EXECUTIVE SUMMARY

FOR

EXPANSION OF CEMENT GRINDING UNIT

LEASE AREA: 3.095 Ha, Khasra no. 807/4 and 811

Existing Capacity: 150 TPD (45,000 TPM)

Proposed Capacity: 1000 TPD (30,000 TPM)

AT

Khasra No. 807/4 & 811 in Village Sarora, Tehsil Tilda,

Distt. Raipur, Chhattisgarh

Project Activity- Cement Plants 3(B)

Project Category – B

Type of Project – Expansion of Existing Grinding Unit

PROJECT PROPONENT

Central Cement Industries

Village Sarora, Tehsil Tilda, Distt. Raipur, Chhattisgarh

ENVIRONMENT CONSULTANT

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Executive summary

1. Introduction

1.1 Project proposal

The project proposal is for capacity expansion of the existing Cement Grinding Unit of Central Cement Industries. The project proposal is as follows:

- **Product**: Portland Pozzolana/Slag Cement (PSC)
- **Existing capacity**: Portland Pozzolana/Slag Cement: 150 TPD, (Based on VSK Technology)
- **Proposed expanded capacity**: Portland Slag Cement (PSC): 1,000 TPD, (Standalone Grinding Units, 2x500 TPD)

This is an expansion project and will consist of the following main facilities:

a) Raw material feeding hoppers : 4 x 200 T
b) Master hopper for blended material : 2 x 500 T
c) Cement Mills for cement grinding : 2x500 TPD or 1,000 TPD
d) Cement storage silos : 2 x 100 T
e) Packing Machine : 1 x 90 TPH
f) Bag houses : 5 Nos.
g) Chimneys (30 m height) : 3 Nos.

The plants will have in-built pollution control devices and will be operated on zero discharge of wastewater. Other facilities required for operation of the project, viz., work shop, administrative building, canteen, community center, first-aid post, electric sub-station, DG Set, boundary walls, internal roads, weigh bridge, etc. are existing.

Other features of the project are as follows.

- Total plot area : 3.095 hectares
- Annual Stream Days : 300
- Permanent Man Power Requirement : 25
- Project Time Schedule : 6 months from statutory clearances
- Project Capital Cost : Rs. 5 Crore

1.2 Project location

The project site, comprising 3.095 Hectares land, is located at Khasra No. 807/4 & 811 in Village Sarora, Tehsil Tilda, Distt. Raipur, Chhattisgarh. At present, part of the plot area is occupied by the existing Cement Plant and associated facilities of Central Cement Industries. The two plots of agricultural land were purchased from private owners in the year 2007. The land use of the two plots of agricultural land was converted for industrial use, and the existing Cement Plant was established after grant of Prior Environmental Clearance, Consent to Establish and Consent to Operate.

Central Cement Industries, is well connected by roads to other parts of Chhattisgarh. It is connected by an all-weather road to Raipur-Bilaspur Road (NH-30) at Mohada, which is approx. 7.5 km from the site. It is also connected to Simga-Tilda-Kharora Road, at a distance of approx. 3.5 km through all-season road, which joins NH-30 at Simga and NH-130B at Kharora. The project site is at a distance of approx. 40 km from Raipur, approachable through Raipur-Bilaspur Road (NH-30) up to Mohada and then through all season road. The nearest Railway Station is at Tilda,

at a distance of approx. 6.5 km in the east-southeast direction. The nearest airport is at Raipur, approx. 55 km from the site.

1.3 Importance of the project

The proposed project is for expansion of the Cement grinding unit for manufacturing Portland Slag Cement from Portland cement clinker, Blast furnace slag and gypsum.

Cement is a fine powder made from a combination of limestone, clay, and other minerals. It is a binding material used in construction to bind other materials such as sand, gravel, and water to create concrete, mortar, and other building materials. Cement is known for its ability to harden and set when mixed with water, creating a solid structure that can support heavy loads and withstand harsh weather conditions. It is a critical component of many construction projects, including buildings, bridges, roads, and dams.

2. Project Description

2.1 Process Description

The main process steps involved in manufacturing of Portland Slag Cement (PSC) are as follows:

- Receipt of raw materials by road and railway (up to Tilda RS)
- Clinker storage & handling
- Gypsum storage & handling
- Slag Storage & handling
- Blending and mixing of clinker, slag and gypsum in Master Hoppers
- Grinding of clinker, gypsum and slag in Ball Mills
- Product collection and storage
- Cement packing and storage
- Dispatch of product PSC by road and railway

Portland Slag Cement (PSC) manufacturing is done in the closed circuit grinding unit and automated rotary packers. Clinker, Slag, and Gypsum are transferred from the Storage sheds into their respective Hoppers, fed to the conveyor belt through Weigh Feeders in appropriate ratio (50:45:5), mixed in Master Hopper, and transferred into the Ball Mills. The ground material from the Ball Mill is drawn pneumatically, and passed through Classifiers. The oversize material is returned to the Ball Mills. Portland Slag Cement (PSC) from the grinding section is transported to the storage silo by a system of air slides and bucket elevator. The undersize material from the Classifier/Separator, as well as the material collected from the air stream in the Bag House, are collected in the Cement Hopper. The air, with particulate matter less than 25 mg/Nm3, is discharged into the atmosphere through a Stack of adequate height. From silos PSC is extracted and packed in HDPE bags of 50 kg weight by rotary type electronic packer and stored in a godown or loaded on to the trucks with the help of automatic truck loaders.

- **Cement Mill Feeding**: Apron Weigh Feeders for extraction and weight control of Clinker, Slag and Gypsum.
- **Ball Mill System:** Ball Mill with high efficiency Separators and Air Slides.
- **Product Collection:** PSC collected in the Separator and the Bag House is transported to the Cement Silo with the help of Air Slides.

2.2 Raw materials and utilities

Portland Slag Cement (PSC) will be manufactured by blending of Clinker, Slag and Gypsum in appropriate ratio and grinding of the blended mass. The raw materials and utilities required for operation of the Unit are as follows.

Table 1: Raw material and utility consumption

Raw Material/Utilities	Unit	Requirement	
		Daily	Annual
Cement clinker	T	500	150,000
Blast furnace slag	T	450	135,000
Gypsum	T	50	15,000
Electric Power	Mwh	35	10,500
Water	KL	10	3,000

2.3 Pollution Control System

Provisions of bag filters/bag houses in cement mill, storage silos, transfer belt conveyors, and cement packing to maintain the outlet dust concentration below 25 mg/Nm^3, storage of raw materials and finished products in covered areas with paved surfaces, sprinkling of water to control fugitive dust emission.

Waste water is not generated from the plant operation or maintenance, and the plant shall be operated on zero effluent discharge basis. Domestic and sanitary wastewatwer will be trated in septic tanks and disposed in soak pits or utilized for plantation.

Raw material and product dust collected in the hoppers of bag filters/ houses shall be recycled quantitatively to the ball mills. Domestic waste shall be segregated and disposed either through composting or through approved recyclers. Used oil, used batteries and empty drums shall be disposed through approved recyclers.

3. Description of the Environment

3.1 Study period and study area

The baseline environmental status around the project site has been established for the major environmental attributes, *viz.,* land, air, water, noise, ecology & bio-diversity and Socio-economics, during the Summer (Pre-monsoon) season, from 1st March to 31st May, 2023. The area falling within 10 kms distance from the project site has been considered as study area for baseline data generation and collection.

3.2 Land environment

The topography of the study area is undulating, gently sloping towards west and north-west directions, i.e towards Kharun and Seonath rivers. Elevation of the study area varies from 270 m AMSL to 315 m AMSL. The general ground level of the project area is 290 m AMSL. The drainage pattern in the study area is dendritic to sub-dendritic.

Major portion of land in the study area (76.9%) is under cultivation, followed by grassland and scrubs (8.3%), waste land (7.8%), settlements (2.7%), Forest land 2.5%), and water bodies (1.8%).

Soil texture in the study area is sandy loam. The levels of main nutrients, viz., available nitrogen, phosphorous and potassium are in the range 25.67 to 31.58 mg/100g, 17.8 to 21.5 mg/100g and 142 to 153 mg/100g, respectively. Organic carbon was found in the range 0.62% to 0.84%. Based on the soil analysis reports, it is concluded that the soil in the area is fertile.

3.3 Climate & meteorology

Raipur district has a tropical wet and dry climate, with good rainfall. the temperatures remain moderate throughout the year, except from March to June, which are extremely hot. The highest temperature goes up to 43^0C and observed in the months of May and June. Winters last from November to January and are mild and the lowest falls up to 13 °C and observed in the months of December and January. The district receives its rainfall mainly from the south-west monsoon which usually sets in the third/fourth week of June and spread over a period from late June to early October with heaviest shower in the months of July and August. The normal rainfall in the district is 1319 mm and the average are 1323 mm in the year 2011. Areas of chronic shortfall are few and localized.

Site specific meteorological data was recorded for one full season from 1st March to 31st May, 2023. The wind speed was recorded from calm to a maximum of 17.4 m/s, with an average value of 3.75 m/s. The pre-dominant wind direction is Western (approx. 13%), followed closely by South western (approx. 10%), West-south-western (approx 12%), and Northern (approx 10%). The recorded hourly data were used for dispersion modeling.

3.4 Air quality

Ambient air quality survey was performed during the full summer season (1st March to 31st May) of 2023 at 9 sampling locations. Samples were collected continuously for 24-hour period with the frequency of twice per week per location. The maximum observed concentrations are given in Table 2.

Table 2: Maximum observed concentrations air pollutants

Sampling location	Maximum observed concentrations, µg/m³				
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO
Project Site	91	50	23	35	0.98
Sarora	86	48	20	30	0.94
Binaika	82	46	18	29	0.92
Parsada	66	40	14	19	0.70
Biladi	77	43	14	24	0.88
Bhumia	72	42	13	24	0.83
Tilda Newra	82	49	16	26	0.95
Simga	77	47	15	23	0.90
Kiritpur	65	40	13	19	0.76

Based on the results of monitoring, it is concluded that major part of the study area has adequate carrying capacity to sustain further industrial development.

3.5 Noise level

Noise levels were measured, using an Integrating sound level meter, at 9 monitoring locations – 5 in residential areas, 2 in urban (commercial) area, and 1 in Industrial area, 1 in sensitive area

(primary school). The observed values are within the specified limits for respective area categories.

Table 3: Noise levels in the Study Area

Location Name	Area Category	Noise Level dB(A)	
		Day (Ld)	Night (Ln)
Project Site	Industrial	65.2	56.7
Village Sarora	Residential	52.4	48.1
Village Binaika	Residential	50.6	39.6
Village Parsada	Residential	48.8	38.2
Biladi (Primary School)	Sensitive	48.2	37.5
Bhumiya	Residential	50.2	36.4
Tilda Newra	Commercial	49.4	40.8
Simga	Commercial	51.2	40.5
Kiritpur	Residential	50.6	39.8

3.6 Water quality

To establish the water quality of the study area, 6 ground water and 5 surface water sources were identified. Samples from these sources were collected by grab sampling method and analyzed for their physico-chemical characteristics.

The ground water charcteristics in the area have been compared with respect to the Drinking Water Quality Standards as per IS:10500. Total dissolved solids, pH, chloride, sulphate, phosphate and nitrate concentration at all locations in the area are within the desirable limits.

Table 4: Summary of Study Area Ground Water Characteristics

Sl. No.	Parameters	IS 10500 : 2012		Observed values			
		Desirable	Permissible	Minm.	Maxm.	Mean	Median
1.	pH at 25 ^{0}C	6.5 to 8.5		7.2	7.7	7.6	7.6
2.	Total Dissolved Solids, mg/l	500.0	2000.0	327	413	374	379
3.	Total Hardness as $CaCO_3$, mg/l	200.0	600.0	196	251	230	234
4.	Calcium as Ca, mg/l	75.0	200.0	51.2	67.2	58.9	59.4
5.	Magnesium as Mg, mg/l	30.0	100.0	16.5	23.8	19.2	18.2
6.	Total Alkalinity as $CaCO_3$, mg/l	200	600.0	212	294	248	235
7.	Chloride as Cl, mg/l	250.0	1000.0	36.0	64.0	46.3	42.0
8.	Sulphate as SO_4, mg/l	200.0	400.0	21.0	35.0	26.8	26.3
9.	Nitrate as NO_3, mg/l	45.0		3.3	5.9	4.2	4.1
10.	Fluoride as F, mg/l	1.0	0.27	0.24	0.48	0.30	0.27
11.	Iron as Fe, mg/l	1.0		0.15	1.15	0.37	0.24
12.	Zinc as Zn, mg/l	5.0	15.0	<0.001	<0.001	<0.001	<0.001

The characteristics of surface water samples from the 2 rivers are within the limits specified by CPCB and BIS IS 2296 for, Drinking water source after conventional treatment and disinfection.

Table 5: Surface Water Characteristics in Study Area

Sl. No.	Parameters	Requirement (CPCB/ IS 2296)*	Observed values for	
			Kharun River	Seonath River
1	pH at 25 ^{0}C	6 to 9	7.54	7.84
2	Dissolved Oxygen, mg/l	4 mg/l or mor	6.2	6.4
3	BOD (3 days at 27^{0}C), mg/l	3 mg/l or less	7.8	7.2
6	Total Dissolved Solids, mg/l	1500	508	458
9	Sulphate as SO_4, mg/l	400	28.6	22.7
13	Total Hardness as $CaCO_3$, mg/l	300	234	172
17	Chloride as Cl, mg/l	600	58	58
20	Total Coliform, MPN/100 ml.	5000 or less	920	785
	Faecal Coliform, MPN/100 ml.	-	350.0	640.0

The salient features of surface water samples from the canal and the two ponds are within the limits specified by CPCB and BIS IS 2296, (for Propagation of wildlife and fisheries, and for Irrigation, industrial cooling and conbtrolled waste dispoosal, whichever is more stringent).

Table 6: Salient features of other water bodies

Sl. No.	Parameters	Tolerance limit	Observed values		
			Minimum	Minimum	Average
1	pH	6.5 to 8.5	7.25	7.73	7.40
2	Conductivity, µmhos/cm	1000	667	997.00	771.25
4	Total Dissolved Solids, mg/l	2100	528	608	553
9	Chloride as Cl, mg/l	600	64	72	68
12	Sulphate as SO_4, mg/l	1000	24.5	34.8	28.3
13	Fluoride as F, mg/l	-	0.84	1.02	0.90
14	Ammonical Nitrogen as N, mg/l	-	4.80	6.80	5.45
15	Sodium as Na, mg/l	-	62	64	63

3.7 Biological environment

The topography and climatological conditions of the study area support tropical forests. Based on secondary data, authenticated through field study, a total of 35 flora species, comprising 20 trees, 8 shrubs, and 7 herbs and grasses, have been identified. The plant species common to the area are *Dalbergia latifolia, Tectona grandis, Albizzia lebbeck*, *Mangifera indica Linn., Terminalia arjuna, Ficus glomerata., Ficus religiosa Linn.*, etc. No endangered species of flora is found in the study area.

A total of 42 species of fauna, including 12 mammals, 19 birds, 4 reptiles, 3 amphibians, and 5 butterflies were either observed or confirmed during the field survey. from the area. Among the wild animals, *Herpestes edwardsi, Lepus nigricollis, Macaca mulatta* were observed.

3.8 Socio-economic environment

Total population of the study area is 68141, comprising 34251 males and 33890 females. Sex ratio in the study area is 989 females/1000 males. The schedule caste and schedule tribes' population in the study area is 22.24% and 6.36%, respectively. Literacy rate of the study area is 73.4%, with 84.4% male literates and 62.4% female literates. Main workers constitute 31.24% of total

population, whereas marginal workers constitute 14.70% of total population. Within the main workers, cultivators, agricultural workers, Household workers. and other workers constitute 31.56%, 37.80%, 1.54% and 29.11%, respectively. Due to proximity and ease of access to Raipur City, several medical and educational facilities in the city are available and accessible to the rural areas of the study area.

4. Anticipated Environmental impacts

4.1 Land environment

Topography & drainage: The proposed project is for capacity enhancement of the grinding unit of the existing cement plant, impact on topography or drainage is not envisaged,

Soil quality: Raw materials and the finished products will be transported to the site in covered trucks, and stored at the site in covered sheds. Thus, their spillage and subsequent adverse impact on soil quality, is not foreseen. Adequate control measures (bag filters and cyclones, enclosed storage, etc.) are proposed for control of dust emissions. Therefore, impact on land environment during handling of raw materials and products will be insignificant. The project proposal does not involve disposal of toxic wastes (liquid and solid wastes) on land. Blowdown from cooling water system will be recycled quantitatively and utilized for dust suppression. Spent oil and used containers and batteries will be disposed through approved vendors. All other solid wastes collected in the Bag filter hoppers will be recycled. Thus, impact due to disposal of liquid and solid wastes is not envisaged.

Land use: As the plot of land is already under industrial use, change in land use is not envisaged.

4.2 Air Quality

The air pollutant likely to be emitted from proposed project are

- Fugitive emission of particulate matter from raw materials unloading, storage and transfer to Raw material feeding hoppers, and from there to the Master hopper;
- Particulate matter emission during grinding of blended raw materials;
- Particulate matter emission during transfer of ground material to Cement Silos; and
- Particulate matter emission during packing of cement into bags,
- Fugitive emissions (SO_2, NO_2, CO and hydrocarbons) from vehicular traffic

Compliance with emission standards:

The emission limits and stack height applicable to "Cement Plants without Coprocessing, Standalone Grinding Units, or Blending Plants" is notified vide Ref. GSR 612(E) dated 25th august, 2016, Environment (Protection) (Fifth Amendment) Rules, 2014, are as follows:

a) Particulate matter (concentration not to exceed): 30 mg/Nm3
b) The height of each stack including Clinker Grinding Plant, Coal Mill, Raw Mill, Grinding, Packaging Section, etc. shall be of a minimum of 30 meters.

The details of stacks and the estimated emissions from the proposed project are presented in Table 7.

Table 7: Details of stacks and emissions

S.N.	Particulars	Raw material handling	Mill outlet	Bag Packing
1.	Volumetric flow rate, Nm3/hr	3 x 35,000	35,000	35,000
2.	Exhaust gas temperature, ^{0}C	40	40	40
3.	Stack height, m	30	30	30
4.	Stack top ID, m	1.5	0.9	0.9
5.	Particulate matter concn., mg/m3, max.	30	30	30
6.	PM emission rate, kg/hr, max.	3.15	1.05	1.05

Based on the site specific micro meteorological data recorded during the study period, dispersion modelling for computation of seasonal average and maximum 24-hour average incremental ground level concentrations was performed using AERMOD model. Source related inputs used for the modelling are as follows.

Table 8: Source related inputs for modelling

Particulars	Stack attached to		
	RM handling	Mill outlet	Packing
Volumetric flow, Nm3/hr	105000	35000	35000
Volumetric flow, Nm3/s	29.17	9.72	9.72
Exhaust gas temperature. ^{0}C	40	40	40
Volumetric flow, m3/s	33.44	11.15	11.15
Stack height, m	30	30	30
Stack top ID, m	1.5	0.9	0.9
Stack cross section area, m2	1.77	0.64	0.64
Exhaust velocity. m/s	18.9	17.5	17.5
PM concn., mg/Nm3	30	30	30
Pollutant emission rate, g/s			
Particulate matter, PM10	0.88	0.29	0.29
Particulate matter, PM2.5	0.53	0.18	0.18

Based on the modelling result under observed meteorological condition, the highest 24 hours average incremental Ground Level Concentrations (GLC) of PM10 and PM2.5 are estimated to be 2.314 µg/m3 and 1,416 µg/m3, respectively. The first 5 high 24-hour average incremental GLCs of PM10 and PM2.5 are presented in Table 9, with dates and locations of their occurrence.

Table 9: The 1st high 24-hor incremental GLC of particulate matter

Rank	Incremental Concn.		Date of occurrence	Location w.r.t. Plant	
	PM10	PM2.5		X-axis, m	Y-axis, m
1st	2.314	1.416	3/6/2023	-35.42	-123.91
2nd	1.483	0.907	4/5/2023	959.27	-123.91
3rd	1.118	0.682	4/14/2023	959.27	888.48
4th	0.874	0.534	3/28/2023	-35.42	888.48
5th	0.842	0.514	4/5/2023	1953.96	-123.91

It is, therefore, concluded that the ambient air quality will remain practically unchanged and well within the ambient air quality standards, and operation of the proposed project will not have significant impact on the ambient air quality.

4.3 Water environment

Water resources: Fresh water for industrial and domestic purposes, approx. 10 KLD (approx. 3,000 KL/year), will be extracted through bore well within premises. Level of ground water development in Tilda Block is 34.6%, (Source: Ground Water Brochure of Raipur District, 2012-13, published by CGWB). Further, the project proposal includes development of a Rain Water Harvesting System for ground water recharge. The annual recharge potential of the rainwater harvesting system is approximately 7,567 KL. It is ,therefore concluded that, even after extraction of water for meeting the project fresh water requirements, the rain water harvesting system will have a net positive recharge of approx. 4,500 Kl/year.

Water quality: The proposed project will be operated on zero effluent discharge concept and no wastewater will be discharged. Sewage from toilets, washrooms, and other domestic sources, approx. 2 KLD, will be treated in septic tanks and disposed in soak pits within premises. The only source of industrial wastewater from plant operation is the blow-down from the Cooling Water System, which shall be recycled quantitatively and utilized for dust suppression. This will result into saving of fresh water. Raw materials and finished products will be stored in covered sheds to eliminate their carry-over with rain water. Therefore, the proposed project will have no impact on surface water quality.

Water conservation: Blow-down from the cooling water system will be recycled quantitatively and utilized for dust suppression

4.4 Noise level

The sources of noise during the operational phase of the project are ID fans, pumps, grinders, bucket elevators, screw conveyors, etc., and the movement of vehicles along the roads. The plants will be based on state-of-the-art technology and the machines will be provided with appropriate devices to maintain the noise levels within limits.

The existing ambient noise levels in the study area is well within the standards prescribed for respective areas. The plant is located at a minimum distance of 700m from Sarora human settlements. Result of prediction of noise transmission are as follows:

Existing noise level at Sarora	: 52.4 dB(A)
Predicted incremental noise	: 45.6 dB(A)
Predicted noise level (day time)	: 52.4 dB(A)

It is, therefore, concluded that the existing noise level in the area will remain practically unchanged. Thus, no impact on the noise level is foreseen.

4.5 Biological environment

Construction phase: The project site is presently under industrial use, occupied by the existing Cement Plant. Almost 33% of the land has been covered by plantation and green belt. These trees will not be cleared during the construction phase. As the proposed expansion will be done over the areas presently occupied by the existing plant or devoid of plantation, no impact on the ground clearance is envisaged.

Operation phase: During the operation of the proposed project, the abiotic factors influencing ecology & bio-diversity will remain practically unchanged. Therefore, the proposed project will have, practically, no impact on the biological environment.

Green belt and plantation: It is proposed to increase the green cover within premises from 33% to 50% of the project area. Therefore, significant positive impact on ecology and bio-diversity is foreseen.

4.6 Demographic and Socio-economic

The project will generate direct and indirect employment opportunities. Direct employment will be in the form of skilled, semi-skilled and un-skilled work force required for operation of the facilities. Overall, the project will have significant positive impacts on socio-economic environment.

4.7 Traffic & infrastructure

Mohada-Tilda Road, linking the Cement Plant to Raipur-Bilaspur Road as well as to Simga-Tilda-Kharora Road have adequate capacity to sustain the increased load on road traffic. Impact on the traffic density on Raipur-Bilaspur Road and Simga-Tilda-Kharora Road will be insignificant. However, impact on the link road (Mohada-Tilda Road) will be significant but within the road capacity.

5. Environmental Management Plan

5.1 Solid & Hazardous Wastes

Proposed mitigation measures for solid and hazardous wastes during construction and operation phases of the project are as follows.

- Solid wastes generated during construction phase will be utilized as land fill material during construction phase or disposed through sale as scrap, as applicable
- Particulate matter collected in the three bag houses provided in the raw material charging and blending and feeding to the Grinding Mills shall be transferred quantitatively to the Master Hopper (Blended raw material hopper).
- Particulate matter collected in the Dust Extraction System (Bag house) between Mill outlet and Cement Silo will be recycled quantitatively to the Cement Silo.
- Particulate matter collected in the Dust Extraction System (Bag house) in the Cement Packing area will be recycled quantitatively to the Cement Silo.
- During construction as well as operation phase, transportation of construction & raw materials and finished product, shall be done in covered trucks.

5.2 Air Environment

Proposed mitigate measures during the construction phase are as follows.

- All roads within premises will be paved and black topped.
- Construction equipment and transport vehicles will be maintained properly.
- Clinker and gypsum shall be transported in covered trucks.
- Use of “Pollution under Control” certified vehicles shall be ensured for transportation.

The in-built control devices for control of air pollution and the proposed mitigation measures during operational phase of the project are as follows.

- Dust extraction systems, comprising of 5 Bag houses, each with 212 bags, shall be provided for control of particulate matter from different operations.
- Discharge of process emission through stacks of adequate heights,
- Plantation and green belt in entire available areas within the premises,
- Plantation and green belt development,
- Periodic water spraying for dust suppression,
- Online PM monitor for continuous monitoring of emissions.

5.3 Water environment

The plants will be operated with **zero effluent discharge**. The proposed control and mitigation measures are as follows.

- Blow-down from the cooling water system will be recycled quantitatively and utilized for dust suppression.
- Water sprinkling for dust suppression will be maintained at the minimum required level, to conserve water.
- Wastewater from other domestic uses will be utilized, to the extent feasible, for irrigation of green belt and plantation.
- Raw materials and finished product will be stored under covered sheds and within retaining walls to rule out their carry-over with rain water and polluting surface water bodies.
- A rain water harvesting system will be constructed and maintained to facilitate ground water recharge to the maximum extent.

5.4 Noise Environment

Control and mitigation measures during construction and operation phases are as follows:

- Equipment vendors/ manufacturers will ensure that the noise level at 1 m from their equipment does not exceed 90 dB.
- D.G. set will be housed within acoustic enclosure.
- Proper maintenance and greasing of equipment and machinery.
- Moving parts of equipment and machines shall be properly maintained and lubricated.
- No workers shall be allowed to be exposed to more than 90 dBA in an 8-hourly shift and under no circumstance the noise level from any equipment shall be more than 115 dBA.
- The control rooms shall be provided with acoustic glass walls.
- The operational and maintenance personnel will use earplugs during visits to plants.
- Control of vibration shall be achieved by providing proper foundation and alignment.

5.5 Green belt development

As per the Terms of reference, approx. 50% of the project area, i.e., 15,000m^2 area, is to be provided with green belt and plantation. The entire area available within premises, after accommodating the plant facilities, will be brought under plantation. The minimum thickness of green belt is in the Northern direction - approx. 13m width. Vacant areas in the eastern part will be covered fully with plantation. Available areas in the western and the southern directions will also be covered with plantation to cover a total of 15,000 m^2 area.

5.6 Rain water harvesting

The rain water harvesting systems will capture run-off from roofs of plants & facilities. Total catchment area is 8,250 m^2. The rain water will flow be gravity through PVC pipes into the rain water harvesting pit (dimension 10m x 10m x 4m). The pit would be provided with 4 number of injection wells to facilitate quantitative recharge of rainwater through injection well of 100 m depth. Estimated annual re-charge potential of the proposed system is approx. 7,567 KL.

5.7 Corporate social responsibility

The project proponents are aware of their social responsibilities and are committed to undertake welfare schemes under CSR scheme. On grant of necessary clearances for establishing the proposed project, the company will take up the matter with appropriate authorities, formulate CSR scheme for the nearby villages, and implement the same as per MOU with the authorities.

5.8 Occupational health & safety

In addition to the safety measures incorporated at design stage, the following control, mitigation and safety measures are proposed.

- Formation and functioning of EHS Cell and EHS training to all employees;
- Emergency preparedness and mock drills
- Work-zone ambient air quality monitoring
- Introduction and strict compliance of work permit system and use of applicable PPEs
- Routine health checkup of employees
- Signage for hazardous substance handled and associated risks,
- Training to respond for emergency during handling of hazardous substances
- Provision of adequate firefighting facilities, and firefighting training

5.9 Environment Monitoring

A detailed environmental monitoring plan, including ambient air quality, work zone air quality, ground water quality, noise level, status of green belt & plantation, employees' health, etc. for the proposed project has been outlined. Automatic continuous monitoring of PM is also proposed.