AAC BLOCKS PROJECT BY MOHIT INDUSTRIES LIMITED

Document Prepared by EKI Energy Services Limited

Project title	AAC Blocks Project by Mohit Industries Limited
Project ID	1238
Crediting period	25-November-2022 to 24-November-2032 (inclusive both days)
Original date of issue	29-October-2024
Most recent date of issue	17-December-2025
Version	05
***VCS Standard* Version**	V 4.7
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1 PROJECT DETAILS

1.1 Summary Description of the Project

Big Bloc Construction Limited (hereinafter referred to as BBCL or PP) has installed an autoclaved aerated concrete (AAC) blocks manufacturing unit of capacity 360,000 m^3/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 would use waste material fly ash generated from thermal power plants as the primary raw material. The AAC blocks produced would replace conventional fired (baked) clay bricks as construction material.

The initial (registered) production capacity of the AAC block manufacturing plant was 300,000 cubic meter per annum which has been increased to 360,000 cubic meters per annum w.e.f 19-February-2021.

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.

The location of the project

The project is located in the Surat district of the Gujarat state of India.

An explanation of how the project is expected to generate GHG emission reductions or removals.

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 project would result in average greenhouse gas emission reduction of around 55,007 tCO_2e/ annum.

An estimate of annual average and total reductions and removals

The project activity started in 25-November-2012. In the current crediting period (25-November-2022 to 24-November-2032) the project is expected to achieve an annual emission reduction of 55,007 tCO_2e and a total emission reduction of 550,078 tCO_2e during the 10-year crediting period.

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation	25-November-2012 to 24-November-2022	VCS	SGS United Kingdom Limited	10 years
Verification	25-November-2012 to 31-December-2014	VCS	Earthood Services Private Limited	2 years 1 month 7 days
Verification	01-January-2015 to 31-August-2017	VCS	Earthood Services Pvt. Ltd.	2 years 08 months
Verification	01-September-2017 to 31-December-2020	VCS	KBS Certification Services Pvt. Ltd.	3 years 4 months
Verification	01-January-2021 to 31-August-2021	VCS	KBS Certification Services Pvt. Ltd.	8 months
Verification	01-September-2021 to 24-November-2022	VCS	RINA	1 year 2 months 24 days
Validation/ verification	25-November-2022 to 24-November-2032	VCS	RINA	10 years

1.3 Sectoral Scope and Project Type

Sectoral scope[1]	4: Manufacturing industries
Project activity type	Other project activities, Fuel switch, process improvement and energy efficiency in brick manufacture

1.4 Project Eligibility

[1] Projects, activities, or methodologies may be developed under any of the 16 VCS sectoral scopes: https://verra.org/programs/verified-carbon-standard/vcs-program-details/#sectoral-scopes

1.4.1 General eligibility

Eligibility as per VCS Standard, Version 4.7	Justification
Justify that the project activity is included under the scope of the VCS Program and not excluded under Table 2.1 of the VCS Standard.	The project activity falls under sectoral scope 04 "Manufacturing industries" and is not part of any of the project categories falling under the Table 2.1 "Excluded Project Activities". The project activity effects CH_4 and CO_2 emission reduction which are the covered GHG under the VCS program. Therefore, the project is eligible under the scope of the VCS program and in line with the VCS Standard, Version 4.7.
Provide information to demonstrate that the project meets requirements related to the pipeline listing deadline, the opening meeting with the validation/verification body, and the validation deadline.	As per the VCS Standard, Version 4.7, section 3.8.1: "non-AFOLU projects shall complete validation within two years of the project start date". This is the second renewable crediting period of this project activity. Hence not applicable.
Demonstrate that the applied methodology is eligible under the VCS Program. Where applying a methodology with scale and/or capacity limits, demonstrate that the project is not a fragmented part of a larger project or activity that would otherwise exceed such limits. If applicable, demonstrate that no single cluster of project activity instances exceeds the capacity limit.	The applied methodology AMS-III.Z., version 6 -"Fuel Switch, process improvement, and energy efficiency in brick manufacture" is an active CDM methodology under VCS Program[2]. The methodology is a small-scale methodology applicable to those facilities that result in emission reductions of less than or equal to 60kt CO_2 equivalent annually. The project estimates an annual average reduction of 55,007 tons of CO_2 equivalent per annum, which is less than 60kt CO_2 and hence the methodology is applicable.
Include any other relevant eligibility information.	This is the second renewable crediting period of this project activity.

1.4.2 AFOLU project eligibility

Not applicable as this is not an AFOLU project activity.

1.4.3 Transfer project eligibility

Not applicable as this project is not transferred or CPA.

1.5 Project Design

[2] https://verra.org/methodologies-main/#vcs-program-methodologies

☒ Single location or installation

☐ Multiple locations or project activity instances (but not a grouped project)

☐ Grouped project

1.5.1 Grouped project design

Not applicable as this is not a grouped project.

1.6 Project Proponent

Organization name	Big Bloc Construction Limited
Contact person	Mr. Manish Narayan Saboo
Title	Director
Address	A/601-B, International Trade Centre, Majura Gate, Ring Road, Surat, Gujarat, 395 002, India
Telephone	+91 261 2463261
Email	Manishsaboo84@gmail.com

1.7 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the project	Project Consultant
Contact person	Ankit Sethiya
Title	Manager – Operations
Address	Office No. 201, Plot 48, Scheme 78, Part 2, Vijay Nagar, Indore- 452010 Madhya Pradesh, India
Telephone	0731 428 9086
Email	ankit@enkingint.org, registry@enkingint.org

1.8 Ownership

Purchase order of equipment, clearances and land document in name of PP, helps in establishing MIL as owner of credits generated from this project.

The Project Proponent has established robust measures to ensure that the emission reductions associated with the use of low-carbon bricks are not double counted by consumers in their carbon inventories or product footprint claims. Additionally, the Project Proponent has submitted a double counting declaration letter to prevent any risk of double counting related to this project activity.
The project proponent has now included the statement at the official company website[3] as required by the section 3.24.7 of the VCS standard, Version 4.7. The statement says, "Carbon credits may be issued through Verified Carbon Standard project VCS 1238 for the greenhouse gas emission reductions or removals associated with Big Bloc Construction Limited, Fired clay brick."

1.9 Project Start Date

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

1.10 Project Crediting Period

Crediting period	☐ *Seven years, twice renewable* ☐ *Ten years, fixed* ☒ *Other (state the selected crediting period and justify how it conforms with the VCS Program requirements)*[4]

[3] https://bigbloc.in/environment/

[4] Project activity is registered with VCS Standard 3.4 and in VCS Standard 4.0 a fixed crediting period of 10 years is introduced; deviation has been submitted to VERRA for 10 years crediting period renewable twice and it is been approved by VERRA on 15-September-2021. Ref. email communication by Matt Borden (mborden@verra.org) dated 15-September-2021.

Start and end date of first or fixed crediting period	This is the second crediting period of this project activity. The first & second crediting period of this project activity was given below- 1st Crediting Period: 25-November-2012 to 24-November-2022 2nd Crediting Period: 25-November-2022 to 24-November-2032 (10 years twice renewable)

1.11 Project Scale and Estimated GHG Emission Reductions or Removals

☒ < 300,000 tCO_2e/year (project)

☐ ≥ 300,000 tCO_2e/year (large project)

Calendar year of crediting period	Estimated GHG emission reductions or removals (tCO_2e)
25-November-2022 to 31-December-2022	5,572
01-January-2023 to 31-December-2023	54,963
01-January-2024 to 31-December-2024	55,113
01-January-2025 to 31-December-2025	54,963
01-January-2026 to 31-December-2026	54,963
01-January-2027 to 31-December-2027	54,963
01-January-2028 to 31-December-2028	55,113
01-January-2029 to 31-December-2029	54,963
01-January-2030 to 31-December-2030	54,963

01-January-2031 to 31-December-2031	54,963
01-January-2032 to 24-November-2032	49,542
Total estimated ERRs during the first or fixed crediting period	550,078
Total number of years	10
Average annual ERRs	55,007

1.12 Description of the Project Activity

The primary technology for the AAC block manufacturing at the project plant is supplied by M/s Changzhou Mingjie Building Material Equipment Manufacturing Co., Ltd, China. The blocks will primarily be produced 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 project activity product, i.e. AAC blocks, consume lower amount of energy for production in comparison to the energy required for producing ordinary fired clay bricks. The fuel source for the thermal energy (steam) required for the project activity is presently coal, while the state grid primarily supplies electrical energy for the project. Thus, the project activity results in GHG emission reduction by saving extra quantity of fossil fuel, which would have been required by an ordinary fired clay bricks manufacturing plant of equivalent capacity.

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	Remarks (if any)
Dimension of AAC blocks	Mm	650X240X150	As per actual production data
Density (dry)	kg/m^3	551-650	As per Lab test Report
Dry shrinkage (maximum)	%	Below-0.1	
Thermal conductivity	W/m-K	Max-0.24	As per Lab test Report
Compressive strength	N/mm^2	>3.75	

Fly ash	%	72.11	
Cement	%	18.37	Lab test report and actual monitoring data at the plant
Lime	%	7.38	
Gypsum	%	2.06	
Aluminium powder	%	0.064	

This is to be noted that the initial (registered) production capacity of the AAC block manufacturing plant was 300,000 cubic meter per annum. To improve the efficiency of the plant, the plant's production capacity was increased to 360,000 cubic meter per annum, representing a 20% increase over the original capacity. This enhancement became effective from 19-February-2021. This capacity enhancement was achieved without any major structural changes to the plant or a complete redesign. Instead, it was done through:

- Optimization of existing infrastructure: Making better use of the current resources and space.
- Integration of selected modular equipment, including:
  - Extended moulds parking area: Increasing the space for storing moulds, which likely helps in speeding up production cycles.
  - Installation of Variable Frequency Drives (VFDs) on all cranes: VFDs help in energy-efficient operation of cranes by controlling their speed, which improves operational flexibility and efficiency.
  - Modifications to the autoclave pipeline: Changes to the steam curing system (autoclave) that help enhance production without affecting the core setup.

Importantly, these upgrades did not involve significant changes to the overall plant layout or foundational systems such as the building structure, primary machinery, or major utilities. Despite the capacity enhancement, product quality, operational efficiency, and compliance with industry standards were maintained. The Project Proponent had demonstrated additionality at the time of registration using the barrier analysis approach, specifically citing the barrier due to prevailing practice and limited market acceptability.

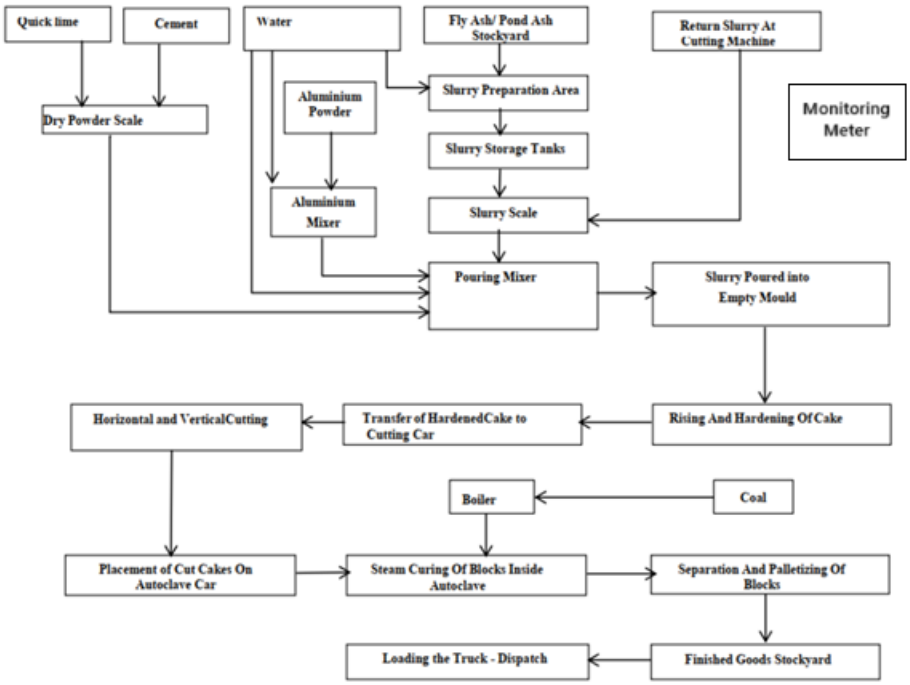
A report published by Bureau of Energy Efficiency on Report on Energy & Resource Mapping of MSME Brick Sector[5] specifies that energy efficient brick projects still face multiple barriers which due to which there is a very low penetration rate of fly ash-based bricks in India.

Therefore, the additionality remains unaffected.

The average lifetime of the major equipment associated with the project, such as the slurry tank, pump, silo conveyor, boiler, and forklift is 25 years, based on specifications provided by the equipment suppliers. Therefore, the overall project lifetime has been aligned with the expected lifespan of this key equipment. The project proponent has submitted the supplier declaration from Jiangsu to the VVB.

Process Flow Chart -

[5] https://beeindia.gov.in/sites/default/files/Brick_sector_Energy_Mapping.pdf



The main plant & equipment installed in the project are:

AAC Autoclave

Production capacity - 870 cum/day (approx.)

Make - Jiangsu Olymspan Equipment Technology Co., Ltd

Weighbridge

Model - Class III

Rated capacity - Max. capacity 100 ton

Make – Untech

AAC (Autoclaved Aerated Concrete) block manufacturing involves several steps, including raw material preparation, mixing, casting, cutting, and curing. The following is a description of the AAC block manufacturing process:

Step 1: Raw Material Preparation The process starts with mixing of raw materials like fly ash and water to form slurry. This is later mixed with other raw materials like cement, gypsum and others.

Step 2: Dosing and mixing Fly ash is poured into a container till a desired weight is obtained. lime powder, cement, and gypsum are in their individual containers connected to a mixer. These are poured into a mixing drum in required proportions from the individual containers. After mixing for a certain time, it is poured into moulds of required sizes.

Step 3: Casting, Rising and Curing The final products are poured into moulds. The moulds are coated with thin layer of oil so that the mixture does not stick to the mould. The mixture is then autoclaved in a large pressure vessel with steam at high pressure.

Step 4: Demoulding and Cutting Once the required strength is achieved, the mixture is removed from moulds and cut as per requirements.

1.13 Project Location

The Project Activity is located in Village- Khatalwada, Tehsil - Umargaon in Valsad District of Gujarat. The details of the project locations are mentioned in the below –

Name of SPVs	Capacity	State
Big Bloc Construction Limited	360,000 m^3/annum	Gujarat

Geographical coordinates of the project location:

Latitude: 20.217° N

Longitude: 72.794°E

Nearest railway station: Surat

Nearest airport: Surat

Indicative map:

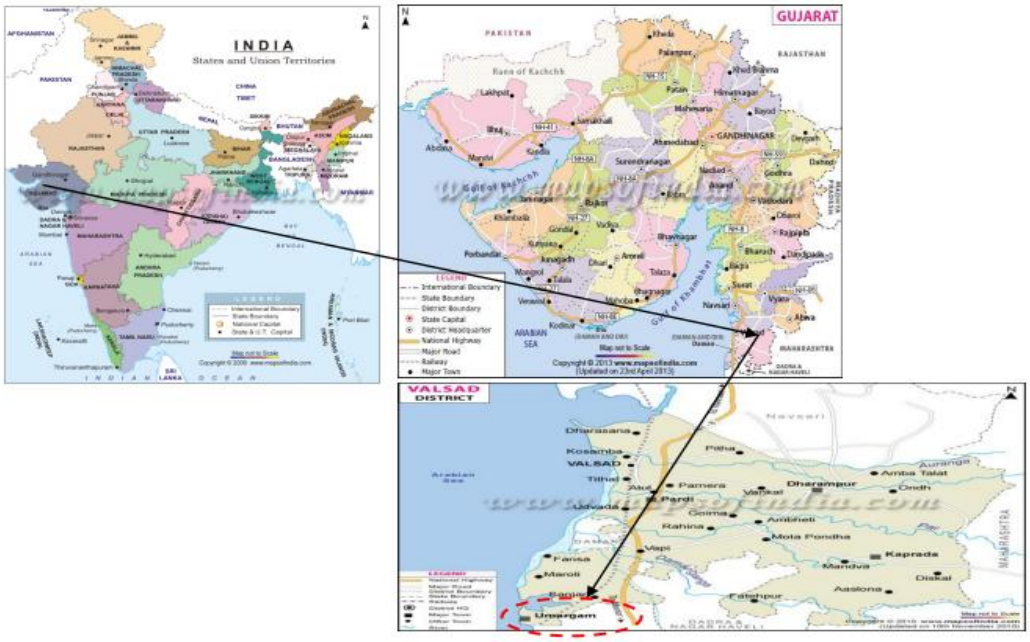


Figure: 1- Maps of project activity

Figure: 2- Satellite image of project activity

1.14 Conditions Prior to Project Initiation

The project is a Greenfield project. The baseline for the project has been established based on national practice across the host nation, India and as per the applicable methodology AMS-III.Z (Fuel Switch, process improvement and energy efficiency in brick manufacture) - Version 06.

1.15 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project obtained all statutory clearances from relevant Indian authorities. The following consents and clearances have been granted by the statutory authorities.

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 Establish	18-December-2012	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 State of Gujarat
Clearance for Plant production capacity increases	19-Feburary-2021	

Consent to Operate	15-November-2019	Gujarat State Pollution Control Board
Boiler Certificate	06-March-2021	Gujarat Boiler Inspection Department
Weigh Bridge License	13-November-2024	Office of the Controller, Legal Metrology, Gujarat State Certificate of Verification
Consent and Authorization	21-March-2025	Gujarat Pollution Control Board

1.16 Double Counting and Participation under Other GHG Programs

1.16.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes ☒ No

If yes, provide required evidence of no double issuance as outlined by the VCS Standard.

1.16.2 Registration in Other GHG Programs

Has the project registered under any other GHG programs?

☐ Yes ☒ No

If yes, provide the registration number and the date of project inactivity under the other GHG program.

Is the project active under the other program?

☐ Yes ☒ No

Project proponents, or their authorized representative, must attest that the project is no longer active in the other GHG program in the Registration Representation.

1.16.3 Projects Rejected by Other GHG Programs

Has the project been rejected by any other GHG programs?

☐ Yes ☒ No

If yes, provide the program name(s), reason(s) and date for the rejection, justification of eligibility under the VCS Program, and any other relevant information.

1.17 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.17.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes ☒ No

If yes, provide all required evidence of no double claiming as outlined by the VCS Standard.

1.17.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes ☒ No

If yes, provide all required evidence of no double claiming as outlined by the VCS Standard.

1.17.3 Supply Chain (Scope 3) Emissions

Do the project activities specified in Section 1.12 affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

1.18 Sustainable Development Contributions

Ministry of Environment, Forest and Climate Change (MoEF&CC), India's Designated National Authority (DNA) for VCS projects has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. During this crediting period, the project has contributed to sustainable development through the following ways.

Social well-being: The project activity has resulted in creating job opportunities for the local population operation of the renewable energy projects. This would result in the improvement in living standards of the local community.

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.

Contribution to sustainable development:

SDG 4: 4.4.1 Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill: The project organizes minimum 01 training/year for the staff on the technology of the plant operation, and the emergency and safety procedures.

SDG 12.0: 12.5.1 Recycling the produced waste: The project uses fly ash which is a waste material from industries. During the period almost 14,000 MT of fly ash was used to make AAC blocks.

SDG 13.0: According to SDG target 13.0, indicator 13.2.2, it states "Total greenhouse gas emissions per year". In the second crediting period (25-November-2022 to 24-November-2032) the project is expected to achieve an annual emission reduction of 55,007 tCO_2e.

1.19 Additional Information Relevant to the Project

1.19.1 Leakage Management

Leakage emissions, as identified under the applied methodologies and tools, are being deducted from gross emission reduction generated by the project. Further, the monitoring plan of the project activity includes detailed description of high-quality monitoring plan required to collect all leakage related data.

1.19.2 Commercially Sensitive Information

Not applicable. No commercially sensitive information has been excluded from the public version of the project description. There is no commercially sensitive information.

1.19.3 Further Information

Not applicable

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification	The various stakeholders identified for the project activity were notified and the necessary consents and approvals were obtained. This was done at various levels. A public notice was issued by the Big Bloc Construction Limited management at site opinion regarding the project activity was also sought from Employees. The following stakeholders were present: - 1. Employees 2. Local people
Legal or customary tenure/access rights	Not Applicable
Stakeholder diversity and changes over time	Stakeholders identified for this project activity are diverse in nature – in terms of socio-economic status, age and gender wise and the diversity is unlikely to change over time.
Expected changes in well-being	Expected changes 1. Economic well-being – the project activity is likely to provide employments to the locality thus economic well beings are expected 2. Environmental well-being – as this project activity reduces the dependence on fossil fuels and conserves natural resources which are on the verge of depletion. Due to its zero emission the Project activity also helps in avoiding significant amount of GHG emissions and specific pollutants like SOx, NOx, and SPM associated with the conventional thermal power generation facilities.
Location of stakeholders	Location of stakeholders Village: Malkhet, Dist: Valsad, State: Gujarat

Location of resources	Not Applicable

2.1.2 Stakeholder Consultation and Ongoing Communication

Date of stakeholder consultation	23-September-2013
Stakeholder engagement process	Stakeholders' consultation is a continuous process and hence a feedback register is kept at the project site office where any stakeholder can come and share his/her feedback. The feedback irrespective of the type is taken care by PP with utmost priority.
Consultation outcome	The meeting was outlined towards making aware local stakeholders including local community, local administration representatives, NGOs working for environmental cause etc., about the project activity that involves setting up a new facility of the AAC blocks manufactured at the project plant would use waste material fly ash generated from thermal power plants as the primary raw material. The AAC blocks produced would replace conventional fired (baked) clay bricks as construction material. The feedbacks/comments received from stakeholders were quite positive and no negative comments were received. The questions asked by stakeholders were only on process and these ere explained by PP representatives.
Ongoing communication	Ongoing Stakeholder Consultation: During the whole crediting period, the PP has kept grievance register in plant site office seeking complaints/grievances from local community.
Stakeholder input	The feedbacks/comments received from stakeholders were quite positive and no negative comments were received. The questions asked by stakeholders were only on process and these are explained by PP representatives.

2.1.3 Free Prior and Informed Consent

Obtaining consent	Not applicable
Outcome of FPIC	Not applicable

2.1.4 Grievance Redress Procedure

Development process	Feedback register is kept at project site office where any stakeholder can come and register his/her feedback
Grievance redress procedure	Stakeholders' feedback is monitored daily and any grievance if found, resolved immediately

2.1.5 Public Comments

Comments received	Actions taken
No comments received	Not applicable as no comments received.

2.2 Risks to Stakeholders and the Environment

2.2.1 Management Experience

Management has always focused on empowering women through its various policies such as maternity leave provisions, prevention of sexual harassment (POSH) policy, flexible timings, gender-friendly sanitation facilities, equal opportunity employer policy, and continuous training opportunities for the women.

2.2.2 Risk Assessment

	Risks identified	Mitigation or preventative measure(s) taken
Natural and human-induced risks to stakeholders' wellbeing	There could be unprecedented natural and human induces risk during operation of the project which needs to avoided.	Project Proponent has implemented Hazard Identification and Risk Assessment (HIRA) process to proactively identify risks in manufacturing facility, which is reviewed periodically.
Risks to stakeholder participation	No risk to stakeholder participation is anticipated	No mitigation or preventive measure is required as no risk has been identified
Working conditions	The working condition of the factory workers could be affected if EHS measures are not taken.	A high priority on the wellbeing of our employees and r commitment to environmental sustainability is placed at the factory premises. The project proponent has

		proactively implemented various policies and measures to create a safe and healthy workplace while minimizing environmental impact. Through regular communication, training, and awareness programs, it is ensured that the employees fully understand and comply with our EHS (Environment, Health, and Safety).
Safety of women and girls	There could be sexual harassment to the women at the workplace.	In compliance of provisions of the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 ("POSH Act") and Rules framed thereunder, the project proponent has formulated and implemented a policy on prevention, prohibition and redressal of complaints related to sexual harassment of women at the workplace.
Safety of minority and marginalized groups, including children	As per the Business Responsibility & Sustainability Report for the year, 2023-24[6] prepared by the project proponent, there is no vulnerable & marginalized Group stakeholder identified. So, there is no risk identified.	No mitigation measure is required.
Pollutants (air, noise, discharges to water, generation of waste, and release of hazardous materials and chemical pesticides and fertilizers)	AAC blocks embody sustainability with their natural, non-toxic origin and minimal waste generation during manufacturing. Utilizing fly ash, a byproduct of thermal power plants, as a key raw material, AAC blocks recycle coal waste, reducing environmental impact. Unlike conventional red clay bricks, AAC blocks do not rely on red soil, preventing deforestation	No mitigation measure is required.

[6] https://bigbloc.in/wp-content/uploads/2025/01/BigBloc_AR2024.pdf

	and environmental degradation. AAC blocks contain two-third of their weight in fly ash, effectively sequestering carbon emissions. This is to be noted that the emission associated with the raw material production (including mining) is not in the control of the project proponent, the emission associated with the transportation is accounted in the leakage emission to calculation emission reduction from the project. Moreover, the same raw material and quantity, except fly ash would have also been consumed in the baseline scenario in producing the fire clay brick. As mentioned above, the by switching to fly ash from red clay as a raw material for brick production, the project contributes to sustainable development. So, no risk is identified in the regard.	

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

	Risks identified[7]	Mitigation or preventative measure(s) taken
Discrimination	There is possibility of discrimination among the workforce in the project company with regard to pay scale and work load which must be avoided.	The project has a zero-tolerance policy towards discrimination. PP has provided declaration that no discrimination has occurred or will occur. PP shall oblige to create

[7] The identified risks and commensurate mitigation or preventative measure(s) for forced labor, child labor, and human trafficking, must be inclusive of staff and contracted workers employed by third parties.

		a workplace free of no discrimination as per local law.
Sexual harassment	There is possibility of sexual harassment at the workplace with the employees which must be avoided.	The project has a zero-tolerance policy towards sexual harassment. PP is committed to establishing a workplace environment devoid of Sexual harassment in accordance with local regulations. PP shall oblige to create a workplace free of sexual harassment as per national law of "The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013"[8].
Equal pay for equal work	There is a chance of unequal treatment with the employees with regard to the remuneration they receive which must be avoided.	Equal pay for equal work is an important principle that aims to eliminate gender pay disparities and ensure that individuals performing the same or similar tasks receive the same compensation, regardless of their gender, race, or other potentially discriminatory factors.
Gender equity in labor and work	There is possibility of gender inequality at the workplace which must be avoided.	PP provides equal opportunities in the context of gender equity and pay for labor and work.
Forced labor	Any kind of forced labor is not pursued by the project proponent in the project. So, there is no risk identified in this regard.	This is assessed not to be applicable.
Child labor	There is possibility the employees are put into work before their legal age which must be avoided.	This project activity does not use victims of child labor.
Human trafficking	This project activity does not use victims of human trafficking. No risk identified.	This is assessed not to be applicable.

[8] https://www.iitk.ac.in/wc/data/Sexual-Harassment-at-Workplace-Act.pdf

2.3.2 Human Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	PP confirmed that there is no human rights violation of any kind to any of the stakeholders during construction and operation of the project activity.

2.3.3 Indigenous Peoples and Cultural Heritage

Risks identified	Mitigation(s) or preventative measure taken
No risk identified	This project does not cause the physical or economic relocation of peoples. The project activity does not involve any alteration of existing nearby structure. In addition, no cultural heritage/ indigenous people are affected by the project.

2.3.4 Property Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	Not applicable. The project does not involve resources owned by the stakeholders. The land is owned by the Project Proponent for the production of AAC blocks.

2.3.5 Benefit Sharing

Process used to design the benefit sharing plan	Not applicable. Current project activity is not a community service project; hence, all benefit of the carbon credit lies with the Project Proponent only.

Summary of the benefit sharing plan	Not applicable. Current project activity is not a community service project; hence, all benefit of the carbon credit lies with the Project Proponent only.
Approval and dissemination of benefit sharing plan	Not applicable. Current project activity is not a community service project; hence, all benefit of the carbon credit lies with the Project Proponent only.

2.4 Ecosystem Health

	Risks identified	Mitigation or preventative measure(s) taken
Impacts on biodiversity and ecosystems	No risk identified	No impact on biodiversity is likely to be caused
Soil degradation and soil erosion	No risk identified	No soil erosion and degradation are likely to be caused
Water consumption and stress	No risk identified	Water consumption will be of moderate level and hence stress is likely to be caused
Usage of fertilizers	No risk identified	No fertilized is used

2.4.1 Rare, Threatened, and Endangered Species

Is the project located in or adjacent to habitats for rare, threatened, or endangered species?

☐ Yes ☒ No

2.4.2 Introduction of Species

Species introduced	Classification	Justification for use	Adverse effects and mitigation
Not applicable (NA)	NA	NA	NA

Existing invasive species	Mitigation measures to prevent the spread or continued existence of invasive species

Not applicable	Not applicable

	Risks identified	Mitigation or preventative measure(s) taken
Invasive species	No risk identified	Since no invasive species exist in the project area, hence no risks associated are identified.

2.4.3 Ecosystem Conversion

	Risks identified	Mitigation or preventative measure(s) taken
Ecosystem conversion	No risk identified	Since, the project activity is neither ARR, ALM, WRC nor ACoGS, hence no risks associated are identified.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	AMS-III.Z	Fuel Switch, process improvement and energy efficiency in brick manufacture	06[9]
TOOL	03	Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion	03[10]

[9] https://cdm.unfccc.int/methodologies/DB/VLZZ1DVT1QI3KHZKSM6QECOAKNSCXZ

[10] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v3.pdf

TOOL	05	Baseline, project and /or leakage emission from electricity consumption and monitoring of electricity generation	03[11]
TOOL	12	Project and leakage emissions from transportation of freight	01.1[12]
TOOL	11	Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period	03.0.1[13]

3.2 Applicability of Methodology

Methodology ID	Applicability condition	Justification of compliance
AMS-III.Z, version 6.0	Para-3: The measures may replace, modify, retrofit[14] or add capacity to systems in existing facilities or be installed in a new facility.	The project has been implemented at a new facility. Hence applicable.
	Para-4: The methodology is applicable for the production of: (a) Bricks that are the same in the project and baseline cases; or (b) Bricks that are different in the project case versus the baseline case due to a change(s) in raw materials, use of different additives, and/or production	It may be noted that blocks are different in the project case versus the baseline cases due to changes in the raw materials, use of different additives and production process changes resulting in avoidance of fossil fuels for forming, sintering or drying. However, it can be demonstrated that the service level of the project

[11] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf

[12] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-12-v1.1.0.pdf

[13] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf

[14] For example, to, replace and/or modify an existing heating and/or firing facility(ies) to enable the use of biomass residues.

	process changes resulting in reduced use or avoidance of fossil fuels for forming, sintering (firing) or drying or other applications in the facility as long as it can be demonstrated that the service level of the project brick is comparable to that of the baseline brick. Examples include pressed mud blocks (soil blocks) with cement or lime stabilization[15] and other 'unburned' bricks that attain strength due to fly ash, lime/cement and gypsum chemistry.	bricks is better than the baseline brick. Hence this applicability condition (b) is met.
	Para-5: New facilities (Greenfield projects) and project activities involving capacity additions are only eligible if they comply with the requirements for Greenfield projects and capacity increase projects specified in the "General Guidelines for SSC CDM methodologies".	The project activity plant is a Greenfield unit and it complies with the related and relevant requirements of the General Guidelines for SSC methodologies. In accordance with, Paragraph 37 of "General Guidelines for SSC CDM methodologies", version 23.1[16], the project is categorized as a Type III Greenfield project, referring to new facilities. The most plausible baseline scenario

[15] May involve mechanical and hydraulic systems for energy transmission to the soil block via a lever, toggle, cam, pivot, ball and socket joint, piston, etc.

[16] https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20210211212225226/MethSSC_Guid25ver23.1.pdf

		for this project activity is the "burnt clay brick manufacturing using conventional technologies." This project activity baseline is in line with the baseline criteria outlined in the Type III small scale methodology as proven in section 3.4. A report published by the Bureau of Energy Efficiency on Market Transformation towards Energy Efficiency in Brick Sector[17] specifies that out of 250 billion of bricks produced annually, 85% are burnt clay bricks whereas the remaining 15% non-fired bricks (AAC blocks, flyash bricks, concrete blocks, etc.). Thus, the other types of brick which includes fly ash bricks contributes only 40 billion bricks out of 250 billion bricks produced annually in India. As demonstrated section 1.12 of the PD, the fly ash-based brick production projects still face barriers in the host country due to which the penetration rate is significantly low. Hence, the project activity meets the applicability criterion.

17 https://www.beeindia.gov.in/sites/default/files/Brick%20Sector%20Market%20Transformation%20Blueprint_BEE.pdf

	Para-6: The requirements concerning demonstration of the remaining lifetime of the replaced equipment shall be met as described in the "General Guidelines for SSC CDM methodologies". If the remaining lifetime of the affected systems increases due to the project activity, the crediting period shall be limited to the estimated remaining lifetime, i.e. the time when the affected systems would have been replaced in the absence of the project activity.	The project activity is not a replacement or retrofit to an existing facility. In fact, it is being implemented as a Greenfield project. Therefore, this criterion is not applicable.
	Para-7: For existing facilities, it shall be demonstrated, with historical data, that for at least three years immediately prior to the start date of the project implementation, only fossil fuels (no renewable biomass) were used in the brick production systems that are being modified or retrofitted. In cases where small quantities of biomass were used for experimental purposes this can be excluded.	The project activity is not being implemented at an existing facility. Hence not applicable.
	Para-8: The renewable biomass utilized by the project activity shall not be chemically processed (e.g. esterification to produce biodiesel, degumming and/or neutralization by chemical	The project activity does not involve use of biomass. Hence not applicable.

	reagents) prior to the combustion but it may be processed mechanically (e.g. pressing, filtering)/thermally (e.g. gasification to produce syngas)[18].	
	Para-9: In cases where the project activity utilizes charcoal produced from renewable biomass as fuel, the methodology is applicable provided that: (a) Charcoal is produced in kilns equipped with a methane recovery and destruction facility; or (b) If charcoal is produced in kilns not equipped with a methane recovery and destruction facility, methane emissions from the production of charcoal shall be considered. A default value of 0.030 t CH_4/t charcoal may be used in accordance with "AMS-III.BG.: Emission reduction through sustainable charcoal production and consumption"; (c) If charcoal is produced from other CDM project activities, it shall be ensured that no double counting of the emission	The project activity does not involve use of biomass. Hence not applicable.

[18] The syngas shall be derived from gasification of renewable biomass only and no methane emissions are to be released to the atmosphere, thus demonstrating the complete use for combustion of the syngas in the project equipment.

	reductions occurs.	
	Para-10: In the case of project activities involving changes in raw materials (including additives), it shall be demonstrated that additive materials are abundant in the country/region, according to the following procedures: a) Step 1: using relevant literature and/or interviews with experts, a list of raw materials to be utilized is prepared based on the historic and/or present consumption of such raw materials. b) Step 2: the current supply situation for each type of raw material to be utilized is assessed and their surplus availability is demonstrated using one of the approaches below: i. Approach 1: demonstrate that the raw materials to be utilized, in the region of the project activity, are not fully utilized. For this	PP has shown surplus availability of waste materials used as raw material in the project activity prior to the project implementation which is as per methodology. For the VCS project activity, only fly ash is a waste product and surplus availability of fly ash has been demonstrated in line with step 2, Approach 1 provided by the methodology. As per report on Fly Ash 2021-22, page number 44, Table-XIX, of Central Electricity Authority, Government of India[19], the total utilization of fly ash in the year 2011-12 was 58.48%, resulting in a surplus availability of 41.52%. Hence applicable.

[19] https://cea.nic.in/wp-content/uploads/tcd/2022/08/Fly_ash_Generation_and_utilisation_Report_2021_22-1.pdf

		purpose, demonstrate that the quantity of material is at least 25% greater than the demand for such materials or the availability of alternative materials for at least one year prior to the project implementation; ii. Approach 2: demonstrate that suppliers of the raw materials to be utilized, in the region of the project activity, are not able to sell all of their supply of these materials. For this purpose, project participants shall demonstrate that a representative sample of suppliers of the raw materials	

	to be utilized, in the region, had a surplus of materials (e.g. at the end of the period during which the raw material is sold) that they could not sell and that is not utilized.	
	Para-11: This methodology is applicable under the following conditions: (a) The service level of project brick shall be comparable to or better than the baseline brick, i.e. the bricks produced in the brick production facility during the crediting period shall meet or exceed the performance level of the baseline bricks (in terms of, for example dry compressive strength, wet compressive strength, density). An appropriate national standard shall be used to identify the strength class of the bricks; bricks that have compressive strengths lower than the lowest class bricks in the	The applicability conditions are being fulfilled in the following manner: a) The compressive strength of the project activity AAC blocks is comparable to the baseline clay bricks. As per latest Indian Standard on common burnt clay building bricks – specification (IS 1077:1992)[20] published by Bureau of Indian Standards, the compressive strength of the lowest class of clay bricks is 3.5 N/mm^2, while the compressive strength of AAC blocks as taken from laboratory test certificate (Third

[20] https://www.scribd.com/document/891128824/1077-1992-Reff2021

	standard are not eligible under this methodology. Project bricks are tested in nationally approved laboratories at six-month intervals (at a minimum) and test certificates on compressive strength are made available for verification; (b) The existing facilities involving modification and/or replacement shall not influence the production capacity beyond ±10% of the baseline capacity unless it is demonstrated that the baseline for the added capacity is the same as that for the existing capacity in accordance with paragraph 5 above; (c) Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.	party report) of MIL is 3.75 N/mm^2, which is more than the compressive strength of lowest class of baseline bricks. Compressive strength and density of the project AAC blocks will be monitored on at least 6 months interval by conducting tests in nationally approved laboratory, following the procedure outlined IS:2185 (Part 3)[21]. This will be done throughout the crediting period in line with the methodology requirements to evidence that service level of the project bricks is higher than the service level of the baseline bricks. PP also clarify that the use of compressive strength as the primary criterion is both appropriate and justified for the following reasons- 1. Structural

[21] https://law.resource.org/pub/in/bis/S03/is.2185.3.1984.pdf

		Integrity: Compressive strength is the most critical parameter for load-bearing capacity and is a standard benchmark in structural assessments of masonry units. AAC bricks meeting or exceeding the baseline compressive strength can reliably perform similar structural roles in construction. 2. Additional Benefits of AAC: While only compressive strength is used for equivalence assessment, AAC bricks inherently offer superior performance in other areas such as thermal insulation, fire resistance, and workability. These additional advantages enhance the overall service level and support the sustainability

		objectives of the methodology. b) The facility is not an existing facility. c) Maximum annual emission reductions from the project activity are estimated to be around 55,007 tCO_2e/year, which is less than the methodology limit of 60,000 tCO_2e.
	Para-12: This methodology is not applicable if local regulations require the use of the proposed technologies or raw materials for the manufacturing of bricks unless widespread non-compliance (i.e. less than 50% of brick production activities in the country comply) of the local regulation evidenced.	With regards to use fly ash, in brick production there is a local regulation on use of fly ash (one of the raw materials for project blocks) for the manufacturing of bricks. As per MoEF&CC Notification dated 14 September 1999 and its amendments dated 27 August 2003, 3 November 2009 and 25 January 2016[22], the use of 25% fly ash in brick manufacturing units set up within 100 km of a coal or lignite based thermal power plant is mandatory. Therefore, local regulation requires the use of raw material fly ash for manufacturing of bricks but the widespread noncompliance rate is very high.

[23] This applicability condition ensures that transport-related emissions are small relative to the expected total emission reductions and, for this reason, enables to use a simplified approach to estimate project or leakage emissions from transportation of freight.

	Para-13: In cases where the project activity utilizes biomass sourced from dedicated plantations; applicability conditions prescribed in the tool "Project emissions from cultivation of biomass" shall apply. If the project activity involves reducing the NRB consumption, project participants shall demonstrate that NRB has been used in the project region since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.	The project does not involve use of charcoal produced from renewable biomass. Hence not applicable.
TOOL 03	Para 2- This tool provides procedures to calculate project and/or leakage CO_2 emissions from the combustion of fossil fuels. It can be used in cases where CO_2 emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties. Methodologies using this tool should specify to which combustion process j this tool is being applied.	The project activity consumes coal, diesel for machinery, equipment and DG set at site. Hence it is applicable.
TOOL 05	Para 5- If emissions are calculated for electricity consumption, the tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption: (a) Scenario A: Electricity	a) The project activity involves electricity consumption from the connected grid. b) Not applicable c) Not applicable

	consumption from the grid. The electricity is purchased from the grid only, and either no captive power plant(s) is/are installed at the site of electricity consumption or, if any captive power plant exists on site, it is either not operating or it is not physically able to provide electricity to the electricity consumer; (b) Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumer and supply the consumer with electricity. The captive power plant(s) is/are not connected to the electricity grid; or (c) Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumer. The captive power plant(s) can provide electricity to the electricity consumer. The captive power plant(s) is/are also connected to the electricity grid. Hence, the electricity consumer can be provided with electricity from the	

	captive power plant(s) and the grid.	
	Para 6- This tool can be referred to in methodologies to provide procedures to monitor amount of electricity generated in the project scenario, only if one out of the following three project scenarios applies to the recipient of the electricity generated: (a) Scenario I: Electricity is supplied to the grid; (b) Scenario II: Electricity is supplied to consumers/ electricity consuming facilities; or (c) Scenario III: Electricity is supplied to the grid and consumers/electricity consuming facilities.	Project activity involves electricity consumption from the connected grid and hence not applicable.
	Para 7- This tool is not applicable in cases where captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage. The tool only accounts for CO_2 emissions.	There are no captive renewable power generation technologies are installed to provide electricity in the baseline scenario.
TOOL 12	Para 4- This tool is applicable to project activities which involve freight transportation by road and where transportation is not the main project activity[23]. This tool is	The project activity is manufacturing of bricks from fly ash. Hench this condition is applicable.

[23] This applicability condition ensures that transport-related emissions are small relative to the expected total emission reductions and, for this reason, enables to use a simplified approach to estimate project or leakage emissions from transportation of freight.

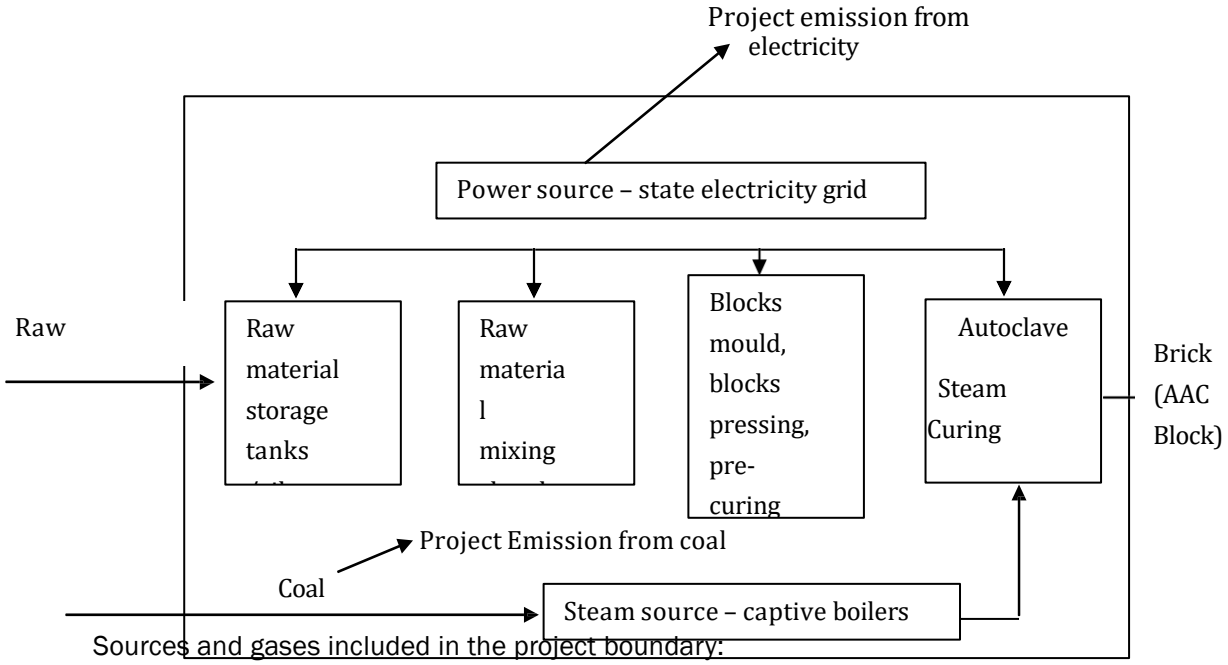
	not applicable to project activities where transportation is the main source of greenhouse gases emissions. This tool does not provide procedures to estimate baseline emissions from road transportation of freight. The tool only provides to determine CO_2 emissions. CH4 and N_2O emissions are excluded for simplification as they are small compared to CO_2 emissions.	
	Para 5- In addition, the tool is applicable for the determination of project or leakage emissions from freight transportation by rail in project activities where transportation is not the main project activity.	The project activity is manufacturing of bricks from fly ash. Hench this condition is applicable.
TOOL 11	Para 1- This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by paragraph 49 (a) of the modalities and procedures of the clean development mechanism.	This condition is applicable. Stepwise procedure has been demonstrated under section 3.4 for assessment of the validity.
	Para 2- The tool consists of two steps. The first step provides an approach to evaluate whether the current baseline is still valid for the next crediting period. The second step provides an approach to update the baseline in case that the	This condition is applicable. Stepwise procedure has been demonstrated under section 3.4 for assessment of the validity.

	current baseline is not valid anymore for the next crediting period.	

3.3 Project Boundary

Project boundary has been delineated in line with paragraph 19 of the methodology AMS-III.Z, version 06 (Fuel Switch, process improvement and energy efficiency in brick manufacture). "The project boundary is the physical, geographical site where the brick production takes place during both the baseline and crediting periods."

The boundary has been drawn below:



Sources and gases included in the project boundary:

Source		Gas	Included?	Justification/Explanation
Baseline	Fossil fuel combustion in red clay brick kiln	CO_2	Yes	Main emission source
		CH_4	No	Neglected for simplicity
		N_2O	No	Neglected for simplicity

Source		Gas	Included?	Justification/Explanation
Project activity	Coal combustion in autoclave boiler	CO_2	Yes	Main emission source
		CH_4	No	Neglected for simplicity
		N_2O	No	Neglected for simplicity
	Electricity consumption for operating plant machinery	CO_2	Yes	Main emission source
		CH_4	No	Neglected for simplicity
		N_2O	No	Neglected for simplicity
Leakage	GHG emissions during raw material production	CO_2	Yes	Main emission source
		CH_4	No	Neglected for simplicity
		N_2O	No	Neglected for simplicity
	GHG emissions during raw material transportation	CO_2	Yes	Main emission source
		CH_4	No	Neglected for simplicity
		N_2O	No	Neglected for simplicity

3.4 Baseline Scenario

As per paragraph 20 of the methodology AMS-III.Z, version 06 (Fuel Switch, process improvement and energy efficiency in brick manufacture).

"The baseline emissions are the fossil fuel and NRB consumption related emissions (fossil fuel consumed multiplied by an emissions factor) associated with the system(s), which were or would have otherwise been used, in the brick production facility (ies) in the absence of the project activity.

a) For projects that involve replacing, modifying or retrofitting systems in existing facilities, the average of the immediately prior three-year historical fossil fuel consumption data, for

the existing facility, shall be used to determine an average annual baseline fossil fuel consumption value. Similarly, prior three-year historical production data (excluding abnormal years) for the existing facility, shall be used to determine an average annual historical baseline brick production rate in units of weight or volume. For calculating the emission factor for fossil fuel, reliable local or national data shall be used. IPCC default values shall be used only when country or project specific data are not available or demonstrably difficult to obtain;

This para is not applicable as the project activity is Greenfield project activity.

b) For projects involving the installation of systems in a new facility or a capacity addition in an existing system, the average annual baseline fossil fuel consumption value and the baseline brick production rate shall be determined as that which would have been consumed and produced, respectively, under an appropriate baseline scenario. If the baseline scenario identification as per paragraph 4 above results in more than one alternative technologies with different levels of energy consumption, the alternative with the least emissions intensity should be chosen for determining the baseline emissions of the facility."

The project activity is implemented at a new facility, i.e. it is a Greenfield project activity. As per the methodology AMS-III.Z Version 06 (Fuel Switch, process improvement and energy efficiency in brick manufacture), for new project activities, the project activity should be in compliance with the general guidelines to SSC CDM methodologies. Accordingly, the baseline to the project activity has been determined in line with the general guidelines. As per paragraph 37 of the General Guidelines for SSC CDM methodologies, Version 23.1, the baseline for Type II and Type III project activity types are established as follows:

Type II and III Greenfield projects (new facilities) may use a Type II and Type III small scale methodology provided that they can demonstrate that the most plausible baseline scenario for this project activity is the baseline provided in the respective Type II and Type III small-scale methodology. The demonstration must include an assessment of the alternatives of the project activity using the following steps:

Step 1:

Identify the various alternatives available to the project proponent that deliver comparable level of service including the proposed project activity undertaken without being registered as a CDM project activity.

Step 2:

List the alternatives identified in Step 1 that are in compliance with the local regulations. If any of the identified baselines is not in compliance with the local regulations, then exclude the same from further consideration.

Step 3:

Eliminate and rank the alternatives identified in Step 2 taking into account barrier tests specified in "Guidelines on the demonstration of additionality of small-scale project activities".

Step 4:

If only one alternative remains that is:

a) Not the proposed project activity undertaken without being registered as a CDM project activity; and

b) Corresponds to one of the baseline scenarios provided in the methodology; then the project activity is eligible under the methodology.

If more than one alternative remain that correspond to the baseline scenarios provided in the methodology, choose the alternative with the lowest emissions as the baseline.

Justification for the Step 1

The alternative scenarios to the project activity comprises of different walling materials that are available in India. Based on the different walling materials, the alternatives available to MIL which would have comparable levels of output are as follows:

Table B.4.1

Baseline alternative Scenario	Alternative Walling Materials	Alternative description
A	Fly ash based AAC Blocks bricks	The project activity undertaken without being registered as a VCS project activity, i.e., installation of a 360,000 m^3/annum AAC blocks manufacturing unit. Manufacturing of fly-ash bricks having comparable quality and application area as AAC block. There is no regulation prevailing in India preventing manufacturing usage of baked Clay bricks in India. With regards to use of raw material in brick production there is a local regulation on use of fly ash (one of the raw materials for project blocks) for the manufacturing of bricks. As per MoEF&CC Notification dated 14 September 1999 and its amendments dated 27 August 2003, 3 November 2009 and 25 January 2016[24], the use of 25% fly ash in brick manufacturing units set

[24] https://kspcb.karnataka.gov.in/sites/default/files/inline-files/Fly%20Ash%20Notification_as%20amended_25.01.2016.pdf

		up within 100 km of a coal or lignite based thermal power plant is mandatory. Therefore, local regulation requires the use of raw material fly ash for manufacturing of bricks but the widespread noncompliance rate is very high. This should be noted that this regulation is not preventive for the fly ash bricks manufacturing or application of fly ash brick; rather it promotes it. However, despite all the measures taken by the Govt. of India[25], the energy efficient bricks have not achieved the desired penetration level in the country. Please refer the common barrier analysis included against alternative C, D and E which is also applicable for the project scenario i.e. Fly ash based AAC Blocks bricks.
B	Baked Clay Bricks	The prevailing alternative technology in the bricks sector, that deliver outputs or services (e.g. electricity, heat or cement) with comparable quality, properties and application areas, taking into account, where relevant, examples of scenarios identified in the underlying methodology. Prevailing alternative for walling material manufacturing in India is baked (fired) clay brick manufacturing through the application of various technologies (as VSBK, Fixed Chimney BTK, Moveable Chimney BTK, Tunnel Kiln, Clamp and other Batch Kilns, etc.) and fuels). These bricks have comparable properties with those of the AAC blocks, in terms of quality and application areas. There is no regulation prevailing in India preventing manufacturing or usage of baked Clay bricks in India. A report published by the Bureau of Energy Efficiency on Market Transformation towards Energy Efficiency in Brick Sector[26] specifies that out of 250 billion of bricks produced annually, 85% are burnt clay bricks whereas the remaining 15% non-fired bricks (AAC blocks, fly ash bricks, concrete blocks, etc.). Thus, the other types of brick which includes fly ash bricks contributes only 40 billion bricks out of 250 billion bricks produced annually in India. Thus, this is credible alternative.
C	Cement stabilized soil blocks	There is no regulation prevailing in India preventing manufacturing and usage of these types of bricks in India. These bricks are high strength and quality which are comparable to the fly ass bricks proposed in the project activity.

[25] https://beeindia.gov.in/sites/default/files/Brick_sector_Energy_Mapping.pdf

[26] https://www.beeindia.gov.in/sites/default/files/Brick%20Sector%20Market%20Transformation%20Blueprint_BEE.pdf

D	Concrete Blocks	However, the report published by the Bureau of Energy Efficiency on Market Transformation towards Energy Efficiency in Brick Sector[27] specifies that out of 250 billion of bricks produced annually, 85% are burnt clay bricks whereas the remaining 15% non-fired bricks (AAC blocks, flyash bricks, concrete blocks, etc.). Thus, the other types of brick which includes fly ash bricks contributes only 40 billion bricks out of 250 billion bricks produced annually in India. There are multiple barriers faced by these of bricks which prevents their wide spread in the country. Below is the analysis of the barriers as per the Bureau of Energy Efficiency report referred above. **Policy & Regulatory Barriers:** One of the key barriers in the adoption of new energy and resource-efficient technologies and attracting new investment in the clay brick sector are the policy risks associated with lack of clarity and uncertainty regarding environment policies and regulations (refer section 6.2 on details of environment regulations). For example, while around 2500 brick kilns located in the NCR region have adopted zigzag technology as per CPCB instructions to reduce air pollution, by investing Rs 20-50 lakh/kiln, their working season has been restricted due to an NGT order, thus severely impacting the viability of these enterprises. This is having a negative impact on adoption of zigzag kiln technology in the neighbouring states. The latest amendment in the fly ash regulation puts uncertainty over the use of clay bricks for building construction in 100 km radius of coal/lignite based thermal power plants, which practically covers the entire country. This is even though the various studies have shown that even if all the remaining available fly ash is utilized for brick making, it will only meet a fraction of the demand for bricks. Large investments in technology upgradation would not materialize till the enterprises get assurance on their future operations. There is a need to have a holistic review of environment policies impacting the brick sector and bring synergies to promote resource efficient brick production in the country. **Technology Barriers:** There are a variety of technical barriers impacting the transformation of Indian brick industry. For example, the use of extruders to produce resource efficient bricks require good quality lab testing facilities to test the clay and suggest the technical feasibility, similarly test lab facilities are required before
E	FAL-G bricks	

[27] https://www.beeindia.gov.in/sites/default/files/Brick%20Sector%20Market%20Transformation%20Blueprint_BEE.pdf

		taking a decision on adopting an advanced dryer or kiln technology. Such lab facilities are generally not available in India. Another example is regarding the access to technologies such as Hybrid Hoffmann Kiln, Tunnel Kiln, Tunnel and Chamber dryers, extruders, etc. Most of the suppliers of these technologies are from Europe or China, which makes both the cost and access to these technologies difficult. There is a large variation in the clay, climatic and market conditions across the country and as these technologies have yet not been tested under different conditions, the perceived technology failure risk is very high among the brick kiln owners. **Capacity & Knowledge Barriers:** The exiting brick enterprises mostly belong to smallscale unorganised sector. Most of the brick kiln owners and supervisors come from rural background and with limited formal education. Their exposure and knowledge about energy-efficient technologies is low. There is no existing system for skill and vocational training for brick industry workers. Thus, the human resource capacity of the existing brick industry to absorb advanced technology is very limited. A programme to build the managerial and technical capacities including skill development programme for workers is essential for bringing a transformation in the brick industry. **Financial Barriers:** The current brick industry enterprises mostly belong to small-scale unorganized sector. A discussion with brick kiln owners shows that the adoption of zigzag kiln by more than 15,000 enterprises in the country. The conversion involved an investment of Rs 10-50 lakh per kiln and this money was mostly raised through personal finance. The penetration of institutional finance (e.g. bank credit) to brick industry is very low. Also, as a large fraction of the brick enterprises belong to the unorganized sector, they do not have necessary financial documents and are not able to offer adequate collateral security (most of the kilns are located on leased lands and do not have much of fixed machinery) to avail credit from banks. It is shown that most of the measures required for bringing a transformation in the brick sector require investments ranging from Rs 2 to 50 crore. This level of investment requires access to finance from formal financial institutions. A better understanding of the financial needs of the brick industry and designing appropriate financial products is needed to improve access to finance to the sector. **Market Barrier:** Building construction industry is a very conservative sector, and the process of adoption of new building materials and

		construction technologies is long and slow. Green building rating systems as well as energy conservation building codes are trying to push resource efficiency in the building construction sector. However, the rate of adoption of resource efficient bricks like perforated and hollow bricks and blocks, is still low and restricted to a few regions. More focused and multi-dimensional approach is required to overcome the market barrier.

Justification for the Step 2

All the baseline alternatives identified under step 1 above, are in compliance with local laws and regulations.

Justification for the Step 3: Referring to "Guidelines on the demonstration of additionality of small- scale project activities", version 10:

"Project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

a) **Investment barrier**: a financially more viable alternative to the project activity would have led to higher emissions.

b) **Technological barrier:** a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions.

c) **Barrier due to prevailing practice**: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions.

d) **Other barriers:** without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher."

The project proponent has used the "barrier due to prevailing practice" and "other barriers" to determine the most plausible baseline for the project activity.

As demonstrated in Step 1 above, since burnt clay bricks are the prevailing walling material that is widely used in India and since the market share of other bricks/blocks manufacturing technology is negligible as compared to the burnt clay bricks and face

several types of barriers, options C, D, & E have not been taken forward for further analysis. Hence only alternative A and alternative B have been carried forward for further analysis. The barrier analysis for identified scenarios is carried out as follows:

Table B.4.2

Barrier	Scenario A – Manufacture of fly ash based AAC blocks without VCS benefit in consideration	Scenario B – Baked clay brick manufacturing
Barrier due to prevailing practice	Faces "Barrier due to prevailing practice • Fly ash based AAC block is not the prevailing walling material used or manufactured in India. As per, "Strategies for cleaner walling material in India", AAC blocks have low penetration in India which is to the tune of only 15% (including AAC blocks, flyash bricks, concrete blocks, etc.) and fired clay bricks are currently prevalent in Indian walling industry and the scenario is expected to be same in future. AAC block project activity technology, unlike the traditional clay brick making, requires recipe control of several main ingredients namely fly ash, cement, lime and water etc. at the mixing step. In case there are changes to the sources of the raw materials, the chemistry and hence the recipe needs to be reworked. Hence it requires the intervention of advanced technologies leading to much higher investments. AAC blocks being a relatively newer product as compared to baked clay bricks in India, there is high scarcity of skilled operators for successfully running the AAC block manufacturing unit.	Does not face Barrier due to prevailing practice – Baked clay bricks manufacturing is an age old and widely followed process for construction brick manufacturing in India. The brick manufacturing industry in India is predominantly constituted of conventional clay bricks manufacturing units. A report published by the Bureau of Energy Efficiency on Market Transformation towards Energy Efficiency in Brick Sector28 specifies that out of 250 billion of bricks produced annually, 85% are burnt clay bricks whereas the remaining 15% non-fired bricks (AAC blocks, flyash bricks, concrete blocks, etc.). Thus, the other types of brick which includes fly ash bricks contributes only 40 billion bricks out of 250 billion bricks produced annually in India. Hence there is an overwhelming prevalence of burnt clay bricks in walling materials used in India. As a result, there is much easier availability of skilled operators for successfully running a clay bricks

28 https://www.beeindia.gov.in/sites/default/files/Brick%20Sector%20Market%20Transformation%20Blueprint_BEE.pdf

	For operating the unit, special on the job training needs to be provided to operators. On the contrary, clay brick production is a simple commonly used technological practice and is practiced at the cottage industry level. Small fired- clay brick producers have no incentives to introduce alternate technologies, which require new investments, training to stabilize the operation, and a different business practice in long-term perspective. Burnt clay bricks are therefore the most prevalent walling material used and manufactured in India and is also expected to remain the most prevalent walling material in the future unless significant regulatory mechanisms are evolved and enforced.	manufacturing unit. Raw material is clay which is available to the brick manufacturer from his surroundings. Manufacturing of burnt clay bricks does not require very sophisticated technology and the technique used is proven and widely practiced for many decades. Burnt clay bricks continue to be the most popular form of walling material, accounting for most of the total market in the country. Moreover, the project proponent is claiming emission reductions based on a production capacity of 300,000 m^3 and has no intention to claim emission reductions for any additional capacity throughout the crediting period.
Other Barriers – Market Acceptability barrier	A report published by Bureau of Energy Efficiency on Report on Energy & Resource Mapping of MSME Brick Sector29 specifies that energy efficient brick projects still face multiple barriers which due to which there is a very low penetration rate of fly ash-based bricks in India. Please refer the barrier analysis for alternative C, D and E above which are also applicable for the project activity.	Does not face this barrier The consumer in India is preferentially biased towards clay bricks. A clay bricks manufacturer does not require any additional marketing efforts for selling the complete production output.

Justification for the Step 4

From the above barrier analysis, it can be concluded that alternative B is the only alternative which is not prevented by any barrier. Thus, there is only one alternative remaining, which is not the project activity undertaken without VCS benefits in

[29] https://beeindia.gov.in/sites/default/files/Brick_sector_Energy_Mapping.pdf

consideration. Thus, the most plausible alternative (Alternative B) derived from the above analysis is considered as baseline to the VCS project activity.

Thus, the baseline to the project activity is: Manufacturing of fired-clay bricks through conventional fired clay brick production processes.

The identified baseline scenario, as mentioned earlier, includes different technologies with different levels of energy consumption. Hence, a weighted average energy use of these technologies has been considered for determining the baseline emissions of the facility or facilities.

Updated baseline for the second crediting period in line with the TOOL11 "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period." Version 03.0.1, EB 66, Annex 47[30]. This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by paragraph 49 (a) of the modalities and procedures of the clean development mechanism. The tool stipulates the following steps to be carried out.

Step 1: Assess the validity of the current baseline for the next crediting period

The "Procedures for the renewal of the crediting period of a registered project activity" approved by the CDM Executive Board require assessing the impact of new relevant national and/or sectoral policies and circumstances on the baseline.

The validity of the current baseline is assessed using the following Sub-steps:

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

The baseline scenario remains unchanged and is in compliance with all relevant mandatory national and/or sectoral policies which have come into effect after the submission of the project activity for validation or the submission of the previous request for renewal of the crediting period and are applicable at the time of requesting renewal of the crediting period, go to Step 1.2.

Step 1.2: Assess the impact of circumstances

The baseline scenario identified at the validation of the project activity is implemented at a new facility, i.e. it is a Greenfield project activity. As per the methodology AMS-III.Z Version 06 (Fuel Switch, process improvement and energy efficiency in brick manufacture), for new project activities, the project activity should be in compliance with

[30] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf

the general guidelines for SSC CDM methodologies. Accordingly, the baseline to the project activity has been determined in line with the general guidelines. As per paragraph 12 of the General Guidelines for SSC CDM methodologies, Version 23.1, the baseline for Type II and Type III project activity types are established as follows:

Type II and III Greenfield projects (new facilities) may use the corresponding Type II and Type III small-scale methodologies, provided that they can demonstrate that the most plausible baseline scenario for the project is consistent with the baseline specified in the respective methodology. As a result, the same baseline identified in the previous crediting period remains valid for the project. Therefore, the assessment changes in market characteristics are not required for the renewal of the project's crediting period.

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested

As explained in step 1.2, the project activity in greenfield project and there is no any baseline equipment or investment involved in project activity. Therefore, this condition is not applicable to the project activity.

Step 1.4: Assessment of the validity of the data and parameters

This step stipulates that "Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission factors, values or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the project activity." In the context of the present project activity the baseline emission factors, including the CO_2 emission factors for cement production, aluminium production, lime production, gypsum production, freight transportation as well as the Density and Weight of baseline bricks, emission factor for electricity and transmission & distribution losses has been updated along with the approach used to calculate the emission factor.

Emission factor for clay bricks manufacturing				
Particulars	Unit	Value	Source	Remarks
CO_2 emission factor of Fire clay brick	$kgCO_2/kg$	0.24	https://pubs.acs.org/doi/10.1021/acs.est.4c08994	Though the study indicates a higher emission

				factor for fire clay produced in India, the lower value (0.24) has been selected conservatively
Density of each brick	kg/m^3	1950	http://aerconindia.com/aac-vs-bricks.html	Page no 1
Emission factor - volume basis	tCO_2/m^3 bricks	0.468	Calculated value	
Emission factor determined in the previous crediting period	tCO_2/m^3 bricks	0.3993[31]	-	

[31] Please note that the emission factor of the fire clay brick determined for the 2nd crediting period as per the latest available data is higher when compared with the emission factor determined in the previous (1st) crediting period. The project proponent has thus considered the emission factor determined for the previous (1st) crediting period for the 2nd crediting period. This is conservative and hence should be acceptable.

CO_2 emission factor considered for ER estimation	tCO_2/ MWh	1.3	https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf#page=11	Default emission factor for captive power plant as per option B.2 of TOOL05, Page no 11
T&D losses	%	20	https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf#page=15	Default T&D factor for scenario B of TOOL05, Page no 15
Transportation emission factor for light vehicles	gCO_2/t-km	245	https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-12-v1.pdf#page=4	Default emission factor as per TOOL12, Page no 4
Transportation emission factor for heavy vehicles	gCO_2/t-km	129		

Step 2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline

Update the current baseline emissions for the subsequent crediting period, without reassessing the baseline scenario, based on the latest approved version of the methodology applicable to the project activity. The procedure should be applied in the context of the sectoral policies and circumstances that are applicable at the time of request for renewal of the crediting period.

Step 2.2: Update the data and parameters

If the application of Step 1.4 showed that the data and/or parameter(s) that were only determined at the start of the crediting period and not monitored during the crediting period are not valid anymore, project participants should update all applicable data and parameters, following the guidance in Step 1.4.

As evident from the explanation above, the baseline scenario remains unchanged. However, the approach used to calculate the baseline emission factors, including the CO_2 emission factors for cement production, aluminium production, lime production, gypsum production, freight transportation as well as the Density and Weight of baseline bricks, emission factor for electricity and transmission & distribution losses has been updated based on the latest data available at the time of PD submission for renewal.

3.5 Additionality

3.5.1 Regulatory Surplus

Is the project located in an UNFCCC Annex 1 or Non-Annex 1 country?

☐ Annex 1 country ☒ Non-Annex 1 country

Are the project activities mandated by any law, statute, or other regulatory framework?

☐ Yes ☒ No

If the project is located inside a Non-Annex 1 country and the project activities are mandated by a law, statute, or other regulatory framework, are such laws, statutes, or regulatory frameworks systematically enforced?

☐ Yes ☐ No

3.5.2 Additionality Methods

The additionality of the project activity has been demonstrated in line with Guidelines on the demonstration of additionality of small-scale project activities, version 09.

As per the guidelines:

Project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

a) Investment barrier
b) Technological barrier
c) Barrier due to prevailing practice
d) Other barriers

The project proponent has used the “barrier due to prevailing practice” and “other barriers (market acceptability barrier)” to determine the most plausible baseline for the project activity.

Detailed analysis of the barriers being faced by the project activity has been undertaken as part of baseline determination under section 3.4 of the PD. The barriers being faced by the project

activity introduces several risks to the project, which are expected to be mitigated through the additional revenue from sale of verified emission reductions (VERs) generated by the VCS project activity.

Thus, in view of the above discussion, it can be concluded that the project activity is additional.

3.6 Methodology Deviations

Not applicable as no methodology deviations are applicable to this project activity.

4 QUANTIFICATION OF ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

As per section 3.4 of the VCS PD the baseline to the project activity is – Installation of similar capacity baked clay bricks manufacturing unit. The corresponding energy baseline has been calculated taking into account the different technologies with different levels of energy consumption associated with the baked clay brick production.

Baseline emissions are quantified in line with paragraph 21 of the methodology as follows:

$$BE_y = SEC_{BL} * EF_{BL} * P_{PJ,y}$$

Where:

BE_y	tCO_2e	The annual baseline emissions from fossil fuels or NRB displaced by the project activity in the year y
SEC_{BL}	Kg or m^3	Specific energy consumption of brick production in the baseline, TJ per unit volume or mass unit
EF_{BL}	tCO_2/m^3	The emission factor of baseline fuel(s), in t CO_2/TJ
$P_{PJ,y}$	m^3	The annual net production of the facility in year y

Since the project is being implemented at a Greenfield location, paragraph 23 of the methodology AMS-III.Z Version 06 (Fuel Switch, process improvement and energy efficiency in brick

manufacture) shall be used to determine baseline emission factor. The project activity uses paragraph 23 (c) to determine the baseline emission factor.

"The specific energy consumption (SEC_{BL}) and the emission factor of the baseline fuel(s) (EF_{BL}) for installation of systems in a new facility or for capacity addition in an existing system shall be determined using reference plant approach."

Using the reference plants approach, as detailed in paragraph 23 of the methodology AMS-III.Z Version 06 (Fuel Switch, process improvement and energy efficiency in brick manufacture), the baseline emission factor shall be calculated from emissions data of other brick manufacturing plant of capacity 360,000 m^3/yr and using the common practice technology. As established in section 3.4 of the PD, the common practice technology in this sector is red clay fired clay bricks, across all plant capacities in India. Publicly available documents released by independent party provides weighted average emission factor for brick manufacturing sector in India. The document calculates the average emission factor for the different technologies and fuel types (represented by $EF_{CO2,\ brick}$ in the Equation below).

For this project activity, the emission factor of 0.24 $kgCO_2/kg$ for baseline bricks has been directly sourced from the document and used. Though the study indicates a higher emission factor for fire clay produced in India, the lower value (0.24) has been selected conservatively.

The annual production specific baseline emission factor is thus estimated ex-ante as follows:

$EF_{BL} = (EF_{CO2,\ brick} / W_{brick}) * (D_{brick}/1000)$

Where:

EF_{BL}	tCO_2/m^3	The annual production specific emission factor for year y
$EF_{CO2,brick}$	$kgCO_2$/brick	CO_2 emission per baseline brick produced (as obtained from third party documents)
W_{brick}	Kg	Weight of each baseline brick produced
D_{brick}	kg/m^3	Density of each baseline brick produced

$EF_{CO2,brick}$	$kgCO_2/kg$	0.24[32]
D_{brick}	kg/m^3	1950[33]

EF_{BL} = 0.24[34] * (1950/1000) = 0.468 tCO_2/m^3

[32] https://pubs.acs.org/doi/10.1021/acs.est.4c08994

[33] http://aerconindia.com/aac-vs-bricks.html

[34] PP has chosen the CO_2 emission factor of fire clay bricks, including the weight of each brick, to calculate the specific emission factor for year y.

Particulars	Unit	Values
Blocks production annually ($P_{PJ,y}$)	m^3/yr	270000
Baseline emission factor (EF_{BL})	tCO_2/m^3	0.3993
Baseline emission (BE_y)	tCO_2/yr	107811

BE_y = 107,811 tCO_2e (for year 1)

4.2 Project Emissions

Project emissions have been calculated using paragraph 24 of the methodology AMS-III.Z Fuel Switch, process improvement and energy efficiency in brick manufacture (Version 06). Project emission sources relevant for this project are:

- Project emissions from electricity consumption within the project boundary
- Project emissions from coal consumption in the autoclave boiler for steam generation

Thus, the project emission can be represented using the following equation:

$$PE_y = PE_{elec,y} + PE_{fuel,y} + PE_{cultivation,y} + PE_{CH4,y}$$

Where:

PE_y	=	Project emissions in year y (t CO_2)
$PE_{elec,y}$	=	Project emissions due to electricity consumption in year y (t CO_2)
$PE_{fuel,y}$	=	Project emissions due to fossil fuel or NRB consumption in year y (t CO_2)
$PE_{cultivation,y}$	=	Project emissions from cultivation of biomass in a dedicated plantation in year y (t CO_2e)
$PE_{CH4,y}$	=	Project emissions due to the production of charcoal in kilns not equipped with a methane recovery and destruction facility in year y (t CO_2e)

Project emission from electricity consumption:

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

As per the tool, the tool is applicable if one out of the following three scenarios applies to the sources of electricity consumption:

- Scenario A: Electricity consumption from the grid
- Scenario B: Electricity consumption from (an) off grid fossil fuel fired captive power plant
- Scenario C: Electricity consumption from the grid and fossil fuel fired captive power plant.

As discussed earlier, the project, would consume electricity from the state electricity grid and diesel generator sets. Under scenario C of the tool, case C III would be applicable as the implementation of the project activity may affect both the quantity of electricity that is generated in captive diesel generator sets and quantity of electricity imported from grid. Electricity would be imported from the regional grid during the monitored period and the captive diesel generator set would operate intermittently during power failure of the grid or under emergency situations. As per the tool, for project activity which falls under case C III, the emission factor for electricity generated should be higher of the emission factors of electricity sources used (i.e. captive diesel generator set and the regional grid in this case). Emission factor for grid electricity is calculated using option A1 of the tool. The project plant is connected to the North East West North East (NEWNE) integrated grid (now Indian grid) of India and the combined margin emission factor of the Indian grid is 0.9124 tCO_2/MWh. Emission factor for captive diesel generator set is calculated using option B2 of the tool. The default emission factor of 1.3 tCO_2/MWh is used. The higher of the two emission factors is used for project emission calculation from electricity consumption. Thus, for project emission calculation from electricity consumption, the electricity supply source is being taken as the captive power plant, making scenario B applicable. Further, since scenario C III is applicable, the default transmission and distribution loss for project emission calculation of 20% has been used.

As per the baseline methodology procedure provided in the tool, project emissions from electricity consumption are calculated based on the quantity of electricity consumed, an emission factor for electricity generation and a factor to account for transmission losses as follows:

$$PE_{elec,y} = \sum EC_{PJ,j,y} * EF_{EL,j,y} * (1+TDL_{j,y})$$

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

Thus,

$$EF_{EL,j,y} = EF_{CPP,y}$$

Where:

$FE_{EL,j,y}$	tCO_2/MWh	Emission factor for electricity generation for source j in year y
$EF_{CPP,y}$	tCO_2/MWh	Emission factor for CPP in the year y

Project emission from Coal consumption:

Sources of fossil fuel consumption in the project activity include coal consumption in the autoclave boiler and diesel oil consumption in the diesel-based generators (DGs). Diesel consumption in DG sets is not required to be monitored as project emission due to diesel consumption would be conservatively accounted for, by considering the default project emission factor of: 1.3 tCO_2/MWh; for all sources of electricity supplied – both from grid and DG set.

Thus, fossil fuel (coal) consumption in the project activity boiler is the only source of project emissions from fossil fuel (coal) consumption that has been accounted using the "Tool to calculate project or leakage CO_2 emission from fossil fuel combustion".

Referring to, "Tool to calculate project or leakage CO_2 emission from fossil fuel combustion, version no. 3", the project emission from fossil fuel (coal) combustion in boilers has been calculated as follows:

As per the tool, CO_2 emission from fossil fuel (coal) combustion is calculated based on quantity of fuels combusted and the CO_2 emission co-efficient of these fuels.

The applicable equation is:

$$PE_{FC,j,y} = FC_{i,j,y} * COEF_{i,y}$$

Where:

$PE_{FC,j,y}$	tCO_2	Project emission due to fossil fuel (coal) consumption in the year y
$FC_{i,j,y}$	Kt	Quantity of fossil fuel (coal) type i combusted by the project activity equipment during the year y
$COEF_{i,y}$	tCO_2/kt	CO_2 emission coefficient of fuel type (coal) i in the year y

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 (coal) type i,
- Option B: Based on the net calorific value and the CO_2 emission factor of the fuel (coal) type i.

Option A should be the preferred approach, if the necessary data is available.

In absence of available data to implement option A, option B has been used to calculate the CO_2 emission co-efficient as follows:

$$COEF_{i,y} = NCV_{i,y} * EF_{co2,i,y}$$

Where:

$COEF_{i,y}$	tCO_2/kt	CO_2 emission coefficient of fuel type i in the year y
$NCV_{i,y}$	TJ/kt	Weighted average net calorific value of the fuel type i in the year y

$EF_{co2,i,y}$	tCO_2/TJ	Weighted average CO_2 emission factor of the fuel type i in the year y. The values have been fixed ex-ante as higher limit of the 95% uncertainty range as provided by IPCC 2006 Report.

$NCV_{i,y}$	TJ/kt	26[35]
$EF_{co2,i,y}$	tCO_2/TJ	100[36]

$COEF_{i,y}$ = 26 * 100 = 2600 tCO_2/kt

Project emission from Diesel consumption:

The fossil fuel (diesel) consumption in the project activity is the source of project emissions, which have been accounted for using the "Tool to calculate project or leakage CO_2 emission from fossil fuel combustion". Diesel is consumed by machinery and equipment used in the project activity, such as forklifts, JCBs, etc.

$NCV_{i,y}$	TJ/kt	43.3[37]
$EF_{co2,i,y}$	tCO_2/TJ	74.8[38]

$COEF_{i,y}$ = 43.3 * 74.8 = 3238.84 tCO_2/kt

The applicable equation is:

$PE_{Diesel,y} = DG_y * COEF_{Diesel,y} *$ Density of Diesel

Where:

$PE_{Diesel,y}$	tCO_2e/yr	Project emission due to Diesel consumption in the year y
DG_y	kt/ yr	Quantity of Diesel consumed by the project activity equipment during the year y
Density of Diesel	Kg/ litres	Density of Diesel

DG_y	kt/ yr	0.0312[39]
Density of Diesel	Kg/ litres	0.832[40]

[35] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf#page=18

[36] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf#page=23

[37] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf#page=18

[38] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf#page=23

[39] As per Plant records

[40] https://unfccc.int/files/national_reports/non-annex_i_natcom/cge/application/pdf/energy_ps_lesotho_2016.pdf

$PE_{Diesel,y}$ = 0.0312 * 3238.84* 0.832 = 83.97 tCO_2/yr

Project emission from Cultivation and CH_4:

Since the project does not involve any cultivation of biomass, production of charcoal in kilns, the $PE_{Cultivation,y}$ and $P_{CH4,y}$ is considered zero.

Project emission due to Coal consumption		
CO_2 emission factor for coal	tCO_2/kt	2600
Quantity of Coal combusted by the project activity equipment during the year (FCi,y)	kt/yr	7.48
Project emission from coal consumption	tCO_2/yr	19450.68

Project emission from electricity consumption		
Electricity consumption	MWh/yr	1753
Emission factor of electricity source	tCO_2/MWh	1.3
Transmission & Distribution losses	%	20
Project emission from electricity consumption	tCO_2/yr	2734.51

Project emission due to Diesel consumption		
CO_2 emission factor for diesel	tCO_2/kt	3238.84
Quantity of diesel consumed by the project activity equipment during the year (FCi,y)	kt/yr	0.0312
Project emission from diesel consumption	tCO_2/yr	83.97

PE_y = 22,287 tCO_2e (Round down value)

4.3 Leakage Emissions

Referring to paragraphs 29 and 30 of AMS-III.Z Fuel Switch, process improvement and energy efficiency in brick manufacture (Version 06), sources of leakage emission relevant to the project activity are as follows:

Sl. No.	Source of leakage emission as per AMS-III.Z Fuel Switch, process improvement and energy efficiency in brick manufacture (Version 06)	Relevant/ Not relevant to the project activity
1.	Leakage emissions on account of the diversion of biomass from other uses (competing uses) shall be calculated as per the "General guidance on leakage in biomass project activities".	Not relevant as the boilers in the project activity are operated by combustion of coal.

2.	In the case of project activities involving a change in the production process or a change in the type or quantity of raw and/or additive materials as compared to the baseline, the incremental emissions associated with the production/consumption and transport of those raw and/or additive materials consumed as compared to baseline, shall be calculated as leakage.	The project activity involves the use of fly-ash, cement, lime, gypsum and minor quantity of aluminium powder as raw materials. Whereas baked clay bricks (baseline) use clay from in and around project site. Thus, the project leads to transportation of the various raw materials to the project site. Further, since cement, lime etc. is used in the production of AAC blocks; emissions due to production of the same should also be accounted. The following leakage sources have been accounted in the project activity: (i) transportation associated with the procurement of fly ash, cement, lime, gypsum, aluminium powder and (ii) manufacturing process of cement, lime gypsum and aluminium powder (fly ash is a waste product and does not result in additional emissions from fly ash production) While the transportation related emission will be computed mainly on the basis of monitored parameters, the production related emissions will be determined by monitoring the amount of raw materials being consumed and multiplying the monitored value by the default GHG emission factors (fixed ex-ante) for production of these raw materials.

The applicable equations are:

$$LE_y = LE_{rm,prod,y} + LE_{rm,trans,y}$$

Where:

LE_y	tCO_2	Leakage emission from raw material production and transportation in the year y

$LE_{rm,prod,y}$	tCO_2	Leakage emission from raw material production in the year y
$LE_{rm,trans,y}$	tCO_2	Leakage emission from raw material transportation in the year y

Leakage emissions due to raw material production:

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

Where:

$LE_{rm,prod,y}$	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

Leakage emission due to raw material transportation:

Leakage emission from raw material transportation has been calculated in line with the guidelines provided in the Tool to calculate "project and leakage emissions from transportation of freight" version 01.1.0.

Vehicle class used for transportation will be monitored for ex-post calculation of leakage emissions and for ex-ante estimation of leakage emissions, light vehicles with GVM of less than or equal to 26 tonnes has been used.

Option B, the conservative default value has been used to calculate leakage emission from raw material transportation. The following information, as required by the tool, has been documented:

Requirement of the tool	Project specific scenario

The origin and destination of the freight (to the extent that this is known at validation);	The origin and the destination of freight transportation for different raw materials are as follows: Cement: Will be transported from Surat, Gujarat to the project site (approximate roundtrip distance: 139 km) Fly ash: Will be transported from Dahanu, Maharashtra to the project site (approximate roundtrip distance: 43 km) Lime: will be transported from Jodhpur, Rajasthan to the project site (approximate roundtrip distance: 980 km) Gypsum: will be transported from Morbi, Gujarat to the project site (approximate roundtrip distance: 603 km) Aluminium powder: Will be transported from Nagpur, Maharashtra to the project site (approximate roundtrip distance: 894 km) For ex-ante estimation, the origins have been taken from actual purchase invoices. For ex-post calculation, the distance travelled will be calculated based on the monitored origin and destination.
The type(s) of freight that are planned to be transported;	The following raw materials will be transported for the project: • Cement • Fly ash • Lime • Gypsum • Aluminium powder
The planned number of trips made and/or the planned quantity of freight that should be transported; and	The quantity of freight transported will be monitored ex-post. For ex-ante estimation the calculated consumption quantity of raw material consumption, has been taken as the quantity of freight transported.
The option selected (A or B) to determine emissions.	Option B i.e. the conservative default value of baseline emission factor will be used for emission calculation throughout the fixed crediting period of 10 years.

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

Where,

$LE_{rm,trans,y}$	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

Leakage emission due to cement consumption		
Specific cement consumption	kg/m^3	107.56
Annual cement consumption	kt/yr	29.04
Emission factor of cement production	tCO_2/tonne cement	0.576
CO_2 emission during manufacture of cement consumed	tCO_2/yr	16728.19

Leakage emission due to fly ash consumption		
Specific fly ash consumption	kg/m^3	549.70
Annual fly ash consumption	kt/yr	148.42
Emission factor of fly ash production	tCO_2/tonne	0
CO_2 emission during manufacture of fly ash consumed	tCO_2/yr	0

Leakage emission due to lime consumption		
Specific lime consumption	kg/m^3	40.64
Annual lime consumption	kt/yr	10.97
Emission factor of lime production	tCO_2/tonne lime	0.75
CO_2 emission during manufacture of lime consumed	tCO_2/yr	8230.50

Leakage emission due to aluminium consumption		
Specific aluminium powder consumption	kg/cum	0.433
Annual aluminium powder consumption	kt/yr	0.117
Emission factor of aluminium production	tCO_2/tonne aluminium	1.7
CO_2 emission during manufacture of aluminium consumed	tCO_2/yr	198.9

Leakage emission due to gypsum consumption		
Specific gypsum consumption	kg/cum	3.51
Annual gypsum consumption	kt/yr	0.947
Emission factor of gypsum production	tCO_2/tonne aluminium	0.01
CO_2 emission during manufacture of gypsum consumed	tCO_2/yr	9.47

Leakage emission due to raw material transportation		
Quantity of cement consumed	tonne	29042
Quantity of fly ash consumed	tonne	148418
Quantity of lime consumed	tonne	10974
Quantity of aluminium powder consumed	tonne	117
Quantity of gypsum consumed	tonne	947
Average roundtrip distance for cement transportation	km/trip	139
Average roundtrip distance for fly ash transportation	km/trip	43
Average roundtrip distance for lime transportation	km/trip	980
Average roundtrip distance for aluminium powder transportation	km/trip	894
Average roundtrip distance for gypsum transportation	km/trip	603
Transportation emission factor	gCO_2/t-km	245
Co_2 emission during transportation	tCO_2/TJ	5412.17
Total leakage CO_2 emission due to raw material transportation	tCO_2/yr	5412.17

LE_y = 30,604 tCO_2e (Round down value)

4.4 Estimated GHG Emission Reductions and Carbon Dioxide Removals

Vintage period	Estimated baseline emissions (tCO_2e)	Estimated project emissions (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated reduction VCUs (tCO_2e)	Estimated removal VCUs (tCO_2e)	Estimated total VCUs (tCO_2e)
25-Nov-2022 to 31-Dec-2022	107,929	2,257	3,100	5,572	0	5,572

01-Jan-2023 to 31-Dec-2023	107,811	22,269	30,579	54,963	0	54,963
01-Jan-2024 to 31-Dec-2024	108,106	22,330	30,663	55,113	0	55,113
01-Jan-2025 to 31-Dec-2025	107,811	22,269	30,579	54,963	0	54,963
01-Jan-2026 to 31-Dec-2026	107,811	22,269	30,579	54,963	0	54,963
01-Jan-2027 to 31-Dec-2027	107,811	22,269	30,579	54,963	0	54,963
01-Jan-2028 to 31-Dec-2028	108,106	22,330	30,663	55,113	0	55,113
01-Jan-2029 to 31-Dec-2029	107,811	22,269	30,579	54,963	0	54,963
01-Jan-2030 to 31-Dec-2030	107,811	22,269	30,579	54,963	0	54,963
01-Jan-2031 to 31-Dec-2031	107,811	22,269	30,579	54,963	0	54,963
01-Jan-2032 to 24-Nov-2032	97,178	20,073	27,563	49,542	0	49,542
Total	**1,078,996**	**222,875**	**306,044**	**550,078**	**0**	**550,078**

5 MONITORING

5.1 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. "Study on Greenhouse Gas Emissions and Decarbonization Potential of Global Fired Clay Brick Production" dated 23rd January 2025[41] 2. Aercon India report on "Comparison between AAC BLOCKS VS. CLAY BRICKS"[42]
Value applied	0.468
Justification of choice of data or description of measurement methods and procedures applied	The value is a calculated value. It has been derived based on CO_2 emission factor of Fire clay brick data taken from "Study on Greenhouse Gas Emissions and Decarbonization Potential of Global Fired Clay Brick Production" dated 23rd January 2025, and density of each brick from Aercon India report on "Comparison between AAC BLOCKS VS. CLAY BRICKS. Values used are such that conservativeness of baseline emission factor is ensured.
Purpose of data	This value has been used to baseline emissions
Comments	-

Data / Parameter	$COEF_{cement}$
Data unit	tCO_2e/ tonne
Description	CO_2 emission factor of cement production
Source of data	AEEE Report of 2021 Emission Reduction Approaches for the Cement Industry[43].
Value applied	0.576
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.

[41] https://pubs.acs.org/doi/10.1021/acs.est.4c08994

[42] http://aerconindia.com/aac-vs-bricks.html

[43] https://aeee.in/emission-reduction-approaches-for-the-cement-industry/

Purpose of data	Leakage emissions calculation
Comments	-

Data / Parameter	$COEF_{aluminium}$
Data unit	tCO_2/ tonne
Description	CO_2 emission factor of aluminium production
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories Inventories46 (Vol.3, Ch. 4, Pg. No. 4.47, Table 10)
Value applied	1.7
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. There is no update of the EF in the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2[44].
Purpose of data	Leakage emissions calculation
Comments	-

Data / Parameter	$COEF_{lime}$
Data unit	tCO_2/ tonne
Description	CO_2 emission factor of lime production
Source of data	IPCC Guidelines 2006 for NGGI (Vol 3 Ch 2 Eqn 2.8), Page no 22
Value applied	0.75
Justification of choice of data or description of measurement methods and procedures applied	IPCC 2006 data is an authentic source of data. There is no update of the EF in the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2[45].
Purpose of data	Leakage emissions calculation
Comments	This value is fixed ex-ante

[44] https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/2_Volume2/19R_V2_1_Ch01_Introduction.pdf

[45] https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/2_Volume2/19R_V2_1_Ch01_Introduction.pdf

Data / Parameter	$COEF_{gypsum}$
Data unit	tCO_2/ tonne
Description	CO_2 emission factor of gypsum production
Source of data	Methodology for free allocation of emission allowances in the EU ETS post 2012[46], Page no 85
Value applied	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 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 transportation of freight" version 01.1.0[47]
Value applied	Light vehicles – 245 Heavy vehicles – 129
Justification of choice of data or description of measurement methods and procedures applied	This is a default data as provided by UNFCCC and is an authentic source of data. For the execution of the project activity, heavy vehicles such as trucks and trailers are used for the transportation of all raw materials to the project site.
Purpose of data	Leakage emissions calculation
Comments	The values are default values as provided by UNFCCC tool.

[46] https://climate.ec.europa.eu/system/files/2016-11/bm_study-project_approach_and_general_issues_en.pdf#page=85

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

Data / Parameter	D_{brick}
Data unit	Kg/m^3
Description	Density of each baseline brick produced
Source of data	Aercon India report on "Comparison between AAC BLOCKS VS. CLAY BRICKS[48], Page no 1
Value applied	1950
Justification of choice of data or description of measurement methods and procedures applied	This data has been taken from public domain.
Purpose of data	Baseline emissions calculation
Comments	-

Data / Parameter	$EF_{CO2,brick}$
Data unit	$kgCO_2/kg$
Description	CO_2 emission factor of Fire clay brick produced
Source of data	"Study on Greenhouse Gas Emissions and Decarbonization Potential of Global Fired Clay Brick Production" dated 23rd January 2025[49]
Value applied	0.24
Justification of choice of data or description of measurement methods and procedures applied	For this project activity, the emission factor of 0.24 $kgCO_2/kg$ for baseline bricks has been directly sourced from the document and used. Though the study indicates a higher emission factor for fire clay produced in India, the lower value (0.24) has been selected conservatively
Purpose of data	Baseline emissions calculation
Comments	-

[48] http://aerconindia.com/aac-vs-bricks.html

[49] https://pubs.acs.org/doi/10.1021/acs.est.4c08994

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	Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation, version no. 03
Value applied	1.3
Justification of choice of data or description of measurement methods and procedures applied	Default emission factor for captive power plant as per option B.2 of TOOL05, "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", version 03, Page no 11
Purpose of data	Project emissions calculation
Comments	Emission factor for CPP is taken as the default emission factor for project emission source as provided under option B.2 of the tool.

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 "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", version 03[50], Page no 15.
Value applied	20
Justification of choice of data or description of measurement methods and procedures applied	Project emissions calculation
Purpose of 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

[50] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf

	calculate baseline, project or leakage emission from electricity consumption", which is an authentic source.
Comments	-

5.2 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 applied	Dry compressive strength of the project block would be tested in nationally approved laboratory. Compressive strength test would be carried in line with IS code: 6441 Part V.
Frequency of monitoring/recording	Monitoring frequency: Once in every 6 months Recording frequency: Once in every 6 months
Value applied:	3.75
Monitoring equipment	Compressive strength was carried out in external laboratory.
QA/QC procedures applied	The laboratory would comply with relevant national standards.
Purpose of 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 applied	Density of the project block would be tested and nationally approved laboratory. Density determination would be carried in line with IS code: 6441 Part I.
Frequency of monitoring/recording	Monitoring frequency: Once in every 6 months Recording frequency: Once in every 6 months
Value applied:	551 – 650
Monitoring equipment	This test would be carried out at the laboratory (at MIL premises).
QA/QC procedures applied	The laboratory would comply with relevant national standards.
Purpose of data	Baseline emissions
Calculation method	Not Applicable. This is a measured data.
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 applied	Number of standard sized cakes being manufactured is being monitored manually. Number of cakes manufactured can be converted to volume units using the standard volume for each cake.
Frequency of monitoring/recording	Monitoring frequency: Continuously Recording frequency: Daily
Value applied:	360,000
Monitoring equipment	Number of blocks produced is manually counted.
QA/QC procedures applied	Blocks selling data and blocks stocks data can be used for verification of figures.
Purpose of data	Baseline Emissions
Calculation method	Production = (Number of cakes) x (standard volume per cake)
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	$FC_{coal,y}$
Data unit	kT
Description	Quantity of coal combusted by the project activity boiler during the year y
Source of data	Plant records – Boiler room log book
Description of measurement methods and procedures applied	Quantity of coal consumed by the project activity boiler is a monitored source of data
Frequency of monitoring/recording	Monitoring frequency: Daily

	Recording frequency: Daily
Value applied:	-
Monitoring equipment	Equipment: Weigh bridge Manufacturer: Endeavour industries Pvt Ltd. Serial #: 09201718 Accuracy class: III
QA/QC procedures applied	Coal stock records can be used. Quantity of coal purchased and coal inventory can be verified for the purpose. This is to be noted that since the value of raw material consumed for the whole production capacity of the plant (with the increased capacity of 360,000 m^3/year) shall be recorded, to arrive at the value for the original capacity, following calculation shall be applied. Raw material consumed corresponding to the original capacity (300,000 m^3/year) = Total raw material consumed/Increased capacity (360,000 m^3) x original capacity (300,000 m^3)
Purpose of data	Project Emissions
Calculation method	Coal stock records can be used. Quantity of coal purchased and coal inventory can be verified for the purpose. 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	$NCV_{i,y}$
Data unit	TJ/kt
Description	Weighted average net calorific value of coal and diesel in the year y

Source of data	IPCC 2006 Vol 2 Chapter 1[51]
Description of measurement methods and procedures applied	Higher value of the uncertainty range of IPCC default values as provided in Table 1.2 Vol 2 of the 2006 IPCC Guidelines. There is no update of the NCV in the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2[52].
Frequency of monitoring/recording	Monitoring frequency: Every update of IPCC Recording frequency: Annually
Value applied:	Coal- 26 Diesel- 43.3
Monitoring equipment	The value is taken from IPCC's publicly available report
QA/QC procedures applied	IPCC data is an authentic source.
Purpose of 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	$EF_{i,y}$
Data unit	tCO_2e/TJ
Description	Weighted average CO_2 emission factor of coal and diesel in the year y
Source of data	Table 1.4 Vol 2 of the 2006 IPCC Guidelines[53]
Description of measurement methods and procedures applied	Higher value of the uncertainty range of IPCC default values as provided in Table 1.4 Vol 2 of the 2006 IPCC Guidelines. There is no update of the NCV in the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2[54].

[51] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf#page=18

[52] https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/2_Volume2/19R_V2_1_Ch01_Introduction.pdf

[53] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf#page=23

[54] https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/2_Volume2/19R_V2_1_Ch01_Introduction.pdf

Frequency of monitoring/recording	Monitoring frequency: Every update of IPCC Recording frequency: Annually
Value applied:	Coal- 100 Diesel- 74.8
Monitoring equipment	The value is taken from IPCC's publicly available report
QA/QC procedures applied	IPCC data is an authentic source
Purpose of 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 plant in year y
Source of data	Plant records – Electricity consumption logbook
Description of measurement methods and procedures applied	Separate electricity meter would be installed for monitoring of electricity imported from state grid and electricity generated by captive diesel generator sets. Electricity consumption of the plant would be calculated as summation of the electricity imports from state grid and electricity generated by captive diesel generator sets.
Frequency of monitoring/recording	Monitoring frequency: Continuously Recording frequency: Daily
Value applied:	-
Monitoring equipment	Equipment: Energy Meter or Electricity Consumption Meter (main power supply) Manufacturer: L& T-Electronic trivector ER-300 P Serial #: 11490797 Accuracy class: 0.55 for Active, 1.05 for Reactive

QA/QC procedures applied	The electricity meters would be calibrated at least once in a year by internal/external agency. The electricity consumption data from grid can be cross verified from electricity purchase invoice
Purpose of data	Project Emissions
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 in the year y
Source of data	Plant records – purchase book
Description of measurement methods and procedures applied	Weigh bridge installed at plant
Frequency of monitoring/recording	Monitoring frequency: Every purchase of raw material Recording frequency: Monthly
Value applied:	-
Monitoring equipment	Equipment: Weighbridge Manufacturer: Endeavour industries Pvt. Ltd. Serial #: 09201718 Accuracy class: III
QA/QC procedures applied	Weigh bridge would be calibrated at least annually by internal/external agency. Purchase data can be cross verified with raw material purchase invoice is a 3rd party data. This is to be noted that since the value for the whole production capacity of the plant (with the increased capacity of 360,000 m^3/year) shall be recorded, to arrive at the value for the original capacity, following calculation shall be applied. Production corresponding the original capacity (300,000 m^3/year) = Annual PLF of the entire capacity (360,000 m^3/year) x original capacity (300,000 m^3).

Purpose of data	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	$RMC_{cement,y}$
Data unit	Kt
Description	Quantity of cement consumed for producing AAC blocks in the year y
Source of data	Plant records
Description of measurement methods and procedures applied	Load cell installed at cement batcher inlet
Frequency of monitoring/recording	Monitoring frequency: Batch wise Recording frequency: Daily
Value applied:	-
Monitoring equipment	Equipment: Load cell Manufacturer: Endeavour Serial #: 09201718 Accuracy class: III
QA/QC procedures applied	The load cell would be calibrated at least annually. Cement purchase invoices and cement stocks data can be used for verification of figures. This is to be noted that since the value of raw material consumed for the whole production capacity of the plant (with the increased capacity of 360,000 m^3/year) shall be recorded, to arrive at the value for the original capacity, following calculation shall be applied. Raw material consumed corresponding to the original capacity (300,000 m^3/year) = Total raw material consumed/Increased capacity (360,000 m^3) x original capacity (300,000 m^3)

Purpose of data	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	$RMP_{fly\ ash,y}$
Data unit	Kt
Description	Quantity of fly ash purchased for producing AAC blocks in the year y
Source of data	Plant records – purchase book
Description of measurement methods and procedures applied	Weigh bridge installed at plant
Frequency of monitoring/recording	Monitoring frequency: Every purchase of raw material Recording frequency: Monthly
Value applied:	-
Monitoring equipment	Equipment: Weighbridge Manufacturer: Endeavour industries Pvt. Ltd. Serial #: 09201718 Accuracy class: III
QA/QC procedures applied	Weigh bridge would be calibrated at least annually by internal/external agency. Purchase data can be cross verified with raw material purchase invoice is a 3rd party data. This is to be noted that since the value for the whole production capacity of the plant (with the increased capacity of 360,000 m^3/year) shall be recorded, to arrive at the value for the original capacity, following calculation shall be applied. Production corresponding the original capacity (300,000 m^3/year) = Annual PLF of the entire capacity (360,000 m^3/year) x original capacity (300,000 m^3).
Purpose of data	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	$RMC_{fly\ ash,y}$
Data unit	Kt
Description	Quantity of fly ash consumed for producing AAC blocks in the year y
Source of data	Plant records – purchase book
Description of measurement methods and procedures applied	Load cell installed at fly ash batcher inlet
Frequency of monitoring/recording	Monitoring frequency: Batch wise Recording frequency: Daily
Value applied:	-
Monitoring equipment	Equipment: Load cell Manufacturer: Endeavour Serial #: 09201718 Accuracy class: III
QA/QC procedures applied	The load cell would be calibrated at least annually. Fly ash purchase invoices and fly ash stocks data can be used for verification of figures. This is to be noted that since the value of raw material consumed for the whole production capacity of the plant (with the increased capacity of 360,000 m^3/year) shall be recorded, to arrive at the value for the original capacity, following calculation shall be applied. Raw material consumed corresponding to the original capacity (300,000 m^3/year) = Total raw material consumed/Increased capacity (360,000 m^3) x original capacity (300,000 m^3)
Purpose of data	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	$RMP_{Lime,y}$
Data unit	Kt
Description	Quantity of lime purchased for producing AAC blocks in the year y
Source of data	Plant records – purchase book
Description of measurement methods and procedures applied	Weigh bridge installed at plant
Frequency of monitoring/recording	Monitoring frequency: Every purchase of raw material Recording frequency: Monthly
Value applied:	-
Monitoring equipment	Equipment: Weighbridge Manufacturer: Endeavour industries Pvt. Ltd. Serial #: 09201718 Accuracy class: III
QA/QC procedures applied	Weigh bridge would be calibrated at least annually by internal/external agency. Purchase data can be cross verified with raw material purchase invoice is a 3rd party data. This is to be noted that since the value for the whole production capacity of the plant (with the increased capacity of 360,000 m^3/year) shall be recorded, to arrive at the value for the original capacity, following calculation shall be applied. Production corresponding the original capacity (300,000 m^3/year) = Annual PLF of the entire capacity (360,000 m^3/year) x original capacity (300,000 m^3).
Purpose of data	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	$RMC_{Lime,y}$
Data unit	Kt
Description	Quantity of lime consumed for producing AAC blocks in the year y
Source of data	Plant records – purchase book
Description of measurement methods and procedures applied	Weighbridge installed at lime batcher inlet
Frequency of monitoring/recording	Monitoring frequency: Batch wise Recording frequency: Daily
Value applied:	-
Monitoring equipment	Equipment: Weigh Bridge Manufacturer: Endeavour Serial #: 09201718 Accuracy class: III
QA/QC procedures applied	The Weighbridge would be calibrated at least annually. Lime purchase invoices and lime stocks data can be used for verification of figures. This is to be noted that since the value of raw material consumed for the whole production capacity of the plant (with the increased capacity of 360,000 m^3/year) shall be recorded, to arrive at the value for the original capacity, following calculation shall be applied. Raw material consumed corresponding to the original capacity (300,000 m^3/year) = Total raw material consumed/Increased capacity (360,000 m^3) x original capacity (300,000 m^3)
Purpose of data	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	$RMP_{gypsum,y}$
Data unit	Kt
Description	Quantity of gypsum purchased for producing AAC blocks in the year y
Source of data	Plant records – purchase book
Description of measurement methods and procedures applied	Weigh bridge installed at plant
Frequency of monitoring/recording	Monitoring frequency: Every purchase of raw material Recording frequency: Monthly
Value applied:	
Monitoring equipment	Equipment: Weighbridge Manufacturer: Endeavour industries Pvt. Ltd. Serial #: 09201718 Accuracy class: III
QA/QC procedures applied	The Weighbridge would be calibrated at least annually Lime purchase invoices and lime stocks data can be used for verification of figures. This is to be noted that since the value for the whole production capacity of the plant (with the increased capacity of 360,000 m^3/year) shall be recorded, to arrive at the value for the original capacity, following calculation shall be applied. Production corresponding the original capacity (300,000 m^3/year) = Annual PLF of the entire capacity (360,000 m^3/year) x original capacity (300,000 m^3).
Purpose of data	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	$RMC_{gypsum,y}$
Data unit	Kt

Description	Quantity of gypsum consumed for producing AAC blocks in the year y
Source of data	Plant records – purchase book
Description of measurement methods and procedures applied	Load cell installed at lime batcher inlet
Frequency of monitoring/recording	Monitoring frequency: Every purchase of raw material Recording frequency: Monthly
Value applied:	-
Monitoring equipment	Equipment: Load cell Manufacturer: Endeavour Serial #: 09201718 Accuracy class: III
QA/QC procedures applied	The Weighbridge would be calibrated at least annually. Gypsum purchase invoices and gypsum stocks data can be used for verification of figures. This is to be noted that since the value of raw material consumed for the whole production capacity of the plant (with the increased capacity of 360,000 m^3/year) shall be recorded, to arrive at the value for the original capacity, following calculation shall be applied. Raw material consumed corresponding to the original capacity (300,000 m^3/year) = Total raw material consumed/Increased capacity (360,000 m^3) x original capacity (300,000 m^3)
Purpose of data	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	$RMP_{aluminium,y}$
Data unit	Kt

Description	Quantity of aluminium powder purchased for producing AAC blocks in the year y
Source of data	Plant records – purchase book
Description of measurement methods and procedures applied	Weigh bridge installed at plant
Frequency of monitoring/recording	Monitoring frequency: Every purchase of raw material Recording frequency: Monthly
Value applied:	-
Monitoring equipment	Equipment: Weighbridge Manufacturer: Endeavour industries Pvt. Ltd. Serial #: 09201718 Accuracy class: III
QA/QC procedures applied	Weigh bridge would be calibrated at least annually by internal/external agency. Purchase data can be cross verified with raw material purchase invoice is a 3rd party data. This is to be noted that since the value for the whole production capacity of the plant (with the increased capacity of 360,000 m^3/year) shall be recorded, to arrive at the value for the original capacity, following calculation shall be applied. Production corresponding the original capacity (300,000 m^3/year) = Annual PLF of the entire capacity (360,000 m^3/year) x original capacity (300,000 m^3).
Purpose of data	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	$RMC_{aluminium,y}$
Data unit	Kt
Description	Quantity of aluminium powder consumed for producing AAC blocks in the year y

Source of data	Plant records – purchase book
Description of measurement methods and procedures applied	Load cell installed at lime batcher inlet
Frequency of monitoring/recording	Monitoring frequency: Every purchase of raw material Recording frequency: Monthly
Value applied:	-
Monitoring equipment	Equipment: Load Cell Manufacturer: Endeavour Serial #: 09201718 Accuracy class: III
QA/QC procedures applied	The load cell would be calibrated at least annually. Aluminium powder purchase invoices and aluminium powder stocks data can be used for verification of figures. This is to be noted that since the value of raw material consumed for the whole production capacity of the plant (with the increased capacity of 360,000 m^3/year) shall be recorded, to arrive at the value for the original capacity, following calculation shall be applied. Raw material consumed corresponding to the original capacity (300,000 m^3/year) = Total raw material consumed/Increased capacity (360,000 m^3) x original capacity (300,000 m^3)
Purpose of data	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	$D_{f,y}$
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 applied	Determined once ex-ante for each freight transportation activity f for a reference trip (actual purchase invoices) and using online map sources.
Frequency of monitoring/recording	Monitoring frequency: Whenever Road trip distance changes Recording frequency: Whenever Road trip distance changes
Value applied:	Following values have been applied Fly ash: 43 Cement: 139 Lime: 980 Gypsum: 603 Aluminium powder: 894
Monitoring equipment	Purchase invoices and online maps are 3rd party applications
QA/QC procedures applied	The data is a 3rd party data.
Purpose of data	Project 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	$FR_{f,m}$
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 applied	Raw material purchase and consumption will be monitored by type
Frequency of monitoring/recording	Monitoring frequency: Continuously Recording frequency: Monthly
Value applied:	-

Monitoring equipment	Purchase invoices are 3rd party documents
QA/QC procedures applied	The data is a 3rd party data.
Purpose of 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	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 applied	Vehicle type (light/heavy) used for raw material transportation will be 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 applied:	-
Monitoring equipment	Way bill and UNFCCC guidelines[55] are 3rd party sources of data
QA/QC procedures applied	The data is a 3rd party data. The value can be further confirmed with the weigh bridge slip generated for raw materials inward quantity.
Purpose of data	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.

[55] 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

Data / Parameter	$D_{G,y}$
Data unit	Litre
Description	Quantity of Diesel consumed in the plant in the year y
Source of data	Consumption Records
Description of measurement methods and procedures applied	Quantities of diesel consumed are monitored based on diesel consumed and filled in the DG set
Frequency of monitoring/recording	Monitoring frequency: Batch wise Recording frequency: Monthly
Value applied:	-
Monitoring equipment	Measuring can / Drums are used to fill diesel
QA/QC procedures applied	Purchase invoices have also been used to cross verify the total diesel purchase from 3rd party data.
Purpose of data	Project Emissions
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.

5.3 Monitoring Plan

The monitoring plan would involve 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 auditors to submit monitored data to VCS Board.

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		✓	✓	✓
5	Ensuring calibration of monitoring instruments		✓	✓	✓
6	Data archiving: ensuring adequate storage of data			✓	✓

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

All data would be collected in paper log books and/or online data collection system and would be converted to spreadsheet form on an annual basis.

The quality of data would be ensured by periodic verification of data by VCS monitoring project manager. All 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.

APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION

No commercially sensitive information has been provided in the PD.

Section	Information	Justification