the majority was only till primary level.

Literacy rates are also disproportionate between sexes. While 88.5% of females are illiterate, the figure is 69.8% for males. Literacy rates are consistently higher for men than women throughout all levels of education.

Health

A detailed Public Health survey has been carried out in the area during Aug-Sept 2007. In general, the health status of the community especially children below five years and pregnant women can be described as poor. Communicable diseases are prevalent in the project area and the situation is related, either directly or indirectly, to a lack of adequate

and safe drinking water and sanitation, low living standards and poor nutrition. The main communicable diseases prevalent in the area include respiratory tract infections, intestinal parasites, and diarrhea including bacillary dysentery, typhoid, skin infections and HIV/ AIDS.

The "AIDS in Ethiopia", Sixth Report Fact sheets indicate that the prevalence rate of HIV/ AIDS stood at 3.5 and 2.4% in the country and Oromiya region respectively.

Health facilities in the project areas are very poor. There is no hospital in the five Weredas falling within the 10 km radius around plant and mining sites. There are 6 Health Centres, 20 clinics, 27 health posts, 19 pharmacies and 5 drug stores in the five Weredas of the study area, which cater to a large population of 478,163.

Occupational Pattern

The main source of livelihood in the project area is agriculture. Therefore, land ownership in the project area becomes an important determinant of welfare. The major crops of the area are teff, barley, maize, sorghum, chickpeas, wheat, etc. Trees grown include banana, orange, mango, coffee, chat and eucalyptus tree is the dominant tree species. The area is mainly cultivated by means of traditional rainfed subsistence farming.

The average landholding of the surveyed household is found to be 2.8 ha. The majority, nearly 90.9% of the surveyed households own more than 2 ha of land. In general the size of individual land holding of the farmers in the study area is better than the average holdings on Regional and country levels. The majority of landless people gain access to land through some internal arrangements including leasing, crop sharing and other land sharing arrangements at family level. The land-rich 44% of the households in the area own nearly 62.3% of the total farmland available.

Income Level

The major source of employment and income in the project area is mixed farming, i.e. crop production and livestock. The most important part of the income accounting to over 88.5% originates from agricultural and related activities mainly from the production of cereals and vegetables, perennial crops, domestic animals and its products, agro-forestry products and renting of farming lands. The remaining activities, i.e., trading, employment, handicrafts and others bring in the remaining income of the people. On the bases of the survey result, the annual per capita income of the households and population is computed to be Birr 10,287.62 and Birr 1,923.4 respectively.

Consumption/ Expenditure

The results of the household survey carried out for the project area comprising of plant and mining areas reveal that the per capita consumption/ expenditure of the household and the population in the project area is estimated to be Birr 9,214.37 and Birr 1,722.77 respectively. According to the 2002 Development and Poverty Profile of Ethiopia the real per capita consumption expenditure of North and West Shoa zone, the area where the project is located, amounts to Birr 1,087.2. The higher figure arrived at during the primary survey may partly be attributed to the time gap and current prices used in the calculation of the data.

In accordance with the 2002 Development and Poverty Profile of Ethiopia, the proportion of people in absolute poverty is about 31.7% in North and West Shoa Zones. This is by far

better than the National and Oromiya Region absolute poverty figures of 39.9% and 44.2% respectively.

A significant portion of the expenditure incurred by people in the area is incurred on food. Food on average accounts for 56.4% of the household budget. Within the non-food category, clothing and house maintenance account for greater share of total expenditure (10.5 and 8.7%). Medical care and education budget contribute 4% and 0.8 % of the total household budget respectively.

0.5 PROJECT ALTERNATIVES

Prior to arriving at a decision regarding establishment of a greenfield cement plant at Derba, different project alternatives were examined and reviewed. The options considered were:

- No project option
- Establishment of a new cement plant close to the quarry.

Three possible plant locations have been considered.

Option 1 (Mugher, in the valley): This option would entail minimal transportation for limestone. However, other materials like pumice, coal, clay, which are available at a higher altitude, will have to be brought down to the valley. There is no road at present linking the heights to the valley area. Thus, a new 14 km long road shall have to be built. In addition transportation of cement also shall be difficult. Moreover, contiguous adequate flat land to the tune of 125 ha for location of plant is not available in the valley, and dispersion of kiln emissions will be difficult considering the elevation difference between the valley and the plateau.

Option 2 (Derba): This village has a good road connection. However, locating the plant close to habitation of Derba village is not advisable since it may lead to detrimental impacts on the local population.

Option 3 (8 km from Derba): The plant site can be connected to the mining area by a 7 km long conveyor. The flat area available is suitable for locating the plant with a residential complex. The site is also far from Derba village.

Thus Option 3 i.e. location of plant about 8 km from Derba has been selected to allow for minimal site disturbance and to avoid a site close to habitation.

The proposed new project works out to be economically viable, socially beneficial and environment friendly. The existence of abundant raw materials for cement production close to the proposed plant site, and the area being far away from habitation are the factors in favour of the selection of the proposed location at Derba.

0.6 PUBLIC CONSULTATION

Public consultation plays a key role in enabling the public to participate in the planning of project that affects the people directly. A detailed and comprehensive Public Consultation programme has been carried out during Aug-Sept 2007. The project is located within Oromiya Regional State of the country. There are five Weredas located within and around the project. There are twenty eight (28) Kebeles or Peasant Associations that are organized under the Weredas consisting of a number of settlement villages. The Kebele Peasant Association (PA) is the lowest governmental administrative unit of the rural area.

The consultative participants from administrative and community levels total to 1,247 consisting of 40 Wereda officials, 28 Kebele Peasant Associations council members, 223 community members consulted through community discussions and 956 individual household heads consulted privately.

The major issues identified and the suggestions received during the Public Consultation include:

- Smoke, dust, noise, hazardous discharge should be contained and environmental pollution should be minimized;
- Health services should be extended to the local residents by constructing hospital or health center;
- Awareness should be created among the locals to combat the spread of HIV/AIDS and other STDs and treatment should be provided for patients;
- Appropriate compensation should be offered to the people to be evicted from their land. In addition, project should seek ways and means of restoring their livelihood;
- Awareness should be created among the people to benefit from project related activities such as trading, etc.;
- Infrastructure, school, electricity, telecommunications, hospital and the like should be developed for the community;
- Remedial measures should be formulated to regulate the unemployment rate in the project area;
- Creation and operation of small and micro institutions should be encouraged;
- Reforestation program should be launched near the project site and the quarry;
- Community level discussion should continue to jointly identify and recommend corrective measures for the potential problems.

0.7 POTENTIAL IMPACTS & MITIGATION MEASURES

The Operation phase of the proposed cement plant mainly comprises of the following activities:

- Excavation of limestone from the captive mines
- Transportation of crushed limestone from mines to plant site
- Transportation of other correctives/ additives to the plant site
- Preparation of raw meal by adding correctives to limestone
- Clinkerisation of raw meal
- Cooling and heat recovery
- Blending & grinding of clinker by adding additives
- Packing & Despatch

The details of main activities and actions to be undertaken and their impacts during operation phase of plant and mines are summarized below.

Sn	Component	Activities	Potential Impacts
1	Transportation of raw materials and products	❑ Increase in traffic movement ❑ Washing and maintenance of vehicles	❑ Disturbance to community & its safety ❑ Contribution of dust and gaseous pollutants like SO_2, NOx, CO, VOC to ambient air quality ❑ Contribution to ambient noise level ❑ Disposal of solid waste & waste water
2	Operation of plant / mines	❑ Mines ❑ Drilling ❑ Blasting ❑ Loading & transportation ❑ Operation of mining machinery ❑ Plant ❑ Crushing of limestone/ other raw materials ❑ Preparation of raw meal ❑ Clinkerisation of raw meal ❑ Cooling and heat recovery ❑ Blending & grinding of clinker ❑ Packing & Dispatch	❑ Air emissions from operations are Dust, NOx, SO_2, GHG and unburnt hydrocarbons. ❑ Generation of noise and vibrations from blasting ❑ Waste water generation from: ❑ Water treatment plant ❑ Domestic usages in plant ❑ Solid waste from wastewater treatment plant as dry sludge, waste lubricating oil from machinery and municipal waste from domestic usages ❑ Accidental spillage of oil, if any.
3	Socio-economic	❑ Acquisition of land ❑ Payment of taxes and royalty ❑ Direct and indirect employment ❑ Development of infrastructure like roads, medical, transportation, etc ❑ Implementation of Welfare schemes ❑ Demand of local products and agricultural products ❑ Development of green belt	❑ Loss of agricultural land ❑ Loss of grazing area ❑ Employment to locals ❑ Business opportunities to locals ❑ Increase in per capita income ❑ Increase in literacy rate ❑ Change in living standard ❑ Regional development ❑ Saving of foreign exchange

0.7.1 QUALITATIVE IMPACT ASSESSMENT

The details of criteria adopted for impact assessment are as follows:

Impact Rating		Criteria		
Nature of impact	Beneficial	Positive		
	Adverse	Negative		
Duration of impact	Short term	Impacts shall be confined to a stipulated time		
	Long term	Impacts shall continue till the end of plant life		
Likelihood of occurrence	Negligible	<10%	Low	10-40%
	Medium	40-60%	High	60-80%
	Very high	80-100%		
Significance of impact	Minor	Noticeable impacts only		
	Localized	Noticed by adjacent locality & may have direct impacts		
	Major	Have direct sustainable impacts		
	Massive	Ability to change the system		
Potential impact level	Low	Has practically no impact		
	Medium	Has impact in local area		
	High	Has impact in region		

The qualitative impacts of the proposed project during construction and operation phases are summarized here

Particulars	Impact Rating				
	Nature	Duration	Likelihood	Severity	Potential
Construction Phase					
Land Use	Adverse	Long term	Medium	Localized	High
Air Quality	Adverse	Short term	Medium	Localized	Medium
Noise level	Adverse	Short term	Medium	Localized	Medium
Water Resources	Adverse	Short term	Medium	Localized	Medium
Waste Water	Adverse	Short term	Medium	Localized	Medium
Soil & Solid Waste	Adverse	Short term	Medium	Localized	Medium
Ecology	Adverse	Short term	Medium	Localized	Medium
Socio-economic & employment	Beneficial	Short term	Medium	Localized	High
Operation Phase					
Green House Gas Emission	Adverse	Long term	High	Regional	Medium
Air Quality	Adverse	Long term	Medium	Localized	Medium
Noise level	Adverse	Long term	Medium	Localized	Medium
Traffic movement	Adverse	Long term	High	Localized	Medium
Water Resources	Adverse	Long term	Medium	Localized	Medium
Waste Water	Adverse	Long term	Medium	Localized	Low
Solid Waste	Adverse	Long term	Medium	Localized	Low
Ecology	Adverse	Long term	Medium	Localized	Low
Loss of agricultural/ grazing land	Adverse	Long term	High	Localized	High
Employment & Economic growth	Beneficial	Long term	High	Regional	High
Socio-economic Measures	Beneficial	Long term	High	Localized	High

0.7.2 MITIGATION MEASURES

The mitigation measures for the identified impacts during implementation phase are described below.

Sn	Potential Impact	Main Source of Risk	Mitigation Measures
1	Natural Resources	Depletion of Limestone reserves and other corrective materials and additives	❑ Availability of raw materials shall be estimated properly ❑ Regular review of raw mix to get consistent quality of products ❑ Continuous attempt to control wastages during transportation, storage and handling of raw materials ❑ Mining plan shall be prepared to optimize the mining methodology and ensure the implementation of a progressive reclamation plan to replant in areas where limestone has been excavated ❑ Regular monitoring of availability of stocks and consumption of raw materials, dispatch of products and loss of material
2	Air Emissions		
A	Emission from mines	❑ Drilling ❑ Blasting ❑ Loading and unloading ❑ Crusher ❑ Transportation ❑ Wind erosion ❑ Traffic movement	❑ Dust emissions from crusher will be controlled by bag filter. ❑ All dumps will be suitably vegetated. ❑ A speed limit shall be defined for the trucks/ dumpers moving within the mining area. ❑ Dust suppression systems (water spraying) shall be adopted at faces/ sites before and after blasting and while loading ❑ Dust generated due to blast hole drilling shall be suppressed by using water injecting system of dust collectors in the drills. ❑ Use of sharp drill bits for drilling holes and drills with water flushing systems (wet drilling) to reduce dust generation, ❑ Use of sharp teeth for shovels to reduce dust generation, ❑ Regular water spraying shall be carried out on haulage roads by water sprinklers during transportation of raw materials. ❑ All vehicles and their exhausts would be well maintained and regularly tested for emission concentration. ❑ Dust masks shall be provided to workers engaged at dust generation points like drills, loading, unloading points, etc. ❑ Extensive plantation shall be carried out in and around the mining area ❑ Use of good quality explosives having proper oxygen balance with regular monitoring.

Sn	Potential Impact	Main Source of Risk	Mitigation Measures
B	Air emissions from stacks	Air Emissions ❑ Crusher ❑ Raw Mill ❑ Coal Mill ❑ Kiln ❑ Clinker Cooler ❑ Cement Mill ❑ Packing Plant ❑ DG sets ❑ Traffic movement	❑ Ensure maximum efficiency of combustion in kiln and emergency DG sets ❑ Suitably designed ESPs/ Bag filters will limit the dust concentration to 25 mg/ Nm^3 in all emissions ❑ In the event of failure of any pollution control equipment, automatic tripping in the control system will be provided ❑ For ESP operations, any disturbance in the power supply to electrode will switch the whole unit off ❑ Efficiency of each air pollution control equipment will be ensured to more than 99% ❑ SO_2 and NOx emissions will be within the norms of 400 mg/ Nm^3 and 600 mg/ Nm^3 respectively as specified by IFC. ❑ A well-designed burner system, will limit the core flame temperature to ensure a low value of NOx ❑ Impact of CO emission will be negligible in view of the firing technique of keeping a positive oxygen balance. ❑ Regular preventive maintenance of pollution control equipment ❑ All vehicles and their exhausts will be well maintained and regularly tested for emission concentration. ❑ Continuous dust monitor will be installed on all point emissions ❑ Continuous SO_2 and NOx monitor will be installed on main stack

Sn	Potential Impact	Main Source of Risk	Mitigation Measures
C	Fugitive Emissions	❑ Storage and Conveying/ transportation of raw materials and products ❑ Leakages from machinery and pipes	❑ Jet Pulse bag filters will be provided at all dry material conveying and transfer points ❑ Drop distances will be minimized by the use of adjustable conveyors ❑ Dust suppression system by water sprinkler at dump hopper of raw materials ❑ Regular dust suppression with water sprinkler on the haul roads ❑ Plant roads & approach roads will be made of bitumen/ concrete & mechanical vacuum cleaner will be used for cleaning of dust on internal roads ❑ Open areas within the plant premises/ along boundaries of the plant premises will be covered under green belt ❑ Raw Materials/ products will be fully covered during transportation to/ from the site by road.
D	Green house Gas Emissions	❑ All stacks ❑ Traffic movement	❑ The proposal to manufacture blended cement shall reduce clinker requirement in cement, thereby reducing GHG emissions. ❑ The state-of-the-art-technology of 5 stage preheater shall lead to increased energy efficiency thereby reducing GHG emissions.
3	Noise Emissions	❑ Operation of noise generating equipment like compressors, pumps, DG sets, etc. ❑ Maintenance ❑ Traffic movement ❑ Procurement of drill, loaders and dumpers and other equipment with noise proof system in operator's cabin	❑ Cumulative noise level at walkways and work areas will be <85 dB (A) and no worker will be exposed to a noise level >85 dB(A) without hearing protection ❑ Noise level at the boundary of plant/ mines will be <70 dB(A) ❑ Blasting operations will be carried out only during the day time using milliseconds detonators and cord relay so as to avoid high noise intensity ❑ Regular maintenance of noise generating equipment ❑ Provision of silencers will be made wherever possible. ❑ Necessary enclosures will also be provided on the working platforms/areas for local protection in high noise level areas ❑ Proper lubrication & housekeeping to avoid excessive noise ❑ The operators will be provided with necessary safety and protection equipment such as ear plugs, ear muffs etc. ❑ Provision of plantation in and around the plant premises

Sn	Potential Impact	Main Source of Risk	Mitigation Measures
4	Ground Vibration/ Fly Rocks	❑ Drilling ❑ Blasting	❑ Careful planning, checking, execution & monitoring of each blast ❑ Blast holes will always be initiated by short delay detonators rather than adopting instantaneous detonation. Short delay in blasting of successive blast holes effectively reduces the vibration problem. ❑ Free faces will be sufficiently cleared of any loose material before blasting and burden. ❑ Multi row blasting will be followed. ❑ Use of ANFO, which has low velocity of detonation, will also reduce the vibration problem.
5	Ground Water Resources	❑ Make up water for cooling ❑ Dust suppression ❑ Domestic	❑ Continuous attempt will be made to optimize/reduce the use of water ❑ Water harvesting will be carried out to the maximum extent possible ❑ Regular monitoring of ground water table
6	Waste Water	❑ Domestic ❑ RO Rejects	❑ STP with tertiary treatment will be provided and no waste water will be discharged from the plant premises ❑ Treated effluent will be used for dust suppression and plantation/ greenbelt development ❑ Rejects from RO of STP will be sprayed on raw material stockpiles and coal stored in yard. ❑ Construction of suitably designed drains all along the roads and boundary of the plant premises ❑ Appropriate storm water and runoff control systems will be provided to minimize the quantities of suspended material carried off site
7	Solid waste (hazardous & non-hazardous)	❑ Maintenance and Operation of integrated plant ❑ Storage and handling of fuel ❑ Accidental spillage	❑ Whenever possible, use of non-hazardous instead of hazardous materials. ❑ All hazardous (ignitable, reactive, flammable, corrosive, and toxic) materials will be stored in clearly labeled containers or vessels ❑ All hazardous wastes, process residues, solvents, oils, and sludges will be properly disposed of ❑ Recycle or reclaim materials where possible ❑ If recycling or reclamation is not practical, wastes will be disposed of in an environmentally acceptable manner and in compliance with local laws and regulations. ❑ Careful garbage transportation to dumping site and disinfection of transport vehicles body ❑ Fire prevention systems and secondary containment will be provided for storage facilities, to prevent fires or the release of hazardous materials to the environment

Sn	Potential Impact	Main Source of Risk	Mitigation Measures
8	Spill Manage-ment	❑ Maintenance and Operation ❑ Storage and handling of fuel ❑ Accidental spillage	❑ Impervious liners in place for fuel, lubricants and chemicals storage area. ❑ Effective bunds capable of containing 110% of the volume within and enclosing all potentially contaminating materials will be used for fuel and lubricants storage area ❑ Oil drip pans will be used wherever there is significant potential for leakage including, but not limited to; o Electric generator engine o Compressors, pumps or other motors o Maintenance areas o Fuel transfer areas
9	Occupational Health & Safety	❑ All Operations	❑ Provision of PPE like ear muffs, helmets, boots, dust masks, etc. to employees ❑ Safe procedure for storage and handling the explosives will be developed ❑ Adequate training will be provided to the staff ❑ Regular medical check up of workers

0.7.3 SOCIO-ECONOMIC DEVELOPMENT PLAN

DMC will actively contribute to improve the socio-economic conditions of the area. The details of the Socio-economic Development Plan are given below:

0.7.3.1 Community Development Fund

DMC is committing an annual contribution of Birr 250,000 per year for establishing a revolving fund to support/ supplement the efforts to help finance small scale businesses for the local communities. A Committee comprising of officials from Sululta Wereda, PAs, and **DMC** will oversee the implementation of the fund. **DMC** shall continue the contribution till the cumulative contribution reaches Birr 2.5 million.

0.7.3.2 Employment and Business Opportunities

Preference is being/ will be given in employment to able-bodied locals whose land has been permanently acquired for the project. Currently 70 local labour have been employed at the project. As the construction progresses, the local labour proposed to be employed shall be around 400. The Community Development Fund which will be established by **DMC** will help the interested locals in setting up small businesses like transportation, auto workshops, eateries, and other small shops which shall come up to cater to the cement plant and the “transport sector” visiting the plant.

0.7.3.3 Road Development

Major road building and upgradation is proposed by **DMC** in the area. Road from the Plant to mines will for the first time link the valley to Derba and further. The proposed bridge over Mugher river will provide an access to the villages in the vicinity of the quarry and beyond. The road from Chancho to Derba, which is presently a gravel road, will be converted to a tarred black-topped road in stages, which will provide a better connectivity. There are presently four old, narrow bridges over small streams on the way from Chancho to plant

site. New bridges will be constructed alongside these bridges thereby providing much improved infrastructure in the area. A new, tarred road will be constructed from Derba to the plant site.

0.7.3.4 Health Facilities

A Health Centre staffed by a Doctor, a Nurse, Laboratory technician, pharmacist and other supporting staff will be set up within the plant which will serve the employees of **DMC**.

DMC plans to extend health facilities for the local community by establishing a Clinic for inhabitants around the plant site. The ownership and administration of the Clinic shall be with the Regional Government. The estimated cost of the Clinic, which will be allocated by **DMC** in its budget, is:

Establishment Cost	:	Birr 300,000
Health facility Cost	:	Birr 200,000
Total	**:**	**Birr 500,000**

DMC is willing to support the upgradation and upkeep of the established Centre by providing the Centre up to Birr 10,000 per month aimed at supplementing the running expenses, manpower expenses, etc. In addition to the above, professional assistance to organize and run the Centre will be provided by **DMC** health professionals.

The health facility at quarry site will also be established to the same standards as the plant facility. The cost of health facility, which will be borne by **DMC**, is estimated as Birr 200,000. However, the administration and management of the health facilities will remain with the concerned office of the Regional Government. A financial assistance of Birr 10,000 per month will be given for supplementing the running expenses of the Health Centre.

DMC health professionals will extend close cooperation and help in periodic health surveys and during occurrence of any accidents, calamities, etc.

Diseases of high concern during the construction phase due to labour mobility are sexually transmitted diseases (STDs) such as HIV/ AIDS. **DMC** propose the following measures:

- Undertaking health awareness and education initiatives by imparting information and counseling to influence individual behaviour as well as promote individual protection, and protect others from infection.
- Training health workers in disease treatment
- **DMC** shall ensure ready access to medical treatment, confidentiality and appropriate care, particularly with respect to migrant workers

A number of measures are proposed to reduce the impact of vector-borne diseases like malaria in the workers and the local communities.

Sanitation in and around the project area will be improved to eliminate breeding habitats. Use of repellants, clothing, netting, etc. will be promoted. **DMC** will make efforts to provide appropriate drugs to workers and collaborate with public health officials to help eradicate disease reservoirs. It is proposed to monitor and treat the migrating population to prevent disease spread and also educate project personnel and area residents on risks, prevention, and available treatment.

0.7.3.5 Education

DMC commits to build new or expand the existing elementary school at the plant and quarry sites and hand over the same to the concerned Government office for managing them. **DMC** is allocating in its budget for expanding and upgrading the educational facilities at Derba town and quarry. The estimated costs are:

Cost of additional classrooms at plant site and quarry	:	Birr 500,000
Cost of facilities like desks, laboratory equipment, etc.	:	Birr 250,000
Total	**:**	**Birr 750,000**

A Regional Vocational Training Center is proposed to be established by Sululta Wereda at Chancho. **DMC** will contribute about Birr 224,000 for the establishment of Vocational (Health Extension Workers and Farmers' Training) Centre.

0.7.3.6 Water Supply

DMC will help in improving the water supply in the area. As observed during the socio-economic baseline survey, almost all villages rely on dirty, non-potable stream water for their water requirement. This has lead to prevalence of water borne diseases.

Water supply access will be extended to a total of seven villages around the plant and mining sites. These villages are Adero, Abale, Becho Kidanemehrat, Debedebe, Muger, Anda Wezero and Anda Botero. The amount of water, which shall be made available, is estimated to be 83,560 litres per day (assuming consumption of 20 l/ day) in the form of one water point per village. The water points shall be run by a Water Committee, which shall be established comprising of members of the community. The community will be expected to generate a small amount of revenue from the sale of water, so as to cover at least the maintenance cost of the system.

0.7.3.7 Communication

With the establishment of the plant, **DMC** will set up modern communication facilities like telephones, internet, etc. in the area, which will also be available to the local population.

0.7.3.8 Electric Power

DMC will extend to 2MW electric power line for the community along the Derba-plant road and around the plant site to facilitate personal connections for the community. However, the cost of individual connections and bills based on the consumption will be borne by the individuals.

0.7.3.9 Area Development Plan

DMC has requested the Government to formulate an Area Development Plan for Derba area and survey work for the same has already been initiated by the Government. **DMC** plans to technically assist in the planning of the area around the plant site by the Government. Since communities, businesses are expected to build and grow around the project site, a Development Plan is necessary to avoid haphazard development and resultant strain on infrastructure. To this effect, **DMC** would like to extend its assistance in the form of covering the cost of the experts doing the planning work.

0.7.4 AUDITS AND MONITORING

Environmental monitoring and audits will be undertaken during & after the construction and development phase and during operation phase to check that the environmental management measures are being satisfactorily implemented and that they are delivering the appropriate level of environmental performance. A summary of the proposed monitoring plan is given below.

Impact	Monitoring method	Parameters	Location	Frequency
Air quality	Measurement/ sampling	PM/ PM_{10}, NOx, SOx	Pyro-processing stacks	Continuous
		PM/ PM_{10}	Cement grinding and clinker cooler stacks	Continuous
		PM/ PM_{10}, CO_2, Temperature, Oxygen level, combustion efficiency	Combustion sources	Biannually
		Ambient PM/ PM_{10}, NOx and SOx	Selected receptor villages, colony, plant premises	Quarterly
Noise	Measurement	Leq (dB(A))	Mines, Crusher, Raw mill, Cement Mill	Biannually
			Four (4) sites around Plant site	Biannually and upon complaints
Surface and ground water	Sampling	Temperature, pH, Oil content, Suspended solids, COD	Ground water wells, installed grease traps, oil/ water separators, sedimentation tanks	Quarterly
Soil	Sampling	Moisture content, pH, salinity, Nitrogen, Phosphate, Chloride, Potassium, Sodium	Agricultural plots near project site	Annual
		Heavy metal content (mercury, lead, chromium, copper, nickel, zinc and cadmium)		Every three years
Solid Waste	Audits, photographic documentation, and interviews	Generation, storage, recycling, transport and disposal	Plant premises	Quarterly
Biodiversity	Visual inspection and photographic documentation	General condition of the floral cover	Plant, mines and landscaped areas	Annual
Resource use	Metering	Water and energy consumption	Plant and mines	Continuously
	Audit	Raw material consumption	Plant and mines	Continuously
Health and Safety	Health and safety surveys	Proper use of PPE, presence of safety signs, first aid kit, fire fighting devices, Injury/ illness records. Accident statistics recording in accordance with ILO standards, including recording of Lost-Day-Accidents per Million-man hours (LDA/MMH)	Plant, road linking plant to Derba	Continuously

Impact	Monitoring method	Parameters	Location	Frequency
Socio-economic	Field questionnaire	Local population	Plant and surrounding areas	Annually
	Interviews	Employment records	Plant	Continuously
Operations monitoring	Visual inspection and documentation	Production rate, gas flow rates, counter readings, pressure valves, temperatures, abnormal readings, overloads, stoppages	All facilities and major equipment at Plant and Mines	Daily

The Federal EPA has no capacity for monitoring or environmental auditing. **DMC** will have a dedicated Environmental Management Cell within the plant to oversee environmental management of its operations. Like the EPA, the Government institutions like Wereda level offices at Chancho and PAs do not have the capacity to undertake or assist in implementing social development schemes in the area on behalf of **DMC**. Thus the Environmental Management Cell will have a strong Social set up to take care of the social development plans in the surrounding area. A Grievance Cell will also be established to address the complaints/ grievances of the local communities.

Chapter 1
Introduction

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INTRODUCTION

1.0 PREAMBLE

Ethiopia is one of the poorest countries in Africa, facing challenges of frequent drought and food shortages, which are compounded by inadequate roads and communications. A country of about 70 million people, Ethiopia has suffered bloody upheavals and famine over the past two decades.

Ethiopia is a land locked country. The countries surrounding Ethiopia are Eritrea, Djibouti, Somalia, Kenya and Sudan. All these countries, except for Kenya, are deficit in terms of cement supply. The government, due to its foreign exchange crunch, as a rule, does not allow import of cement in the country. The shortage of cement has been causing severe setbacks to development and residential projects.

Cement consumption in Ethiopia is concentrated in and around Addis Ababa. Addis Ababa, being the capital of Ethiopia, is seeing the maximum development, both in terms of infrastructure development and residential and commercial complexes/ buildings.

MIDROC (Al-Muwakaba For Industrial Development and Overseas Commerce) is a large group company having many business interests in Ethiopia, Saudi Arabia and other countries.

MIDROC intends to develop a cement business in Ethiopia and a separate company, **DERBA MIDROC CEMENT PLC. (DMC),** has been established for the purpose. **DMC** is proposing to install a green field cement plant of clinker capacity 5,600 tonnes per day (tpd) corresponding to a cement capacity of 7,500 tpd based on Derba limestone deposit.

In view of the above, **DMC** has retained **Holtec Consulting Private Limited (HOLTEC)**, India as its consultant to prepare Environmental and Social Impact Assessment (SEIA), Environmental and Social Management Plan (SEMP) and Resettlement Action Plan (RAP) for the proposed integrated cement project.

The proposed integrated project includes:

- Cement plant
- Captive raw material mines
- New road from plant to mines
- New road from Derba to plant
- Upgradation of road from Chancho to Derba
- Conveyor Belt from mines to plant
- Water pipeline
- Power transmission line

This ESIA Report is prepared for submission to African Development Bank (AfDB), International Finance Corporation (IFC), European Investment Bank (EIB), Development Bank of Ethiopia (DBE) and Environmental Protection Authority (EPA), FDRE for their approval.

Ordinary Portland Cement (OPC) and Portland Pozzolana Cement (PPC) are proposed to be manufactured at the **DMC** Plant. Both the cements shall meet the requirements of

Ethiopian National Standard No. EN-197. OPC shall be produced as per CEM-I - 42.5 grade and shall contain 95% clinker and 5% gypsum. PPC shall be produced as per CEM-II - 32.5 grade and shall contain 67% clinker, 28% pumice and 5% gypsum.

1.1 LOCATION AND ACCESSIBILITY

The project is proposed to be located about 8 km from Derba village in Sululta Wereda in Shoa Zone of Oromiya Regional State, Federal Democratic Republic of Ethiopia (FDRE). The proposed mining area is located within the Anda Weizero Peasant Association in Sululta Wereda, Shoa Zone of Oromiya Regional State and is about 7 km (crow fly distance) from the Plant site.

Derba village is connected to Addis Ababa via Chancho. From Addis Ababa to Chancho (40 km), a good quality black topped road exists. A gravel road connects Chancho to Derba over a distance of 20 km. This road will be upgraded to a black-topped road by **DMC** in stages. From this gravel road, a road will be laid from Derba to the plant site over an 8 km stretch.

The coordinates and elevation of the proposed plant site and mining area are as follows:

Coordinates	:	Latitude	: 09°27'28" to 09°28'25"' North
		Longitude	: 38°34'31" to 38°35'23" East
Elevation of Plant site	:	2380 m to 2420 m above MSL	
Elevation of Mining area	:	1550 m to 1650 m above MSL	

The choice of the plant site is appropriate from the point of view of topography and raw material availability. The location of the plant site is shown in **Fig. 1.1a** and **b**.

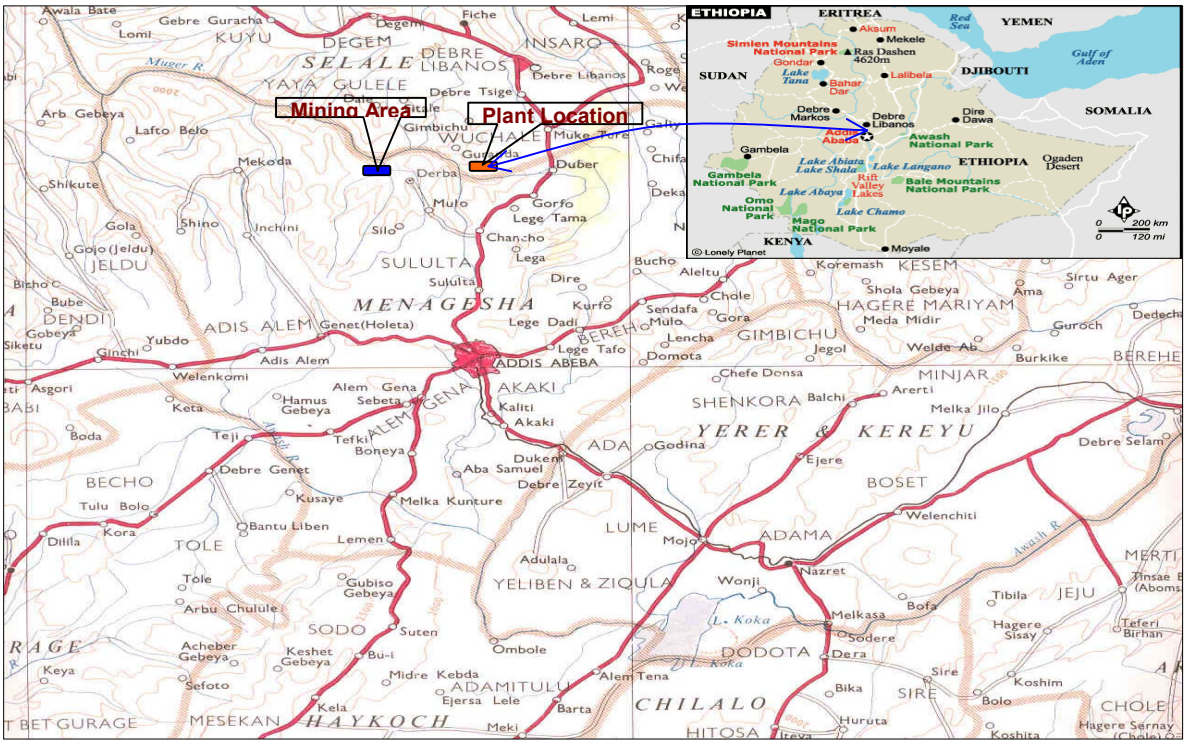


Fig. 1.1a : Location of Proposed Project Site

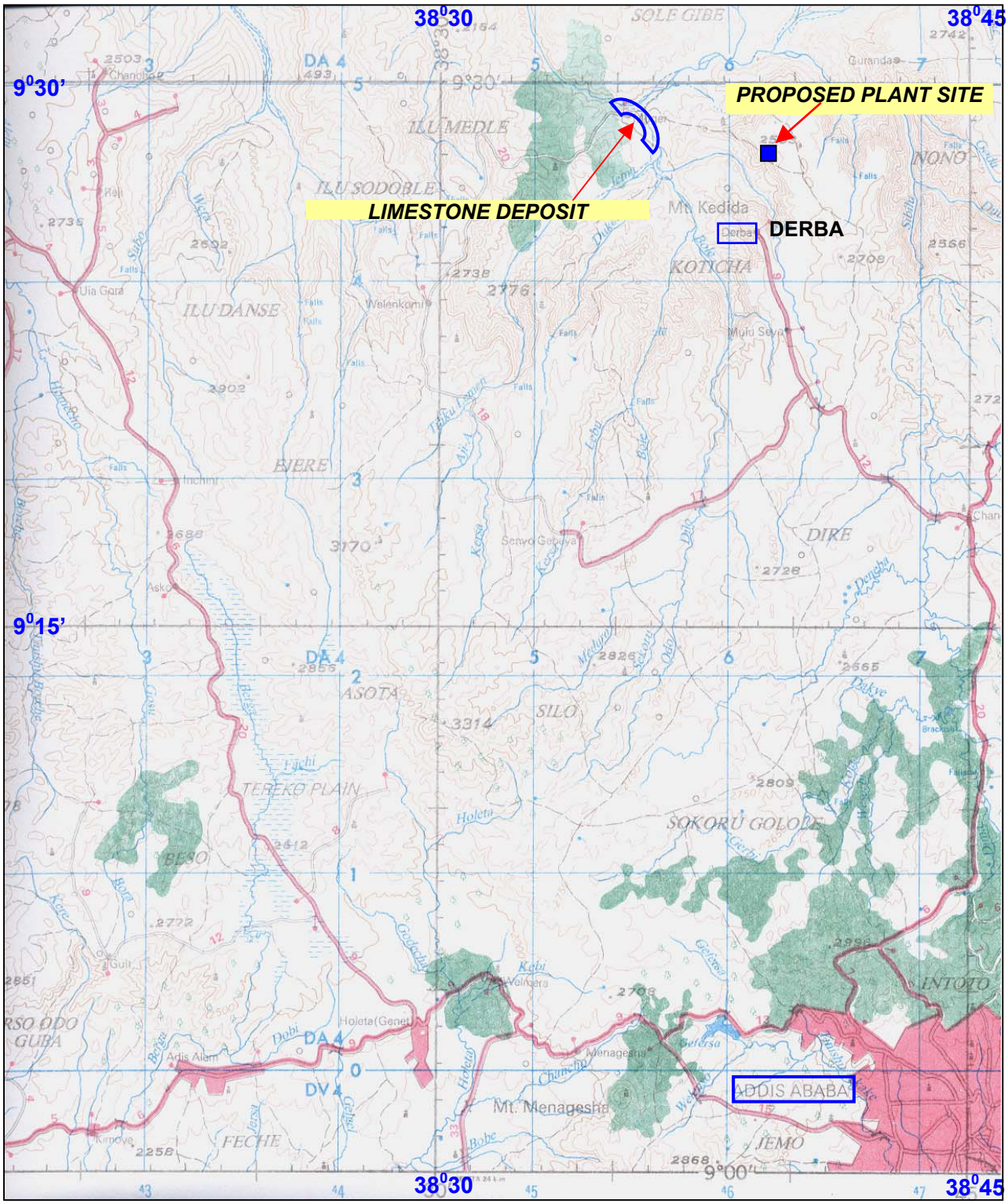


Figure 1.1b : Location of Proposed Plant and Mine areas

1.2 ENVIRONMENTAL SCREENING

Environmental screening of the proposed project operation has been undertaken to determine the appropriate extent and type of EA to be carried out. Depending on the type, location and sensitivity of the project and the nature and magnitude of its potential environmental impacts, the proposed project has been classified.

Within the environmental and social assessment process, any AfDB project is to be categorized in one of the four possible categories. As per the Environmental and Social Assessment Procedures of AfDB, the proposed cement project including its associated mining and other operations is classified as Category 1.

Category 1 projects are likely to have 'important adverse environmental and/ or social impacts that are irreversible, or to significantly affect environmental or social components considered sensitive. This category includes projects that may generate the most severe adverse environmental or social impacts such as, among others, direct pollutant discharges in the natural environment, large scale physical disturbance of the project site and its surroundings, significant migration or displacement of affected populations, significant changes in socio-cultural patterns, adversely affect vulnerable groups, destruction or degradation of substantial biological resources, significant increase in health and safety risks, or major changes in the hydrology or water quality.' The projects assigned to Category 1 require a full ESIA, including the preparation of an ESIA report and ESMP. A Resettlement Action Plan is also required, if the project results in relocation or loss of shelter by the persons residing in the project area, assets being lost or livelihoods being affected.

The proposed cement project falls under Category A as per IFC's Performance Standards. A Category A project has potential significant adverse social or environmental impacts that are diverse, irreversible or unprecedented. The scope of EA for a Category A project may vary from project to project. It examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

IFC applies the Performance Standards to manage social and environmental risks and impacts. Together, the eight Performance Standards establish standards that the project is to meet throughout its life.

The EIA Process as applicable to development projects in Ethiopia is governed by the 'Environmental Impact Assessment Procedural Guidelines Series 1' of November 2003. As per the Schedule I of the Guidelines, both cement plants as well as mining projects have significant environmental impacts, and, therefore, require a full EIA/ EA.

1.3 SCOPING OF ESIA STUDY

Subsequent to Screening of the project, a detailed Scoping has been carried out and a Scoping Report was submitted to AfDB and IFC for their approval. The TOR outlining the Scope of Work is enclosed as **Annex 1.1**.

1.4 OBJECTIVES OF ESIA STUDY

As a part of the EA process, an Environmental and Social Impact Assessment (ESIA) study has been carried out for the cement project, to identify and evaluate the potential impacts of the project on the environment. The objectives of the ESIA Study include assisting **DMC**, the concerned stakeholders and the governmental authorities in recognizing

environmental, social and economic impacts of the proposed project, increasing awareness about the plant and its potential impacts, recommending appropriate control and mitigation and institutional monitoring measures.

For the proposed project, **DMC** aims at the following objectives:

1.4.1 PRODUCTION AND OPERATIONAL

- Establish cement manufacturing capacity by installing state-of-the-art equipment
- Develop and manage the plant and mines in an environment friendly manner according to the regulatory requirements and best environmental practices, whilst ensuring economic viability
- Maximize operational flexibility
- Optimize natural resources use
- Develop and operate the plant to meet community expectations in terms of environmental outcomes and cost.

1.4.2 ENVIRONMENTAL

- Protect the surrounding during operation of proposed integrated cement project with appropriate environmental safeguards
- Ensure that ecological balance of the area is not adversely affected by air emissions, waste water discharge, solid wastes, etc.
- Protect native flora and fauna
- Protect quality of local surface and groundwater
- Minimize public health risks
- Minimize noise and vibration impacts on surroundings.

1.4.3 SOCIO-ECONOMIC

- Improvement in direct and indirect means of livelihood
- Establish monitoring programme and provide procedures for resolution of community concerns, if any
- Improvement in the living standard of local inhabitants.

1.5 SCOPE OF WORK

To carry out the ESIA study, an area of 10 km radius around the plant and mining site has been considered as the study area. The scope of work has been designed:

- To assess the existing baseline status of air, water, noise, soil, land, ecology, hydrology and socio-economic environment.
- To solicit stakeholders' concerns regarding the project
- To identify and quantify significant impacts due to various operations of the proposed integrated cement project on various environmental components through prediction of impacts.
- To evaluate the beneficial and adverse impacts of the proposed project.
- To assess the risks on community due to operation of cement plant

- To prepare the Environmental and Social Management Plan (ESMP) including Disaster Management Plan detailing control technologies and measures to be adopted for mitigation of adverse impacts if any, as a consequence of the cement manufacturing.
- To design Post Project Monitoring Programme for regulating the environmental quality during cement manufacturing and help in sustainable development of the area.

1.6 APPROACH & METHODOLOGY

Any change in the present activity is expected to cause impacts on surrounding environment. The impacts may be adverse or beneficial. In order to assess the impacts, a detailed ESIA study has been conducted within an area of 10 km radius around the plant and mining sites.

This ESIA Report is based on the observations made by HOLTEC team during visits to the study area and collection of primary and secondary environmental data. Literature has also been reviewed and relevant information has been collected for environmental and social baseline. Reconnaissance surveys have been conducted to identify the major environmental issues in the project area.

The primary baseline data has been collected during August to September 2007. The sampling locations have been identified on the basis of:

- Existing topography
- Locations of water bodies
- Location of villages/ towns/ sensitive areas
- Accessibility, power availability, security of monitoring equipment

1.6.1 COLLECTION OF BASELINE STATUS

The baseline environment data has been collected by M/s MDI Consulting Engineers, Addis Ababa, Ethiopia.

Micro-Meteorology

A temporary weather monitoring station to record meteorological parameters was installed in the school campus at Derba village. Wind speed, Wind direction, temperature, rainfall, relative humidity, pressure, cloud cover with cloud types were recorded on hourly basis continuously for the period 05 Aug 07 to 03 Sept 07. The yearly variations in meteorology have not been covered. One month micro-meteorological data is adequate for this EIA but complete one year monitoring is recommended to be carried out.

Wind speed, wind direction data recorded during the study period was used for computation of relative percentage frequencies of different wind directions. The meteorological data thus collected has been used for interpretation of the existing status, and for prediction of impacts of future scenario due to the proposed plant.

Ambient Air Quality

The scenario of the existing ambient air quality in the study region has been assessed through a network of four ambient air quality stations during the study period within an area of 10 km radius around the plant site.

The Ambient air quality monitoring network has been designed keeping in view the available climatological norms of predominant wind direction and wind speed of this particular region. The following points were also taken into consideration in designing the network of sampling station:

- Topography / Terrain of the study area
- Populated areas within the study area
- Residential and sensitive areas within the study area.
- Representation of regional background levels
- Representation of cross sectional distribution in downward direction.

The existing Ambient Air Quality (AAQ) status has been monitored for SPM, PM_{10}, SO_2, NO_X and CO. One month monitoring of ambient air quality has been carried out which is adequate for this EIA, however, it is recommended that one year monitoring of ambient air quality be carried out.

Noise Environment

Noise monitoring has been carried out at various locations to identify the impact due to the existing sources on the surroundings in the study area. Noise levels were recorded at hourly intervals during the day and night times to compute the day equivalent and night equivalent levels.

Water Environment

Ground and surface water samples from various locations in and around proposed site within 10 km radius were collected for assessment of their existing physico-chemical and bacteriological quality.

Hydrological survey has been carried out in the study area to assess the potential of surface and ground water in the area and to prepare water balance of the area with respect to requirement of all users.

A detailed Hydro-meteorological study has been carried out using rainfall data for the last 10 years from seven stations in and around the river basin.

Land Environment

Land use and land cover pattern of the study area has been assessed through secondary data. Field surveys were conducted to identify the land use in and around 10 km radius of the site.

Representative soil samples were collected from different locations within 10 km radius of plant site for analysis of the physico-chemical characteristics. Standard procedures were followed for sampling and analysis. The samples collected were also analysed to check the suitability for growth of native plant species in and around the plant site.

Information on flora and fauna in the study area has been collected in the Ecological survey conducted during the study period within an area of 10 km.

Satellite imageries of the study area were studied to assess the geology, geomorphology, drainage pattern, land use pattern, vegetation cover, etc.

Public Health Status

A detailed study has been carried out on the health facilities available in the area, major prevalent diseases, the proposed health services, etc. within an area of 10 km around the project site.

Socio – Economic Environment

Details on economic status of various villages within an area of 10 km around the project site have been collected. Information on amenities existing in the area has been collected to determine the developmental activities to be undertaken by the plant authorities. Such developmental activities would result in upliftment of the economic status in the area.

1.6.2 STUDY OF VARIOUS ACTIVITIES

Various processes involved in the cement manufacturing have been studied in detail to identify areas resulting in impact on various environmental components.

1.6.3 PUBLIC CONSULTATION

Detailed consultations have been held at various levels, including Federal and Regional Governments, Wereda, Kebele PAs and affected local population. The details of the Public Consultation process are given in Chapter 7 of this Report.

1.6.4 QUANTIFICATION/ PREDICTION OF IMPACTS

The identified impacts based on the above study are quantified using various mathematical models.

1.6.5 EVALUATION OF IMPACTS

The quantified incremental impacts are superimposed on the baseline status of various environmental components to have an overall scenario. The overall scenario estimated has been checked for compliance with various statutory requirements/ standards.

1.6.6 FORMULATION OF ENVIRONMENTAL MANAGEMENT PLAN

Based on the existing environmental status and quantified impacts, a detailed Environmental and Social Management Plan has been formulated for implementation during the construction phase and operational phase. A detailed environmental monitoring programme has been drawn for implementation by **DMC**. The ESMP is detailed in a separate ESMP Report.

1.6.7 FORMULATION OF RESETTLEMENT ACTION PLAN

Agricultural and grazing land has been acquired by **DMC** for the project. The details of expropriation of land holdings and the Compensation paid by **DMC** are given in a separate report on Resettlement Plan.

1.7 STRUCTURE OF THIS REPORT

This report is divided into the following chapters:

- *Chapter 2 presents policy, legal, and administrative framework applicable to the project*
- *Chapter 3 presents a brief description of the project.*
- *Chapter 4 presents the environmental baseline information*
- *Chapter 5 presents the analysis of alternatives for the project*
- *Chapter 6 presents the environmental and social impacts of the project*
- *Chapter 7 presents a summary of public consultation*

TOR FOR ESIA STUDY

Sn	Project Components/ Activities
1	**BASELINE SURVEY**
1.1	**Physical Environment**
1.1.1	Monitor ambient air quality for SPM, PM_{10}, SO_2, NOx, CO and lab analysis
1.1.2	Record onsite Meteorological data for wind speed, wind direction, dry and wet bulb temperature, relative humidity, rainfall and cloud cover
1.1.3	Collect five years hydro-meteorological data from secondary sources
1.1.4	Monitor dust fall rate and analyse for free silica and heavy metals
1.1.5	Noise Level Measurement
1.1.6	Collect surface and ground water samples *(samples to be analysed for essential drinking water quality parameters as per WHO guideline)*
1.1.7	Collect wastewater samples and test for relevant parameters
1.1.8	Collect and analyse soil samples for physical and chemical parameters
1.1.9	Survey hydrology potential within the project area
1.1.10	Survey hydrogeology potential within the project area
1.1.11	Procurement of satellite imagery, image interpretation and mapping to be used for all sector analysis
1.2	**Biological Environment**
1.2.1	Terrestrial Ecology Survey and plant identification at National Herbarium
1.2.2	Terrestrial fauna survey including birds
1.2.3	Prepare land use and resource use maps - preparation of base map, field verification and data collection and finalisation of the land use/cover map
2	**Assess the impacts of the proposed project on various environmental components and prepare EIA**
3	**Formulate mitigation measures and prepare Environmental Management Plan (EMP)**

Sn	Project Components/ Activities
4	**Socio-Economic Environment**
4.1	Develop questionnaire for socio-economic survey (Household, PA and Wereda Level)
4.2	Carry out socio-economic survey at Household, PA and Wereda Level and collect statistically reliable information on the socio-economic conditions and livelihoods of the affected households
4.3	Identify key project stakeholder and carry out public consultation meetings
4.4	Collect data on population and demography, settlement pattern, land tenure and community structure
4.5	Assess and describe the existing agricultural and livestock system
4.6	Collect data on the health status, major health problems and the health system in the project area
4.7	Carry out traffic Count at representative locations
4.8	Data entry and analysis
5	**Assess the impacts of the proposed project on various social components (SEIA)**
6	**Social Environment Management Plan (SEMP)**
6.1	Review the detailed project design report
6.2	Review the legal framework in the FDRE and Oromiya Regional State;
6.3	Conduct consultation with the local government officials in affected Weredas and Peasant Associations
6.4	Develop questionnaire for socio-economic and census survey
6.5	Field inspections and identification of impacted area
6.6	Undertake a census of all Project Affected People (PAPs) (with 100% coverage) and take inventory of affected assets
6.7	Undertake sample socio-economic survey of the project area to establish a baseline of PAPs
6.8	Hold consultations with the key stakeholders to design compensation package (based on the needs and preferences of the affected population) for each category of PAPs
6.9	Analyze data to identify different categories of PAPs

BASELINE ASSESSMENT - PERSONNEL INPUTS

Sn	Position	Task Assignment
1	Environmentalist/Team Leader - Baseline Survey	Responsible for the base line survey components. He will work closely with other members of the team to mainstream cross-cutting issues and concerns in to the ESIA and ESMP
2	Air Pollution Expert	Responsible for collecting baseline information on ambient air quality, Dust fall rate and Noise level of the project site, analyze the data for the selected parameters
3	Hydrologist	Responsible for compiling and analysis available hydro-meteorological data from the nearest stations. He will assess the potential surface water and develop water balance of the study area which includes rain fall, evaporation rate, recharge rate, lean season flow and water requirement by the plant and other competing users.
4	Hydrogeologist	Responsible for assessing the groundwater potential/quantity, quality and condition of the ground water resources. He will identify and describe local and regional hydrogeology including details of lithology and aquifers present in the study area. He will also identify and describe existing GW users and identify competing water users if there are any.
5	Water Quality Expert	Responsible to collect and analyse surface and ground water quality. He will identify existing wastewater points and describe their quality and quantity. He will also perform biotic integrity analysis.
6	Soil Expert	Responsible for conducting ground investigation for soil sampling, analysis, classification, and mapping.
7	GIS / Remote Sensing Specialist	Responsible for identification and specification of remote sensing imagery and image processing. Implementation of the natural and socioeconomic database for the project area and the production of thematic map.
8	Terrestrial Ecologist	Responsible for undertaking both Flora and Fauna studies. Describing vegetation types, species composition and biodiversity. Identify, list and locate the any endangered, rare or vulnerable species and medicinal plants and assess their ecological and economic importance.
9	Land Use Expert	He will define the land use and land cover used in the study area. Prepare land use land cover map of the project area. He is responsible for the definition of land use characteristics and preparation of land use map and classification table for the project area.

Sn	Position	Task Assignment
10	Sociologist/ Economist	Collect data on population and demography, land use and planned development activities, land tenure and community structure, employment and the labour market, population migration, education, cultural properties and customs; sites of religious significance and aspirations and attitudes. Identify key project stakeholder and conduct public consultation. Also responsible for analysing the data on socio-economic and cultural factors that impact on agriculture sector, land tenure system, poverty, alternative sources of income, etc. He will evaluate past and on-going development activities in and around the project area.
11	Gender Specialist	Formulate inputs that address gender issues for the environmental and social impact assessment, establish gender division of labour, rights, responsibilities and socio- economic importance of the various members of the households and examine gender- related cultural dimensions that influence access to different types of resources.
12	Public Health Expert	Responsible to undertake comprehensive survey and collect information on prevailing diseases and causes of the same, meal pattern of the locals, available medical facilities (existing and planned) in the study area, Identify the potential health risks due to the implantation of the project.
13	Socio-Economic Survey Team	Carry out questionnaire-based survey of households identified on maps showing the land and villages / communities that will be affected by the project.

Chapter 2
Policy, Legal and Administrative Framework

CHAPTER - 2

POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.0 PREAMBLE

The ESIA study for the proposed Cement project has been carried out within the framework of local, national and international environmental regulations. The legislative framework applicable to the proposed project is governed by the Federal Democratic Republic of Ethiopia (FDRE), the African Development Bank (AfDB), the International Finance Corporation (IFC), the European Investment Bank (EIB) and the Development Bank of Ethiopia (DBE). The following sections describe the national and international regulations/ conventions/ standards applicable to the proposed project.

2.1 REGULATORY FRAMEWORK OF FDRE

2.1.1 ENVIRONMENTAL POLICY

Ethiopia adopted its Constitution in 1995, which provides the basic and comprehensive principles and guidelines for environmental protection, and management in the country.

The first comprehensive statement of Environmental Policy of Ethiopia (EPE) was approved by the Council of Ministers in April 1997. It was based on the policy and strategic findings and recommendations of the Conservation Strategy of Ethiopia. The National Conservation Strategy (NCS) which was developed through the consultative process over the period 1989-1995 takes a holistic view of natural, human made and cultural resources, and their use and abuse and seeks to integrate into coherent framework plans, policies and investment related to environmental sustainability. The document consists of five volumes, i.e., the Natural Resource Base, Policy and Strategy, Institutional Framework, The Action Plan and Compilation of Investment Programme.

The Environmental Policy is predicated on a growing concern for the degradation of the natural resource base. The 'overall policy goal is to improve and enhance the health and quality of life of all Ethiopians and to promote sustainable social and economic development through the sound management and use of natural, human made and cultural resources and the environment as a whole.'

The following are extracts from the National Environmental Policy and have provided essential guidance for activities of environmental agencies in general.

- Incorporate the full economic, social and environmental costs and benefits of natural resources development;
- Appropriate and affordable technologies which use renewable resources efficiently shall be adopted, adapted, developed and disseminated;
- When a compromise between short term economic growth and long term environmental protection is necessary, then development activities shall minimize degrading and polluting impacts on ecological and life support systems;
- Regular and accurate assessment and monitoring of environmental conditions shall be undertaken;
- Ensure that EIAs consider not only physical and biological impacts but also address social, socio-economic, political and cultural conditions;

- Recognise that public consultation is an integral part of EIA and ensure that EIA procedures make provision for both an independent review and public comment before consideration by decision makers;
- Establish the necessary institutional framework and determine the linkage of its parts for undertaking, coordinating and approving EIAs and the subsequent system of environmental audits required to ensure compliance with conditions;
- Develop detailed sectoral technical guidelines in EIA and environmental audits;
- Ensure that preliminary and full EIAs are undertaken by the relevant sectoral ministries or departments, if in the public sector, and by the developer if in the private sector.

Thus EPE provides a number of guiding principles that indicate and require a strong adherence to sustainable development.

Sectoral Environmental Polices are also defined under the EPE, 1997. These policies cover the following sectors:

- Soil Husbandry and Sustainable Agriculture
- Forest, Woodland and Tree Resources
- Genetic, Species and Ecosystem Biodiversity
- Water Resources
- Energy Resource
- Mineral resources
- Human Settlement, Urban Environment and Environmental Health
- Control of Hazardous materials and Pollution from Industrial waste
- Atmospheric Pollution and Climate Change
- Cultural and Natural Heritage

The Cross-sectoral Environment Policies of the EPE include:

- Population and Environment
- Community Participation and Environment
- Tenure and Access Rights to Land and Natural Resources
- Land Use Plan
- Social and Gender Issues
- Environmental Economics
- Environmental Information System
- Environmental Research
- Environmental Impact Assessment (EIA)
- Environmental Education and Awareness

2.1.2 LEGAL AND POLICY CONTEXT

The concept of Sustainable Development and environmental rights are enshrined in Articles 43, 44 and 92 of the Constitution of FDRE.

In Article 43 : the Right to development, where people's right to:

- Improved living standards and to sustainable development;
- Participate in national development and, in particular, to be consulted with respect to policies and projects affecting their community;
- The enhancement of their capacities for development and to meet their basic needs, are recognized;

In Article 44 : Environmental Rights, all persons are entitled to:

- Live in a clean and healthy environment;
- Compensation, including relocation with adequate state assistance

In Article 92 : Environmental Objectives, it is declared that,

- Government shall ensure that all Ethiopians live in a clean and healthy environment;
- Programs and projects design shall not damage or destroy the environment;
- Peoples have the right to full consultation and expression of views;
- Government and citizens have the duty to protect the environment.

2.1.3 INSTITUTIONAL FRAMEWORK

The FDRE consists of the Federal State and Regional States, which are nine in number. Proclamations 33/ 1992, 41/ 1993 and 4/ 1995 define the duties and responsibilities of the Regional States which include planning, directing and developing social and economic development programs as well as protection of natural resources.

The most important step in setting up the legal framework for the environment in Ethiopia has been the establishment of the Environmental Protection Authority (EPA) by Proclamation no. 299/ 2002. According to this Proclamation,

The EPA as a Federal Environmental agency is responsible for:

- The establishment of a required system for EA of public and private sector projects, as well as social and economic development policies, strategies, laws, and programs of federal level functions;
- Reviewing and passing decisions and follow-up the implementation of Environmental Impact Study Reports of projects, as well as social and economic development programs or plans where they are
  - subject to federal licensing, execution or supervision;
  - proposed activities subject to execution by a federal agency;
  - likely to entail inter or transregional, and international impacts
- Notifying its decision to the concerned licensing agency at or before the time specified in the appropriate law or directives;
- Auditing and regulating the implementation of the conditions attached to the decision;
- Provide advice and technical support to the regional environmental agencies, sectoral institutions and the proponents;
- Making its decisions and the EA report available to the public, resolving all complaints and grievances in good faith and at the appropriate time;

- Develop incentive or disincentive structures required for compliance of EA requirements, pave the way and involve in EA awareness creation, etc.

The Regional Environmental Agencies are responsible to:

- Adopt and interpret federal level EA policies and systems or requirements in line with their respective local realities;
- Establish a system for EA of public and private projects, as well as social and economic development policies, strategies, laws, or programs of regional level functions;
- Inform EPA about malpractices that affect the sustainability of the environment regarding EA and cooperate with EPA in compliant investigations;
- Administer, oversee, and pass major decisions regarding impact assessment of:
  - projects subject to licensing by regional agency
  - projects subject to execution by a regional agency
  - projects likely to have regional impacts

The Proclamation assigns responsibilities to separate organizations for environmental development and management activities on one hand, and environmental protection, regulation and monitoring on the other. It gives the EPA the legal powers required for enforcing as well as to spearhead the enforcement of and ensure compliance with environmental laws and standards.

In this regard, EPA has established an Environmental Impact Assessment system for Ethiopia including the preparation of Procedural and Sectoral Guidelines as a prerequisite for the approval of new development activities and projects.

"Environmental Protection Organs Establishment Proclamation (Proclamation no. 295 of 2002)" stipulates the need to establish a system that enables to foster co-ordinated but differentiated responsibilities among environmental protection agencies at Federal and Regional levels. The proclamation requires the establishment of Sectoral and Regional Environmental Units and agencies, respectively. This shows that institutionalizing and mainstreaming environmental concerns has a legal foundation.

"Environmental Impact Assessment Proclamation (Proclamation no. 299 of 2002)" has made EA to be a mandatory legal prerequisite for the implementation of major development projects, programs and plans. This proclamation is a proactive tool and a backbone to harmonizing and integrating environmental, economic and social considerations into a decision making process in a manner that promotes sustainable development.

"Environmental Pollution Control Proclamation (Proclamation no. 300 of 2002)" is promulgated with a view to eliminate or, when not possible to mitigate pollution as an undesirable consequence of social and economic development activities. This proclamation is one of the basic legal documents, which need to be observed as corresponding to effective EA administration.

The EIA Process as applicable to development projects is detailed in the 'Environmental Impact Assessment Procedural Guidelines Series 1' of November 2003. *As per the Schedule I, which lists projects requiring a full EIA and is annexed to the Guidelines, both cement plants as well as mining projects have significant environmental impacts, and, therefore, require a full EIA/ EA.*

The Derba Cement plant will be responsible for implementing environmental management plans at its facilities in coordination with the Federal EPA and the Regional EPA for Oromiya region.

The basic administrative unit is Wereda. Each Wereda is divided into Kebele and further into Peasant Associations. Several Sectoral Bureaus and Authorities including the EP Office have been established by Oromiya Regional Govt.

2.1.4 OVERVIEW OF SUSTAINABLE DEVELOPMENT & POVERTY REDUCTION PROGRAMME

Ethiopia has been hit hard by recurrent events of drought and concomitant famines since the early 70s. These droughts are a series of occurrences of rainfall shortages with negative effects on agriculture and rural life. The sweeping droughts have not only devastated the agricultural base of the country but also gripped the environmental complex of the country.

In order to combat land degradation and reverse the prevailing level of poverty the Government has prepared the Sustainable Development and Poverty Reduction Programme (SPDRP). As noted in the programme, realization of this can only be achieved by implementing a number of prioritized programmes and development in different sectors. The programme has been prepared with the objective of building a free market economic system, which will enable the economy to develop rapidly, the country to extricate itself from its dependence on food aid and make poor people the main beneficiaries of growth.

EPA has prepared the Draft EMP for the Identified Sectoral Developments in the Ethiopian Sustainable Development and Poverty Reduction Programme (ESDPRP) in May 2004.

2.1.5 INTERNATIONAL OBLIGATIONS

The Ethiopian Government has adopted a number of multilateral environmental agreements as a basis for state obligations with regard to sustainable development. The international agreements to which Ethiopia is a signatory include:

- Framework Convention on Climate Change (New York, 1992)
- Convention on Biological Diversity (Rio de Janeiro, 1992)
- Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel, 1989)
- Protocol on Substances that Deplete the Ozone Layer (Montreal, 1987)
- Convention for the Protection of the Ozone Layer (Vienna, 1985)
- The United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/ or Desertification, particularly in Africa
- Convention on Persistent Organic Pollutants, Stockholm
- Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, Rotterdam

2.1.6 EIA PROCEDURES AND GUIDELINES IN ETHIOPIA

Table 2.1 outlines the EIA procedures in Ethiopia.

EIA Stage	Action	Agency involved
Screening	• Preparation of project profile • Decision on whether or not the project requires an EIA	EPA
Scoping of the EIA	• Developing TORs • Initiating initial public consultation	EPA, Funding agency, Consultant
Environmental Impact Study	• Impact assessment • Design of mitigation measures • Design monitoring and audit plan	EPA, Funding agency, Consultant, Proponent
Reviewing the adequacy of the EIA	• Review contents and provide comments for necessary revisions	EPA, Funding agency
Decision Making	• Summary evaluation made available to public • Decisions & conditions for approval made public	EPA
Systematic EA Follow ups	• Ensuring implementation of agreed mitigation measures • Periodic review & alteration of management plan if required	Private Contractors, EPA, Funding Agency

Table 2.1 : EIA Procedure in Ethiopia

2.1.6.1 EIA Process

The general description of the EIA process and the permit requirements are detailed in the Environmental Impact Assessment Procedural Guideline Series 1 of the FDRE released in Nov 2003. As per the Guidelines, an EIA shall contain:

- sufficient information to enable the determination of whether and under what conditions the project shall proceed.
- as a minimum, a description of:
  i. the nature of the project, including the technology and processes to be used and their physical impacts;
  ii. the content and amount of pollutants that will be released during implementation as well as during operation;
  iii. source and amount of energy required for operation
  iv. characteristics and duration of all the estimated direct or indirect, positive or negative impacts on living things and the physical environment
  v. measures proposed to eliminate, minimize, or mitigate negative impacts
  vi. a contingency plan in case of accidents
  vii. procedures of internal monitoring and auditing during implementation and operation.

Subsequent to Screening, Scoping and EIA Study, the stages, which have already been completed for the proposed **DMC** project, the balance stages involved in the EA include the following:

Reviewing

The purpose of review is to examine and determine whether the EIA report is an adequate assessment of the environmental effects and of sufficient relevance and quality for decision- making. Reviewing is conducted at various stages in the EA processes and includes reviewing of Screening report, Scoping report, TORs, EIA Report, and Performance (monitoring or audit) reports at different stages in the project cycle.

Reviewing may include considerations of the adequacy of:

- Compliance with the “approved TOR”;
- Required information;
- The examination of alternatives, assessment of impacts, appropriateness of mitigation measures and monitoring schemes as well as implementation arrangements;
- The use of scientific and analytical techniques;
- The extent of public involvement and reflection of their concerns;
- Presentation of the information to decision makers at Regional, Sectoral, and Local levels.

Decision Making

EIA is an on-going process of review, negotiations and incremental decision-making at various levels of the project cycle, about whether or not the proposal is to proceed, and under what conditions. Decision-making is consultative, participatory and influences others to behave responsibly and sustainably. It also acknowledges and implements mandates and responsibility. Full-scale assessment is required where the project is known to have significant adverse environmental impacts. Important considerations of decision-making are:

- A summary of evaluation is made available to the public;
- Reasons for decision and conditions of approval are made public;
- There is the right of appeal against decision;
- Approval can be reversed or permit can be revoked on the advent of changing circumstances;
- Approval of a proposal cannot immune the proponent from being accountable of the occurrence of adverse significant impacts in the course of the implementation of the project.

The licensing agency shall, prior to issue of an operating license for a project, ensure that the EIA of the project has been approved.

Approval of an EIA report is only to mark a simple agreement to the proposal. The culmination of the approval procedure will be the issuance of an Environmental Clearance Certificate upon the satisfactory trial operation phase.

2.1.6.2 Applicable Proclamations/ Guidelines

The Proclamations and EPA Guidelines applicable to the proposed cement project as well as the mining project at Derba are listed below:

Sn	Title	No.	Date of Issue
1	Environmental Impact Assessment Proclamation	299	31 Dec 2002
2	Environmental Pollution Control Proclamation	300	03 Dec 2002
3	Environmental Protection Organs Establishment Proclamation	295	31 Oct 2002
4	Expropriation of Landholdings for Public Purposes and Payment of Compensation Proclamation	455	15 Jul 2005
5	Rural Land Administration Proclamation	89	07 Jul 1997
6	Mining Regulations		20 Apr 1994
7	Mining Proclamation	52	23 Jun 1993
8	Solid Waste Management Proclamation	513	12 Feb 2007
9	Environmental Impact Assessment Procedural Guideline Series 1		Nov 2003
10	Draft EMP for the Identified Sectoral Developments in the Ethiopian Sustainable Development & Poverty Reduction Programme (ESDPRP)		May 2004
11	Environmental Impact Assessment Guideline for Mineral and Petroleum Operation Projects		Dec 2003
12	Investment Proclamation	280	02 Jul 2002
13	Council of Ministers Regulations on Investment Incentives and Investment Areas Reserved for Domestic Investors	84	07 Feb 2003
14	Investment (Amendment) Proclamation	373	28 Oct 2003

2.2 ETHIOPIAN DRAFT STANDARDS APPLICABLE TO THE PROJECT

The EPA of FDRE has been actively engaged in the preparation of national environmental quality standards for air, water, noise, etc. To date many of these standards are still in draft form. As such, International Standards are commonly relied upon. The proposed draft standards as formulated by the FDRE for ambient air quality, noise levels, emission levels and discharge of wastewater are given in **Table 2.2**.

Sn	Element	Requirement		Draft Standard
1	Quality for discharge to water			
	Cement manufacturing	pH BOD_5 at 20°C COD Total Phosphorus as P Suspended Solids Mineral oils at the oil trap or interceptor	6-9 25 mg/ l 150 mg/ l 5 mg/ l 50 mg/ l 20 mg/ l	EPA, FDRE
2	Stack Emissions			
	Cement Manufacturing	Total particulates SO_2 NO_2	150 mg/ Nm^3 1000 mg/ Nm^3 2000 mg/ Nm^3	EPA, FDRE

Sn	Element	Requirement			Draft Standard
3	Ambient Air Quality				
		Parameter	*Standard ($\mu g/ m^3$)*	*Averaging Time*	EPA, FDRE
		SO_2	500	10 min	
			125	24 hr	
			50	1 yr	
		NO_2	200	24 hr	
			40	1 yr	
		CO	100,000	15 min	
			60,000	30 min	
			30,000	1 hr	
			10,000	8 hr	
		PM_{10}	50	1 yr	
			150	24 hr	
4	Noise Quality				
a	Noise standards where people live or work	*Category of area*	*Limits in dB(A) Leq*		EPA, FDRE
			Day time[1]	Night time[2]	
		Industrial	75	70	
		Commercial	65	55	
		Residential	55	45	
		1: Day time reckoned from 6 am to 9 pm *2: Night time reckoned from 9 pm to 6 am*			
b	Vibration & Air Overpressure in Mining & Quarrying				
	Peak particle vibration	Level of 12 mm/sec[1], measured in any three mutually orthogonal directions at a receiving location when blasting occurs at a frequency of once per week or less Level of 8 mm/ sec[2] for more frequent blasting *1, 2: For vibrations <40 Hz*			EPA, FDRE
	Air Overpressure	Blasting should not give rise to air overpressure values in excess of 125 dB(Lin) max peak at sensitive locations			

Table 2.2 : Draft Standards Proposed by EPA, Ethiopia

2.3 INTERNATIONAL REGULATORY FRAMEWORK

2.3.1 WORLD BANK GUIDELINES

The World Bank and IFC provide guidelines for the Environment Assessment (EA) process. As of April 30, 2007, new versions of the World Bank Group Environmental, Health and Safety Guidelines (EHS) are in use. The EHS Guidelines also include sector specific:

- EHS Guidelines for Cement and Lime Manufacturing
- EHS Guidelines for Construction Material Extraction

In addition to the above, the EHS- General Guidelines are also applicable. The EHS Guidelines contain the performance levels and measures that are normally acceptable to the IFC and are generally considered to be achievable in new facilities at reasonable cost by existing technology.

The proposed cement project falls under Category A as per IFC's Performance Standards and its procedures for project appraisal. Category A projects are those with potential significant adverse social or environmental impacts that are diverse, irreversible or unprecedented. The scope of EA for Category A projects examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

2.3.2 AFRICAN DEVELOPMENT BANK GUIDELINES

The AfDB has defined the 'African Development Bank Group's Policy on the Environment' in Feb 2004 on sustainable development in Africa. The policy assesses environmental constraints and opportunities that affect medium and long term development objectives across Africa. It also sets out the broad strategic and policy framework under which all Bank operations are made.

Within the environmental and social assessment process, any AfDB project is to be categorized in one of the four possible categories. As per the Environmental and Social Assessment Procedures of AfDB, the proposed cement project including its associated mining operations is classified as Category 1.

Category 1 projects are likely to have 'important adverse environmental and/ or social impacts that are irreversible, or to significantly affect environmental or social components considered sensitive by the Bank or the borrowing country. This category includes projects that may generate the most severe adverse environmental or social impacts such as, among others, direct pollutant discharges in the natural environment, large scale physical disturbance of the project site and its surroundings, significant migration or displacement of affected populations, significant changes in socio-cultural patterns, adversely affect vulnerable groups, destruction or degradation of substantial biological resources, significant increase in health and safety risks, or major changes in the hydrology or water quality.'

The projects assigned to Category 1 require a full ESIA, including the preparation of an ESIA report and ESMP. If the project involves involuntary resettlement of community, a detailed Resettlement Action Plan is also required.

2.3.3 IFC STANDARDS APPLICABLE TO THE PROJECT

The EHS Guidelines released on 30 April 2007 are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP). The World Bank 'EHS Guidelines for Cement and Lime Manufacturing' have set standards for air emissions levels and effluent levels from cement manufacturing as given below.

2.3.3.1 Emissions

Table 2.3 gives the emission guidelines for the cement sector. These guidelines are achievable under normal operating conditions in appropriately designed and operated facilities through the application of pollution prevention and control techniques. These

levels should be achieved, without dilution, at least 95% of the time that the plant is operating, to be calculated as a proportion of annual operating hours.

Sn	Pollutants	Units	Guideline Value
1	Particulate Matter (new kiln systems)	mg/ Nm^3	30[a]
2	Dust (Other point sources including clinker cooling, cement grinding)	mg/ Nm^3	50
3	SO_2	mg/ Nm^3	400
4	NOx	mg/ Nm^3	600
5	HCl	mg/ Nm^3	10[b]
6	Hydrogen fluoride	mg/ Nm^3	1[b]
7	Total organic carbon	mg/ Nm^3	10
8	Dioxins-furans	mgTEQ/Nm^3	0.1[b]
9	Cadmium & Thallium (Cd+Tl)	mg/ Nm^3	0.05[b]
10	Mercury (Hg)	mg/ Nm^3	0.05[b]
11	Total Metals[c]	mg/ Nm^3	0.5

Notes

** Emissions from the kiln stack unless otherwise noted. Daily average values corrected to 273K, 101.3 kPa, 10 percent O_2 and dry gas, unless otherwise noted*

[a] *10 mg/ Nm^3 if more than 40 percent of the resulting heat release comes from hazardous waste.*

[b] *If more than 40 percent of the resulting heat release comes from hazardous waste average values over the sample period of a minimum of 30 minutes and a maximum of 8 hours.*

[c] *Total Metals = Arsenic (As), Lead (Pb), Cobalt (Co), Chromium (Cr), Copper (Cu), Manganese (Mn), Nickel (Ni), Vanadium (V) and Antimony (Sb)*

Table 2.3 : EHS Emission Guidelines for Cement Sector

2.3.3.2 Ambient Air Quality

As per EHS- General Guidelines, projects with significant sources of air emissions should ensure that emissions do not result in pollutant concentrations that reach or exceed relevant ambient air quality guidelines and standards by applying national legislated standards, or in their absence, the current WHO Air Quality Guidelines as given in **Table 2.4**.

Sn	Parameter	Averaging Period	Guideline value in µg/ m^3
1	Sulphur dioxide (SO_2)	24 hour 10 minute	125 (Interim target -1) 50 (Interim target-2) 20 (Guideline) 500 (Guideline)
2	Nitrogen dioxide (NO_2)	1-year 1-hour	40 (Guideline) 200 (Guideline)
3	Particulate Matter PM_{10}	1-year 24-hour	70 (Interim target -1) 50 (Interim target -2) 30 (Interim target -3) 20 (Guideline) 150 (Interim target -1)

Sn	Parameter	Averaging Period	Guideline value in µg/ m^3
			100 (Interim target -2) 75 (Interim target -3) 50 (Guideline)
4	Particulate Matter $PM_{2.5}$	1-year	35 (Interim target -1) 25 (Interim target -2) 15 (Interim target -3) 10 (Guideline)
		24-hour	75 (Interim target -1) 50 (Interim target -2) 37.5 (Interim target -3) 25 (Guideline)
5	Ozone	8-hour daily maximum	160 (Interim target-1) 100 (Guideline)

Table 2.4 : EHS Guidelines for Ambient Air Quality

2.3.3.3 Effluents

Effluent guidelines as specified in the EHS Guidelines for Cement Manufacturing are applicable for discharges of treated waters for general use and are given in **Table 2.5.**

Sn	Pollutant	Units	Guideline value
1	pH	pH	6 – 9
2	BOD	mg/l	30
3	COD	mg/l	125
4	Total Nitrogen	mg/l	10
5	Total Phosphorus	mg/l	2
6	Oil and grease	mg/l	10
7	Total suspended solids	mg/l	50
8	Total coliform bacteria	MPN[b]/100 ml	400[a]

[a]Not applicable to centralized, municipal, waste water treatment systems which are included in EHS guidelines for Water and Sanitation

[b]MPN = Most Probable Number

Table 2.5 : EHS Guidelines for Effluent

2.3.3.4 Noise Levels

Noise Levels beyond the property boundary of the Plant

The General EHS Guidelines on Noise Management specify the noise level guidelines applicable to this project. Noise levels should not exceed the levels as given in **Table 2.6**, or result in a maximum increase in background levels of 3 dB at the nearest receptor location off site.

Sn	Receptor	One hour Leq (dBA)*	
		Day time 07.00-22.00	Nighttime 22.00-07.00
1	Residential, institutional, educational@	55	45
2	Industrial, commercial	70	70

** Guidelines values are for noise levels measured out of doors. Source : Guidelines for Community Noise, WHO, 1999*
@ For Acceptable indoor noise level for residential, institutional, and educational settings, WHO, 1999.

Table 2.6 : EHS Guidelines on Noise Management

Noise Levels in Work Environment

The General EHS Guidelines on Occupational Health & Safety specify the noise level guidelines applicable to different working environments. Noise levels should not exceed the levels as given in **Table 2.7**.

As per the guidelines:

- No employee shall be exposed to noise levels greater than 85 dB(A) for a duration of more than 8 hours per day without hearing protection. In addition, no unprotected ear should be exposed to a peak sound pressure level (instantaneous) of more than 140 dB(C). The use of hearing protection shall be strictly enforced when the sound level over 8 hours reaches 85 dB(A), the peak sound levels reach 140 dB(C) or the average maximum sound level reaches 110 dB(A).
- For every 3 dB(A) increase in sound levels, the 'allowed' exposure period or duration should be reduced by 50%.

Sn	Location/ Activity		
		Equivalent Level LA_{eq}, 8h	Maximum LA_{max}, fast
1	Heavy Industry (no demand for oral communication)	85 dB(A)	110 dB(A)
2	Open offices, Control Rooms	45-50 dB(A)	-

Table 2.7 : Noise Limits for Working Environment

2.3.3.5 Effluent from Mining Activities

Limestone mining activities may generate dewatering effluents, which may contain suspended solids. As per the 'EHS Guidelines for Construction Material Extraction', the concentration of Total Suspended Solids (TSS) should be limited to 50 mg/ l at the point of discharge.

EHS General Guidelines for Ambient Air Quality standards as specified in Table 2.4 above shall apply to mining areas also.

2.3.3.6 Resource Use and Waste

Table 2.8 provides examples of resource use and waste generation at cement projects that can be considered as indicators of the plant's efficiency and may be used to track performance changes at **DMC** over time.

Resource and energy consumption		
Inputs per unit of product	**Unit**	**Industry Benchmark**
Fuel energy-cement	GJ/ t clinker	3.0-4.2
Electric energy-cement	kWh/ t equivalent cement	90-150
Electric energy-clinker grinding	kWh/ t	40-45
Emission and waste generation		
Waste	kg/ t	0.25-0.6
Dust emissions	g/ t equivalent cement	20-50
NOx emissions	g/ t equivalent cement	600-800
SOx emissions	kg/ t	0.1-2.0
CO_2 emissions from decarbonation	kg/ t	400-525
CO_2 emissions from fuel	kg/ t equivalent cement	150-350
Heat consumption and production capacity for kiln		
Heat consumption for Preheater-precalciner (3-6 stage)	MJ/ t clinker	3000-3800

Table 2.8 : Resource Use and Waste Generation

2.3.4 CEMENT SUSTAINABILITY INITIATIVE

The World Business Council for Sustainable Development's (WBCSD) Cement Sustainability Initiative (CSI) is a global effort by the world's leading cement producers to address issues related to global sustainability of the cement industry. The purpose of the Initiative is to:

- Explore what Sustainable Development means for cement industry
- Identify actions & facilitate steps cement companies can take, individually and as a group, to accelerate progress towards Sustainable development
- Provide a framework for other cement companies to become involved
- Create the content and context for further stakeholder engagement

Under the Initiative, the following six critical sectors of sustainability have been dealt with and individual guidelines have been prepared for the same:

- CO_2 and Climate
- Responsible Use of Fuel and Raw Materials
- Health & Safety
- Emissions monitoring & Reporting
- Land & Communities
- Reporting & Communications

These guidelines have been incorporated to a large extent while planning the project's development, operation and eventual closure. The Good Practices in the Cement Industry shall be reviewed and an attempt made to incorporate them into the operations of **DMC** to the extent possible.

2.3.5 IFC'S PERFORMANCE STANDARDS

IFC applies to all the projects it finances environmental and social standards to minimize their impact on the environment and on affected communities. Together the following eight performance Standards establish standards that **DMC** is to meet throughout the project life:

- Performance Standard 1 : Social and Environmental Assessment and Management System
- Performance Standard 2 : Labour and Working Conditions
- Performance Standard 3 : Pollution Prevention and Abatement
- Performance Standard 4 : Community Health, Safety and Security
- Performance Standard 5 : Land Acquisition and Involuntary Resettlement
- Performance Standard 6 : Biodiversity Conservation and Sustainable Natural Resource Management
- Performance Standard 7 : Indigenous Peoples
- Performance Standard 8 : Cultural Heritage

Performance Standard 1 establishes the importance of: (i) integrated assessment to identify the social and environmental impacts, risks, and opportunities of projects; (ii) effective community engagement through disclosure of project related information and consultation with local communities on matters that directly affect them; and (iii) the client's management of social and environmental performance throughout the life of the project. Performance Standards 2 through 8 establish requirements to avoid, reduce, mitigate or compensate for impacts on people and the environment, and to improve conditions where appropriate. Performance Standards 2 to 8 describe potential social and environmental impacts that require particular attention in emerging markets. Where social or environmental impacts are anticipated, the proponent is required to manage them through its Social and Environmental Management System consistent with Performance Standard 1.

Chapter 3
Project Description

CHAPTER - 3
PROJECT DESCRIPTION

3.0 PREAMBLE

DMC proposes to establish a greenfield integrated cement project to produce 5,600 tpd of clinker for manufacture of 7,500 tpd of OPC and PPC.

3.1 RAW MATERIALS

The raw material and fuel requirements for the proposed plant are to be met from different sources as given in **Table 3.1**.

Sn	Material	Source Locality	Distance from plant (km)	Remarks
Raw materials				
1	Limestone & Marl	Mugher	6.5	The crusher, located in the mine, would be connected to the plant by a 7 km long belt conveyor.
2	Clay	Mulu Seyo	18	Considered as a corrective.
3	Sand	Mugher	15	Considered as a corrective.
4	Basalt	Near Gimbichu	10	Considered as a corrective.
5	Gypsum	Mugher	15	Considered as an additive
6	Pumice	Dera Ararate/ Nazerat	125	Considered as an additive
Fuel				
1	HFO	Middle East	-	Transport by sea up to Djibouti port, land transport 925 km
2	Imported coal	South Africa	-	

Table 3.1 : Raw Materials

3.1.1 DERBA LIMESTONE DEPOSIT

The limestone deposit is accessible from Addis Ababa via Chancho - Seno Gebeya - Welenkomi - Mugher by a partly tar, gravel and semi finished road. The 40 km road from Addis Ababa to Chancho is tar road whereas the 29 km road from Chancho to Seno Gebeya is gravel road. The remaining 38 km road is unfinished and accessible by four-wheel drive vehicle only.

In practice the deposit is at present accessible by about 12 km foot track from Derba plant site, which is situated at a distance of 70 km from Addis Ababa.

The deposit is surrounded by Mugher river and its tributaries. Due to the natural topography of the area, limestone deposit lies in the valley (1550-1650 m above MSL) whereas the flat area where the plant is proposed to be located is at an altitude of 2380-2420 m above MSL. There is a sharp fall in elevation of approximately 800 to 850 m between the plant and the mining areas.

A view of the mining area from the plant site is show in **Fig. 3.1** and the satellite picture of the area along with the toposheet is shown in **Fig. 3.2.**

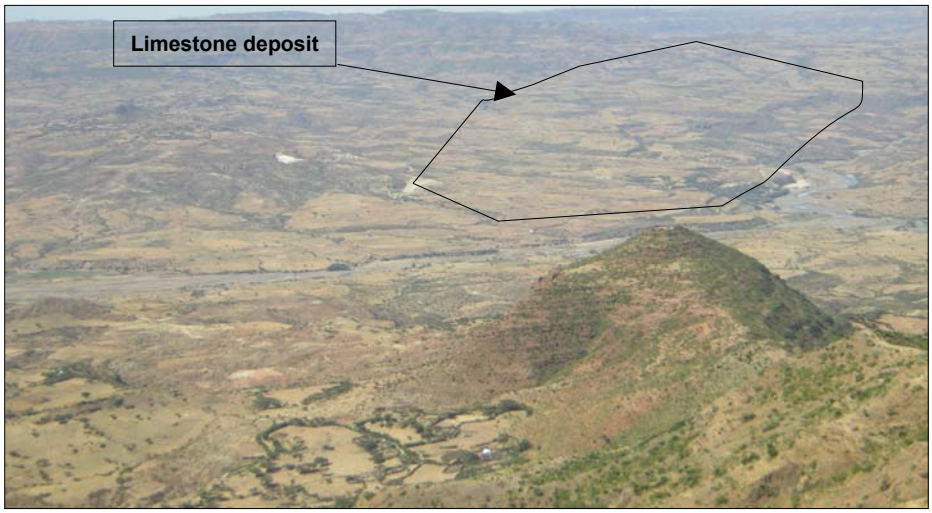


Fig. 3.1 : View of the deposit from the proposed plant location

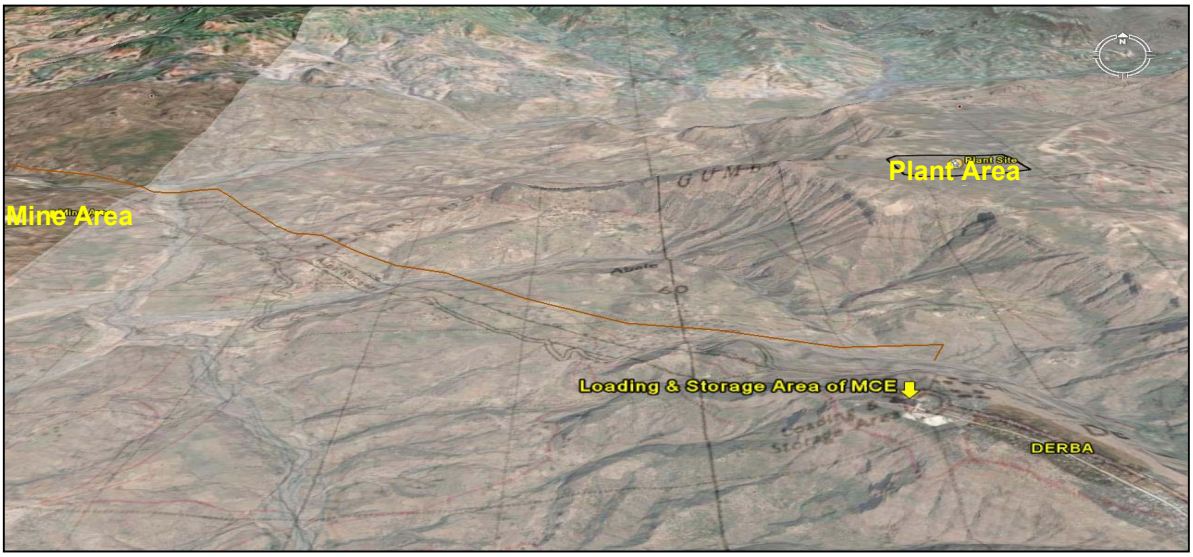


Fig. 3.2 : Satellite picture along with Toposheet of the area showing the Project Location

The limestone is massive with alternate beds of soft calcareous thinly bedded marl. The limestone beds are EW trending showing a dip variation of 4° to 15°. The thickness of limestone and the associated marl is >30m.

3.1.2 OTHER RAW MATERIALS

Correctives Basalt, sandstone and clay are found in the immediate vicinity of the limestone deposit. Basalt occurs all over the top of the plateau as well as a hillock around the plant site. Sandstone occurs in the adjacent area and is currently being mined by Mugher Cement for supply to float glass industry. Clay occurs in pockets about 18 km from the plant site. Additive gypsum is interbedded with marl and occurs under the limestone formation. Pumice proposed to be used for PPC manufacture shall be purchased from a distance of 125 km from the plant site.

Coal will be imported from South Africa. It will be transported by sea up to the nearest seaport at Djibouti and from Djibouti to the plant site by road. The locations of the raw material sources are shown in **Fig. 3.3**.

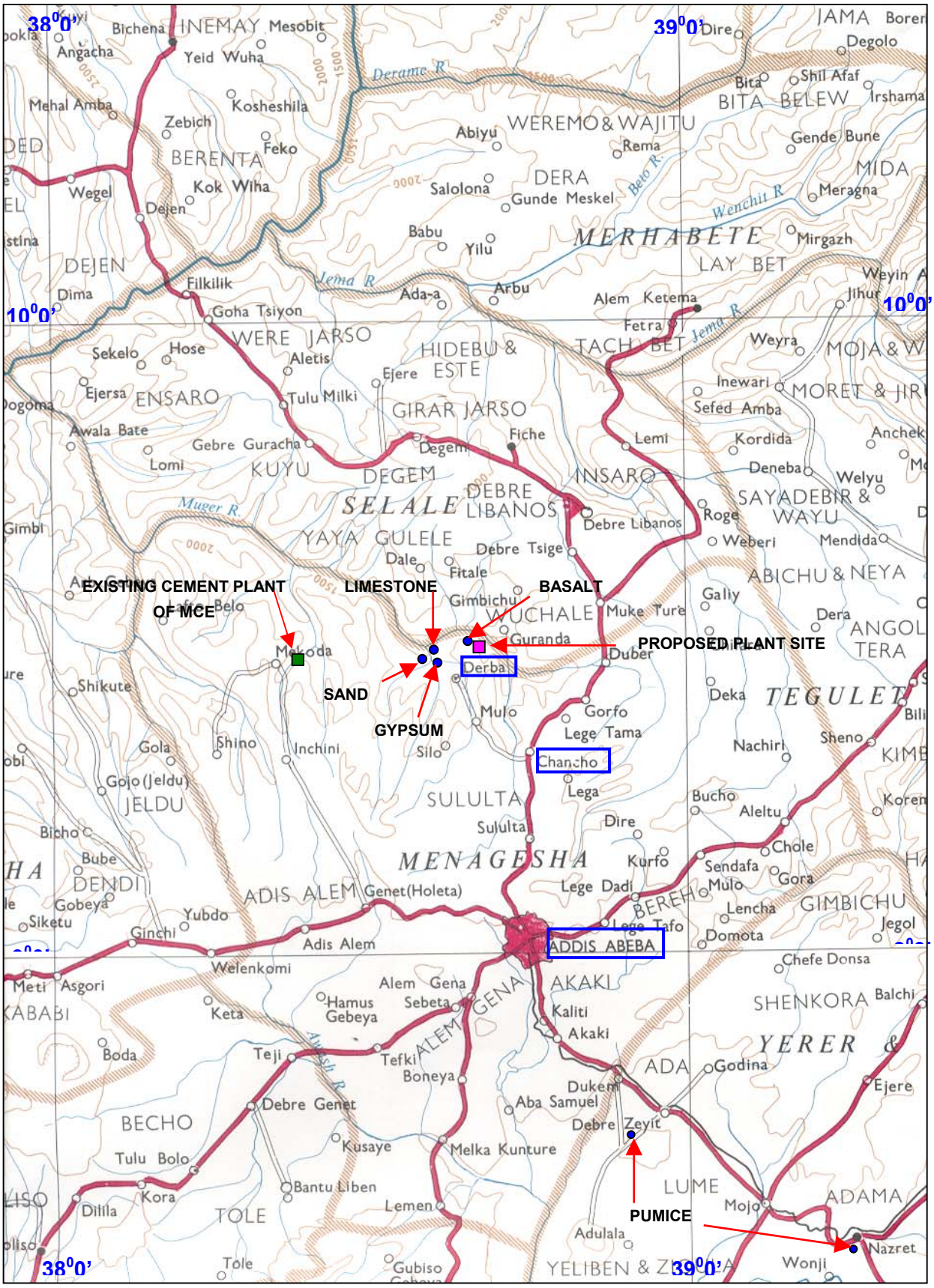


Fig. 3.3 : Raw Material Sources

3.2 PRODUCTION CAPACITY

The product i.e. OPC and PPC shall meet the requirements of Ethiopian National Standard No. EN-197. OPC shall be produced as per CEM-I – 42.5 grade and shall contain 95% clinker and 5% gypsum. PPC shall be produced as per CEM-II – 32.5 grade and shall contain 67% clinker, 28% pumice and 5% gypsum. Considering a mix of OPC : PPC at 30:70 and kiln run days as 330 per annum, the required clinkerisation capacity works out to 5,620 tpd or say, 5,600 tpd clinker. This is equivalent to a cement capacity of about 7,500 tpd of cement with the above composition of OPC and PPC. The annual cement capacity works out to 2.46 mio tpa cement.

3.3 SIZING NORMS FOR MAIN MACHINERY AND STORAGE

Assessment of sizing of the main machinery and storages has been carried out based on the International Norms and Practices adopted for sizing of similar plants. These norms are summarized in **Tables 3.2 & 3.3** for "Main Machinery" and "Storages" respectively.

Sn	Department	Design factor for safety	Operating		
			Hrs/Day	Days/Year	Hrs/Year
1	Mines	1.25	10	300	3,000
2a	Limestone Crusher	1.25	10	300	3,000
2b	Belt Conveyor	1.25	10	300	3,000
2c	Additive and coal crusher	1.25	15	300	4,500
3	Raw Mill	1.10	22	330	7,260
4	Kiln	-	24	330	7,920
5	Cement Mill	1.10	22	330	7,260
6	Coal Mill	1.10	22	330	6,930
7	Packer	1.25	15	360	5,400
8	Bulk Loader	1.25	15	360	5,400
9	Other material handling equipments	1.25	Operating hours shall be governed by preceding and succeeding equipments.		

Table 3.2 : Operating Norms for Main Machinery

The provision of storages have been finalized based on the following:

- Lead of source from plant
- Ownership of source i.e. self or "bought out"
- Transportation route
- Cost of resource
- Inventory carrying cost

Sn	Department	Storage Days	Remarks
1	Mix (Limestone + Marl) Preblending Stockpile	5 - 7	Mill Days
2	Corrective (Basalt / sand stone)	5 - 7	Mill Days
3	Raw Meal Storage (Active/ Total)	1.5/ 3	Kiln Days
4	Clinker Storage	7 - 10	Kiln Days
5	Cement Storage	3 - 4	Mill Days
6	Additive (Pumice)	10 -14	Mill Days
7	Gypsum Storage	5 - 7	Mill Days
8	Imported coal	30, or equivalent of 1 ship load, whichever is higher	Kiln consumption

Table 3.3: Operating Norms for Main Storage

Limestone, marl, gypsum, basalt, sandstone are all locally available, hence storage of about a week is planned. However, for pumice about 2 weeks storage is considered. Clinker storage of 7-10 days is considered based on the kiln likely stoppage of about 7-10 days every 6-8 months.

3.4 RAW MIX AND PLANT DESIGN

The project envisages coal as the main fuel. The exploration for indigenous coal are still in initial stages, hence plant design is being based on Imported coal. However, as an emergency measure provision to use HFO is being kept in the plant, so that plant can be operated during emergencies. Accordingly, the raw mix has been developed as given in **Table 3.4** below.

Sn	Raw mix constituents	Percentage (%)
1	Limestone and marl in an approximate proportion of 90:10	80.855
2	Basalt	16.441
3	Sandstone	2.704

Table 3.4: Raw Mix

The clinkerisation factor works out to be 1.518 with imported coal.

For the sizing of raw material preparation and storage equipment, the following have been considered.

- Limestone and marl - 85%
- Basalt - 10 %
- Sandstone - 5%

3.5 PLANT SYSTEMS

3.5.1 MIX (LIMESTONE/ MARL) CRUSHING

For limestone and marl use, the required crushing capacity is 762 tph. Considering 25% margin over this requirement, the crusher capacity works out to 952.7 tph say 1,000 tph. The capacity of crusher is considered as 1,000 tph for this project.

The brief technical details of the proposed crushing system are as under:

Type of Crusher	:	Single Stage Impact / Hammer Crusher
Crusher Location	:	In Quarry
Feed Size	:	ROM Limestone 1,500 x 1,500 x 1,200 mm
Output Size	:	95 % (-) 75 mm (to suit Vertical roller mill, being considered for raw grinding)
Crusher Feed Hoppers	:	Dump hopper (140 m^3 for limestone and marl)
Hopper Extraction	:	Heavy Duty Apron Feeder
Crusher Discharge System	:	Short belt of 2,000 mm width. This conveyor shall feed a short cross belt conveyor. On-line PGNAA analyser has been considered on the cross-country belt conveyor from the crusher. Cross-country belt conveyor feeds the transport conveyor to the mix stockpile.
Environmental Control	:	Element controlled is fugitive dust from crusher and transfer points. Method of control adopted is with the help of bag filters and dust suppression systems.

Broad details of the system are shown in **Drg. No. 07150-05-01.**

3.5.2 LIMESTONE TRANSPORTATION

The distance from the quarry to the plant is about 7 km. The altitude difference between the quarry location and the plant location is about 800 m. A Belt conveyor system consisting of 4 number belt conveyors has been selected for the transportation of limestone and marl from the crusher to the pre-blending stockpiles. Another raw mix component sand and cement mix component Gypsum shall also be transported through the same conveyor during off time of limestone crusher**.**

The capacity of the belt conveyor system is proposed as 1,250 tph considering a 25% margin on the limestone and marl crusher. As a measure to control dust the conveyor will be covered. Dust shall be controlled at transfer points. The conveyor will feed the limestone/ marl directly to the stockpile.

3.5.3 MIX (LIMESTONE/ MARL) PRE-BLENDING STOCKPILE

The required capacity of the mix bed shall be 50,000 t. Hence a circular mix stockpile of 1 X 50,000 t has been considered. A covered stockpile is proposed. The capacity of the stacker shall be 1,250 tph (1,000 x 1.25 = 1,250) equivalent to the conveyor belt capacity

and considering a margin of 25 % over the crusher capacity. The required capacity of the reclaimer shall be 525 tph say 550 tph, considering 25 % margin on the raw mill capacity.

The broad technical details of the system under installation are as follows:

Storage Capacity	:	1 x 50,000 t
Stacking Capacity	:	1,250 tph
Type of Stacker	:	Luffing Boom
Reclaim Capacity	:	550 tph
Type of Reclaimer	:	Bridge Reclaimer

The reclaimed limestone/ marl mix shall be transported to the raw mill feed bin building with the help of a mix reclaim belt conveyor.

Environmental control measures include totally covered mix storage area, dust suppression systems and installation of a bag filter at the raw mill feed bin.

3.5.4 CORRECTIVE /ADDITIVE CRUSHING

The project envisages an independent crushing system for correctives and additives. Two correctives, namely high-grade limestone and basalt, shall be required for producing Portland Cement clinker. In addition to these, additives, namely, gypsum and pumice shall be required for producing OPC and PPC as per the requirements of Ethiopian National Standard No. EN-197.

The total additive and corrective requirements are worked out as under.

Basalt	= 13,223 t (daily requirement : 1,889 tpd), say 14,000 t
Sandstone / Sand	= 3,305 t, say 6,000 t provided for symmetry
Gypsum and Pumice	
Storage requirement of gypsum (7 days)	= 2,611 say 2,500 t
Storage requirement of pumice (14 days)	= 20,454 say 20,000 t

The Sand and gypsum (not requiring crushing) shall be directly transported to the additive stockpile from the mines through belt conveyor. However, pumice, gypsum (requiring crushing) and basalt shall be transported through dump trucks from their respective sources. After crushing in the additive/ corrective crusher these materials will be stored in the additive stockpile.

Based on this, the crusher capacity (for crushing basalt, pumice and gypsum) has been worked out as 400 tph.

The brief technical details of the proposed crushing system are as follows:

Type Of Crusher	:	Single / double Stage Impact / Hammer Crusher
Crusher Location	:	In Plant
Feed Size	:	800 x 800 x 800 mm
Output Size	:	95 % (-) 25 mm
Crusher Feed Hopper	:	One dump hopper
Hopper Extraction	:	Heavy Duty Apron Feeder
Crusher Discharge System	:	Short belt of 1,000 mm width
Transportation to stockpile	:	Crushed material shall be transported to stockpile with the help of belt conveyor.
Environmental Control	:	Element controlled is fugitive dust from crusher and transfer points. Method of control adopted is with the help of bag filters and dust suppression system.

Broad details of the system are shown in **Drg. No. 07150-05-02.**

3.5.5 CORRECTIVE AND ADDITIVE STORAGE

A common storage is envisaged for correctives and additives. Storage requirement for correctives and additives works out to:

Basalt	:	14,000 t
Sandstone	:	6,000 t
Gypsum	:	2,500 t
Pumice	:	20,000 t

Based on the above, a covered linear stockpile for correctives and additives with 14,000 t storage for basalt, 6,000 t for sandstone, 2,500 t for gypsum and 2 x 10,000 t for pumice is considered adequate. Stacking shall be with the help of a luffing boom common stacker and reclaiming by 2 nos. “side scraper type reclaimer”. One of them would be for correctives and another for gypsum and pumice. This solution allows flexibility in adjusting the material storages spaces as per operational needs.

The capacity of the stacker shall be around 500 tph (400 x 1.25) considering 25% margin over the crusher capacity. The reclaimer capacity shall be around 200 tph for each of the reclaimers, considering completion of reclaiming operations in 12 hours. For computations it is presumed that PPC is being manufactured from all the cement mills. An emergency dump hopper shall also be provided for feeding of various corrective and additive materials through pay loader.

Environmental control is by virtue of having totally closed “material storage shed”, bag filters at transfer points and bag filters at all discharge points of conveyors.

3.5.6 RAW MATERIAL DRYING AND GRINDING

The raw mill capacity is proposed at 425 tph. The mill rated output, at 12% residue on 90 micron, is proposed to be 425 tph capacity considering a 10% margin above the required capacity.

Vertical Roller Mill with Dynamic Separator of 425 tph has been considered for drying and grinding of the raw materials (limestone and correctives).

The brief technical details of the raw mill drying & grinding system are as follows:

Raw Mill Hoppers	:	3 steel mill feed bins {one for raw material mix (800 t), Sand stone / Sand (200 t), Basalt (200 t)} of mass flow design have been considered. As per raw mix, only three components are required, namely mix of limestone & marl, sand and basalt. However to take care of eventualities, 4th mill feed bin to be considered of 200 t capacity.
Raw Mill Feeding	:	Weigh feeders have been considered for extraction of limestone and marl mix, Sandstone / Sand and basalt. Feed to the mill shall be controlled with the help of these weigh feeders.
Drying	:	Hot gases from the PH shall be used for drying of raw materials in the raw mill.
Mill System	:	The VRM will have an external re-circulation of 120 tph (rated)/ design capacity of 300 tph (max). External re-circulation is achieved by removing the oversize particles from the mill bottom by a vibrating conveyor and elevating the same to the mill feed belt conveyor by a chain type bucket elevator.
Product Collection	:	A high efficiency cyclone system has been considered for product collection. Airflow through the mill and cyclone is with the help of a variable speed mill fan. Raw meal, collected from the cyclones is transported to the homogenizing silo feeding system with the help of airside(s).
Mill Dedusting	:	The solution envisaged for dedusting of raw mill gases after mill cyclones, is with Electrostatic Precipitator (ESP) / reverse air or pulse jet Bag house.

From layout and general arrangement considerations the proposed solution is compact and acceptable.

Since the entire mill system is a closed system and operating under negative pressure, environmental control is by dedusting of cyclone gases followed by an ESP / Bag house.

Broad details of the system are shown in **Drg. No. 07150-05-02.**

3.5.7 RAW MEAL BLENDING AND KILN FEED

Capacity of the blending silo at 21,252 t is equivalent to a requirement of total 2.5 kiln days or approx 1.5 day's active storage. A 24,000 t continuous flow-blending silo has been considered.

A pneumatic system requires higher energy in comparison to a mechanical bucket elevator system. Therefore, a mechanical conveying system with belt bucket elevator is proposed. Installation of a mechanical system, both for silo feeding as well as preheater

feeding, is suggested. In addition, the kiln feed system shall be provided with gravimetric control by the installation of a solid flow meter at the discharge point of the kiln feed bin airslides.

Broad details of the system are shown in **Drg. No. 07150-05-03**.

3.5.8 PREHEATER, PRECALCINER, KILN, COOLER

For the proposed clinkerisation capacity of 5,600 tpd, a rotary kiln in conjunction with a preheater-preclaciner and a grate cooler is envisaged.

A five stage, single/double string, suspension type preheater with inline calciner is proposed. The proposed system is proven and contemporary. The system is compact and functional from layout and arrangement point of view. As suggested for the raw mill, a Bag house shall be installed for dedusting of the raw mill-kiln system.

A separate system for handling of kiln dust, comprising of screw conveyor, chain conveyor, bucket elevator and kiln dustbin has been proposed. For dedusting of cooler vent gases, an Electrostatic Precipitator has been considered.

Clinker transport from cooler to clinker silo has been considered to be with the help of pan conveyor. Pan conveyors are sized with a capacity 400 tph considering about 75 % safety margin on equipment capacity as per usual industrial practice.

Broad details of the system are shown in **Drg. No. 07150-05-04**.

3.5.9 CLINKER STORAGE

From cost, time (construction point of view) and environmental considerations, a clinker silo provides a better option. Looking at the high rainfall situations, clinker storage capacity equivalent to 9 kiln days is proposed and works out as 5,600 x 9 = 50,400 t.

Thus, an RCC construction clinker silo of 1 x 50,000 t is considered. An off spec. silo of 1,000 t is also considered for under-burnt clinker. For extraction of clinker from the clinker storage, 3 number pan conveyors have been considered. It has been observed that quite often, fresh clinker needs to be ground, in which case, belt conveyor failures could occur. Installation of pan conveyors for this duty application can eliminate this problem. For the transportation of clinker from the pan conveyor discharge to cement mill bins, heat resistant belt conveyors are proposed.

Broad details of the system are shown in the **Drg. No. 07150-05-05**.

3.5.10 COAL CRUSHING

Use of imported coal is proposed for the project. The coal will be imported through Djibouti port and will be brought to site through trucks. Generally the imported coal comes in crushed form (mostly below 50 mm), having few larger size lumps upto about 500 mm. Since the details of material are not readily available, the crusher capacity is being considered for about 75% of the capacity.

Since the coal will be received through Panamax ships, plant is likely to receive about 35,000 – 40,000 t of coal in a matter of few days (12 - 15 days). Hence the crushing and handling facilities shall be designed taking into consideration the above.

The required crushing capacity for coal is 107 tph. Considering a 25% margin over this requirement, the crusher capacity works out to 133 tph. The capacity of crusher is considered as 150 tph for this project. As per the normal practice crushers are designed with 10 hrs daily operation (effective out of 2 shifts). However in this case it is expected that the material will be transported round the clock, hence 20 hrs of daily operations are assumed.

The brief technical details of the proposed crushing system is as under:

Type of Crusher	:	Single Stage Roll / Hammer Crusher
Crusher Location	:	In plant
Feed Size	:	ROM coal 500 x 500 x 500 mm
Output Size	:	95 % (-) 50mm
Crusher Feed Hoppers	:	80 m^3
Hoppers Extraction	:	Heavy Duty Apron Feeders
Crusher Discharge System	:	Short belt of 1,600 mm width. This conveyor shall feed an in line belt conveyor to feed the stockpile.
Transportation to stockpile	:	Crushed coal shall be transported to the circular stockpile with the help of a belt conveyor.
Environmental Control	:	Element controlled is fugitive dust from crusher and transfer points. Method of control adopted is with the help of bag filters and dust suppression system.

Broad details of the system are shown in **Drg. No. 07150-05-11.**

3.6 COAL PRE-BLENDING STOCKPILE

Looking at the storage requirement of entire shipload, stockpile capacity should be 40,000 t. Hence, a covered circular stockpile of 1 X 40,000 t has been considered. The capacity of the stacker shall be tph (400 x 1.25 = 500) considering a margin in 25 % over the crusher capacity. The required capacity of the reclaimer shall be around 100 tph, considering 12 hrs operation of reclaimer every day.

The broad technical details of the system under installation are as follows:

Storage Capacity	:	1 x 40,000 t
Stacking Capacity	:	500 tph
Type of Stacker	:	Luffing Boom
Reclaim Capacity	:	100 tph
Type of Reclaimer	:	Scraper type side reclaimer

The reclaimed coal shall be transported to the coal mill feed bin building with the help of a reclaim belt conveyor.

Environmental control measures include totally covered mix storage area, installation of bag filters at the coal mill feed bins and dust suppression system.

3.7 COAL DRYING AND GRINDING

The Coal Mill capacity, on dry basis is calculated as 40 tph. The mill rated output, at 12% residue on 90 micron, is proposed to be 40 tph capacity considering a 10% margin above the required capacity. Coal mill is designed considering average fuel consumption of 740 kcal/kg of clinker and calorific value of coal as 6250 kcal/kg of coal.

Vertical Roller Mill with Dynamic Separator of 40 tph has been considered for drying and grinding of coal.

The brief technical details of the coal mill drying & grinding system are as follows:

Coal Mill Hoppers	:	Steel mill feed bins of 2 x 200 t capacity of mass flow design have been considered. 2 feed bins are considered to handle 2 different grade of coal, which is quite likely in coal import.
Coal Mill Feeding	:	Apron Weigh feeders have been considered for feed to the mill.
Drying	:	Hot gases from the PH shall be used for drying of coal in the coal mill.
Product Collection	:	A high efficiency cyclone system has been considered for product collection. Airflow through the mill and cyclone is with the help of a variable speed mill fan. Fine coal, collected from the cyclones is transported to the Fine coal bins with the help of Screw conveyors.
Mill Dedusting	:	The solution envisaged for dedusting of coal mill gases after mill cyclones, is with pulse jet Bag house.
Coal dosing	:	Coal dosing to the Kiln and calciner will be through a set of coal dosing system. The system will consist of load cell bins, Solid flow feeders, and FK pumps.

From layout and general arrangement considerations the proposed solution is compact and acceptable. To take care of fire hazards in coal milling, an inert gas generator and dosing system is proposed.

Since the entire mill system is a closed system and operating under negative pressure, environmental control is by dedusting of cyclone gases followed by a Bag house.

Broad details of the system are shown in **Drg. No. 07150-05-12.**

3.7.1 CEMENT GRINDING SYSTEM

Considering total cement grinding requirements (OPC + PPC) capacity of cement grinding, a Cement Mill of 125 tph capacity is required. Hence, Close Circuit Ball Mills of 3 x 125 tph capacity are proposed for the project.

Broad technical features of each of the three cement mill systems are as follows

Cement Mill Bin(s)	:	3 bins for each mill system comprising of 1 x 600 t capacity for clinker, 1 x 300 t for gypsum and 1 x 300 t for Pumice, so that each of the mill is suitable to produce OPC as well as PPC.
Cement Mill Feeding	:	Belt weigh feeders have been considered for extraction of clinker, gypsum and Pumice. Feed to the mill shall be controlled with the help of these weigh feeders.
Mill System	:	The ball mill has re-circulation of 500 tph (rated) and a capacity of 600 tph (max). A Belt type bucket elevator coupled with air slides achieves re-circulation.
Product Collection	:	A high efficiency separator in conjunction with cyclone system has been considered for product collection. Cement collected from the cyclones shall be transported to the cement silo feeding system with the help of airslide(s).
Mill Dedusting	:	The solution envisaged for dedusting of cement mill gases is with a bag filter. The separator circuit shall also be dedusted by means of bag filter.

Broad details of the system are shown in **Drg. No. 07150-05-06, 07 & 08.**

3.7.2 CEMENT STORAGE

The Cement storage capacity based on 5 mill days is estimated as 28,875 tonnes, say 3 x 10,000 t.

3 x 10,000 t, RCC construction, cement storage silos have been considered for the project. Since about 70 % of the cement produced will be PPC, two silos will be allocated for PPC and one silo for OPC.

Cement from the grinding system is transported to the silo with the help of airslides and bucket elevator. From the silo, cement shall be transported to the packers, with the help of a set of airslides and bucket elevators.

For the bulk loading provisions one loading bay shall be created below each silo. Which will take care of the bulk loading needs of the plant. At present the bulk loading requirements are low (upto about 20%), however looking at the proximity of plant to Addis Ababa, bulk consumption of cement is likely to increase with time.

Broad details of the system are shown in **Drg. No**. **07150-05-09.**

3.7.3 CEMENT DISPATCH

Bulk dispatches amounts to about 20% of the total dispatches. Rest 80% is dispatched through packed bags. For the purpose of equipment sizing bagging is considered for 80% of the cement dispatches.

The capacity of packing system shall be 455 tph, say 4 X 120 tph.

Requirement of packing depends upon the market requirements i.e. extent of bulk and bagged cement sales. Keeping in view the current bulk dispatches being low, a packing system consisting of 4 x 120 tph electronic 8 spout roto packers have been considered. 8 truck loaders shall be provided for loading bags onto trucks. From the packer outlet upto loading of the packed bags into the trucks, a suitable system with flat belts and diverters has been considered. Provisions shall be considered in the layout to add new packers and additional truck loaders.

Further sufficient bulk loading provision is proposed, keeping in view the anticipated future demand for bulk cement. It is envisaged to install 1 x 120 tph bulk loading facilities below each silo for loading cement in Bulk.

Cement from the cement silo shall be transported to the packers and bulk loading with the help of a set of airslides and bucket elevator.

Broad details of the system are shown in **Drg. No. 07150-05-10.**

3.8 PLANT LAYOUT

Based on the above description, the proposed plant layout is shown in **Drg. No. 07150-05-11.**

3.8.1 MATERIAL FLOW DIAGRAM

Based on the technical concept as described above, the material flow diagram for the proposed project is shown in **Annex 3.1.**

3.8.2 SUMMARY OF MAIN MACHINERY

The following main machinery and storage capacity are proposed for the project:

Item	Description
Mix (Limestone/ Marl) Crushing	Impact 1,000 tph Feed size=1,500X1, 500X1, 200 mm Product Size < 75 mm, 95 %
Mix (Limestone/ marl) Pre-blending stockpile (Covered)	Circular stockpile 1 x 50,000 t capacity Stacker 1,250 tph Reclaimer 550 tph
Coal Crushing	Impact 400 tph Feed size= 500 x 500 x 500 mm Product Size < 50 mm, 95 %
Coal Pre-blending stockpile (Covered)	Circular stockpile 1 x 40,000 t capacity Stacker 500 tph Reclaimer 100 tph

Item	Description
Corrective & Additive Crusher	400 tph, Product size 95 % < 25 mm
Corrective & Additive (Covered) Storage	Basalt: 8,000 t Corrective Limestone: 6,000 t Gypsum: 2,500 t Pumice: 2 x 10,000 t Stacker: 500 tph Reclaimer: 2 x 200 tph
Raw Material Drying Grinding	VRM 1 X 420 tph Product Size <12% residue on 90 micron sieve Moisture < 1.0% ESP / bag house
Raw Mill Hoppers	Mixed raw materials : 800 t Corrective limestone : 200 t Basalt : 200 t
Raw Meal Blending & Kiln Feed	1 x 24,000 t
Preheater, Pre-calciner, Kiln, Cooler	5,600 tpd
Clinker Storage, RCC Construction	1 x 50,000 t
Cement Grinding System	2 x 185 tph ball mills for OPC and PPC
Cement Storage, RCC Construction	3 x 10,000 t Air Slides & Bucket elevator
Cement Despatch	6 x 120 tph single discharge, 8 spout roto packers 4 x 120 tph Bulk Loading 9 truck loaders
Fuel Storage & Firing	Storage Tank: 500 m^3 Day Oil Tank: 50 m^3

Table 3.5: Main Equipment

3.9 UTILITIES

3.9.1 POWER

The maximum power demand for the proposed plant is estimated at about 45 MVA. The power demand will be meet from the national grid. Electricity Department (EEPCO) shall supply the power at 132 KV. The main feeder line passes close to Chancho. A sub-station will be constructed at Chancho and a power line will be drawn over 20 km distance.

3.9.2 WATER SUPPLY

Water supply will be met from ground water sources. Borewells are proposed to be located near Mulo Seya around 16 km away and pipelines shall be laid for the same. The water distribution system in the plant will include:

- Process Water Circuit
- Cooling water (required for machine cooling)
- Make-up water shall be provided while re-circulating water shall be in a close loop.
- Potable Water (for drinking, etc.)
- Water required for township.

The approximate requirement of water including water for drinking and sanitation is around 2,000 m^3/day.

3.9.3 SEWAGE TREATMENT PLANT

A properly designed sewage network will be put in place. Each building or a group of buildings will have its own inspectable sewer manhole and rainwater receptacle. Grease/ Mud/ Starch/ Oil separation will be installed at the sewer inlet of the buildings wherever required. A Sewage Treatment Plant (STP) is proposed to treat sewage effluent. Septic tanks will be provided for individual buildings and effluent from septic tanks will go to the STP through sewage network.

Most water used in cement production is recycled or used up in the process and is not discharged as waste water. This includes water used for dust control, which gets evaporated.

A common STP for the Plant and colony is proposed with a capacity of 300 m^3/ day. The treated waste water will be totally utilized in green belt development and for spray on roads. No waste water will be discharged outside the plant premises.

3.9.4 FIRE FIGHTING SYSTEM

A complete fire fighting system will be provided comprising of:

- A suitable high-pressure system of fire hydrants consisting of suitable number of fire hydrants;
- A complete separate fire fighting water piping network for feeding the hydrants;
- Heavy-duty ABC powder type fire extinguishers shall be hung at particularly important electrical equipment areas;
- Portable CO_2 extinguishers shall be provided throughout the plant;
- Automatic fire extinguishing system, using water shall be considered for empty bags store in the packing plant.

3.9.5 AUXILIARY INFRASTRUCTURAL FACILITIES

Auxiliary infrastructural facilities have been adequately considered to meet the plant requirements as listed below. A full fledged colony with all modern amenities is proposed to be established for the employees.

- Workshop

A mechanical and an electrical workshop is envisaged to take care of the regular maintenance/ repair jobs in the plant.

- Machinery stores

A store building needs to be constructed for storing tools, spare parts, consumables, etc. Open area to be earmarked for storing machinery and construction materials for the proposed plant.

- Cranes, Monorails and Pulley blocks

Adequate sized maintenance cranes/ hoists, monorails and pulley blocks to be provided at all suitable locations at the plant for ease of maintenance and operation.

- Technical & Administrative office

A suitable technical office & administrative office will be constructed for the project activities and operation phase.

- Time and Security office

At the entrance of the main plant, a time office and a security office will be constructed.

- Dispensary

A Health center will be set up at the Plant to serve the employees of **DMC**. The Health Centre will be staffed as per standards of Ethiopian health centers and would include:

  - Doctor/ Health Officer
  - Nurse
  - Laboratory technicians
  - Pharmacist
  - Sanitation and other supporting staff

- Weighbridge

Two nos. electronic weighbridges are envisaged to take care of the incoming and outgoing materials at the plant. These may be located near the main entrance of the plant. One electronic weighbridge is also envisaged near bulk loading system for weighing the tankers carrying the cement in bulk.

- Bags Godown

Space will be provided in the packing plant department for the storage of bags.

- Parking

Adequate parking space will be provided in the plant premises for the parking of trucks/ other vehicles.

- Colony

A residential colony to provide accommodation for plant personnel will be constructed. A total of 392 numbers of 4 different standard residential units will be constructed in two stages. The first stage envisages construction of 242 units and the second stage will have 150 units.

These residential houses will be allotted to the workers on the basis of the position/ job grade of the workers. The workers are expected to pay a nominal amount in lieu of the actual market house rent each housing type deserves to fetch.

The lower ranked job positions are assumed to be filled in mainly by the local people and job types that will be sub contracted, do not qualify for housing allocation.

In addition to the residential buildings, the colony will also include other facilities to make the plant area self sufficient in different services. These modern facilities mainly include:

- Kindergarten school
- Elementary and High schools
- Amphitheatre
- Cafeteria and related facilities
- Supermarket and related facilities
- Swimming pool
- Stadium
- Tennis, basket ball and volley ball courts
- Auditorium
- Gymnasium
- Health center
- Jogging area
- Fountain, etc.

3.9.6 FUEL SUPPLY

Imported coal has been considered as the primary fuel. During emergencies Heavy Fuel Oil / Diesel shall be used a stand-by fuel. Storage tanks of 3000 m^3 capacity for HFO storage and 90 m^3 for diesel storage are planned. Suitable oil unloading facilities from bulk tankers will also be installed. Tanks capable of holding 100% containment capacity will be installed.

3.9.7 LABORATORY

The laboratory shall be equipped for testing of raw materials, fuel, clinker, additives and cement for sample preparation as well as chemical and physical testing.

3.9.8 GAS ANALYSER

Microprocessor based gas analysers shall be installed for combustion control in kiln. CO + O_2 analysers shall be provided to monitor and control oxygen and carbon monoxide gases at the preheater outlet and kiln inlet.

The CO + O_2 analyzer at kiln inlet shall include automatic purging and cleaning unit as well as retraction system. Automatic analyzer for monitoring of NOx shall also be installed to evaluate the performance of burner.

3.9.9 DUST MONITOR

A microprocessor based monitoring device will be deployed which will provide concentration of particles in exhaust stack. The equipment will have built in air purge system.

3.10 RELEASES TO THE ENVIRONMENT

The details of anticipated release to the environment during construction and operation phase of the proposed cement project are described in **Table 3.6** hereunder:

Sn	Type of Waste	Source	Details of Waste
During Construction Phase			
1	Air Emission	1.1 Traffic movement 1.2 DG set operation 1.3 Operation of earth moving equipment & machinery 1.4 Domestic Activities 1.5 Welding, coating, painting & civil work 1.6 Storage and handling of construction materials	1.1 PM, SOx, NOx, CO, VOCs 1.2 PM, SOx, NOx, CO, VOCs 1.3 PM, SOx, NOx, CO, VOCs 1.4 PM, CO 1.5 PM, VOCs 1.6 PM
2	Effluent	2.1 Domestic Activities 2.2 Civil & mechanical works	2.1 & 2.2 Effluent containing mainly solid, oil & grease
3	Solid waste		
	Hazardous	3.1 Welding, coating, painting & Civil work 3.2 DG sets and other machinery 3.3 Storage	3.1 & 3.2 Oily sludge/ sand and waste lubricants, waste material from welding, coating & painting and dry cell batteries 3.3 Packing & chemical containers
	Non-hazardous	3.1 Civil & mechanical works 3.2 Domestic 3.3 Storage 3.4 Scraps	3.1 Iron, electrical cable, tyres, wood, papers, metal/ plastics. 3.2 Kitchen waste 3.3 Packing, papers, containers, etc. 3.4 Iron, electrical cable, tyres, wood, papers, metal/plastics, etc.
4	Noise	4.1Traffic movement 4.2 DG set operation 4.3 Operation of earth moving equipment & machinery 4.4 Domestic Activities 4.5 Mechanical & civil work 4.6 Handling of construction materials	4.1 to 4.6 Noise
During Operational Phase – Plant			
1	Air Emission from plant operation	1.1 Operation of Crusher 1.2 Operation of raw mill 1.3 Operation of kiln 1.4 Operation of clinker cooler 1.5 Operation of cement mill 1.6 Operation of packing plant	1.1 PM 1.2 PM 1.3 PM, SO_x, NOx 1.4 PM 1.5 PM 1.6 PM

Sn	Type of Waste	Source	Details of Waste
		1.7 Operation of DG sets 1.8 Handling and storage of materials 1.9 Traffic movement	1.7 PM, SO_x, NOx, CO, VOCs 1.8 PM 1.9 PM, SO_x, NOx, CO, VOCs
2	Effluent	2.1 Domestic use in plant & colony 2.2 RO rejects	2.1 Effluent containing mainly solid, BOD and oil & grease 2.2 Effluent containing mainly high dissolved solids
3	Solid waste		
	Hazardous	3.1 Operation & maintenance of system	3.1 Oily Sludge 3.2 Waste lubricants, Oily sludge & dry cell batteries
	Non-hazardous	3.1 Operation & maintenance of system 3.2 Operation of STP	3.1 Packing, papers, containers iron, electrical cable, wood, metal/plastics, etc. 3.2 Sludge
4	Noise	4.1 Operation of crusher 4.2 Operation of raw mill 4.3 Operation of kiln 4.4 Operation of clinker cooler 4.5 Operation of cement mill 4.6 Operation of packing plant 4.7 Operation of DG sets 4.8 Handling and storage of materials 4.9 Traffic movement	4.1 Noise
During Operational Phase – Mines			
1	Air Emission from mine operation	1.1 Mines Development 1.2 Drilling 1.3 Blasting 1.4 Loading & Transportation of materials 1.5 Operation of machinery 1.6 Traffic movement	1.1 PM 1.2 PM 1.3 PM, NOx, CO 1.4 PM 1.5 PM, SO_x, NOx, CO, VOCs 1.6 PM, SO_x, NOx, CO, VOCs
2	Effluent	2.1 Domestic use in Mines	2.1 Effluent containing mainly solid, BOD and oil & grease
3	Solid waste		
	Hazardous	3.1 Operation & maintenance of system	3.1 Oily Sludge 3.2 Waste lubricants, Oily sludge & dry cell batteries
	Non-hazardous	3.1 Excavation of raw material 3.2 Operation & maintenance of system 3.3 Operation of STP	3.1 Subsurface soil and overburden 3.2 Packing, papers, containers iron, electrical cable, wood, metal/plastics, etc 3.3 Sludge

Sn	Type of Waste	Source	Details of Waste
4	Noise	4.1 Drilling 4.2 Blasting 4.3 Loading and unloading of raw material 4.4 Traffic movement	4.1 Noise

Table 3.6: Anticipated Releases to Environment

3.10.1 ENVIRONMENT MANAGEMENT

3.10.1.1 Air Pollution

The plant is being designed taking cognizance of prevalent environmental laws and the importance attached to maintaining environmental standards. Efficient tapping of dust generating sources, their dedusting with efficient filters/ ESP and recycling the dust to the process is the prime objective. Primary dust sources of the manufacturing process are raw material, cement grinding, kiln exhaust gas and cooler gas and transfer points. All other dust sources are considered as secondary sources since these are not process implied. These dust sources may occur wherever relatively dry or dusty material is handled, conveyed, pumped or extracted. To achieve the stipulated emission levels, bag filters will be used at all dust generating points including transfer towers.

Besides arresting emission of dust, appropriate steps will be taken to arrest "generation of dust" e.g. no large drops, water spray controlled dust suppression system at unloading hoppers, discharge gate at reclaims of silos and totally enclosed operations for all belt conveyors, storages, etc. The packing plant and loading area will also be enclosed with side cladding. Bag filters will be provided at belt transfer points.

SO_2 pollution will be negligible as alkali available with raw meal absorbs SO_2 completely in the kiln.

In kiln, generation of NO_2 gases depends to a great extent on the core flame temperature and percentage excess air. Installation of a well-designed burner system using low quantity of primary air, therefore, will limit the core flame temperature to ensure a low value of NO_x.

Generation of Carbon Monoxide (CO) emission will be negligible in view of the firing technique of keeping a positive oxygen balance.

The stack details are summarized in **Table 3.7**.

Sn	Description	Stack Details											
		Control Equip.	Ht. (m)	Dia. (m)	Vel. (m/s)	Temp (0C)	Emission rate (g/s)			IFC Standard SPM (mg/Nm³)	IFC standards		Design Cap. Particulate Matter (mg/Nm³)
							SPM	SO_2	NOx		SOx (mg/Nm³)	Nox (mg/Nm³)	
1	Coal Crusher	Bag Filter	20.5	0.55	15.21	25	0.09	0	0	50	-	-	25
2	Kiln / Vertical Roller Mill	Bag House	113.5	4.7	9.71	94	2.35	33.67	134.69	30	400	600	25
3	Clinker Cooler	ESP	40	4.4	15.16	250	5.76	0	0	50	-	-	25
4	Cement Mill	Bag Filter	10	1.3	9.7	62	0.187	0	0	50	-	-	25
	Cement Mill	Bag Filter	10	1.3	9.7	62	0.187	0	0	50	-	-	25
	Cement Mill	Bag Filter	10	1.3	9.7	62	0.187	0	0	50	-	-	25
	O-Sapa	Bag Filter	42	2.3	12.9	40	0.821	0	0	50	-	-	25
	O-Sapa	Bag Filter	40	2.3	12.9	40	0.821	0	0	50	-	-	25
	O-Sapa	Bag Filter	40	2.3	12.9	40	0.821	0	0	50	-	-	25
5	Packing Plant	Bag Filter	10.3	0.75	12.40	25	0.14	0	0	50	-	-	25
	Packing Plant	Bag Filter	10.3	0.75	12.40	25	0.14	0	0	50	-	-	25
	Packing Plant	Bag Filter	10.3	0.75	12.40	25	0.14	0	0	50	-	-	25
	Packing Plant	Bag Filter	10.3	0.75	12.40	25	0.14	0	0	50	-	-	25
	Packing Plant	Bag Filter	10.3	0.75	12.40	25	0.14	0	0	50	-	-	25
	Packing Plant	Bag Filter	10.3	0.75	12.40	25	0.14	0	0	50	-	-	25
	Packing Plant	Bag Filter	8.5	0.6	9.08	25	0.06	0	0	50	-	-	25
	Packing Plant	Bag Filter	8.5	0.6	9.08	25	0.06	0	0	50	-	-	25
	Packing Plant	Bag Filter	8.5	0.6	9.08	25	0.06	0	0	50	-	-	25
	Packing Plant	Bag Filter	8.5	0.6	9.08	25	0.06	0	0	50	-	-	25
	Packing Plant	Bag Filter	8.5	0.6	9.08	25	0.06	0	0	50	-	-	25
	Packing Plant	Bag Filter	8.5	0.6	9.08	25	0.06	0	0	50	-	-	25
6	Coal Mill	Bag Filter	46	1.6	14.78	95.3	0.41	0	0	50	-	-	25
7	Correctives Crusher	Bag Filter	22	0.65	14.95	25	0.09	0	0	50	-	-	25

Table 3.7 : Source Characteristics/ Release Characteristics

3.10.1.2 Fugitive Emission Management

The roads in the cement plant will be paved to prevent dust emissions. To prevent fugitive dust from traffic water sprinkling will be practiced during transport activities. To control the dust emissions at transfer points, bag filters will be provided at transfer points. All raw material stockpiles will be covered.

3.10.1.3 Water Pollution

Wastewater Generation

No wastewater will be generated from cement plant process and cooling as the total water undergoes evaporation during the exchange of heat. The domestic wastewater mainly from toilets and kitchen will be let into the septic tanks and the overflow from the septic tanks will be connected to the wastewater collection mains.

The proposed STP will be designed for hydraulic loading of 300 m^3/day.

The anticipated quality of treated effluent is given in **Table 3.8.**

Sn	Parameter	Effluent Quality at Outlet
1	pH	6-9
2	BOD	<30 mg/ l
3	COD	<125 mg/ l
4	Total Nitrogen	<10 mg/ l
5	Total Phosphorus	<2 mg/ l
6	Total suspended solids	<50 mg/ l
7	Oil & grease	<10 mg/ l

Table 3.8 : Effluent Quality

The wastewater collected in a common collection tank (size 8mx8mx3m) will be passed through the skimmer wherein oil and grease if any in the wastewater will be removed. Subsequently the water will be passed through a clarifier (Dia. 3m, Ht. 3.65 m) to remove the suspended solids. The clarified water will be collected in an underground concrete tank and it will be pumped to the following utilities depending upon requirements:

- Wetting of coal (Dust suppression) and fire quenching in Coal yard as per requirement
- Dust suppression on roads
- Green belt development

Tertiary treatment system will be based on the treatment of water @ 25 m^3/hr. The system will comprise of pressure sand filter (Dia 2m, Ht. 2.5m) followed by chlorination tank (size 3mx3mx2.5m).

The solids carried in the wastewater used for wetting of coal will get absorbed in the cement clinker phase upon burning in the kiln system as safe compounds and will not affect the performance of kiln.

3.11 SOLID WASTE

3.11.1 NON HAZARDOUS WASTE

The main solid waste generated from the cement plant is cement dust collected from various pollution control devices. The dust collected in the air pollution control equipment in the cement plant will be recycled back to the process. Hence no solid waste that requires disposal is generated from the plant.

Refractory bricks are one of the solid wastes generated from the kiln section. Due to wear and tear, the refractory bricks will be replaced once in a year. These bricks due to their high recycling value will be disposed to outside agencies.

About 2 tpd solid wastes is expected to be generated at the plant from the following activities:

- Regular Road Sweeping collection – comprises of a mixture of limestone dust, clay and soil. This material will be put in raw meal.
- Civil and construction debris / rubbish (Occasionally)- This material will be disposed off at municipal waste site allocated to **DMC**.

3.11.2 HAZARDOUS WASTE

The hazardous wastes generated from a cement plant mainly are:

- Waste oil and grease drained out of gearboxes and other equipment
- Scrapped automobile batteries

Waste oil shall be stored in leak proof steel drums and sent to the “Spent Oil Storage Site”. The waste oil drums shall be properly identified with label of what is contained both in local language (Amahrik/ Oromiya) and English. The above wastes will be sold off as per rules to the licensed vendors. The waste oil may also be disposed off by burning it in cement kiln under controlled conditions after seeking proper permission from the regulatory bodies.

3.12 MANPOWER

The manpower requirement for operation of the proposed plant is foreseen as 474. A broad break up is as follows:

Top Management	:	9
Middle Management	:	17
Specialists/ Engineers	:	26
Supervisors	:	35
Labour	:	387
Total	**:**	**474**

Despite the proposed process line being state-of-art, a relatively high Human Resources requirement has been considered for the project. Since the project is proposed to be located in an underdeveloped region, it is slated to provide economic growth opportunities by generating both direct as well as indirect employment for the local inhabitants. The major contributing factors are:

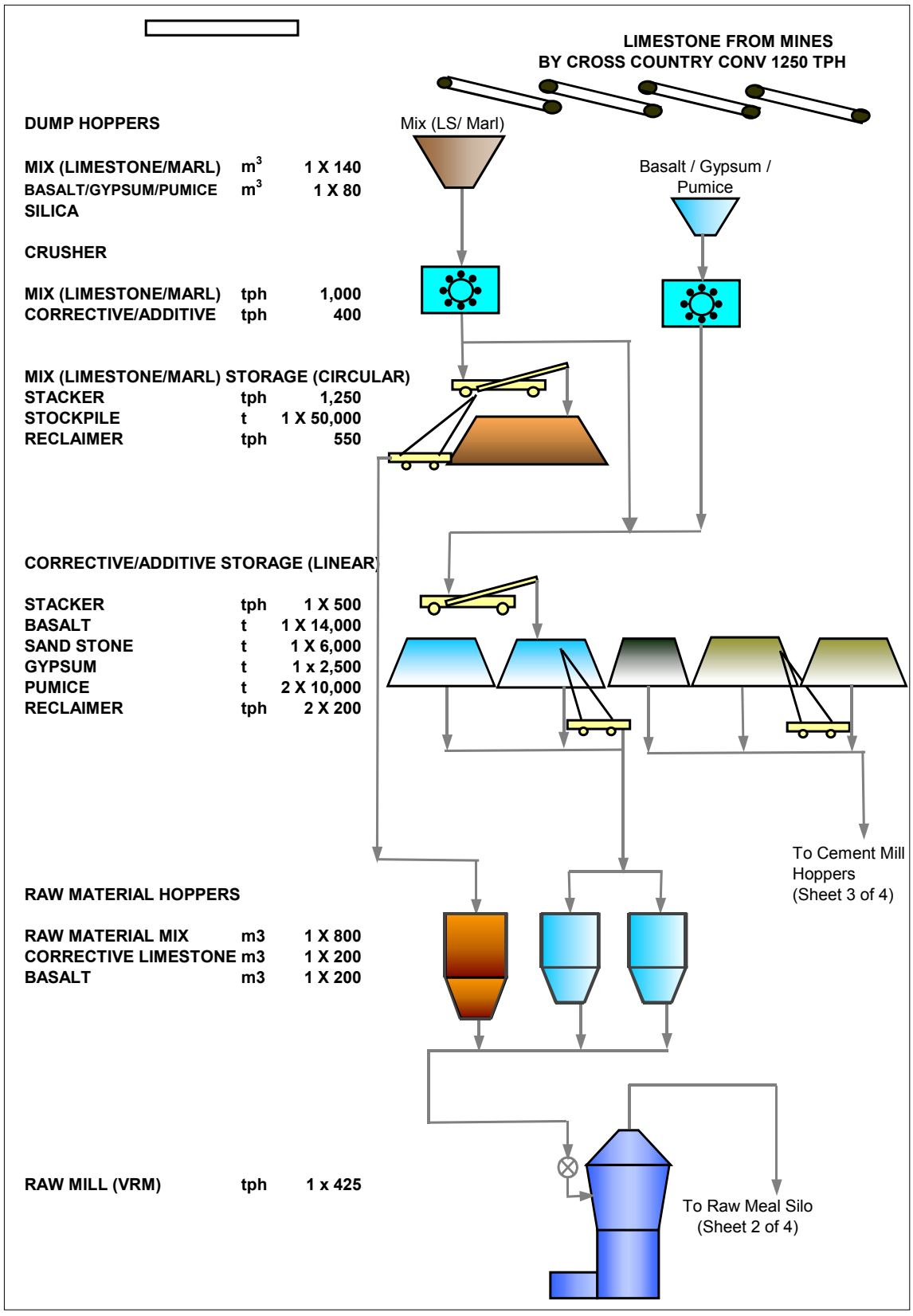
Logistical operations associated with limestone, marl and gypsum mining have been conceived to be carried out internally. This is due to the comparative lack of reliable companies in surrounding areas, which can be contractually entrusted with this work keeping in view the quantum of material handling foreseen. Logistical operations for other raw materials e.g. basalt and pumice, etc, have lesser material-handling requirement and are therefore proposed to be sub-contracted.

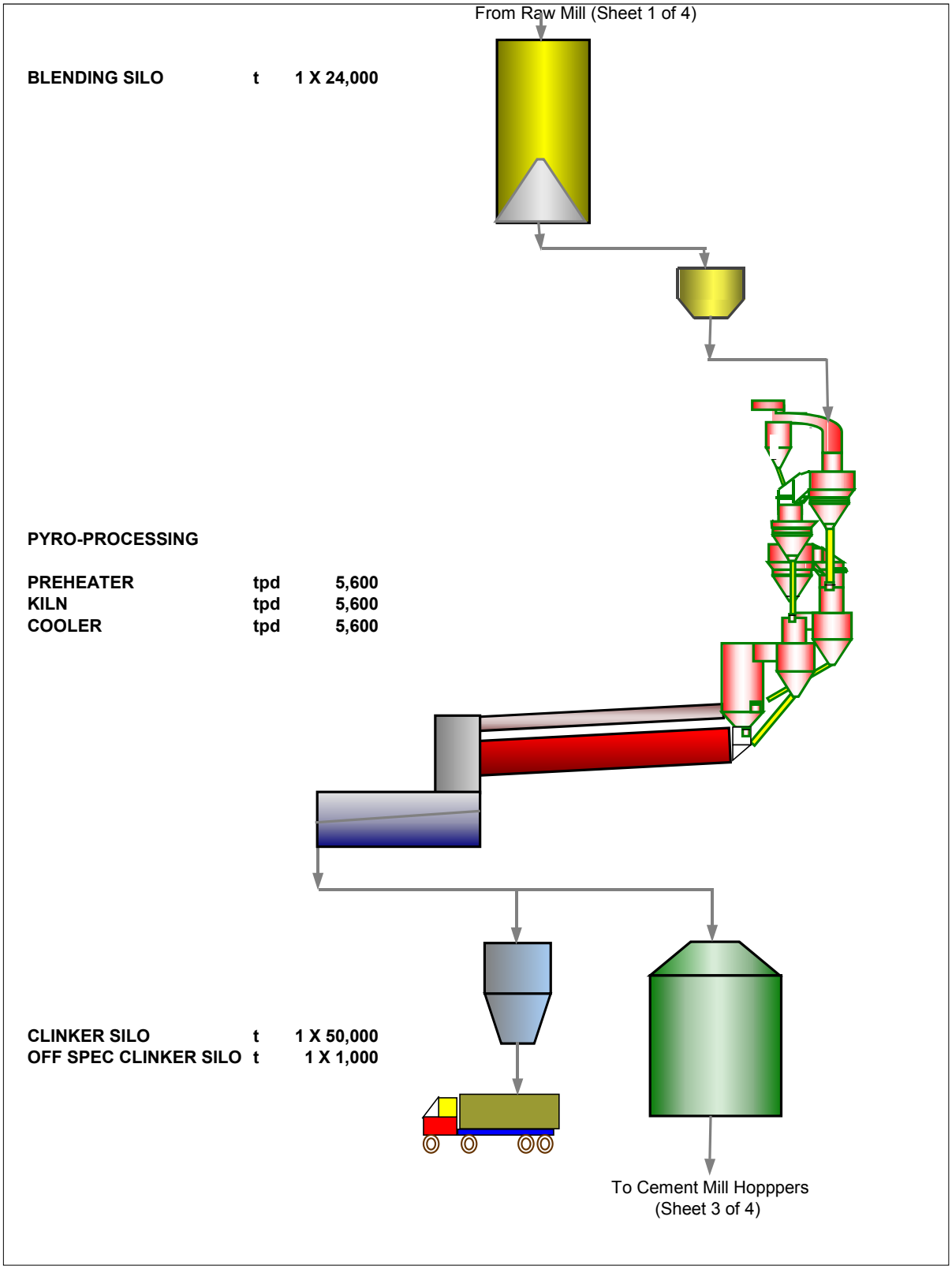
Similarly, due to the absence of any meaningful maintenance infrastructure in the vicinity, the entire requirement of the cement plant shall need to be internally serviced. Generally, cement plants outsource varying components of their maintenance requirements.

Loading operations, security and canteen have been assumed to be subcontracted. This is in accordance with general practice followed in the cements plants. The headcount in these functions has therefore not been considered in staff strength.

Social and economic development of the region, which shall result from the establishment of the cement project, is detailed in Environmental and Social Management Plan.

Mass Flow Diagram

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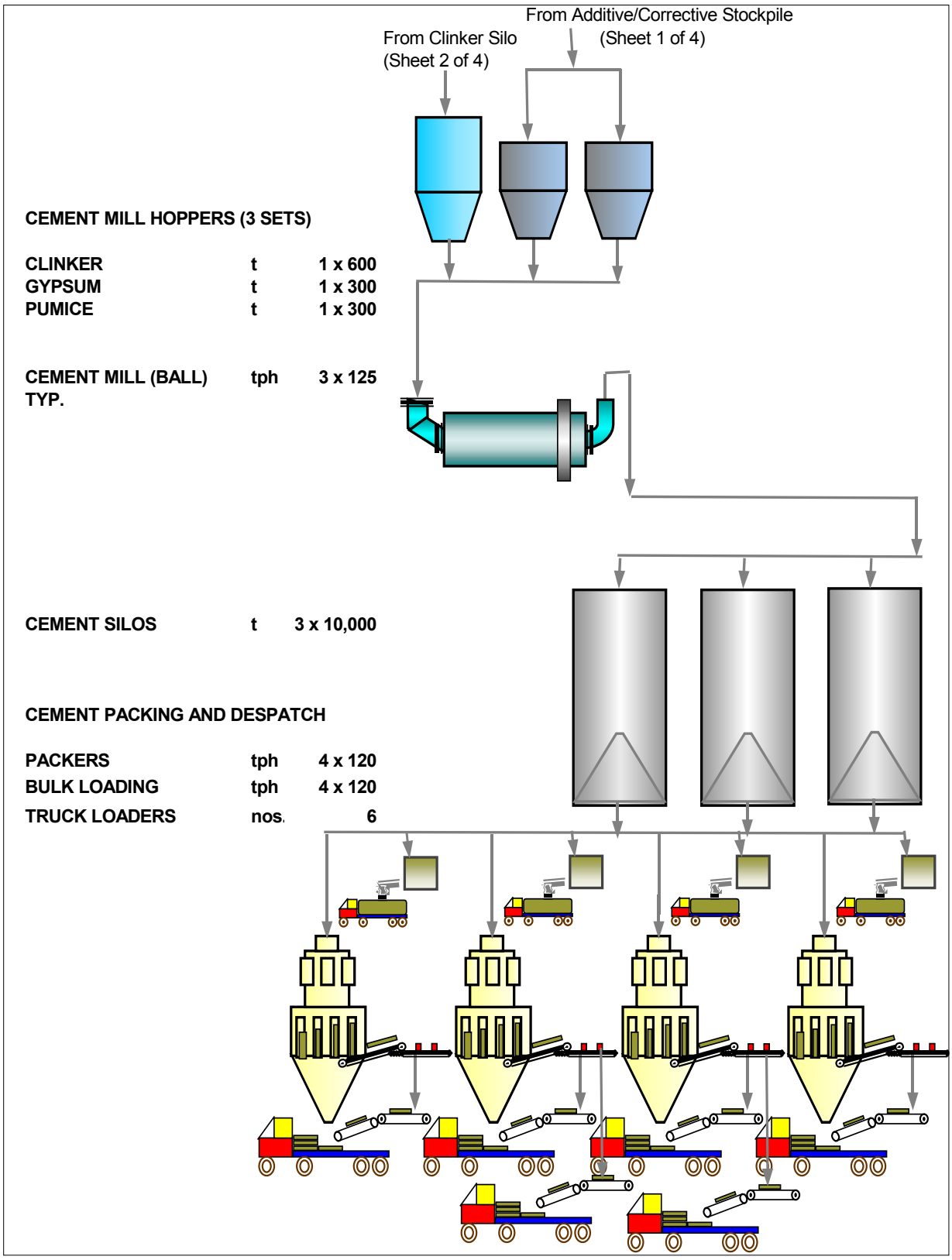
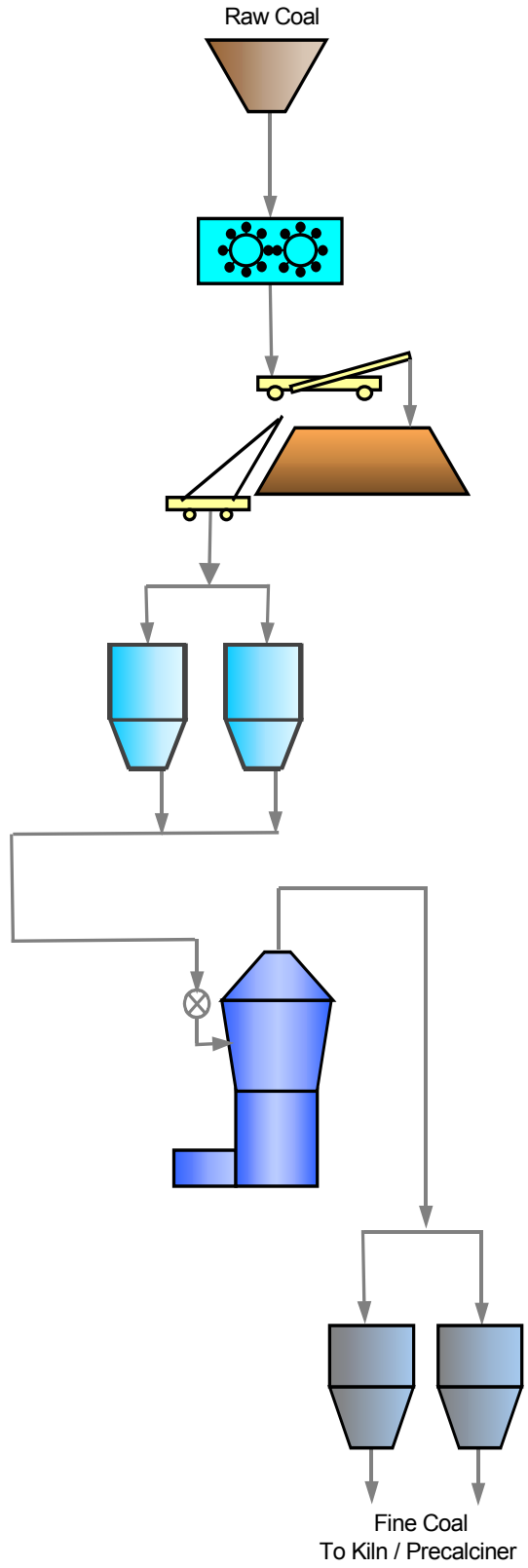
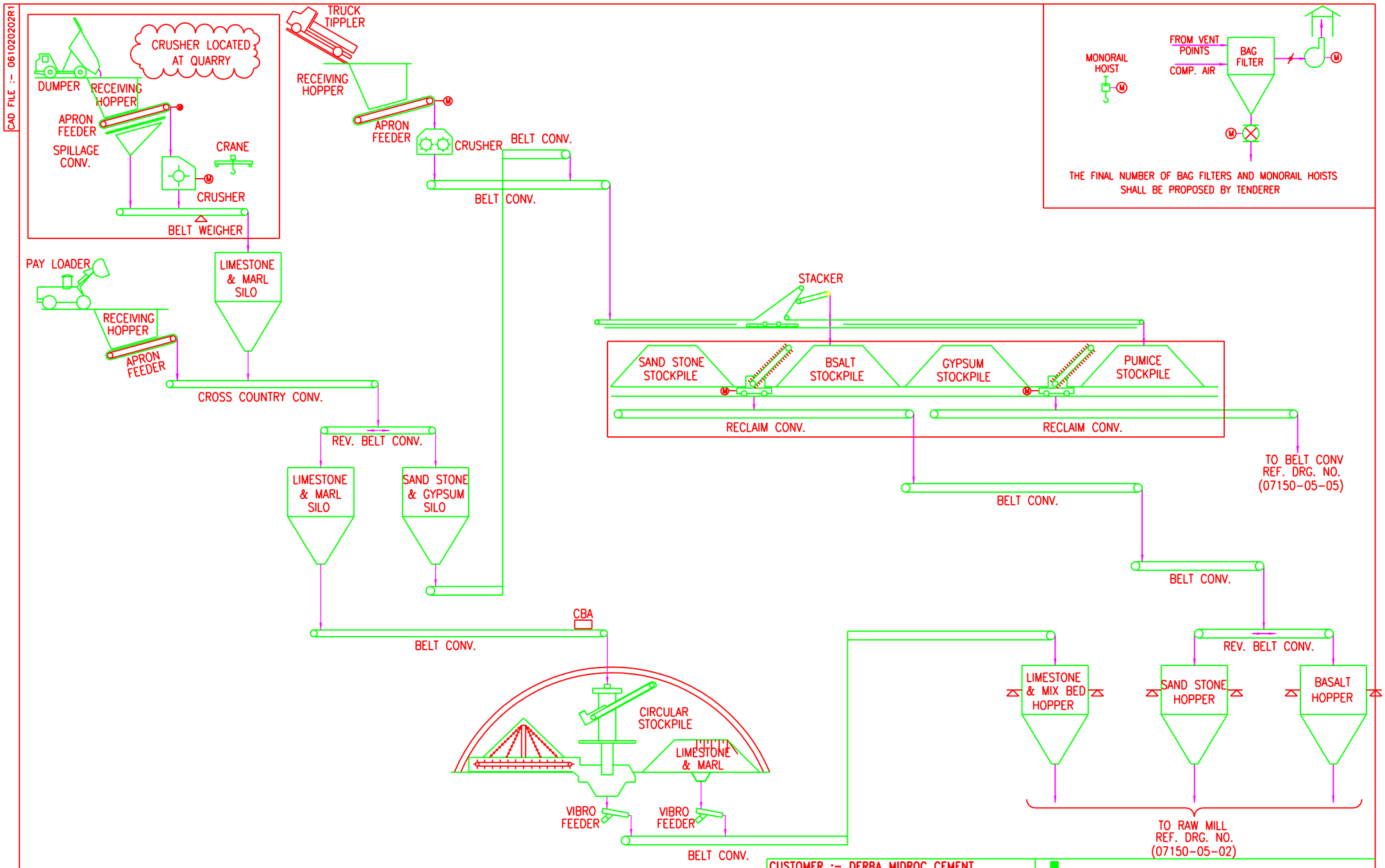
BLENDING SILO t 1 X 24,000
PYRO-PROCESSING
PREHEATER tpd 5,600
KILN tpd 5,600
COOLER tpd 5,600
CLINKER SILO t 1 X 50,000
OFF SPEC CLINKER SILO t 1 X 1,000
To Cement Mill Hopppers
(Sheet 3 of 4)


From Additive/Corrective Stockpile
(Sheet 1 of 4)
From Clinker Silo
(Sheet 2 of 4)
CEMENT MILL HOPPERS (3 SETS)
CLINKER t 1 x 600
GYPSUM t 1 x 300
PUMICE t 1 x 300
CEMENT MILL (BALL) TYP. tph 3 x 125
CEMENT SILOS t 3 x 10,000
CEMENT PACKING AND DESPATCH
PACKERS tph 4 x 120
BULK LOADING tph 4 x 120
TRUCK LOADERS nos. 6

COAL DUMP HOPPER	**m^3**	**1 X 80**
COAL CRUSHER	**tph**	**1 X 150**
COAL STORAGE (CIRCULAR)		
STACKER	**tph**	**200**
STOCKPILE	**t**	**1 X 40,000**
RECLAIMER	**tph**	**100**
RAW COAL HOPPER	**t**	**2 X 200**
COAL MILL (VRM)	**tph**	**1 x 40**
FINE COAL BIN	**t**	**2 x 100**

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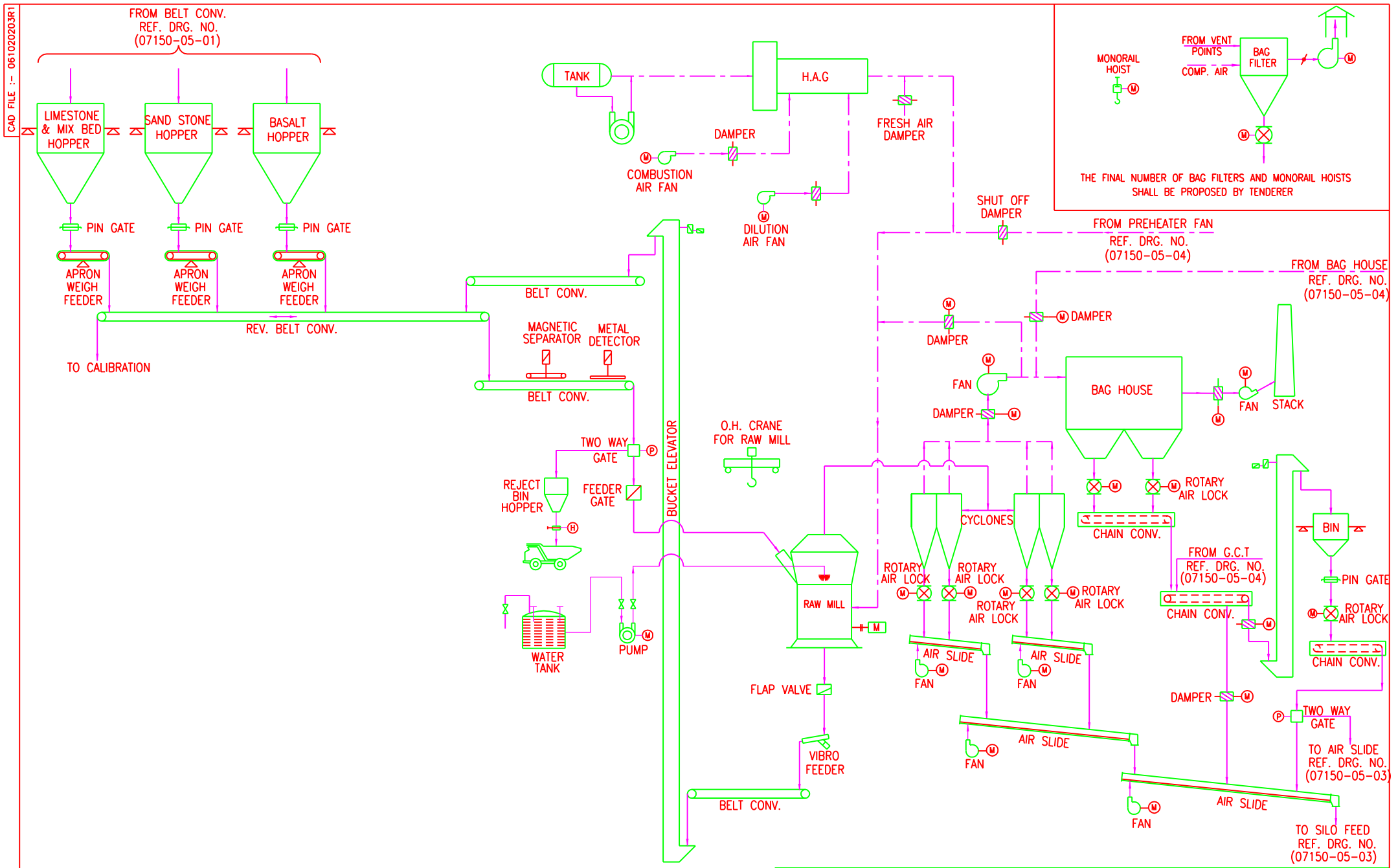
CRUSHER LOCATED AT QUARRY
DUMPER
RECEIVING HOPPER
APRON FEEDER
SPILLAGE CONV.
CRANE
CRUSHER
BELT WEIGHER
TRUCK TIPPLER
RECEIVING HOPPER
APRON FEEDER
CRUSHER
BELT CONV.
BELT CONV.
MONORAIL HOIST
FROM VENT POINTS
COMP. AIR
BAG FILTER
THE FINAL NUMBER OF BAG FILTERS AND MONORAIL HOISTS SHALL BE PROPOSED BY TENDERER
PAY LOADER
RECEIVING HOPPER
APRON FEEDER
LIMESTONE & MARL SILO
CROSS COUNTRY CONV.
STACKER
SAND STONE STOCKPILE
BSALT STOCKPILE
GYPSUM STOCKPILE
PUMICE STOCKPILE
RECLAIM CONV.
RECLAIM CONV.
TO BELT CONV REF. DRG. NO. (07150-05-05)
BELT CONV.
REV. BELT CONV.
LIMESTONE & MARL SILO
SAND STONE & GYPSUM SILO
CBA
BELT CONV.
BELT CONV.
CIRCULAR STOCKPILE
LIMESTONE & MARL
VIBRO FEEDER
VIBRO FEEDER
BELT CONV.
REV. BELT CONV.
LIMESTONE & MIX BED HOPPER
SAND STONE HOPPER
BASALT HOPPER
TO RAW MILL REF. DRG. NO. (07150-05-02)
CUSTOMER :- DERBA MIDROC CEMENT
PROJECT :- 07150
FLOW SHEET FOR
LIMESTONE, CORRECTIVE & ADDITIVE
STORAGE AND TRANSPORT
HOLTEC CONSULTING PRIVATE LIMITED
HOLTEC CENTRE, A BLOCK, SUSHANT LOK, GURGAON-122001 HARYANA, INDIA
DRN. KSI
CHKD. GKR
APPD. JPG
SCALE NTS
DRG.NO. 07150-05-01
REV. 1
20.03.06
1 08.08.07 FOR REPORT JPG
0 20.03.06 FOR TENDER PURPOSE JPG
REV. DATE ISSUED FOR BY



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0	20.03.06	FOR TENDER PURPOSE	JPG

CUSTOMER :- DERBA MIDROC CEMENT.

PROJECT :- 07150

FLOW SHEET FOR
RAW MEAL PREPARATION

HOLTEC CONSULTING PRIVATE LIMITED

HOLTEC CENTRE, A BLOCK, SUSHANT LOK, GURGAON-122001 HARYANA, INDIA

DRN.	CHKD.	APPD.	SCALE	DRG.NO.	REV.
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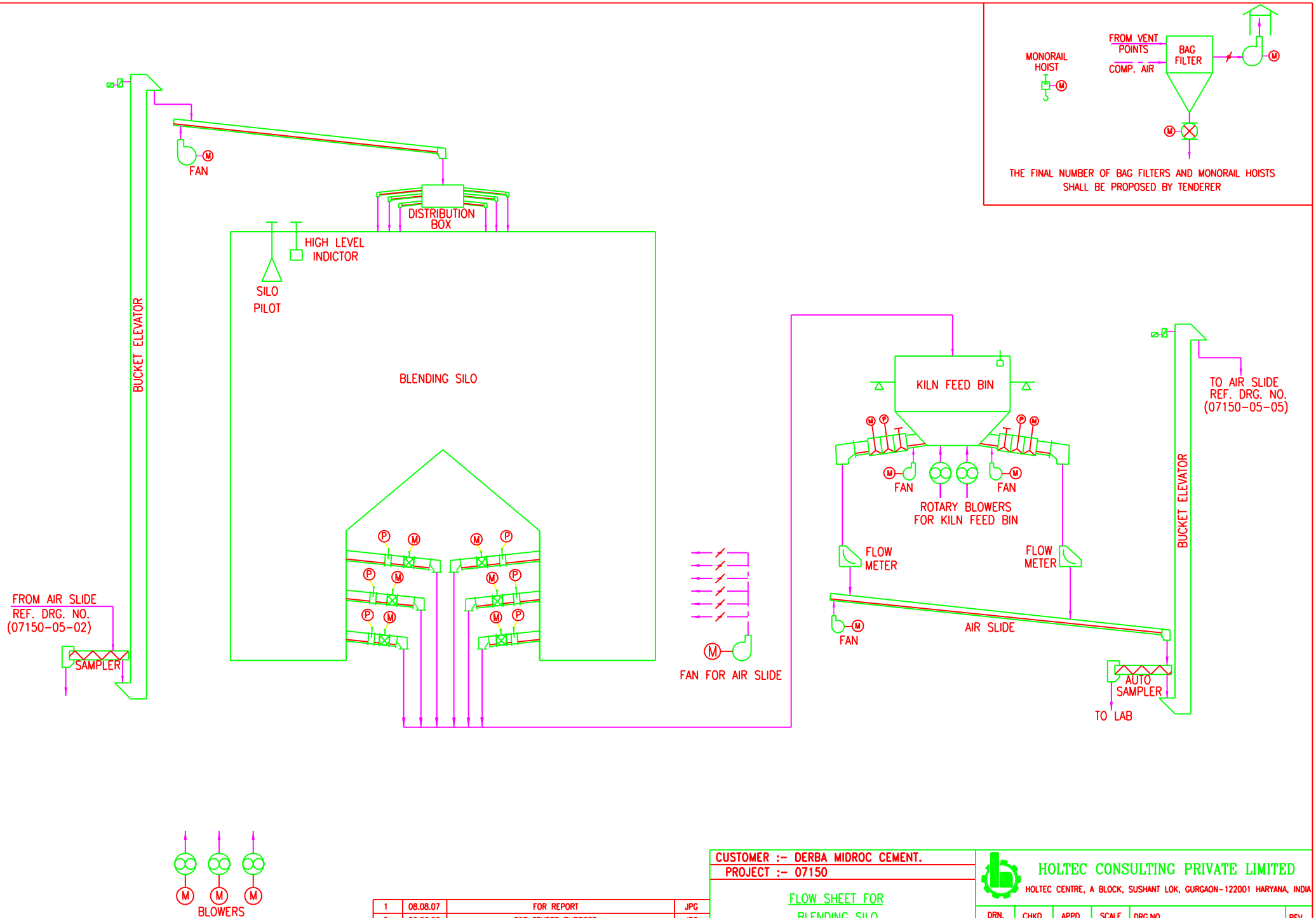

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0	20.03.06	FOR TENDER PURPOSE	JPG

CUSTOMER :- DERBA MIDROC CEMENT.
PROJECT :- 07150

FLOW SHEET FOR BLENDING SILO

HOLTEC CONSULTING PRIVATE LIMITED
HOLTEC CENTRE, A BLOCK, SUSHANT LOK, GURGAON-122001 HARYANA, INDIA

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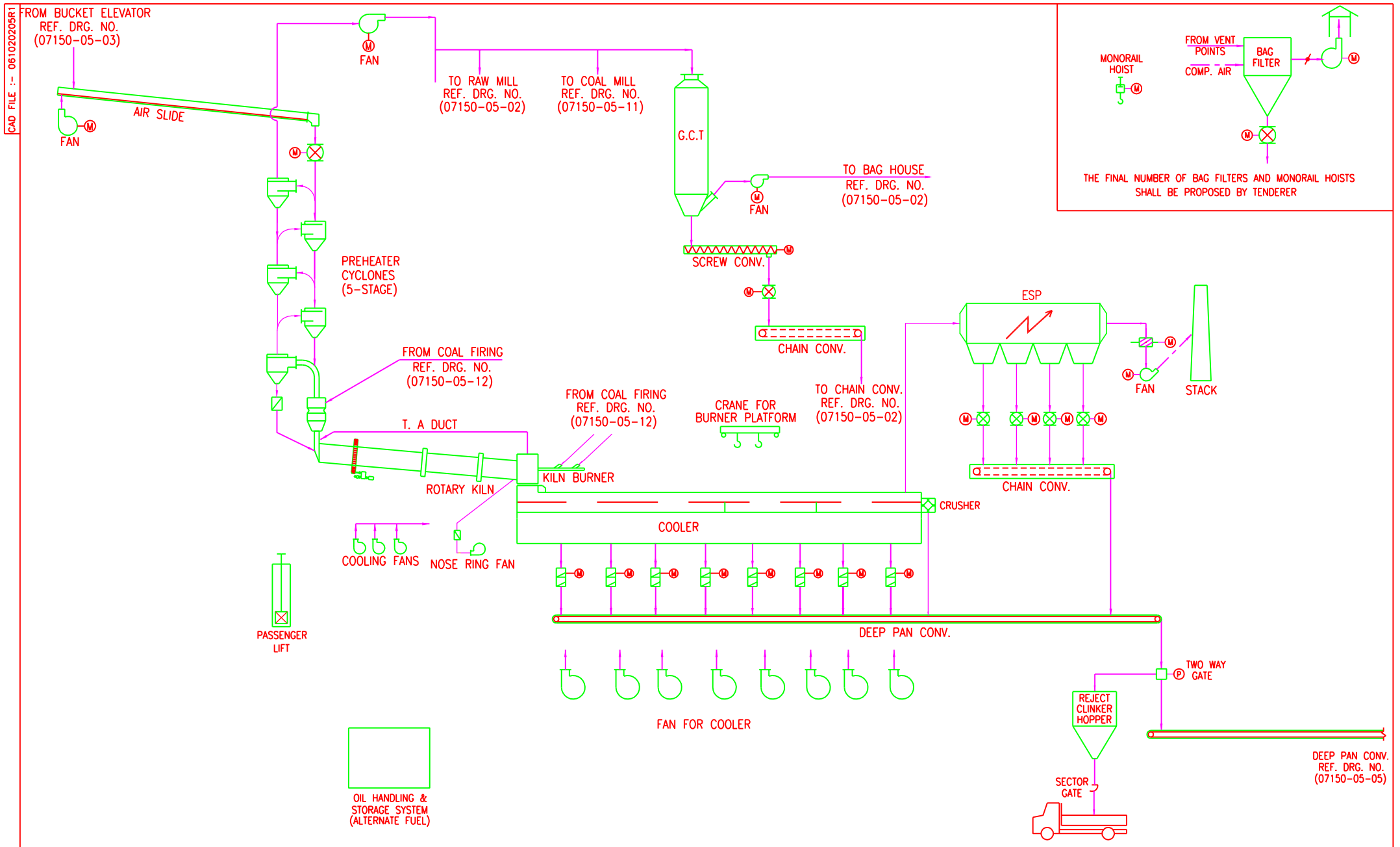

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0	20.03.06	FOR TENDER PURPOSE	JPG

CUSTOMER :- DERBA MIDROC CEMENT
PROJECT :- 07150

FLOW SHEET FOR
PREHEATER, KILN & COOLER

HOLTEC CONSULTING PRIVATE LIMITED
HOLTEC CENTRE, A BLOCK, SUSHANT LOK, GURGAON-122001 HARYANA, INDIA

DRN.	CHKD.	APPD.	SCALE	DRG.NO.	REV.
KSI	GKR	JPG	NTS	07150-05-04	1

20.03.06

CAD FILE :- 06102026R1

DEEP PAN CONV.
REF. DWG. NO.
(07150-05-04)

SILO PILOT

NIVO PILOT

CLINKER SILO

SLIDE GATE

CONTROL GATE

DEEP PAN CONV.

DEEP PAN CONV.

DEEP PAN CONV.

FROM RECLAIM BELT CONV.
REF. DRG. NO.
(07150-05-01)

BELT CONV.

REV. BELT CONV.

BELT CONV.

REV. BELT CONV.

REV. BELT CONV.

REV. BELT CONV.

REV. BELT CONV.

REV. BELT CONV.

REV. BELT CONV.

GYPSUM HOPPER

CLINKER HOPPER

PUMICE HOPPER

GYPSUM HOPPER

CLINKER HOPPER

PUMICE HOPPER

GYPSUM HOPPER

CLINKER HOPPER

PUMICE HOPPER

PIN GATE

WEIGH FEEDER

TO CEMENT MILL NO.1
REF. DRG. NO.
(07150-05-06)

TO CEMENT MILL NO.2
REF. DRG. NO.
(07150-05-07)

TO CEMENT MILL NO.3
REF. DRG. NO.
(07150-05-08)

MONORAIL HOIST

FROM VENT POINTS

COMP. AIR

BAG FILTER

THE FINAL NUMBER OF BAG FILTERS AND MONORAIL HOISTS SHALL BE PROPOSED BY TENDERER

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0	20.03.06	FOR TENDER PURPOSE	JPG

CUSTOMER :- DERBA MIDROC CEMENT.

PROJECT :- 07150

FLOW SHEET FOR
CLINKER, GYPSUM & ADDITIVE
STORAGE & TRANSPORT

HOLTEC CONSULTING PRIVATE LIMITED

HOLTEC CENTRE, A BLOCK, SUSHANT LOK, GURGAON-122001 HARYANA, INDIA

DRN.	CHKD.	APPD.	SCALE	DRG.NO.	REV.
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20.03.06

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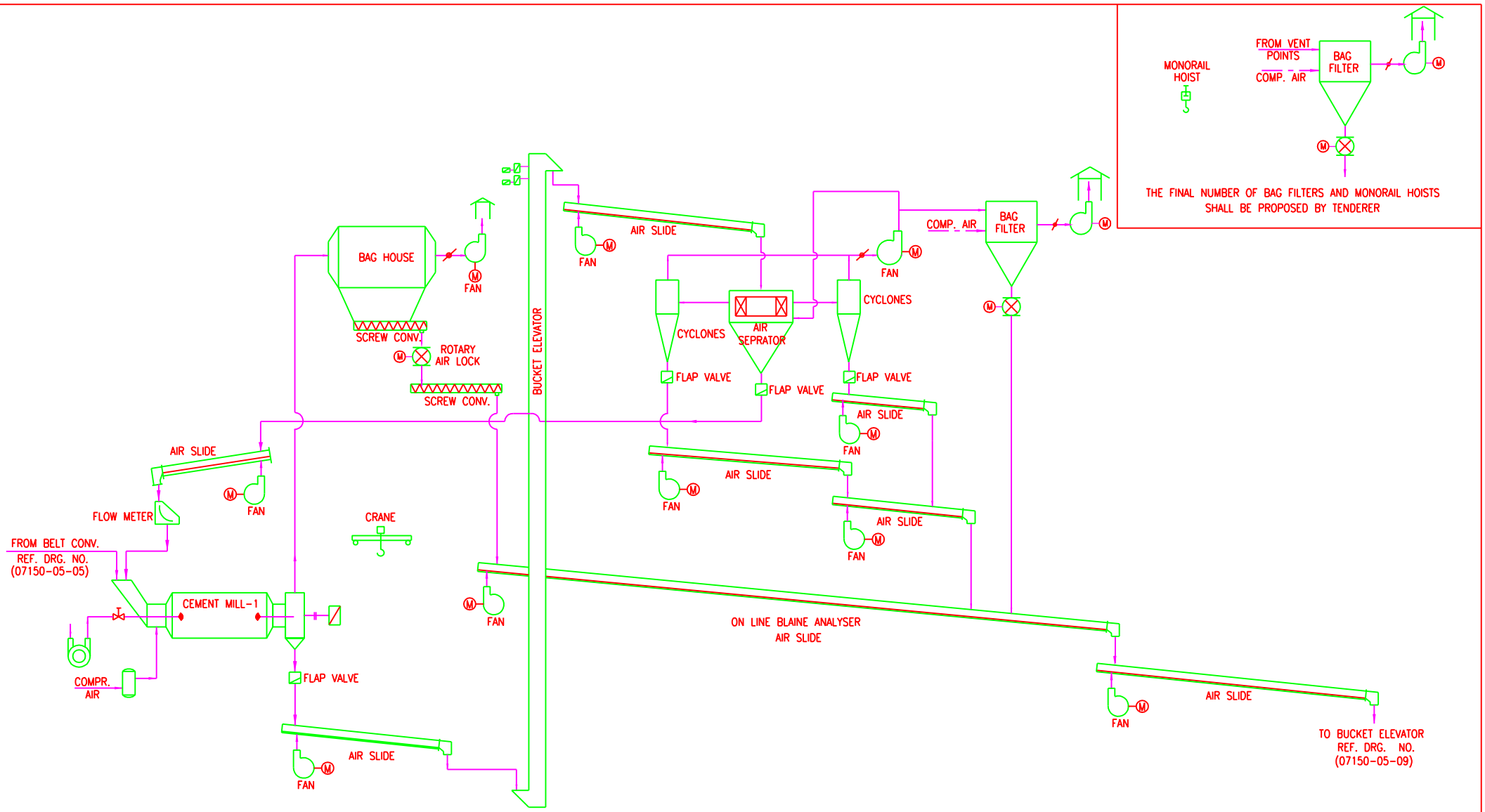

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0	20.03.06	FOR TENDER PURPOSE.	JPG

CUSTOMER :- DERBA MIDROC CEMENT.
PROJECT :- 07150

FLOW SHEET FOR
CEMENT MILL

HOLTEC CONSULTING PRIVATE LIMITED
HOLTEC CENTRE, A BLOCK, SUSHANT LOK, GURGAON-122001 HARYANA, INDIA

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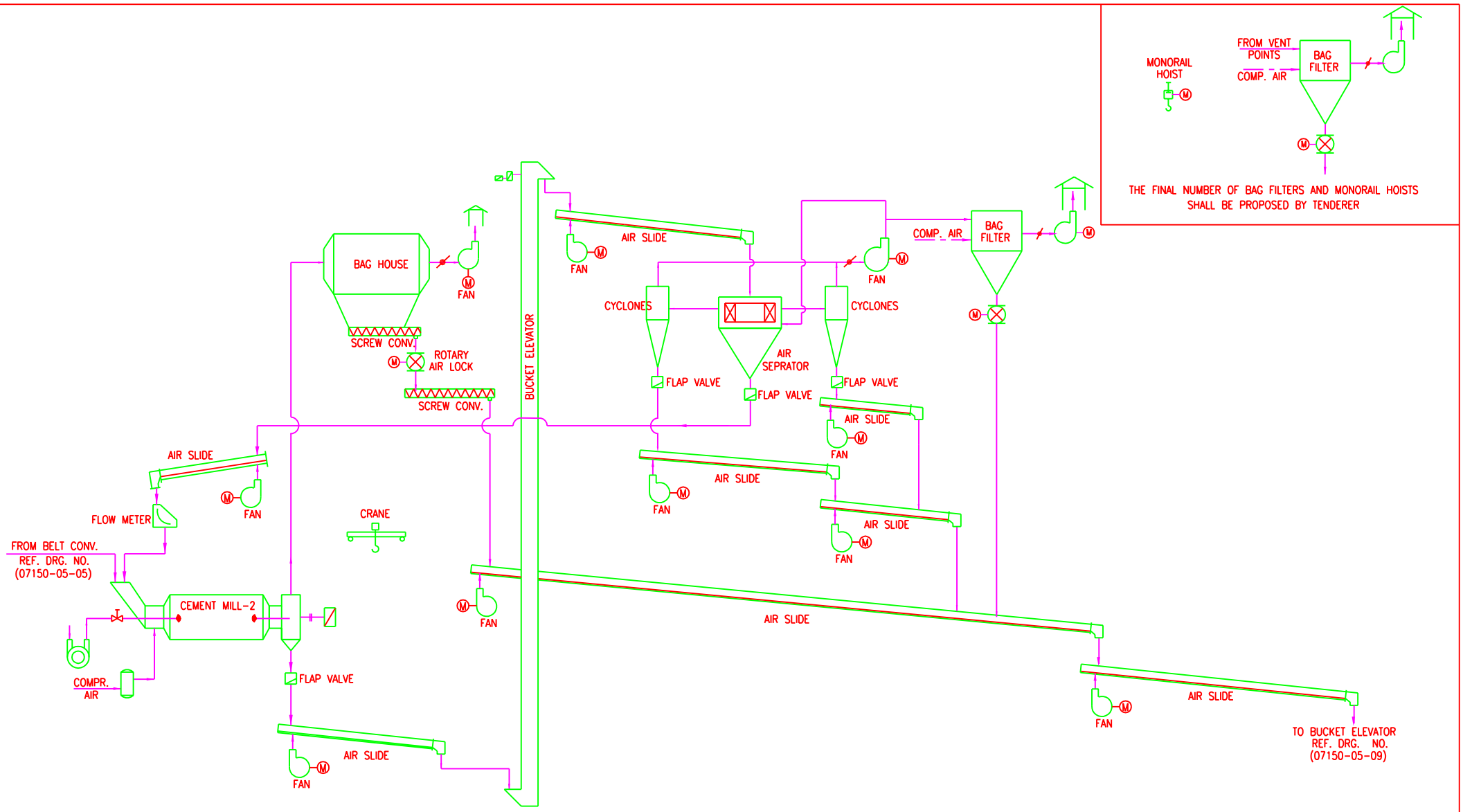

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CUSTOMER :- DERBA MIDROC CEMENT.

PROJECT :- 07150

FLOW SHEET FOR CEMENT MILL

HOLTEC CONSULTING PRIVATE LIMITED

HOLTEC CENTRE, A BLOCK, SUSHANT LOK, GURGAON-122001 HARYANA, INDIA

DRN.	CHKD.	APPD.	SCALE	DRG.NO.	REV.
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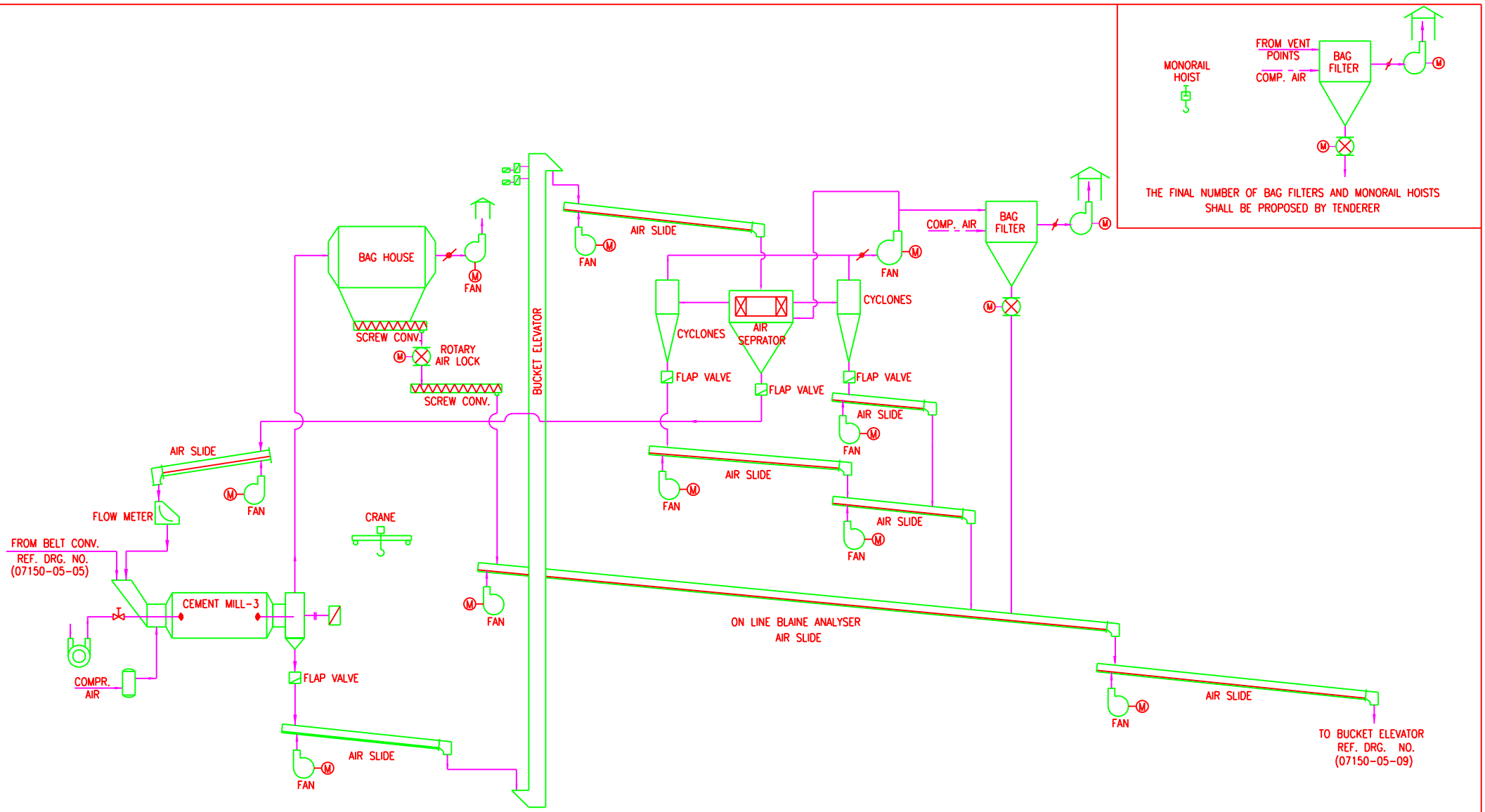

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0	20.03.06	FOR TENDER PURPOSE.	JPG

CUSTOMER :- DERBA MIDROC CEMENT.
PROJECT :- 07150

FLOW SHEET FOR
CEMENT MILL

HOLTEC CONSULTING PRIVATE LIMITED
HOLTEC CENTRE, A BLOCK, SUSHANT LOK, GURGAON-122001 HARYANA, INDIA

DRN.	CHKD.	APPD.	SCALE	DRG.NO.	REV.
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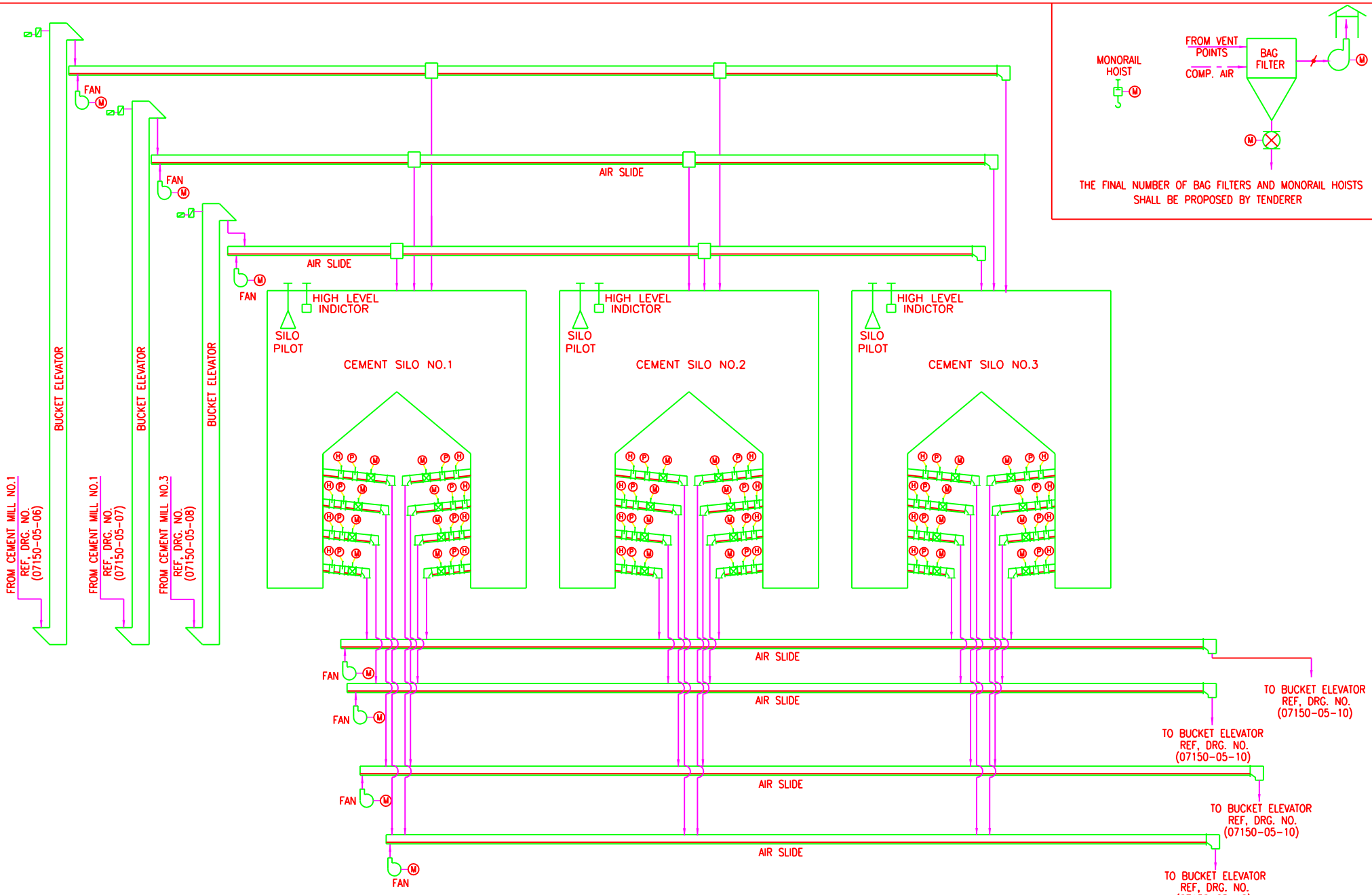

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0	20.03.06	FOR TENDER PURPOSE	JPG

CUSTOMER :- DERBA MIDROC CEMENT.

PROJECT :- 07150

FLOW SHEET FOR CEMENT SILOS

HOLTEC CONSULTING PRIVATE LIMITED

HOLTEC CENTRE, A BLOCK, SUSHANT LOK, GURGAON-122001 HARYANA, INDIA

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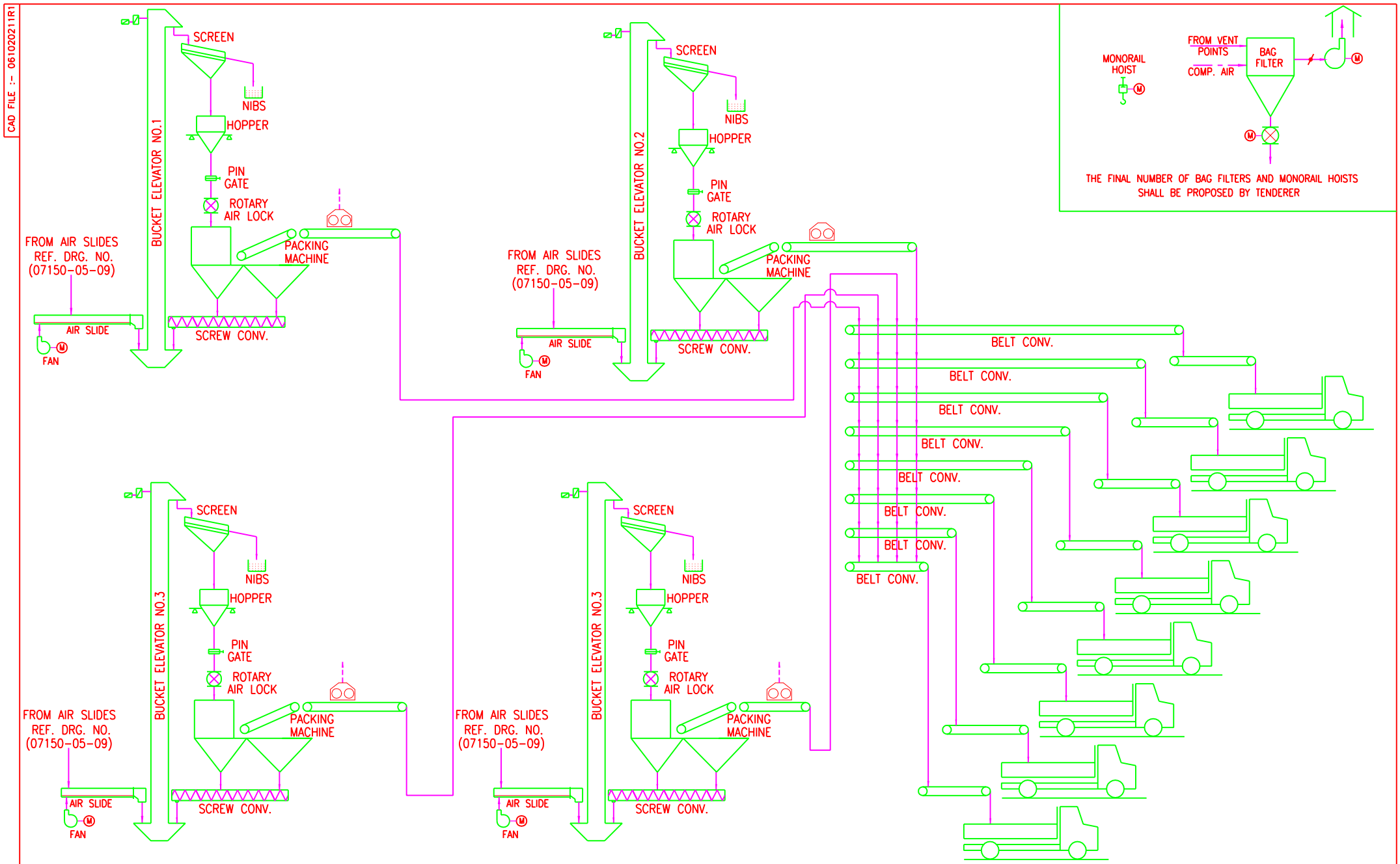
20.03.06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SCREEN
NIBS
HOPPER
PIN GATE
ROTARY AIR LOCK
PACKING MACHINE
BUCKET ELEVATOR NO.1
BUCKET ELEVATOR NO.2
BUCKET ELEVATOR NO.3
FROM AIR SLIDES REF. DRG. NO. (07150-05-09)
AIR SLIDE
FAN
SCREW CONV.
MONORAIL HOIST
FROM VENT POINTS
COMP. AIR
BAG FILTER
THE FINAL NUMBER OF BAG FILTERS AND MONORAIL HOISTS SHALL BE PROPOSED BY TENDERER
BELT CONV.
CUSTOMER :- DERBA MIDROC CEMENT.
PROJECT :- 07150
FLOW SHEET FOR PACKING PLANT
HOLTEC CONSULTING PRIVATE LIMITED
HOLTEC CENTRE, A BLOCK, SUSHANT LOK, GURGAON-122001 HARYANA, INDIA
DRN. KSI
CHKD. GKR
APPD. JPG
SCALE NTS
DRG.NO. 07150-05-10
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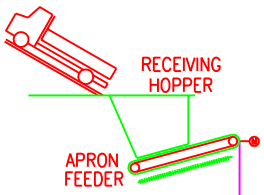
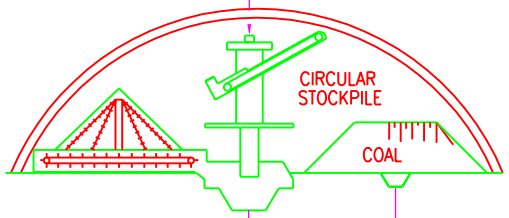


CRUSHER

BELT CONV.



VIBRO FEEDER

VIBRO FEEDER

BELT CONV.

REV. BELT CONV.

RAW COAL HOPPER

RAW COAL HOPPER

PIN GATE

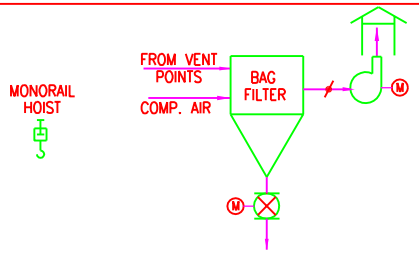
PIN GATE

APRON FEEDER

APRON FEEDER

SCREW FEEDER

TO COAL MILL
REF. DRG. NO.
(07150-05-12)



THE FINAL NUMBER OF BAG FILTERS AND MONORAIL HOISTS SHALL BE PROPOSED BY TENDERER

REV.	DATE	ISSUED FOR	BY
1	08.08.07	FOR REPORT	JPG
0	20.03.06	FOR REPORT	JPG

CUSTOMER :- DERBA MIDROC CEMENT.

PROJECT :- 07150

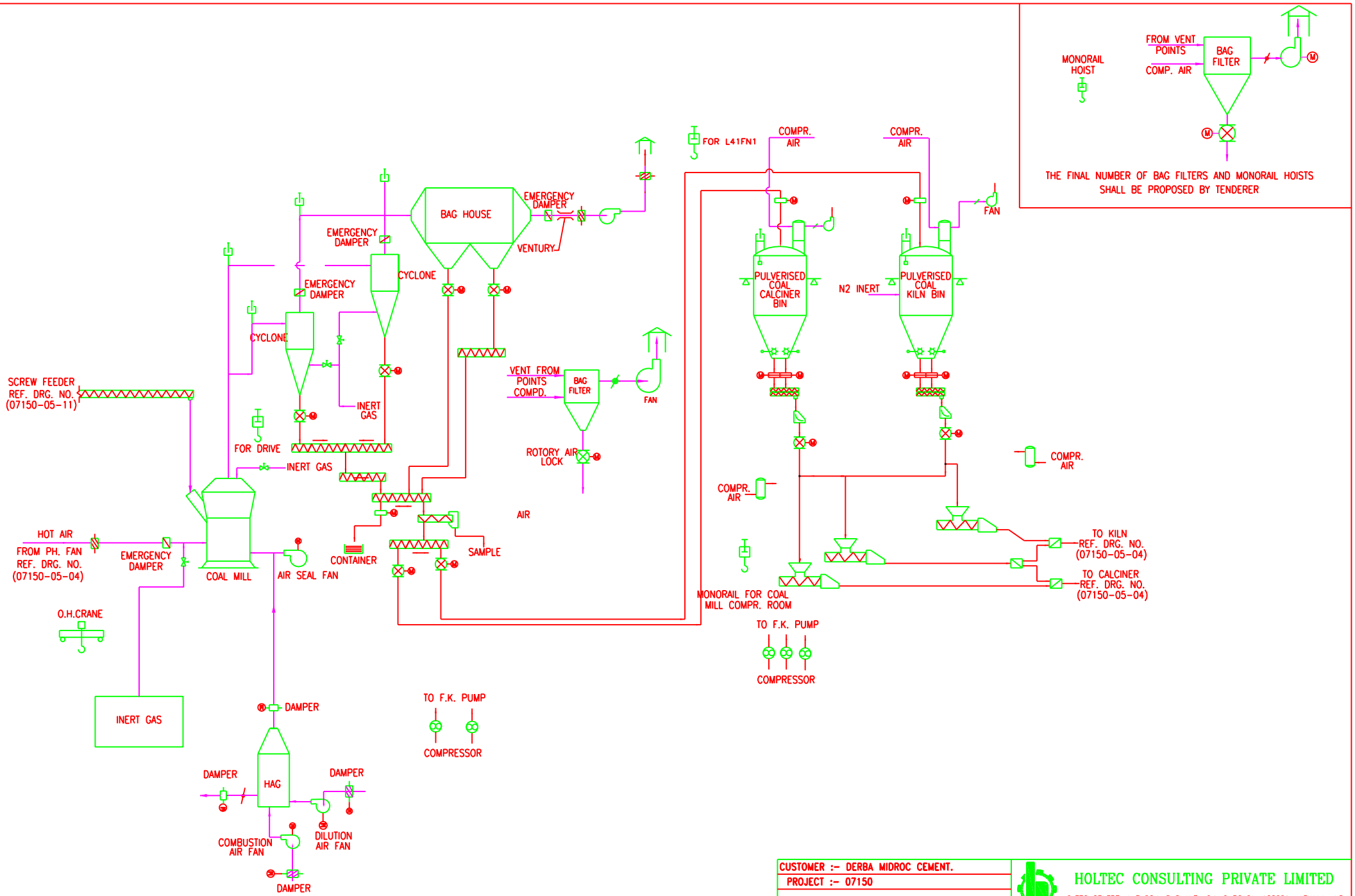
FLOW SHEET FOR
RAW COAL PREPARATION

HOLTEC CONSULTING PRIVATE LIMITED
HOLTEC CENTRE, A BLOCK, SUSHANT LOK, GURGAON-122001 HARYANA, INDIA

DRN.	CHKD.	APPD.	SCALE	DRG.NO.	REV.
KSI	GKR	JPG	NTS	07150-05-11	1

20.03.06

CAD FILE :- 06102021 3R1



REV.	DATE	ISSUED FOR	BY
1	08.08.07	FOR REPORT	JPG
0	20.03.06	FOR TENDER PURPOSE	JPG

CUSTOMER :- DERBA MIDROC CEMENT.

PROJECT :- 07150

FLOW SHEET FOR
COAL MILL PREPARATION

HOLTEC CONSULTING PRIVATE LIMITED

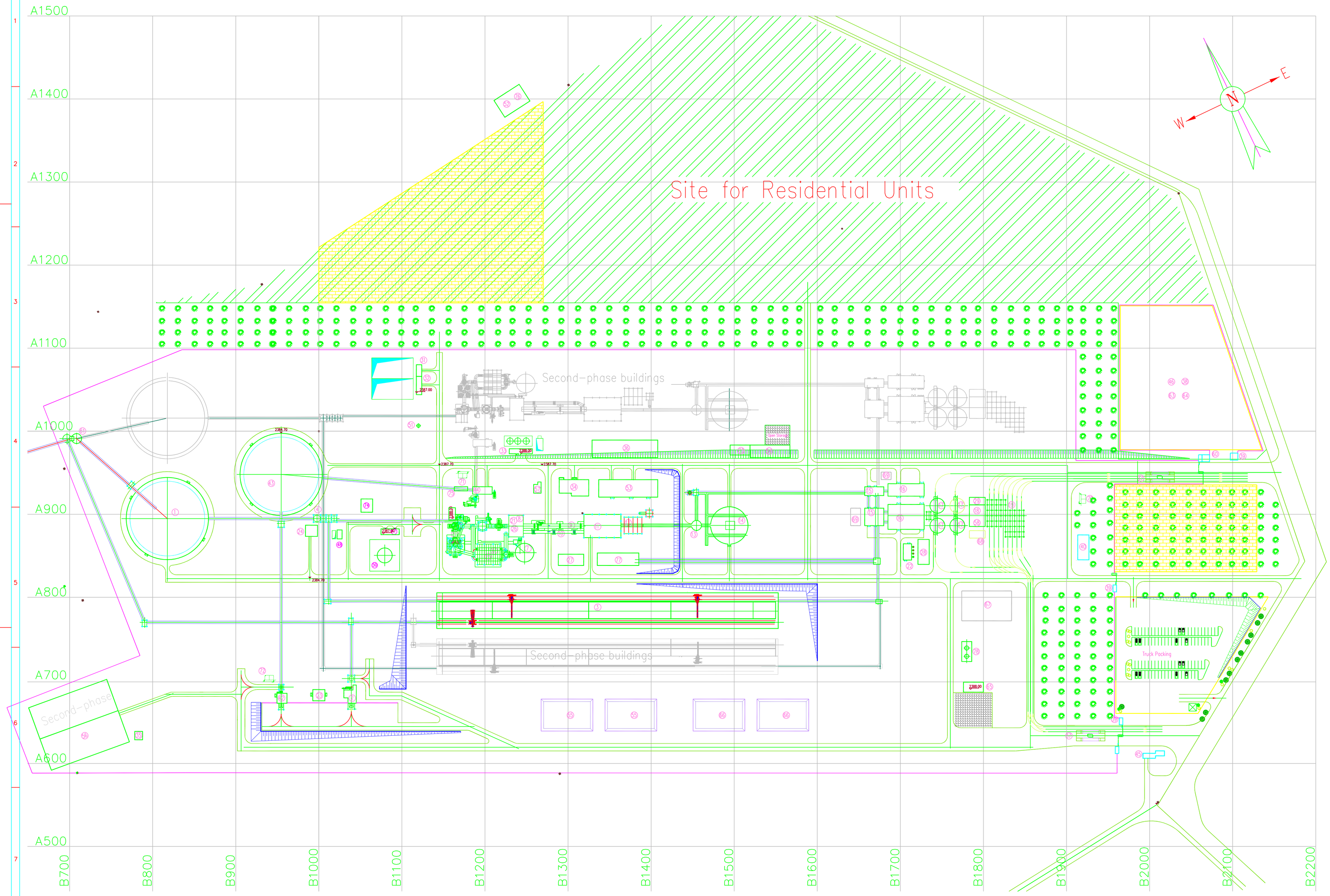
HOLTEC CENTRE, A BLOCK, SUSHANT LOK, GURGAON-122001 HARYANA, INDIA

DRN.	CHKD.	APPD.	SCALE	DRG.NO.	REV.
KSI	GKR	JPG	NTS	07150-05-12	1

20.03.06

DRG. NO. 07150-05-13

IF IN DOUBT ASK



S.NO.	LEGEND DESCRIPTION
1.	LIMESTONE STOCKPILE
2.	ADDITIVE & CORRECTIVE DUMP HOPPER WITH CRUSHER
3.	CORRECTIVE STOCKPILE
4.	RAW MILL FEED SYSTEM
5.	RAW MEAL GRINDING
6.	DEDUSTING OF RAW MILL & PREHEATER
7.	RAW MEAL SILO
8.	PREHEATER TOWER
9.	KILN
10.	TERTIARY AIR DUCT
11.	CLINKER COOLER
12.	DEDUSTING OF CLINKER COOLER
13.	OFF-SPEC CLINKER SILO
14.	CLINKER TRANSPORT AND STORAGE
15.	CEMENT MILL FEED STSTEM
16.	CEMENT GRINDING
17.	CEMENT STORAGE
18.	CEMENT PACKING
19.	CEMENT BAG LOADING
20.	CEMENT BULK LOADING
21.	COMPRESSED AIR STATION -1(1F)
22.	COMPRESSED AIR STATION-2
23.	E.R. FOR ADDITIVES & CORRECTIVES CRUSHING
24.	E.R. FOR RAW MATERIALS SYSTEM
25.	E.R. FOR RAW MEAL GRINDING SYSTEM (1F)
26.	E.R. FOR KILN FEEDING SYSTEM (1F)
27.	E.R. FOR CLINKER COOLING SYSTEM (1F)
28.	E.R. FOR CEMENT GRINDING SYSTEM (1F)
29.	E.R. FOR CEMENT PACKING SYSTEM
30.	----------
31.	WATER PURIFER PLANT
32.	RESSERVOIR & FIRE FIGHTING PUMP STATION
33.	CIRCULATING WATER TANK & PUMP STATION
34.	CENTRAL CONTROL ROOM & LABORATORY
35.	MV POWER MAIN STATION
36.	MECHANICAL & ELECTRICAL WORK SHOP
37.	WEIGH BRIDGE
38.	ADMINISTRATION BUILDING
39.	SECURITY ROOM
40.	CANTEEN
41.	----------
42.	CRUSHING OF COAL TO STORAGE
43.	COAL PREBLENDING STOCKPILE
44.	COAL MILL
45.	SALES OFFICE & DRIVERS REST ROOM
46.	CAR PARKING SHED
47.	PUMP ROOM FOR HFD UNLOADING & TRANSPORTATION
48.	FOARM SYSTEM FOR HFD TANK
49.	BOILING AND PUMPING FOR HFO
50.	HFO TANK
51.	WATER TANK
52.	SEWAGE TREATMENT
53.	REFRACTORY STORAGE
54.	SPARE PARTS STORAGE
55.	CORRECTIVE & ADDITIVE OPEN STOCKPILE
56.	SWITCH YARD
57.	DIESEL GENERATOR ROOM
58.	PACKING CONTROL ROOM & EMPTY BAG STORAGE
59.	----------
60.	TOME OFFICE
61.	MARL SILO
62.	----------
63.	COMPACT TRANSFORMER
64.	CLINIC
65.	GARAGE
66.	OPEN COAL STORAGE
67.	BAG STORAGE
68.	5TH PARKING POANT
69.	ROLLER PRESS
70.	TOILET-1
71.	TOILET-2
72.	TOILET-3
73.	OXYGEN & ACETYLENE TANK STORAGE
74.	OIL BURNING BOILER ROOM
75.	E.C FOR COAL CRUSHING
76.	SEWAGE TREATMENT STRUCTURE
77.	DRYER SYSTEM
78.	DESEL & PETROL STORAGE

REV	01	DATE	04	DATE
CONCURRENCE				

REV	DATE	ISSUED FOR	BY
2	09.08.07	FOR REPORT	JPG
1	17.08.06	FOR APPROVAL	JPG
0	22.03.06	FOR TENDER PURPOSE	JPG

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REFERENCES

REFERENCE NO.	DETAILS

NOTES

1. DO NOT SCALE, WORK TO DIMENSIONS ONLY.
2. FOR TOLERENCES REF. HOLTEC STD. DRG. NO. A1-HOL-STD-1-129

NOTES

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SPECIFIED

ONLY THE LATEST VERSION OF THIS DRG. AS INDICATED IN REVISION COLUMN IS VALID. THE PREVIOUS DRG. SHALL BE MARKED SUPERSEDED AND REMOVED FROM SITE OF WORK.

REVISIONS

REV No	DATE	BY	CHKD	APPD	DETAILS

HOLTEC CONSULTING PRIVATE LIMITED

HOLTEC CENTRE, A BLOCK, SUSHANT LOK, GURGAON-122001 HARYANA, INDIA

CUSTOMER : DERBA MIDROC CEMENT.

DES.	GKR	18.03.06	PROJECT : 07150	CAD FILE : 061020201R2
DRN.	GKR	20.03.06		
CHKD.	JPG	21.03.06		
APPD.	JPG	22.03.07		

PLANT LAYOUT

SCALE : 1:2000

DRG.NO. 07150-05-13 REV. 2