AAC Blocks Project By Mohit Industries Limited, Gujarat, India

NXTBLOC
AUTOCLAVED AERATED CONCRETE BLOCKS

Document Prepared By Infinite Solutions

Project Title	AAC blocks project by Mohit Industries Limited, Gujarat, India
Version	04
Report ID	VCS/MIL/02
Date of Issue	28/11/2017
Project ID	VCS project database ID: **VCSPD1238**
Monitoring Period	01-January-2015 to 31-August-2017 (Both days inclusive)
Prepared By	Infinite Solutions
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Summary Description:

Mohit Industries Limited now named as Big Bloc Construction Limited (hereinafter referred to as MIL or PP) has installed an autoclaved aerated concrete (AAC) blocks manufacturing unit of capacity 300,000 m3/annum in Gujarat, India. The project activity involves setting up a new facility and is accordingly classified as a Greenfield project. The AAC blocks manufactured at the project plant uses, waste material fly ash generated from thermal power plants as the primary raw material. The AAC blocks produced replaces conventional fired (baked) clay bricks as construction material. The specific energy demand for manufacturing AAC blocks is lower as compared to conventional clay bricks.

The energy requirement for fired clay bricks manufactured in India is supplied predominantly by high carbon intensive fossil fuel sources. AAC blocks are manufactured by the autoclaving process, which is less energy intensive as compared to the thermal baking process used for manufacturing of fired clay bricks. Thus, the project activity results in lower greenhouse gas emission as compared to the conventional clay bricks manufacturing process. In terms of performance standard of AAC blocks, the AAC blocks are being manufactured in compliance with the requirements of the relevant national standard. The GHG emissions accrued from the project activity during the monitoring period 01-January-2015 to 31-August-2017 (both days inclusive) is1,22,954 tCO2e/ annum

Implementation Status:

The project has been implemented on 25-November-2012 and the primary technology for the AAC block manufacturing at the project plant is from **M/s Changzhou Mingjie Building Material Equipment Manufacturing Co., Ltd, China**. The blocks are manufactured, largely through mechanical processes, using cement, lime, gypsum and fly ash from thermal power plants as major raw materials along with aluminium powder (in small quantities).The batched raw materials are mixed with water and the slurry formed is fed to the moulds to set and form green cakes. The green cakes are finally cured by autoclaving with steam to form the AAC blocks. Steam is generated in coal fired boiler.

The major components of equipment installed as part of project activity are as follows:

- Raw materials storage silos
- Raw material mixer
- Hydraulically operated moulding section
- Autoclave section
- Steam boilers
- Compressed air network
- Internal transportation system

Specifications of AAC blocks manufactured under the project activity are as follows:

Particulars	Unit	Value	Remark (if any)
Dimension of AAC blocks	Mm	650X240X150	As per actual production data
Density (dry)	kg/m3	551-600	As per Lab test Report
Dry shrinkage (maximum)	%	0.1	As per Indian Standard – IS 2185
Thermal conductivity	W/m-K	0.24	
Compressive strength	N/mm2	>3.75	
Fly ash	%	72.11	Lab test report and actual monitoring data at the plant
Cement	%	18.37	
Lime	%	7.38	
Gypsum	%	2.06	
Aluminium powder	%	0.064	

Commissioning Date:

Commissioning of the Project Activity	**25-November-2012**

1.2 Sectoral Scope and Project Type

The project activity is a non AFOLU project, developed in line with UNFCCC approved CDM methodology. With reference to Appendix B to the simplified modalities and procedures for small scale CDM project activities, the project activity falls under the following category:

Type	(iii)- Other Project Activities
Scale	Small Scale
Category	Z: Fuel switch, process improvement and energy efficiency in brick manufacture
Methodology	AMS-III.Z: Fuel Switch, process improvement and energy efficiency in brick manufacture
Version	04
Weblink	*http://cdm.unfccc.int/methodologies/DB/WPNWYRJ0FN59EFPA4A7N ABU0849FD3*

1.3 Project Proponent

Organization name	Big Bloc Construction Limited
Contact person	Mr. Manish Narayan Saboo
Title	Director

Address	A/601-B, International Trade Centre, Majura Road, Ring Road, Surat, Gujarat, 395-002, India
Telephone	+91 261 2463261
Email	Manishsaboo84@gmail.com

1.4 Other Entities Involved in the Project

Organization name	Infinite Solutions
Role in the project	Carbon Consultant
Contact person	Jimmy Sah
Title	Head Sustainability
Address	611, Chetak Centre Main, RNT Marg Indore
Telephone	+91 9644130430
Email	jimmy@infisolutions.org

1.5 Project Start Date

The start date of the project activity is 25-November-2012 which corresponds to the first production start date of the NXTBLOCK Autoclaved Aerated Concrete Block.

1.6 Project Crediting Period

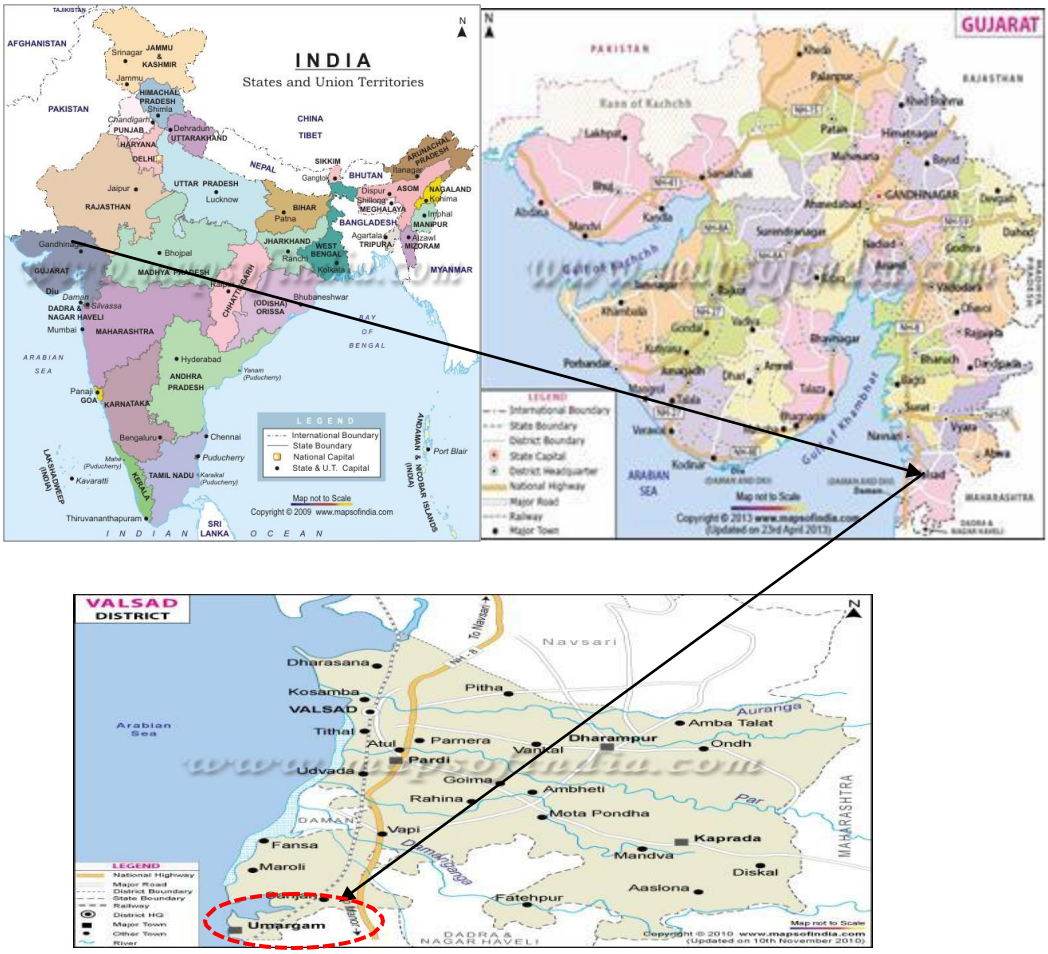
Crediting period start date: 25-November-2012

Crediting period end date: 24-November-2022

Length: 10 years 00 months

1.7 Project Location

Country	India
Region	Western India
State	Gujarat
District	Valsad
Tehsil/Mandal	Umargaon
Village	Khatalwada
Latitude	20.217° N
Longitude	72.794°E
Nearest Airport	Surat
Nearest Railway Station	Surat



1.8 Title and Reference of Methodology

The project has been developed using the following baseline and monitoring methodology approved under CDM program of UNFCCC:

Methodology	AMS-III.Z: Fuel Switch, process improvement and energy efficiency in brick manufacture
Version	04
Weblink	*http://cdm.unfccc.int/methodologies/DB/WPNWYRJ0FN59EFPA4A7NABU0849FD3*

1.9 Other Programs

- Emission Trading Programs and Other Binding Limits: The project activity has not participated in Emission Trading Programs and other binding limits.

- Other Forms of Environmental Credit: The project has not availed nor it is in the process of availing any other forms of environmental credit.

- Participation under Other GHG Programs: The project activity has not participated in any other GHG program.

1.10 Sustainable Development

The project is not part of any nationally stated sustainable development priorities.

However, since the project is a Greenfield project generation it leads to various economic, social and technological development in the country.

Economic: The project leads to employment generation, both during construction as well as operational stage leading to overall upliftment of the economic status of the local area.

Technological: The project being a non-conventional project which leads to adoption of a new technology in the country. Such projects encourage further R&D and enhancement/viability for various other players to study and further refine the technology available.

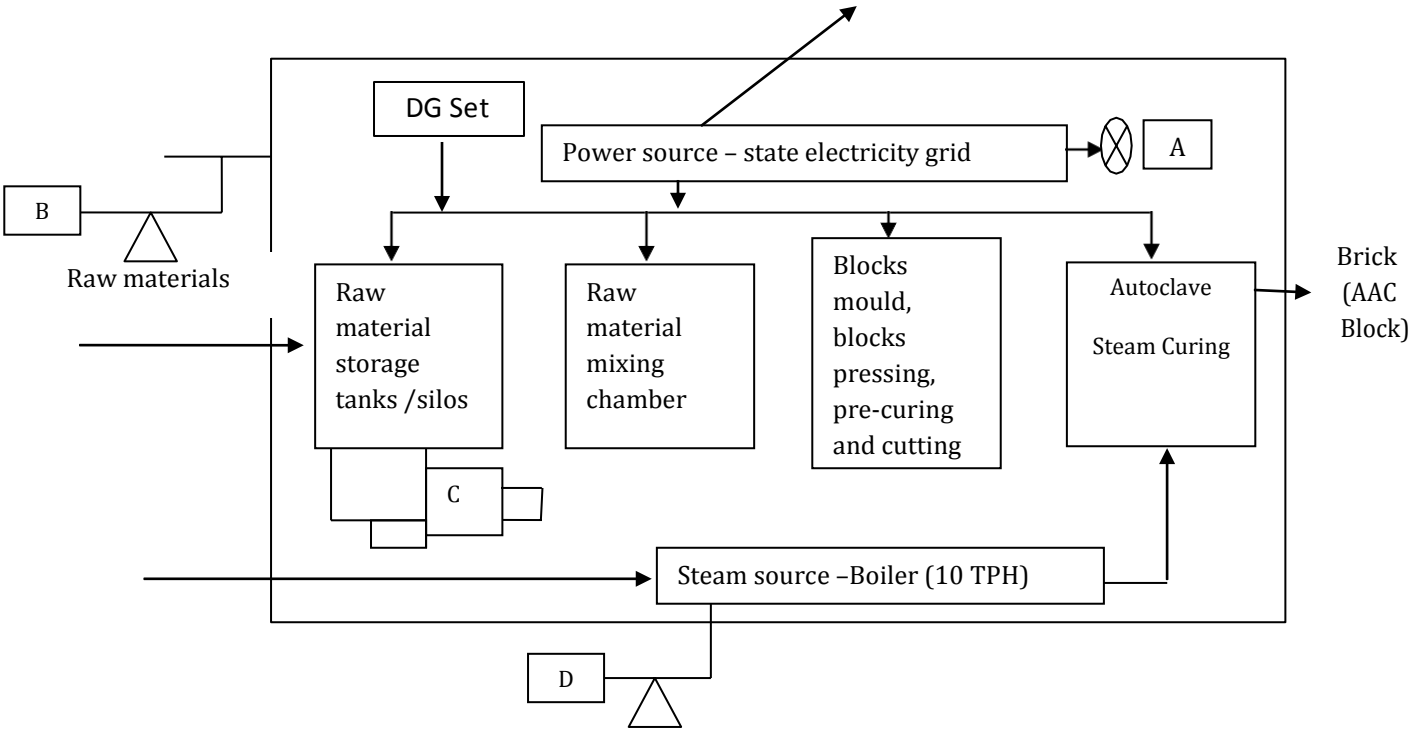
2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The project activity has been implemented on 25-November-2012. There has not been any change in technology/equipment/ design or any other critical factor which may affect GHG emissions associated with this project activity. The major components of equipment installed as part of project activity are as follows:

- Raw materials storage silos
- Raw material mixer
- Hydraulically operated moulding section
- Autoclave section
- Steam boilers
- Compressed air network
- Internal transportation system
- Diesel Generator

A brief layout of the metering arrangement has been provided below:



Metering Details

Parameter	Denotes	Instrument Details
$EC_{PJ,y}$ A	Quantity of electricity consumed by the project plant in year y	**Energy Meter.**
RMP_{cement}, RMP_{flyash} RMP_{gypsum} $RMP_{aluminium\ powder}$ RMP_{lime} B	Quantity of cement, flyash, gypsum, aluminium powder & lime purchased for producing AAC blocks in the year y	**Weighbridge**
RMC_{cement}, RMC_{flyash} RMC_{gypsum} $RMC_{aluminium\ powder}$ RMC_{lime} C	Quantity of cement, flyash, gypsum, aluminium powder & lime consumed for producing AAC blocks in the year y	**Electronic Weighbridge**
$FC_{coal,y}$ D	Quantity of coal combusted by the project activity boiler during the year y	**Electronic Weighbridge**

Consents & Clearances

Mohit Industries Limited has taken all the requisite clearance. A list of clearances is provided below:

Consent/Clearance Name	Date	Statutory Authority

Factory License	17-September-2012	Directorate Industrial Safety & Health
Clearance from District Industries Centre	01-August-2012	District Industries Centre, Valsad (Govt. of Gujarat)
Consent to Operate	18-December-2011	Gujarat State Pollution Control Board
Permission for Erection of Boiler	21-April-2012	Office of Directorate of Boiler
Commissioning of the project activity	25-November-2012	Start date of the production of the NXTBLOC Autoclaved Aerated Concrete

Diesel Generator Technical Specifications

Particular	**Alternator**	**Engine**	**Energy Meter**
Make	Stamford	Cummins	HPL Socomec
Capacity	500 KVA	600 BHP	3 X -/5 A
Sr. No.	N12E196429	25378061	1K 122653
R.P.M	1500	1500	1600 Imp/Kwh
Voltage	415 V	-	3X240 V
Amp./C.T. Ratio	695.6 AMP	-	800/5 Amp
M.F.	-	-	160

2.2 Deviations

2.2.1 Methodology Deviations

There has not been any methodology deviation which has affected the aforesaid project activity.

2.2.2 Project Description Deviations

The Deviations observed in the project activity are as follows;

1. Measurement of Raw Material Consumption (using Weigh- Bridge)

The details of the weigh-bridge used for monitoring the consumption of raw material was missing in the registered VCS PD and has been added. Additionally, the calibration frequency has been set as once in a year.

2. The parameters Df,y & FRf,m has been used to compute the leakage emissions.

The purpose of monitoring of parameter "Return trip road distance between the origin and destination of freight transportation activity f" (Df,y) and "Total mass of freight transported in freight transportation activity f" (FRf,m) was given as project emission in the registered PD. However it has been changed to mention leakage emission in line to the applied methodology.

3. The project has added monitoring for the parameter of Diesel Consumption considering the usage of DG sets at site in case of emergency or grid failures. The addition of parameter is based on the conservativeness of project emission calculations.

4. Change in Meter and Accuracy class:

Old Energy Meter (L&T Make)	Serial No: 11490797	Accuracy class: 0.55 for Active, 1.05 for Reactive
Energy Meter (L&T Make)	Serial No: 09512220	Accuracy class: 0.5 for Active, 1.0 for Reactive

2.3 Grouped Project

The project activity is not a grouped project.

2.4 Safeguards

2.4.1 No Net Harm

There are no negative environmental and/or socio-economic impacts due to the project.

2.4.2 Local Stakeholder Consultation

Discussions with Local stakeholders is being carried out at periodic intervals. There are no negative comments received for the project. In line with VCS requirements the following process has been implemented to receive comments from local stakeholders as well as communicate with them at periodic intervals.

Methods	Details	Reason for Selection
Communication Book or Register	Communication Register is maintained at Admin office at project site office. Any comments/inputs/grievance received shall be processed in line with the procedure as described in Annex2.	The administrative office of the plant is located in the plant premises. Thus it is appropriate publicly accessible location at which local stakeholders can provide their feedback on the project.
Process Book	Any comments/inputs/grievance received shall be processed in line with the procedure as described in Annex2.	The local stakeholder shall be informed about the Communication Register during the next interaction. Further, a public notice shall be posted at the site informing the

		stakeholders about the communication procedure.
Telephone access	Mr. Tejas Dhoot, an employee of the company who is based at the project location can be contacted. His mobile number is +91 9998449514	For those who are unable to travel to site or are not literate, they may contact the Project Implementer via telephone. Persons dialing this telephone number will have access to a Project representative who speaks English, Hindi and the local language, Gujarati.
Internet/email access	Mr. Tejas Dhoot Email Id: info@nxtbloc.in tejasdhoot@hotmail.com The comments mentioned shall be recorded in the Communication register and shall be processed in line with procedure.	Two email id of the project Implementer has been provided for the convenience of stakeholders with internet access.
Company Representative	Mr. Tejas Dhoot, an employee of the company located at project site has been assigned as the point of contact for all the local issues.	A local employee shall be available in case stakeholders have any comments.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data / Parameter	EF_{BL}
Data unit	tCO_2/m^3
Description	The annual production specific baseline emission factor.
Source of data	Calculated based on data taken from: 1. "Brick and ceramic sectors" report by Asian Institute of Technology[1] 2. "Energy Conservation and Pollution Control in brick kilns" report by Sameer Maithel, N Vasudevan, Lt. Col. Rakesh Joshi (Retrd.)[2] 3. Density of bricks taken from www.reade.com[3]
Value applied	0.3993
Justification of choice of data or description of	The value is a calculated value. It has been derived based on CO_2 emission per brick data taken from "Brick and ceramic sector report", which has been converted to CO_2 emission per unit volume of baseline brick with weight of each brick taken from

[4] http://www.wbcsdcement.org/pdf/tf1_co2%20protocol%20v3.pdf

measurement methods and procedures applied	"Energy conservation and Pollution Control in brick kilns" report and density of each brick from the engineering tool box. Values used are such that conservativeness of baseline emission factor is ensured.
Purpose of the data	This value has been used to baseline emissions
Comments	This value is fixed ex-*ante*

Data / Parameter	**$COEF_{cement}$**
Data unit	tCO_2/kt
Description	CO_2 emission factor of cement production
Source of data	Cement Sustainability Initiative (CSI) - The Cement CO_2 and Energy Protocol. [4] CO_2 and Energy Accounting and Reporting Standard for the Cement Industry(May 2011) by WBCSD- Version 3.0
Value applied	$0.638x10^3$
Justification of choice of data or description of measurement methods and procedures applied	This value is a default value as per Cement Sustainability Initiative protocol and is an authentic source of data
Purpose of the data	Leakage emissions calculation
Comments	This value is fixed ex-*ante*

Data / Parameter	**$COEF_{aluminium}$**
Data unit	tCO_2/kt
Description	CO_2 emission factor of aluminium production
Source of data	IPCC 2006 Report Volume 3 Chapter 1 for Soderberg Smelting Technology
Value applied	1.7×10^3
Justification of choice of data or description of measurement methods and procedures applied	IPCC Report is an authentic source of data. Further, for leakage emission more emission intensive of the two available technologies (Prebake and Soderberg) for aluminium production is taken for conservativeness.
Purpose of the data	Leakage emissions calculation
Comments	This value is fixed ex-*ante*

Data / Parameter	**$COEF_{lime}$**
Data unit	tCO_2/kt

Description	CO_2 emission factor of lime production
Source of data	IPCC Guidelines 2006 for NGGI (Vol 3 Ch 2 Eqn 2.8)
Value applied	$0.75x10^3$
Justification of choice of data or description of measurement methods and procedures applied	IPCC 2006 data is an authentic source of data
Purpose of the data	Leakage emissions calculation
Comments	This value is fixed ex-*ante*

Data / Parameter	**$COEF_{gypsum}$**
Data unit	-tCO2/t
Description	CO_2 emission factor of gypsum production
Source of data	Methodology for free allocation of emission allowances in the EU ETS post 2012[5]
Value applied	[6]0.01
Justification of choice of data or description of measurement methods and procedures applied	EU ETS data is an authentic source of data
Purpose of the data	Leakage emissions calculation
Comments	This value is fixed ex-*ante*

Data / Parameter	**$EF_{CO2,f}$**
Data unit	gCO_2/t-km
Description	Default CO_2 emission factor for freight transportation activity f
Source of data	Default value as provided in the methodological tool to calculate "*Project and leakage emissions from road transportation of freight*" version 01.1.0[7]
Value applied	Light vehicles – 245 Heavy vehicles –129
Justification of choice of data or description of	This is a default data as provided by UNFCCC and is an authentic source of data

[5] http://ec.europa.eu/clima/policies/ets/cap/allocation/docs/bm_study-gypsum_en.pdf.

[6] *With reference to the source of data (Methodology for the free allocation of emission allowances in the EU ETS post 2012-Sector report for the gypsum industry), the value has been given as 0.01 tCO2/tonne*

[7] *Project and leakage emissions from transportation of freight* (*https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-12-v1.1.0.pdf*)

measurement methods and procedures applied	
Purpose of the data	Leakage emissions calculation
Comments	This value is fixed ex-*ante*

Data / Parameter	D_{brick}
Data unit	kg/m^3
Description	Density of each baseline brick produced
Source of data	Density of common clay bricks taken from www.reade.com[8]
Value applied	1920
Justification of choice of data or description of measurement methods and procedures applied	This data has been taken from public domain (www.reade.com).
Purpose of the data	Baseline emissions calculation
Comments	The source of data is a third party publicly available source. The value can also be cross-checked from the following source http://www.simetric.co.uk/si_materials.htm

Data / Parameter	W_{brick}
Data unit	Kg
Description	Weight of each baseline brick produced
Source of data	Section 3.0 page 3/29 of the report: "Energy Conservation and Pollution Control in brick kilns" report by Sameer Maithel, N Vasudevan, Lt. Col. Rakesh Joshi (Retrd.)[9]
Value applied	3.75
Justification of choice of data or description of measurement methods and procedures applied	Higher value of the range of weight provided is chosen for conservativeness. The source of data chosen is an authentic 3rd party source.
Purpose of the data	Baseline emissions calculation
Comments	http://www.reade.com/Particle_Briefings/spec_gra2.html http://www.cosmile.org/papers/brick_energyconservationpollutioncontrol.pdf Both the websites are authentic sources of data

[8] *http://www.reade.com/Particle_Briefings/spec_gra2.html*

[9] *http://www.cosmile.org/papers/brick_energyconservationpollutioncontrol.pdf*

Data / Parameter	$EF_{CO2,brick}$
Data unit	$kgCO_2$/brick
Description	CO_2 emission per baseline brick produced
Source of data	Page # 25of the "Brick and ceramic sectors" report by Asian Institute of Technology[10]
Value applied	0.78
Justification of choice of data or description of measurement methods and procedures applied	Lower value of the range of CO_2 emission per brick provided is chosen for conservativeness. The source of data chosen is an authentic 3rd party source.
Purpose of the data	Baseline emissions calculation
Comments	Report by the "Brick and ceramic sectors" is an authentic source of data

Data / Parameter	$EF_{EL,plant,y}$
Data unit	tCO_2/MWh
Description	Emission factor for electricity used in project plant in year y
Source of data	Tool to calculate baseline, project and/or leakage emission from electricity consumption, version no. 1
Value applied	1.3
Justification of choice of data or description of measurement methods and procedures applied	Higher of the CO_2 emission factor for captive source (DG set) or the regional grid. Emission factor data for captive source taken from Tool to calculate baseline, project and/or leakage emission from electricity consumption, version no. 1 and emission factor of NEWNE grid taken from CEA database Version 09.
Purpose of the data	Project emissions calculation
Comments	The values have been taken from ***Tool to calculate baseline, project and/or leakage emission from electricity consumption, version no. 01[11], which is an authentic source of data.***

Data / Parameter	$TDL_{plant,y}$
Data unit	%
Description	Average technical transmission and distribution losses for providing electricity to project plant in year y
Source of data	Default value for project electricity source taken from ***Tool to calculate baseline, project and/or leakage emissions from***

[10] *http://www.faculty.ait.ac.th/visu/Prof%20Visu's%20CV/Books%20and%20research%20reports/BRICK%20AND%20CERAMIC.pdf*

[11] *http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf (Version 01, EB 39, Annex 07, Date: 16-May-2008)*

	electricity consumption, version 01[12]
Value applied	20
Justification of choice of data or description of measurement methods and procedures applied	Project emissions calculation
Purpose of the data	The emission factor for project emission has been selected as the default transmission and distribution losses for project emission estimation applicable to scenario CIII. Data taken from "Tool to calculate baseline, project or leakage emission from electricity consumption", which is an authentic source.
Comments	The values have been taken from ***Tool to calculate baseline, project and/or leakage emission from electricity consumption, version no. 01***[13], which is an authentic source of data.

3.2 Data and Parameters Monitored

Data / Parameter	**Compressive strength of AAC blocks**
Data unit	N/mm^2
Description	Compressive strength of project blocks
Source of data	Laboratory test report
Description of measurement methods and procedures to be applied	Dry compressive strength of the project block has been tested in nationally approved laboratory.
Frequency of monitoring/recording	Monitoring Frequency: Once in 6 Months Recording Frequency: Once in 6 Months
Value monitored	**Date of Test** / **Value(N/mm^2)** 04-02-2015 / 3.8 07-09-2015 / 3.8 27-11-2015 / 3.65 19-9-2016 / 4.14 19-11-2016 / 3.77 23-03-2017 / 3.80 16-06-2017 / 3.81
Monitoring equipment	Not Applicable as Compressive strength test was carried out in external laboratory and not at plant site.

[12] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf *(Version 01, EB 39, Annex 07, Date: 16-May-2008)*

[13] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf *(Version 01, EB 39, Annex 07, Date: 16-May-2008)*

QA/QC procedures to be applied	NABL accredited laboratory has been appointed for all the lab analysis. .
Purpose of the data	Baseline Emissions
Calculation method	This is a measured data. Hence not applicable.
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter	**Density of AAC blocks**
Data unit	kg/m^3
Description	Density of AAC blocks
Source of data	Laboratory test reports
Description of measurement methods and procedures to be applied	Density of the project block has been tested at a nationally approved laboratory.
Frequency of monitoring/recording	Monitoring frequency: Once in every 6 months Recording frequency: Once in every 6 months
Value monitored	**Date of Test** / **Value(kg/m^3)** 04-02-2015 / 569 07-09-2015 / 560 27-11-2015 / 551 19-9-2016 / 579.4 19-11-2016 / 525.8 23-03-2017 / 564.9 16-06-2017 / 596
Monitoring equipment	Not Applicable. Compressive strength was carried out in external laboratory
QA/QC procedures to be applied	NABL accredited laboratory has been appointed for all the lab analysis. .
Purpose of the data	Baseline Emissions
Calculation method	This is a measured data. Hence not applicable.
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter	$P_{PJ,y}$
Data unit	M^3
Description	The annual production of the facility in year y
Source of data	Plant Records – production log book data

Description of measurement methods and procedures to be applied	Number of standard sized cakes being manufactured is being monitored manually. Number of cakes manufactured has been converted to volume units.
Frequency of monitoring/recording	Monitoring frequency: Continuously Recording frequency: Daily
Value monitored	Period: Total Production(m^3) 01-Jan-2015 to 31-Dec-2015: 2,39,399 01-Jan-2016 to 31-Dec-2016: 2,51,334 01-Jan-2016 to 31-Aug-2017: 1,50,900
Monitoring equipment	Number of blocks produced have been manually counted
QA/QC procedures to be applied	Blocks selling data and blocks stocks data can be used for verification of figures.
Purpose of the data	This data has been used to calculate Baseline Emission.
Calculation method	Production(m^3) = (Number of cakes in kg) x (Density in kg/m^3)
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later

Data / Parameter	$\mathbf{FC_{coal,y}}$
Data unit	kT
Description	Quantity of coal combusted by the project activity boiler during the year y
Source of data	Plant log book
Description of measurement methods and procedures to be applied	Coal Consumption has been measured with Electronic Weighbridge. Coal inventory has been maintained and monitored through the equation: Coal consumed = Opening Stock + Purchases – Closing Stock
Frequency of monitoring/recording	Monitoring Frequency: Daily Recording Frequency: Daily
Value monitored	Period: Coal Consumption(kt) 01/01/2015 to 31/12/2015: 5618.74 01/01/2016 to 31/12/2016: 6126.72 01/01/2017 to 31/08/2017: 3866.46
Monitoring equipment	Electronic weighbridge has been used to measure the parameter ($\mathbf{FC_{coal,y}}$).
QA/QC procedures to be applied	The QA/QC of the parameter has been ensured by timely calibration of the weighbridge.
Purpose of the data	This data has been used to calculate project emissions.
Calculation method	The following equation has been used to ascertain the coal consumption quantity: Quantity = Opening Stock + Purchases – Closing stock
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter	**$NCV_{,coal,y}$**
Data unit	TJ/kt
Description	Weighted average net calorific value of coal in the year y
Source of data	IPCC 2006 Vol 2 Chapter 1
Description of measurement methods and procedures to be applied	Higher value of the uncertainty range of IPCC default values as provided in Table 1.2 Vol 2 of the 2006 IPCC Guidelines has been selected
Frequency of monitoring/recording	Monitoring frequency: Every update of IPCC Recording frequency: Annually
Value monitored	26
Monitoring equipment	The value is taken from IPCC's publicly available report.
QA/QC procedures to be applied	IPCC data is an authentic source; hence no QA/QC was required.
Purpose of the data	This data has been used to calculate the project emissions due to coal consumption
Calculation method	Not Applicable
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later

Data / Parameter	**$EF_{coal,y}$**
Data unit	tCO_2/TJ
Description	Weighted average CO_2 emission factor of coal in the year y
Source of data	Table 1.2 Vol 2 of the 2006 IPCC Guidelines
Description of measurement methods and procedures to be applied	Higher value of the uncertainty range of IPCC default values as provided in Table 1.4 Vol 2 of the 2006 IPCC Guidelines has been selected
Frequency of monitoring/recording	Monitoring frequency: Every update of IPCC Recording frequency: Annually
Value monitored	100
Monitoring equipment	The value is taken from IPCC's publicly available report.
QA/QC procedures to be applied	IPCC data is an authentic source; hence no QA/QC was required.
Purpose of the data	Project Emissions
Calculation method	Not Applicable
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter	**$EC_{PJ,y}$**
Data unit	MWh
Description	Quantity of electricity consumed by the project activity in year y
Source of data	Plant records – Electricity consumption logbook
Description of measurement methods and procedures to be applied	Energy meter has been used to measure the electricity consumption by the project activity.
Frequency of monitoring/recording	Monitoring frequency: Continuously Recording frequency: Daily
Value monitored	Period: Electricity Consumption (MWh) 01/01/2015 to 31/12/2015: 1571.96 01/01/2016 to 31/12/2016: 1606.67 01/01/2017 to 31/08/2017: 1048.28
Monitoring equipment	Energy Meter has been used to measure the electricity consumption in the project activity.
QA/QC procedures to be applied	The QA/QC of the parameter has been ensured by timely calibration of the energy meter.
Purpose of the data	This data has been used to determine the project emissions from electricity consumption.
Calculation method	Not Applicable. This is a directly measured parameter.
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter	**$RMP_{cement,y}$**
Data unit	kT
Description	Quantity of cement purchased for producing AAC blocks in the year y
Source of data	Purchase records maintained at plant
Description of measurement methods and procedures to be applied	Cement purchased for producing AAC blocks have been measured using weighbridge
Frequency of monitoring/recording	Monitoring frequency: Every purchase of raw material Recording frequency: Monthly
Value monitored	Period: **Cement Purchased(kt)** 01/01/2015 to 31/12/2015: 25.961 01/01/2016 to 31/12/2016: 26.293 01/01/2017 to 31/08/2017: 18.304
Monitoring equipment	Electronic Weighbridge has been used to measure the parameter.
QA/QC procedures to be applied	The QA/QC of the parameter has been ensured by timely calibration of the weighbridge.

	Purchase data has also been used to cross verify the total raw material (cement) purchase from 3rd party sources.
Purpose of the data	This data has been used to calculate leakage.
Calculation method	This is a measured parameter.
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter	**$RMC_{cement,y}$**
Data unit	kT
Description	Quantity of cement consumed for producing AAC blocks in the year y
Source of data	Consumption records maintained at plant
Description of measurement methods and procedures to be applied	Cement consumed for producing AAC blocks have been measured using weighbridge
Frequency of monitoring/recording	Monitoring frequency: Batch-wise Recording frequency: Daily
Value monitored	Period: **Cement Consumption(kt)** 25/11/2012 to 31/12/2012: 25.404 01/01/2013 to 31/12/2013: 30.795 01/01/2014 to 31/12/2014: 17.887
Monitoring equipment	Electronic Weighbridge has been used to measure the parameter.
QA/QC procedures to be applied	The QA/QC of the parameter has been ensured by timely calibration of the weighbridge. Purchase invoices have also been used to cross verify the total raw material (cement) purchase from 3rd party sources.
Purpose of the data	This data has been used to calculate leakage emission
Calculation method	This is a measured parameter.
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter	**$RMP_{flyash,y}$**
Data unit	kT
Description	Quantity of flyash purchased for producing AAC blocks in the year y
Source of data	Purchase records maintained at plant

Description of measurement methods and procedures to be applied	Flyash purchased for producing AAC blocks have been measured using weighbridge
Frequency of monitoring/recording	Monitoring frequency: Every purchase of raw material Recording frequency: Monthly
Value monitored	Period: **Flyash Purchased(kt)** 01/01/2015 to 31/12/2015: 175.61 01/01/2016 to 31/12/2016: 212.52 01/01/2017 to 31/08/2017: 165.80
Monitoring equipment	Electronic Weighbridge has been used to measure the parameter.
QA/QC procedures to be applied	The QA/QC of the parameter has been ensured by timely calibration of the weighbridge. Purchase invoices have also been used to cross verify the total raw material (flyash) purchase from 3rd party sources.
Purpose of the data	This data has been used to calculate leakage emission
Calculation method	This is a measured parameter.
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter	**$RMC_{flyash,y}$**
Data unit	Kt
Description	Quantity of flyash consumed for producing AAC blocks in the year y
Source of data	Consumption records maintained at plant
Description of measurement methods and procedures to be applied	Flyash consumed for producing AAC blocks have been measured using weighbridge
Frequency of monitoring/recording	Monitoring frequency: Batch-wise Recording frequency: Daily
Value monitored	Period: **Flyash Consumption(kt)** 01/01/2015 to 31/12/2015: 127.70 01/01/2016 to 31/12/2016: 126.77 01/01/2017 to 31/08/2017: 72.821
Monitoring equipment	Electronic Weighbridge has been used to measure the parameter.
QA/QC procedures to be applied	The QA/QC of the parameter has been ensured by timely calibration of the weighbridge. Purchase invoices have also been used to cross verify the total raw material (flyash) purchase from 3rd party sources.
Purpose of the data	This data has been used to calculate leakage emission

Calculation method	This is a measured parameter.
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later

Data / Parameter	**$RMP_{Lime,y}$**
Data unit	Kt
Description	Quantity of Lime purchased for producing AAC blocks in the year y
Source of data	Purchase records maintained at plant
Description of measurement methods and procedures to be applied	Lime purchased for producing AAC blocks have been measured using weighbridge
Frequency of monitoring/recording	Monitoring frequency: Every purchase of raw material Recording frequency: Monthly
Value monitored	**Period** | **Lime Purchased(kt)** 01/01/2015 to 31/12/2015 | 10.333 01/01/2016 to 31/12/2016 | 9.965 01/01/2017 to 31/08/2017 | 6.97
Monitoring equipment	Electronic Weighbridge has been used to measure the parameter.
QA/QC procedures to be applied	The QA/QC of the parameter has been ensured by timely calibration of the weighbridge. Purchase data has also been used to cross verify the total raw material (lime) purchase from 3rd party sources.
Purpose of the data	This data has been used to calculate leakage emission
Calculation method	This is a measured parameter.
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter	**$RMC_{Lime,y}$**
Data unit	Kt
Description	Quantity of lime consumed for producing AAC blocks in the year y
Source of data	Consumption records maintained at plant
Description of measurement methods and procedures to be applied	Lime consumed for producing AAC blocks have been measured using weighbridge
Frequency of monitoring/recording	Monitoring frequency: Batch-wise Recording frequency: Daily
Value monitored	**Period** | **Lime Consumption(kt)** 01/01/2015 to 31/12/2015 | 10.797

	01/01/2016 to 31/12/2016: 10.300 01/01/2017 to 31/08/2017: 6.852
Monitoring equipment	Electronic Weighbridge has been used to measure the parameter.
QA/QC procedures to be applied	The QA/QC of the parameter has been ensured by timely calibration of the weighbridge. Purchase invoices have also been used to cross verify the total raw material (lime) purchase from 3rd party sources.
Purpose of the data	This data has been used to calculate leakage emission
Calculation method	This is a measured parameter.
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter	**$RMP_{gypsum,y}$**
Data unit	Kt
Description	Quantity of gypsum purchased for producing AAC blocks in the year y
Source of data	Purchase records maintained at plant
Description of measurement methods and procedures to be applied	Gypsum purchased for producing AAC blocks have been measured using weighbridge
Frequency of monitoring/recording	Monitoring frequency: Every Purchase of Raw Material Recording frequency: Daily
Value monitored	**Period** / **Gypsum Purchased(kt)** 01/01/2015 to 31/12/2015: 1.004 01/01/2016 to 31/12/2016: 0 01/01/2017 to 31/08/2017: 0
Monitoring equipment	Electronic Weighbridge has been used to measure the parameter.
QA/QC procedures to be applied	The QA/QC of the parameter has been ensured by timely calibration of the weighbridge. Purchase data have also been used to cross verify the total raw material (gypsum) purchase from 3rd party sources.
Purpose of the data	This data has been used to calculate leakage emission
Calculation method	This is a measured parameter.
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter	**$RMC_{gypsum,y}$**
Data unit	Kt

Description	Quantity of gypsum consumed for producing AAC blocks in the year y
Source of data	Consumption records maintained at plant
Description of measurement methods and procedures to be applied	Quantity of Gypsum consumed for producing AAC blocks have been have been measured using weighbridge
Frequency of monitoring/recording	Monitoring frequency: Batch-wise Recording frequency: Daily
Value monitored	Period: **Gypsum Consumption(kt)** 01/01/2015 to 31/12/2015: 1.085 01/01/2016 to 31/12/2016: 0.027 01/01/2017 to 31/08/2017: 0
Monitoring equipment	Electronic Weighbridge has been used to measure the parameter.
QA/QC procedures to be applied	The QA/QC of the parameter has been ensured by timely calibration of the weighbridge. Purchase invoices have also been used to cross verify the total raw material (gypsum) purchase from 3rd party sources.
Purpose of the data	This data has been used to calculate leakage emission
Calculation method	This is a measured parameter.
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later

Data / Parameter	$RMP_{aluminiumpowder,y}$
Data unit	Kt
Description	Quantity of Aluminium powder purchased for producing AAC blocks in the year y
Source of data	Purchase records maintained at plant
Description of measurement methods and procedures to be applied	Aluminium Powder purchased for producing AAC blocks have been have been measured using weighbridge
Frequency of monitoring/recording	Monitoring frequency: Every purchase of raw material Recording frequency: Monthly
Value monitored	**Period** / **Aluminium Powder Purchased(kt)** 01/01/2015 to 31/12/2015: 0.106 01/01/2016 to 31/12/2016: 0.114 01/01/2017 to 31/08/2017: 0.077
Monitoring equipment	Electronic Weighbridge has been used to measure the parameter.

QA/QC procedures to be applied	The QA/QC of the parameter has been ensured by timely calibration of the weighbridge. Purchase data have also been used to cross verify the total raw material (aluminium) purchase from 3rd party sources.
Purpose of the data	This data has been used to calculate leakage emission
Calculation method	This is a measured parameter.
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter	**$RMC_{aluminiumpowder,y}$**
Data unit	Kt
Description	Quantity of aluminium powder consumed for producing AAC blocks in the year y
Source of data	Consumption records maintained at plant
Description of measurement methods and procedures to be applied	Quantity of aluminium powder consumed for producing AAC blocks have been have been measured using weighbridge
Frequency of monitoring/recording	Monitoring frequency: Batch-wise Recording frequency: Daily
Value monitored	**Period** / **Aluminium Powder Consumption(kt)** 01/01/2015 to 31/12/2015 — 0.109 01/01/2016 to 31/12/2016 — 0.120 01/01/2017 to 31/08/2017 — 0.072
Monitoring equipment	Electronic Weighbridge has been used to measure the parameter.
QA/QC procedures to be applied	The QA/QC of the parameter has been ensured by timely calibration of the weighbridge. Purchase invoices have also been used to cross verify the total raw material (aluminium powder) purchase from 3rd party sources.
Purpose of the data	This data has been used to calculate leakage emission
Calculation method	This is a measured parameter.
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter	**DG_y**
Data unit	Litre

Description	Quantity of Diesel consumed in the plant in the year y
Source of data	Consumption records maintained at plant
Description of measurement methods and procedures to be applied	Quantity of diesel consumed are monitored based on diesel consumed and filled in the DG set.
Frequency of monitoring/recording	Monitoring frequency: Batch-wise/Every time Diesel is filled in the DG set Recording frequency: Monthly
Value monitored	**Period** / **Consumption (litre)** 01/01/2015 to 31/12/2015 — 23958 01/01/2016 to 31/12/2016 — 13437 01/01/2017 to 31/08/2017 — 10432
Monitoring equipment	Measuring Can/Drums are used to fill Diesel
QA/QC procedures to be applied	Purchase invoices have also been used to cross verify the total Diesel purchase from 3rd party sources. The total Diesel purchased during the monitoring period is 48000 litre while consumed is 47827 litre. The difference is due to stock maintained at site.
Purpose of the data	This data has been used to calculate project emission
Calculation method	This is a measured parameter.
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter	$D_{f,y}$
Data unit	Km
Description	Return trip road distance between the origin and destination of freight transportation activity f in monitoring period m
Source of data	Purchase records
Description of measurement methods and procedures to be applied	This data has been measured using online maps and purchase invoices
Frequency of monitoring/recording	Monitoring frequency: Whenever road trip distance changes Recording frequency: Whenever road trip distance changes
Value monitored	**Raw Mat.** / **From** / **To** / **Roundtrip Distance**[14] Cement — Surat — Umargaon — 296 Flyash — Dahanu — Umargaon — 60

[14] *http://www.distancesfrom.com*

	Lime	Nagaur	Umargaon	1946
	Gypsum	Rajkot	Umargaon	1143
	Aluminium Powder	Nagpur	Umargaon	1658
	Coal	Mundra Port	Umargaon	1483
Monitoring equipment	Purchase invoices and online maps have been used to estimate the roundtrip distances.			
QA/QC procedures to be applied	This is a third party data.			
Purpose of the data	This data has been used to calculate leakage emissions.			
Calculation method	Roundtrip road travel distances calculated from online maps.			
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.			

Data / Parameter	$\mathbf{FR_{f,m}}$
Data unit	Tonne
Description	Total mass of freight transported in freight transportation activity f in monitoring period m
Source of data	Purchase records
Description of measurement methods and procedures to be applied	This parameter has been measured through Raw material purchase invoices. Raw materials include (cement, flyash, limestone, gypsum & aluminium powder)
Frequency of monitoring/recording	Monitoring frequency: Continuously Recording frequency: Monthly
Value monitored	
Monitoring equipment	3rd party purchase invoices would be used to ascertain this parameter.

Period	Freight Type	Total Freight Transported
01/01/2015 to 31/12/2015	Cement	7050.62
	Flyash	175611.41
	Lime	10333.52
	Gypsum	1004
	Aluminium Powder	106.59
	Coal	7050.62
01/01/2016 to 31/12/2016	Cement	5601.35
	Flyash	212521.85
	Lime	9965.61
	Gypsum	0
	Aluminium Powder	114.99
	Coal	1072
01/01/2017 to 31/08/2017	Cement	17880.28
	Flyash	155071.89
	Lime	6438.73
	Gypsum	0
	Aluminium Powder	70.62
	Coal	695

QA/QC procedures to be applied	The data is a 3rd party data.
Purpose of the data	This data would be used to calculate leakage emissions.
Calculation method	Not Applicable
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later.

Data / Parameter	**The vehicle class used**
Data unit	-
Description	The vehicle class used for freight transportation
Source of data	Transportation records
Description of measurement methods and procedures to be applied	Vehicle type (light/heavy) used for raw material transportation has been monitored based on road challan for raw material transported during each transportation activity.
Frequency of monitoring/recording	Monitoring frequency: Continuously Recording frequency: Every receipt of raw materials at site
Value monitored	From the purchase records, it has been found that the raw materials have been transported in heavy vehicles
Monitoring equipment	Weigh bills and UNFCCC guidelines[15] are 3rd party sources of data
QA/QC procedures to be applied	The data is a 3rd party data. The value has been further confirmed with the weigh bridge slip generated for raw materials inward quantity.
Purpose of the data	This data has been used to determine leakage Emissions
Calculation method	Not Applicable
Comments	All data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later

Calibration details for the parameters monitored are provided separately for each equipment along with documentary evidences to the DOE. Delayed calibration is observed for 15 days for the parameter of Electricity consumption and accordingly the ER sheet has been revised.

The details for Delayed calibration are as follows;

Electricity Meter No: 09512220

[15] *Project and leakage emissions from transportation of freight (EB70, Annex23, Version 01.1.0, Tool 12)* http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-12-v1.1.0.pdf

Calibration dates: 06-06-2016 and late calibration on 30-06-2017, thus there is a delay of 24 days and accordingly delay factor considering 0.5 class meter (error factor of 1.005) has been applied for 24 day electricity consumption.

3.3 Monitoring Plan

The monitoring plan involves structure for:

- Monitoring, recording and archiving of all data required for calculation of *ex-post* emission reduction from the project.
- Storing documents required for emission reduction calculations.
- Conducting/arranging calibration tests for monitoring equipment
- Ensuring quality of recorded data
- Co-ordinating with consultants and verifiers to submit monitored data to APX VCS Registry for verification

The monitoring team will be structured as follows:

Position	Report to:
Operators	Plant head
Supervisor Managers (Technical/Maintenance)	
VCS monitoring project manager	

Detailed responsibility of each member in the monitoring team is provided below:

#	Tasks description	Operator(s)	Supervisor	Plant Manager	VCS monitoring project manager
Monitoring activity					
1	Recording of monitored data	✓	✓		
Quality Assurance & Quality Control					
2	Verification of data monitored (consistency and completeness)		✓	✓	
3	Ensuring adequate training of staff			✓	✓
4	Ensuring adequate maintenance		✓	✓	✓
	Ensuring calibration of monitoring instruments		✓	✓	✓

5	Data archiving: ensuring adequate storage of data monitored (integrity and backup)			✓	✓
6.	Identification of non-conformance and corrective/preventive actions and monitoring plan improvement			✓	✓
7	Emergency procedures		✓	✓	
Calculation of GHG emission reductions and reporting					
8	Processing of data and calculation of emission reductions				✓
9	Monitoring report: management review of monitoring report (internal audit)			✓	✓

Data Collection & Storage:

All data has been collected in paper log books and/or online data collection system and has been converted to spreadsheet form on an annual basis. It has been ensured that raw data would be stored for a minimum of 2 years after the end of the crediting period or last verification, whichever occurs later. In case there is any inconsistency on monitored data, the period will be removed from emission reduction crediting period, unless sufficiently reliable alternative methods are available and validated by external agencies appointed to verify monitoring report submitted to VCS Board.

QA & QC Procedures followed: All meters have been calibrated as per industry practices at regular intervals. Records of calibration certificates have been maintained for verification. The details of the calibrations have been provided below:

Equipment	Serial Number	Accuracy Class
Weighbridge	26/12-13	III
Energy Meter	09512220	0.5 for Active 1.0 for Reactive

Calibration Dates: Calibration details are provided along with documentary evidences to the DOE.

Emergency Preparedness: In the event of emergency situations like non-functioning of equipments/instruments, the same has to be reported to Plant Head. The faulty equipment/instrument would be replaced with immediate effect. In the event of unavailability of the instrument, the emission

reductions for the concerned would not be considered and generation records for the aforesaid months would be adjusted with reference to the **GUIDELINES FOR ASSESSING COMPLIANCE WITH THE CALIBRATION FREQUENCY REQUIREMENTS**

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Baseline emissions are quantified in line with paragraph 15 of the methodology ***AMS-III.Z Fuel Switch, process improvement and energy efficiency in brick manufacture (Version 04)***. as follows:

$$BE_y = EF_{BL} * P_{PJ,y}$$ ____Equation no. 1

Where:

BE_y	tCO_2e	The annual baseline emissions from fossil fuels displaced by the project activity in the year y
EF_{BL}	tCO_2/m^3	The annual production specific baseline emission factor
$P_{PJ,y}$	m^3	The annual net production of the facility in year y

For the project activity

Annual Net Production of the facility from 01-01-2015 to 31-12-2015 =239399m^3
Annual Net Production of the facility from 01-01-2016 to 31-12-2016 =251334m^3
Annual Net Production of the facility from 01-01-2017 to 31-08-2017 =150900m^3
[16]Specific Baseline Emission Factor=0.3993 tCO2/m^3
As per Equation No.1Baseline Emissions for the aforesaid monitoring period has been calculated as:

Period	Annual Production ($P_{PJ,y}$)	Specific Baseline EF EF_{BL}	Baseline Emission BE_y
	m^3	tCO_2/m^3	tCO_2
01-01-2015 to 31-12-2015	239399	0.3993	239399x0.3993=95,591
01-01-2016 to 31-12-2016	251344	0.3993	251334x0.3993=100357
01-01-2017 to 31-08-2017	150900	0.3993	150900x0.3993=60254

Baseline Emission (BE_y) for the monitoring period (01-Jan-2015 to 31-Aug-2017) = 2,56,202 tCO_2e

4.2 Project Emissions

Project emission sources relevant for this project are:

[16] http://www.faculty.ait.ac.th/visu/Prof%20Visu's%20CV/Books%20and%20research%20reports/BRICK%20AND%20CERAMIC.pdf

- **Project emissions from electricity consumption within the project boundary.**
- **Project emissions from coal consumption in the boiler for steam generation.**
- **Project emissions from diesel consumption in the DG set within project boundary.**

Thus, Project Emission (PE_y) = $PE_{elec,y} + PE_{Coal,y} + PE_{Diesel,y}$

- **Project emission from electricity consumption within the project boundary:**

Referring to, "***Tool to calculate baseline, project and/or leakage emission from electricity consumption, version no. 01***[17] the project emission from electricity consumption has been calculated as follows:

$$PE_{elec,y} = \sum_j EC_{PJ,j,y} * EF_{EL,j,y} * (1 + TDL_{j,y}) \quad \text{Equation 2}$$

Where:

$PE_{elec,y}$	tCO_2/yr	Project emissions due to electricity consumption in year y
$EC_{PJ,j,y}$	MWh/yr	Quantity of electricity consumed by the project emission source j in year y
$FE_{EL,j,y}$	tCO_2/MWh	Emission factor for electricity generation for source j in year y
$TDL_{j,y}$	%	Average technical transmission and distribution losses for providing electricity to source j in year y

For the project activity

Quantity of electricity consumed by the project activity from 01-01-2015 to 31-12-2015 =1571.96MWh
Quantity of electricity consumed by the project activity from 01-01-2016 to 31-12-2016 =1606.67MWh
Quantity of electricity consumed by the project activity from 01-01-2017 to 31-08-2017 =1048.17MWh
[18]Emission factor for electricity generation for source j in year y=1.3
Average technical transmission and distribution losses for providing electricity to project=20%
As per the equation 2 as mentioned above

- **Project emissions from coal consumption in the boiler for steam generation.**

As per the tool, CO2 emission from fossil fuel combustion are calculated based on quantity of fuels combusted and the CO2 emission co-efficient of these fuels.
The applicable equation is:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y}$$

Where:

$PE_{FF,y}$	Are the CO2 emissions from fossil fuel combustion in process j during the year y (tCO2/yr)

[17] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf (Version 01, EB 39, Annex-7, date 16-May-2008)
[18] *Tool to calculate baseline, project and/or leakage emission from electricity consumption, version no. 01(http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf(Version 01, EB 39, Annex-7, date 16-May-2008)*

$FC_{i,y}$	Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)
$COEF_{i,y}$	Is the CO2 emission coefficient of fuel type i in year y (tCO2/mass or volume unit)

As per the tool, the CO_2 emission coefficient can be calculated using one of the options, depending on the availability of data.

- Option A: Based on the chemical composition of the fossil fuel type i
- Option B: Based on the net calorific value and the CO_2 emission factor of the fuel type i.

Based on availability of data, Option B has been used to calculate the CO_2 emission co-efficient as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where:

$COEF_{i,y}$	Is the CO2 emission coefficient of fuel type i in year y (tCO2/mass or volume unit)
NCVi,y	Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
EFi, *y*	Is the weighted average CO2 emission factor of fuel type i in year y (tCO2/GJ)

$PE_{Coal.y} = FC_{Coal.y} * COEF_{Coal.y}$ _____ **Equation 3**

$COEF_{Coal, y} = NCV_{Coal, y} * EF_{Coal, y}$ _____ **Equation 4**

For the project activity

Coal consumption for the period 01-01-2015 to 31-12-2015 = 5618.74 tonnes
Coal consumption for the period 01-01-2016 to 31-12-2016 = 6126.72 tonnes
Coal consumption for the period 01-01-2017 to 31-08-2017 = 3866.46 tonnes
Using equation 3 and equation 4

Period	Coal Consumption	Weighted average net calorific value of coal	Weighted average CO2 emission factor of coal	Project Emissions from Coal Consumption
	Tonnes	TJ/kt	tCO_2/TJ	tCO_2
01-01-2015 to 31-12-2015	5618.74	26	100	14,069
01-01-2016 to 31-12-2016	6126.72	26	100	15,930
01-01-2017 to 31-08-2017	3866.46	26	100	10,053

- **Project emissions from diesel consumption in the DG set within project boundary.**

As per the project emissions tool calculation, CO2 emission from fossil fuel combustion are calculated based on quantity of fuels combusted and the CO2 emission co-efficient of these fuels.
The applicable equation is:

$$PE_{FC,j,y} = \sum_{i} FC_{i,j,y} \times COEF_{i,y}$$

Where:

$PE_{FF,y}$	Are the CO2 emissions from fossil fuel combustion in process j during the year y (tCO2/yr)
$FC_{i,y}$	Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)
$COEF_{i,y}$	Is the CO2 emission coefficient of fuel type i in year y (tCO2/mass or volume unit)

As per the tool, the CO_2 emission coefficient can be calculated using one of the options, depending on the availability of data.

- Option A: Based on the chemical composition of the fossil fuel type i
- Option B: Based on the net calorific value and the CO_2 emission factor of the fuel type i.

Based on availability of data, Option B has been used to calculate the CO_2 emission co-efficient as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where:

$COEF_{i,y}$	Is the CO2 emission coefficient of fuel type i in year y (tCO2/mass or volume unit)
NCVi,y	Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
EFi, y	Is the weighted average CO2 emission factor of fuel type i in year y (tCO2/GJ)

$PE_{Diesel.y}$ = DG_y*$COEF_{Diesel.y}$*Density of Diesel _____ **Equation 5**

$COEF_{Diesel}$, y = NCV_{Diesel}, y * EF_{Diesel}, y _____ **Equation 6**

$PE_{Diesel.y}$	tCO_2/yr	Project emissions due to Diesel consumption in year y
DGy	TJ/Gg	Quantity of Diesel consumed by the project emission source j in year y
$COEF_{Diesel,y}$	tCO2e/ TJ	Emission factor for Diesel generation for source j in year y
Density of Diesel	KG/litres	Density of Diesel

For the project activity

Diesel consumption for the period 01-01-2015 to 31-12-2015 = 23,958 Litres
Diesel consumption for the period 01-01-2016 to 31-12-2016 = 13,437 Litres
Diesel consumption for the period 01-01-2017 to 31-08-2017 = 10,432 Litres
Using equation 5 and equation 6

Period	Diesel Consumption	Weighted average net calorific value of Diesel	Weighted average CO2 emission factor of Diesel	Project Emissions from Diesel Consumption
	Litres	TJ/Gg	tCO_2/TJ	tCO_2
01-01-2015 to 31-12-2015	23,958	43	74.1	68
01-01-2016 to 31-12-2016	13,437	43	74.1	39
01-01-2017 to 31-08-2017	10,432	43	74.1	30

Total Project Emissions (PEy) for the monitoring period (01-01-2015 to 31-08- 2017) has been tabulated below:

Period	Project Emissions from electricity consumption within the project boundary	Project Emissions from Coal Consumption	Project Emissions from Diesel Consumption	Total Project Emissions from the Project Activity
	tCO_2	tCO_2	tCO_2	tCO_2
01-01-2015 to 31-12-2015	2,453	14,609	68	17,130
01-01-2016 to 31-12-2016	2,507	15,930	39	18,476
01-01-2017 to 31-08-2017	1,636	10,053	30	11,719

4.3 Leakage

Leakage emission sources relevant for this project are:

- **Leakage emissions due to raw material production**
- **Leakage emission due to raw material transportation**

- **Leakage emissions due to raw material production**

Leakage emission due to raw material production has been calculated based on the formula:

$$LE_{rm,prod,y} = RMC_{cement,y} * COEF_{cement} + RMC_{lime,y} * COEF_{lime} + RMC_{gypsum,y} * COEF_{gypsum} + RMC_{aluminium,y} * COEF_{aluminium}$$ Equation 7

$LE_{rm,prod,y}$	tCO_2	Leakage emission from raw material production in the year y
$RMC_{cement,y}$	kt	Quantity of cement consumed for producing AAC blocks in the year y
$COEF_{cement}$	tCO_2/kt	CO_2 emission factor of cement production
$RMC_{lime,y}$	kt	Quantity of lime consumed for producing AAC blocks in the year y
$COEF_{lime}$	tCO_2/kt	CO_2 emission factor of lime production
$RMC_{gypsum,y}$	kt	Quantity of gypsum consumed for producing AAC blocks in the year y
$COEF_{gypsum}$	tCO_2/kt	CO_2 emission factor of gypsum production

$RMC_{aluminium,y}$	kt	Quantity of aluminium powder consumed for producing AAC blocks in the year y
$COEF_{aluminium}$	tCO_2/kt	CO_2 emission factor of aluminium production

Where:

For the project activity:

Period	Freight Type	Raw Material consumed	Specific GHG Emissions	Leakage Emissions from Raw Material Production
01-01-2015 to 31-12-2015	**Raw Material**	**Tonnes**	**tCO_2/tonne of raw material**	**tCO_2**
	Cement	25404.07	0.638	**16,208**
	Flyash	127709.47	0	**0**
	Lime	10797.43	0.75	**8,099**
	Gypsum	1085.17	0.01	**11**
	Al.Powder	109.96	1.7	**187**
	Coal	5618.74	0	**0**
01-01-2016 to 31-12-2016	**Cement**	30795.21	0.638	**19,647**
	Flyash	126776.34	0	**0**
	Lime	10300.67	0.75	**7,725**
	Gypsum	27.42	0.01	**0.27**
	Al. Powder	120.81	1.7	**205**
	Coal	6126.72	0	**0**
01-01-2017 to 31-08-2017	**Cement**	17887.12	0.638	**11412**
	Flyash	72821.14	0	**0**
	Lime	6851.93	0.75	**5139**
	Gypsum	0.00	0.01	**0**
	Al.Powder	72.00	1.7	**123**
	Coal	3866.46	0	**0**

- **Leakage emissions due to raw material transportation**

Leakage emission due to raw material transportation has been calculated based on the formula

Where:

$$LE_{rm,trans,y} = \sum_{f} D_{f,y} * FR_{f,y} * EF_{CO2,f} * 10^{-6}$$ _____Equation 8

For the project activity

$LE_{rm,trans,y}$	tCO_2	Leakage emission from road transportation of freight in monitoring period m
$D_{f,y}$	km	Return trip road distance between the origin and destination of freight transportation activity f in monitoring period m
$FR_{f,m}$	tonne	Total mass of freight transported in freight transportation activity f in monitoring period m
$EF_{CO2,f}$	gCO_2/t-km	Default CO_2 emission factor for freight transportation activity f
F		Freight transportation activities conducted in the project activity in monitoring period m

Period	Freight Type	Raw Material Transported	Total Roundtrip distance	Default CO_2 Emission Factor for Freight Transportation activity	Leakage Emissions from Raw Material Transportation
	Raw Material	**Tonnes**	**kms**	**gCO_2/t-km**	**tCO_2**
01-01-2015 to 31-12-2015	**Cement**	25961.81	296	129	992
	Flyash	175611.41	60	129	1360
	Lime	10333.52	1946	129	2595
	Gypsum	1004.00	1143	129	149
	Al.Powder	106.59	1672	129	23
	Coal	7050.62	1483	129	1349
01-01-2016 to 31-12-2016	**Cement**	26293.91	296	129	1005
	Flyash	212521.85	60	129	1645
	Lime	9965.61	1946	129	2502
	Gypsum	0.00	1143	129	0
	Al. Powder	114.99	1672	129	25
	Coal	5601.35	1483	129	1072
01-Jan-2017 to 31 Aug-2017	**Cement**	18304.09	296	129	699
	Flyash	155071.89	60	129	1284
	Lime	6438.73	1946	129	1751
	Gypsum	0.00	1143	129	0
	Al.Powder	70.62	1672	129	17
	Coal	3628.5	1483	129	695

Total Leakage Emissions (LEy) for the monitoring has been tabulated below:

Period	Leakage Emissions from Raw Material Production	Leakage Emissions from Raw Material Transportation	Total Leakage Emissions from the Project Activity
	tCO_2	tCO_2	tCO_2
1/1/2015 to 31/12/2015	24505	6468	30973

01/01/2016 to 31/12/2016	27581	6249	33830
01/01/2017 to 31/8/2017	16674	4446	21120

4.4 Net GHG Emission Reductions and Removals

Period	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
01/01/2015 to 31/12/2015	95,591	17,130	30,973	47,488
01/01/2016 to 31/12/2016	1,00,357	18,476	33,830	48,051
01/01/2017 to 31/08/2017	60,254	11,719	21,120	27,415
Total	**2,56,202**	**47,325**	**85,923**	**1,22,954**