# PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

**Title: AAC block project by Starbigbloc Building Material Limited**

Version 1.2

Date 16/05/2025

First CoU Issuance Period: 06 years 10 months 12 days

Date: 20/02/2018 to 31/12/2024

| | |
|---|---|
| | Project Concept Note (PCN)<br>CARBON OFFSET UNIT (CoU) PROJECT |

| BASIC INFORMATION | |
|---|---|
| Title of the project activity | **AAC block project by Starbigbloc Building Material Limited** |
| Scale of the project activity | **Small Scale** |
| Completion date of the PCN | **16/05/2025** |
| Project participants | **Starbigbloc Building Material Limited (Project Owner)**<br>**Climate Detox Private Limited (Project Aggregator)** |
| Host Party | **India** |
| Applied methodologies and standardized baselines | **Applied Baseline Methodology: AMS-III.Z.: "Fuel Switch, process improvement and energy efficiency in brick manufacture", Version 06.0** |
| Sectoral scopes | **04 Manufacturing industries** |
| Estimated amount of total GHG emission reductions | **241703 $tCO_2e$** |

**SECTION A. Description of project activity**

## A.1. Purpose and general description of Carbon offset Unit (CoU) project activity >>

The **AAC block project by Starbigbloc Building Material Limited** is located in **Village Savli, Kheda District, Gujarat, India**.

The project aims to manufacture Autoclaved Aerated Concrete (AAC) blocks, a sustainable alternative to traditional red clay bricks. These blocks are produced using fly ash/sand, cement, lime, aluminium powder, and water, undergoing a chemical reaction and high-pressure steam curing (autoclaving), resulting in lightweight, durable building material with excellent insulation properties.

**Purpose of the project activity:**

The main objective of the project is to reduce greenhouse gas emissions by displacing carbon-intensive red clay bricks with energy-efficient and eco-friendly AAC blocks. This shift leads to:
- Avoidance of emissions associated with coal combustion in brick kilns.
- Conservation of topsoil used in traditional brick manufacturing.
- Utilization of industrial by-products (fly ash), reducing waste.

The plant is owned by Starbigbloc Building Material Limited, a wholly owned subsidiary of Bigbloc Construction Ltd., one of India's leading AAC block manufacturers with over 13 years of experience. The facility is state-of-the-art, using modern equipment and fully automated processes to ensure quality, efficiency, and compliance with green building norms.

The installed capacity is approximately 2,50,000 cubic meters per annum of AAC blocks which includes sand based AAC . These blocks are marketed under the "NXTBloc" brand and serve a range of infrastructure sectors including residential, commercial, and industrial projects.

The project not only contributes to climate action by reducing emissions but also supports the circular economy by using fly ash—a waste product from thermal power plants—as a primary raw material. This aligns with sustainable development and ESG (Environmental, Social, and Governance) principles, particularly in resource efficiency, emission reduction, and responsible production.

**Transition from Traditional Masonry Systems**

Prior to the implementation of AAC technology, construction projects predominantly used **red clay bricks** or **concrete blocks**, laid manually in a repetitive masonry process:

- **Brick/Block Placement**: Units were arranged using **trowels** and bonded with **cement mortar**, requiring significant labor.
- **Mortar Mixing**: Carried out using **mortar mixers**, consuming additional energy and materials.
- **Scaffolding Systems**: Temporary structures were erected to facilitate manual laying of bricks at height.

These **conventional systems were labor- and energy-intensive**, heavily dependent on fossil fuels for the production of red bricks in kiln-fired units. The environmental burden was considerable—mainly from:

- **Coal combustion** in kilns.
- **Topsoil degradation** for clay extraction.

- **GHG emissions** from sintering processes.

**Innovation and Modernization through AAC**

The **AAC block technology adopted by Starbigbloc** offers a significant leap forward:

- **Production Process**: Fly ash/sand, lime, cement, gypsum, aluminum powder, and water are mixed and poured into molds. The slurry undergoes chemical aeration, is pre-cured, cut by wire, and steam-cured in autoclaves at ~180–200°C under pressure.
- **Lightweight Structure**: Reduces structural load and simplifies handling.
- **Thermal and Sound Insulation**: Improves energy efficiency and occupant comfort.
- **No Sintering Required**: Avoids fossil fuel combustion entirely in the forming process.

The result is a **reduction of approximately 241703 $tCO_2e$ emission,** based on the displacement of energy-intensive red brick usage.

## A.2 Do no harm or Impact test of the project activity>>

The AAC block project by Starbigbloc Building Material Limited provides substantial social, environmental, economic, and technological benefits that support sustainable development and ensures no harm is caused to local communities or ecosystems. The project has undergone an internal impact assessment, demonstrating positive outcomes across the following dimensions:

**Social benefits:**

- **Employment Generation**: The project creates both direct and indirect job opportunities for skilled and unskilled workers in the Kheda district, especially benefitting the rural community of Savli village.
- **Skill Development**: Local labour is trained in advanced, automated AAC production systems, contributing to long-term employability.
- **Health and Safety**: Unlike conventional brick kilns that emit harmful particulates, the AAC process eliminates combustion-related exposure, resulting in cleaner air and improved worker and community health.

**Environmental benefits:**

- **Emission Reduction:** The project avoids GHG emissions from coal-fired brick kilns by using an autoclaving process powered by lower-energy inputs.
- **Resource Conservation:** Utilizes fly ash—a hazardous industrial waste—as a primary input, reducing environmental burden and conserving natural topsoil.
- **Pollution Control:** No air emissions or sintering processes are involved, leading to lower particulate pollution and minimal solid waste generation.

**Economic benefits:**

- **Cost-Efficient Construction:** AAC blocks are lightweight and offer better thermal insulation, reducing energy costs and structural load in buildings.
- **Local Economic Boost:** The project supports regional supply chains and industrial symbiosis by sourcing fly ash from nearby thermal plants.

| **SDG Goal** | **Goal Description** | **Project Contribution** |
|---|---|---|
| **SDG 9**   | Industry, Innovation and Infrastructure | The project promotes modern, energy-efficient infrastructure and introduces innovative green manufacturing practices in the construction sector. |

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|---|---|---|
| **SDG 11**   | Sustainable Cities and Communities | By producing eco-friendly building materials, the project supports green construction and sustainable urban development. |
| **SDG 12**   | Responsible Consumption and Production | Uses fly ash, an industrial waste, as a raw material, promoting circular economy and reducing landfill burden. |
| **SDG 13**   | Climate Action | Replaces high-emission clay brick production with a low-carbon process, resulting in substantial GHG emission reductions. |

## A.3. Location of project activity >>

Country: India
District: Kheda
Village: Savli
State: Gujarat
Code: 387620
Coordinates: 22.95718, 73.10937


Google Location: [STARBIGBLOC BUILDING MATERIAL LIMITED]

## A.4. Technologies/measures >>

Autoclaved Aerated Concrete (AAC) Block is an innovative and lightweight building material crafted from a blend of **cement, fly ash or sand, lime, water, gypsum, and aluminium powder**. Through a unique combination of **chemical aeration, steam curing under high pressure, and accurate cutting techniques**, the final product consists of porous, thermally insulating blocks suitable for various types of construction.

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:

| | |
|---|---|
| MIXING SECTION | Fly ash is mixed with water in appropriate proportion to prepare fly ashslurry. After attaining required |
| BATCHING SECTION | All the raw materials are mixed in pouring mixer as per pre-determinedrecipe for around 5 minutes & then |
| RISING & CURING SECTION | After casting in mould rising process takes place for a period of around 45mins where millions of tiny pores are created due to the liberation of hydrogen |
| CUTTING SECTION | Once proper hardness is attained, mould is lifted by tilting crane & is placedat cutting section for cutting |
| AUTOCLAVING | Green cakes are placed in autoclave where it is steam cured at around 12 bar pressure & around 190 degree |
| SEGREGATION | After proper curing in autoclave, blocks are segregated on pallets as per size & forklift lifts the |
| READY TO DISPATCH | After 48-72 hours of stocking in yard, blocks are loaded in trucks as per requirements with proper |

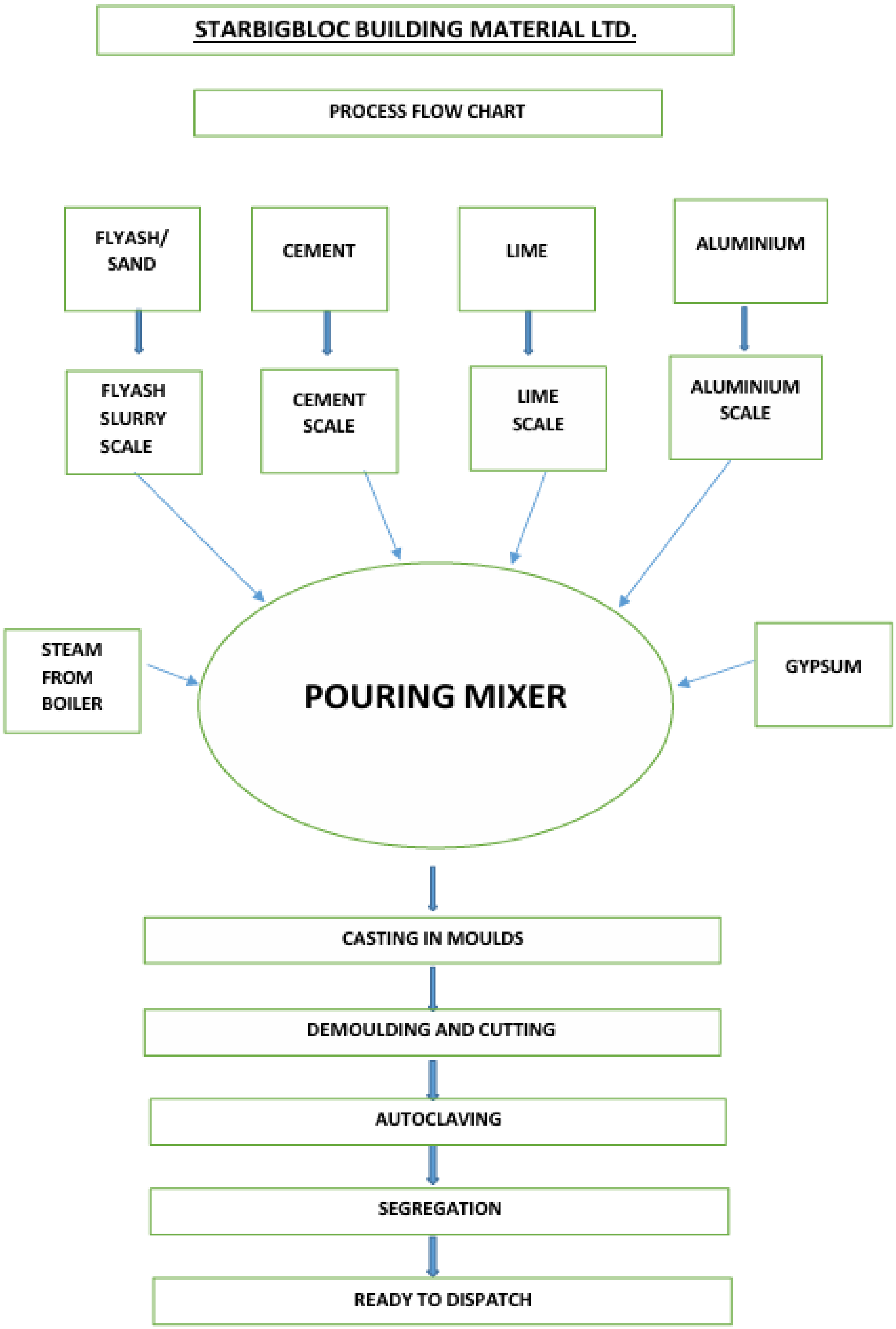


**Figure 1 AAC Bloc Manufacturing Process**

**Figure 2 RAW Material Storage SILO (Cement, Lime)**

**Figure 3 Raw material mixing section**

**Figure 4 Preparation of Mould**

**Figure 5 Cutting Section**

**Figure 6 Steam Curing Process (Autoclave Reactor)**

- **Product Specification**

| Parameter | Value |
|---|---|
| **Main Material** | Fly Ash (byproduct of coal combustion) |
| **Composition** | 65% Fly Ash<br>23% Cement<br>11.1% lime<br>1.1% Gypsum<br>0.1% Aeration Agent |
| **Block Size**<br>**(Variation in Size = ±1.5mm )** | 600 mm  200 mm  (50-300 mm)<br>625 mm  240 mm  (50-300 mm)<br>650 mm  240 mm  (50-300 mm) |
| **Density** | 550 – 650 kg/m³ |
| **Compressive Strength** | 550 – 650 kg/m³ |
| **Thermal Conductivity** | 0.16 W/m2.K |
| **Fire Resistance** | Up to 4 hours (depending on thickness) |
| **Sound Insulation** | 45-48 dB (200 mm thickness wall) |
| **Drying Shrinkage** | 0.04% to 0.06% |

| Parameter | Value |
|---|---|
| **Main Material** | Quartz Sand |
| **Composition** | 62% Sand<br>16% Cement<br>11.1% lime<br>1.1% Gypsum<br>0.1% Aeration Agent |

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|---|---|
| **Block Size**<br>**(Variation in Size = ±1.5mm )** | 600 mm 200 mm (50-300 mm)<br>625 mm 240 mm (50-300 mm)<br>650 mm 240 mm (50-300 mm) |
| **Density** | 600 – 800 kg/m³ |
| **Compressive Strength** | 3.5 – 5.0 N/mm² |
| **Thermal Conductivity** | 0.13 W/m2.K |
| **Fire Resistance** | Up to 4 hours (depending on thickness) |
| **Sound Insulation** | 43-46 dB (200 mm thickness wall) |
| **Drying Shrinkage** | 0.05% |

## ● List of Machinery

| Sr. No | Name Of The Machinery | Make | Capacity | Qty | Purpose |
|---|---|---|---|---|---|
| 1 | Pond Agitator With Gear Box & Motor | Mingjie Enc,China | 7.5 Kw & 11 Kw | 8 Nos | Slurry Making |
| 2 | Storage Tank Agitator With Gear Box & Motor | Mingjie Enc,China | 15 Kw | 2 Nos | Slurry Storage |
| 3 | Pond Slurry Pump | China Zibo Dabo Pump Industry Ltd Company | 8.0 Cu. M/Hr | 8 Nos | Slurry Transfer |
| | Motor | Shangdong Huali | 18.5 Kw | 8 Nos | Slurry Pump |
| 4 | Pond Agitator With Gear Box | Mingjie Enc,China | | 8 Nos | Slurry Tank |
| 5 | Silo (Cement) | Home Made | 200 Tone | 1 Nos | Cement Storage |
| 6 | Silo (Lime) | Home Made | 200 Tone | 1 Nos | Lime Storage |
| 7 | Lime Crane With Elevator | Home Made | 3 Ton | 1 Nos | Lime Unloading |
| 8 | Pouring Mixture ( Batching Slurry Mixture) | Mingjie Enc,China | 3.6 Cu.M | 1 Nos | Batch Mixing |
| 9 | Ferry Cart Gear Box And Roller Plumber Block Sn | Mingjie Enc,China | 3 Kw | 1set | Ferrycart Use |

| | | | | | |
|---|---|---|---|---|---|
| | 510 & Motor | | | | |
| 10 | Track Of Gear Box And Roller Plumber Block Sn 220 With Motor | Mingjie Enc,China | 5.5 Kw | 8 Set | Draught Device |
| 11 | Demoulding Crane | Mingjie Enc,China | 10 Tons | 1 Nos | Cake Demoulding |
| 12 | Cutting Wagon Gear Box With Motor | Mingjie Enc,China | 4 Kw | 2 Nos | Cutting Trolley |
| 13 | Horizontal Cutting Machine | Mingjie Enc,China | | 1 Nos | Horizontal Size Cutting |
| 14 | Vertical Cutting Machine | Mingjie Enc,China | | 1 Nos | Vertical Size Cutting |
| 15 | Transfer Crane - In | Mingjie Enc,China | 5 Tons | 1 Nos | Cake Transfer |
| 16 | Plate Return Track 12no's Of Gear Box And Roller Plumber Block Sn 208 With Motor | Mingjie Enc,China | 0.35kw | 1 Set | Plate Transfer |
| 18 | Autoclave | Laxmi Fab. & Engg. | 37.8 Cum | 2 Nos | Mould Curing |
| | | Mingjie Enc,China | 37.8 Cum | 8 Nos | Mould Curing |
| 19 | De-Watering Pump With Motor | Kirloskar | 3.81 Kw | 1 Nos | Water Transfer |

| | | | | | |
|---|---|---|---|---|---|
| 20 | Transfer Crane | Mingi Enc,China | 5 Tons | 1 Nos | Plate Transfer |
| 21 | Compressor With Motor | Elgi Equipment Ltd | 3.17 Cu.M/Minute | 1 Nos | Pneumatic Purpose |
| 22 | Boiler | Rajdeep | 6.0 Ton/Hr | 1 Nos | Steam Generation |
| 23 | Ro Plant Main Pump With Motor | Zion | 10 Cu.M/Hr. 7.5 Kw | 1 Nos | Water Treatment |
| 24 | Weight Bridge | Cibi (Giri Brothers) | 60 Tons | 1 Nos | Weighing |
| 25 | Transformers | Voltamp Transformer Ltd. Jn53186 | 800 Kva | 1 Nos | Electrical |
| 26 | Generator Sets | Alternator-Stamford | 500kva | 1 Nos | Power Back Up |
| | | Engine-Cummins India Ltd. | | | |
| 27 | Mould | Size 4350*650*1250 | 3.15 Cbm. | 26 | Casting |
| 28 | Winch Machine | Mingjie Enc,China | 11 Kw ,5 Ton | 3 Set | Wagon Movement |

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|---|---|---|---|---|---|
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| 29 | Ball Mill | Teeyer,China | 210kw ,10 Ton | 1 Nos | Sand Grinding |
| 30 | Belt Conveyor | Teeyer,China | | 2set | Coal,Sand Convey |
| | | Home Made | | | |
| 31 | Wagon | Mingjie Enc,China | | 62 Nos | Cake Transfer With Plate |
| | | Home Made | | 18 Nos | Cake Transfer With Plate |
| 32 | Mould Plate | Mingjie Enc,China | | 150 Nos | Cake Transfer |
| | | Home Made | | 36 Nos | Cake Transfer |
| 33 | Root Blower | Root | | 2 Nos | Cement Unloading |
| 34 | Lime Unloading Crane | Home Made | 2ton | 1 Nos | Lime Unloading |
| 35 | Lime Bucket Elevator | Home Made | | 1 Nos | Lime Transfer To Silo |
| 36 | Coal Bucket Elevator | Home Made | | 1 Nos | Coal Transfer |

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|---|---|---|---|---|---|
| 37 | Pallets | Home Made | 1.5 Cbm | 2700 Nos | Block Storage |

## A.5. Parties and project participants >>

| Party (Host) | Participants |
|---|---|
| India | **Climate Detox Private Limited (Aggregator)**<br>**Contact person:** Dhvani Kanani<br>**Contact number:** +91-9898292011/+91-6358169569<br>**Email id** : dhvani.kanani@climatedetox.in<br>**Address** : 310, Rajhans Montessa, Dumas Road, Magdalla, Surat-395007, Gujarat<br><br>**Starbigbloc Building Material Limited (Project Owner)**<br>**Contact Person:** Manish Saboo<br>**Contact Number:** 9825161000<br>**Email id** : manish.saboo@nxtbloc.in<br>**HO Address:** 908, Rajhans Montessa, Dumas Road, Magdalla, Surat-395007, Gujarat |

## A.6. Baseline Emissions>>

Baseline scenario is that the specific energy demand for manufacturing AAC blocks is lower compare to conventional bricks. AAC blocks are being manufactured by the autoclaving process, which is less energy intensive as compared to the thermal baking process used for manufacturing fired clay bricks. Thus, the project activity results in lower GHG emission as compared to the conventional clay bricks manufacturing process.

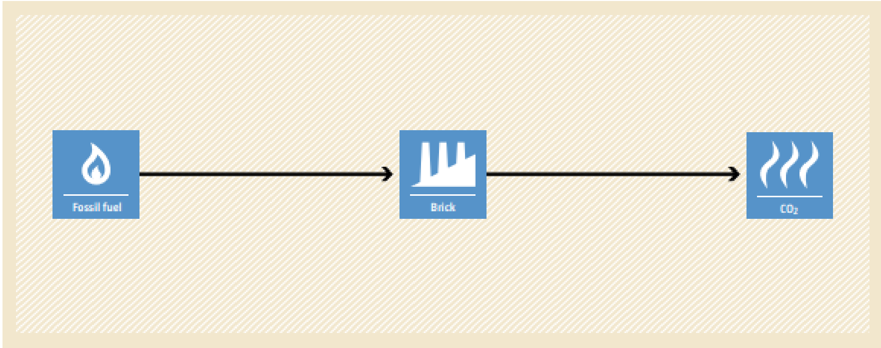
The baseline scenario is the continued production of traditional **fired clay bricks** using **coal- or fossil fuel-based kilns**, which is a highly energy- and emission-intensive process. These bricks are typically manufactured in Fixed Chimney Bull's Trench Kilns (FCBTKs), clamp kilns, or other inefficient designs across India.

In contrast, the proposed project involves the manufacturing of **Autoclaved Aerated Concrete (AAC) blocks** through a **steam-curing autoclaving process**, which **does not require high-temperature sintering** and therefore consumes significantly less energy.

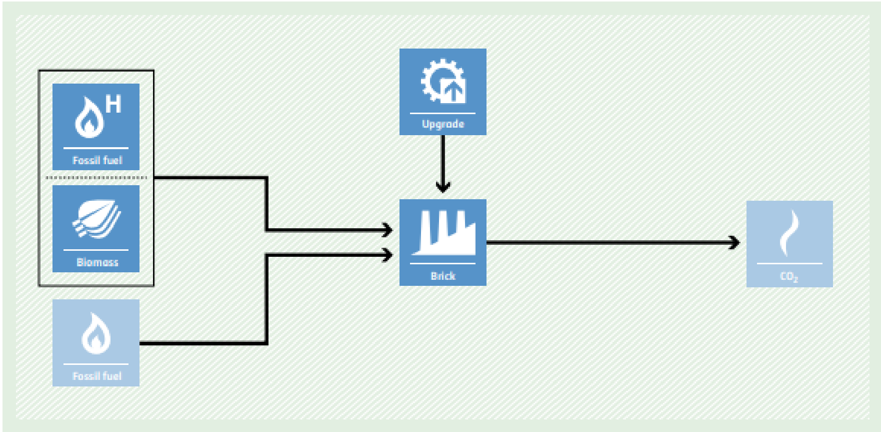
**The specific energy demand for manufacturing AAC blocks is substantially lower than that for conventional clay bricks.**

Thus, the **project activity results in lower greenhouse gas (GHG) emissions** compared to the baseline scenario of coal-fired brick manufacturing.

**BASELINE SCENARIO**
Brick production using more-carbon-intensive fuel and energy-intensive technology.




**PROJECT SCENARIO**
Brick production using less-carbon-intensive fuel or biomass in a more-efficient facility.




## A.7. Debundling>>

The project is not a debundled component of a larger project activity.

## SECTION B. Application of methodologies and standardized baselines

### B.1. References to methodologies and standardized baselines >>

SECTORAL SCOPE: 04, Manufacturing industries
TYPE : III – other projects
CATEGORY- AMS-III.Z.. (Title: "Fuel Switch, process improvement and energy efficiency in brick manufacture", Version 06.0)

### B.2. Applicability of methodologies and standardized baselines >>

The project activity involves installation of a new technology for brick/block manufacturing which is not a traditional activity in India. This activity leads to reduction of burning of coal, which is a major contributor in Green House Gas (GHG) emission in the environment. The project activity produces average 2,50,00 m3 of AAC blocks. The emission reduction is below 60,000 tCO2e and it will qualify as small-scale project activity under Type-III of the Small-Scale methodology. The project status is corresponding to the methodology AMS-III.Z., Version 06.0 and applicability of methodology is discussed below:

| Applicability condition | Justification of compliance |
|---|---|
| The methodology comprises one or more technology / measures listed below in brick[1] production facilities:<br><br>(a) Shift to an alternative brick production technology/process or installation of a new brick production technology/process;<br><br>(b) Complete/partial substitution of fossil fuels or non-renewable biomass (NRB) with renewable biomass (including biomass from dedicated plantations or solid biomass residues such as sawdust and food industry organic liquid residues);[2] | The proposed project activity adopts option (a) installation of a new brick production technology/process.<br><br>**Hence, Project activity meets the applicability criterion.** |

1 Brick in the context of this methodology includes solid bricks and blocks as well as hollow blocks used in building construction.

2 Fatty acids from oil extraction, waste oil and waste fat of biogenic origin (includes waste oil from restaurants, agro and food industry, slaughterhouses or related commercial sectors). The sources/origin of waste oil/fat and respective volumes must be identified and clearly documented in the PDD. No CERs from waste oil/fat can be claimed under this methodology if it is not produced from biogenic origin, biogenic shall mean the oils and/or fats originate from either vegetable or animal biomass, but not from mineral (fossil) sources.

<table>
<tr>
<td>(c) Complete/partial substitution of high carbon fossil fuels with low carbon fossil fuels;[3]<br><br>(d) Reduce the consumption of fossil fuels or NRB due to improvement of the production process.</td>
<td></td>
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<tr>
<td>The measures may replace, modify, retrofit[4] or add capacity to systems in existing facilities or be installed in a new facility.</td>
<td>The proposed project activity is a new facility (Greenfield project activity).<br><br>Hence, Project activity meets the applicability criterion.</td>
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<tr>
<td>The methodology is applicable for the production of:<br><br>(a) Bricks that are the same in the project and baseline cases; or<br><br>(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 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 (see paragraph 11). Examples include pressed mud blocks (soil blocks) with cement or lime stabilization[5] and other ‘unburned’ bricks that attain strength due to fly ash, lime/cement and gypsum chemistry.</td>
<td>While the blocks produced under the project activity differ from those in the baseline scenario in terms of raw materials, additives, and production process—including the avoidance of fossil fuels for forming, sintering, or drying—the end-use application, compressive strength, and functional performance of the blocks remain equivalent or superior compared to the baseline bricks.<br><br>As per the comparative analysis sourced http://aerconindia.com/aac-vs-bricks.html the blocks produced in the baseline and project scenario demonstrate [6] as follows:<br><br>
<table>
<tr><th>Parameter</th><th>Baseline</th><th>Project</th></tr>
<tr><td>Minimum Compressive strength (N/mm2)</td><td>2.5-3</td><td>3.0 to 4.0 N/mm2(IS 2185, Part-3)</td></tr>
<tr><td>Dry density (kg/m3)</td><td>1950</td><td>550 – 650</td></tr>
</table>
</td>
</tr>
</table>

3 For example, from anthracite coal to natural gas

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

5 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.

6 http://aerconindia.com/aac-vs-bricks.html

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| | **Hence, Project activity meets the applicability criterion.** |
| 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". | In line with paragraph 37 of the "General Guidelines for SSC CDM Methodologies, v23.1"[7] this project qualifies as a Type III Greenfield project, representing new facilities. The most plausible baseline scenario has been determined to be "burnt clay brick manufacturing using conventional technologies." This baseline scenario has been identified following the prescribed steps, which involved assessing various alternatives, ensuring regulatory compliance, and evaluating potential barriers. This baseline scenario is in full alignment with the Type III small-scale methodology.<br>**Therefore, the project activity fulfils the necessary applicability criteria.** |
| 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.<br>**Hence, criteria is not applicable**. |
| 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 or NRB (non-renewable biomass) were used in the brick production systems that are being modified or retrofitted. In cases where small quantities of renewable biomass were used for experimental purposes this can be excluded. | The project activity is not being implemented at an existing facility. It is being implemented as a Greenfield project.<br>**Hence, criteria is not applicable.** |
| 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 reagents) prior to the combustion but it may be processed mechanically | The project activity does not involve use of biomass.<br>**Hence, criteria is not applicable.** |

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

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| (e.g. pressing, filtering) and/or thermally (e.g. gasification to produce syngas).[8] | |
| In cases where the project activity utilizes charcoal produced from renewable biomass as fuel, the methodology is applicable provided that:<br>(a) Charcoal is produced in kilns equipped with a methane recovery and destruction facility; or<br>(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 CH4/t charcoal may be used in accordance with "AMS-III.BG.: Emission reduction through sustainable charcoal production and consumption";<br>(c) If charcoal is produced from other CDM project activities, it shall be ensured that no double counting of the emission reductions occurs. | The project does not involve use of charcoal produced from renewable biomass.<br>**Hence, criteria is not applicable.** |
| 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:<br>(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;<br>(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:<br>(i) Approach 1: demonstrate that the raw materials to be utilized, in the region of the project activity, are not fully utilized. For this purpose, demonstrate that the quantity of material is at least 25 per cent greater than the demand for such materials or the availability of alternative materials for at least one year prior to the project implementation;<br>(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 | The project involves altering the raw materials used compared to the traditional method of manufacturing burnt clay bricks. It is a small-scale project with an annual capacity of 250,000 cubic meters of AAC (Autoclaved Aerated Concrete) blocks. This assessment focuses on using waste products as raw materials rather than commercially valuable industrial products. The primary raw material for the project is fly ash, a waste product, supplemented by small quantities of gypsum, lime, cement, and aluminium. Therefore, the assessment specifically considers the use of ash.<br>Step 2- Approach 1<br>The project activity uses around 65 wt.% of the fly ash. Being a byproduct of coal-based thermal power plants with annual generation of millions of tons, fly ash is abundantly available within a feasible distance from the plant. Its surplus availability has been demonstrated according to Approach 1 provided by the methodology.<br>As per the "REPORT ON FLY ASH GENERATION AT COAL / LIGNITE BASED THERMAL POWER STATIONS AND ITS UTILIZATION IN THE COUNTRY FOR THE YEAR 2021 – 22" (https://cea.nic.in/wp-content/uploads/tcd/2022/08/Fly_ash_Generation_and_utilisation_Report_2021_22-1.pdf) page 55, TABLEXIX shows |

8 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.

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|---|---|
| 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. | that in the year 2015-16 (one year prior to the project implementation) around 117 million tons of fly ash generated and only 60.97% were utilized. Thus, it may be concluded that fly ash is available in abundance and the project activity meets the applicability criterion.<br><br>**Therefore, this demonstrates the abundant availability of fly ash and confirms that the project aligns with the relevant eligibility criteria.** |
| This methodology is applicable under the following conditions:<br><br>(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 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;<br><br>(b) The existing facilities involving modification and/or replacement shall not influence the production capacity beyond ±10 per cent 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;<br><br>(c) Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO2 equivalent annually. | a)While the blocks produced under the project activity differ from those in the baseline scenario in terms of raw materials, additives, and production process—including the avoidance of fossil fuels for forming, sintering, or drying—the **end-use application, compressive strength, and functional performance of the blocks remain equivalent or superior** compared to the baseline bricks.<br><br>As per the comparative analysis sourced http://aerconindia.com/aac-vs-bricks.html the blocks produced in the baseline and project scenario demonstrate [9] as follows:<br><br><table><tr><th>Parameter</th><th>Baseline</th><th>Project</th></tr><tr><td>**Minimum Compressive strength (N/mm2)**</td><td>2.5-3</td><td>3.0 to 4.0 N/mm2(IS 2185, Part-3)</td></tr><tr><td>**Dry density (kg/m3)**</td><td>1950</td><td>550 – 650</td></tr></table><br>b) This criteria is not applicable as this project is a greenfield activity.<br><br>c) Maximum annual emission reductions from the project activity are estimated to be around 241703 tCO2e/year, which is less than the methodology limit of 60,000 tCO2e.<br><br>**Hence, the applicability conditions are being fulfilled**. |
| 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 per cent of brick production activities in the country comply) of the local regulation evidenced. | There are no such regulations which make it mandatory for the use of this technology in the region and Project proponent use this technology voluntarily, therefore this criterion does not apply to the project activity. |

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

| | |
|---|---|
| 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 activity does not involve use of biomass. **Hence, criteria is not applicable.** |
| The following cases are exempted from 'determining the occurrence of debundling' as per the "Guidelines on assessment of debundling for SSC project activities": (a) Project activities that aggregate brick units with holistic production cycles i.e. from raw material procurement to finished product, where each unit is not larger than 5 per cent of the Type III small-scale CDM project activity thresholds i.e. 3,000 t CO2e; or (b) Project activities that aggregate brick units, where each unit qualifies as Type III microscale CDM project activity and the geographic location of the project activity is a least developed countries/small island developing states (LDC)/(SIDS) or special underdeveloped zone (SUZ) of the host country as identified by the government in accordance with the guideline on "Demonstrating additionality of microscale project activities". | The project activity is not a de-bundled activity. **Hence this criterion is not applicable.** |

## B.3. Applicability of double counting emission reductions >>

There is no double accounting of emission reductions in the project activity as the project is uniquely identifiable based on its location coordinates and it was not registered previously on other registry.

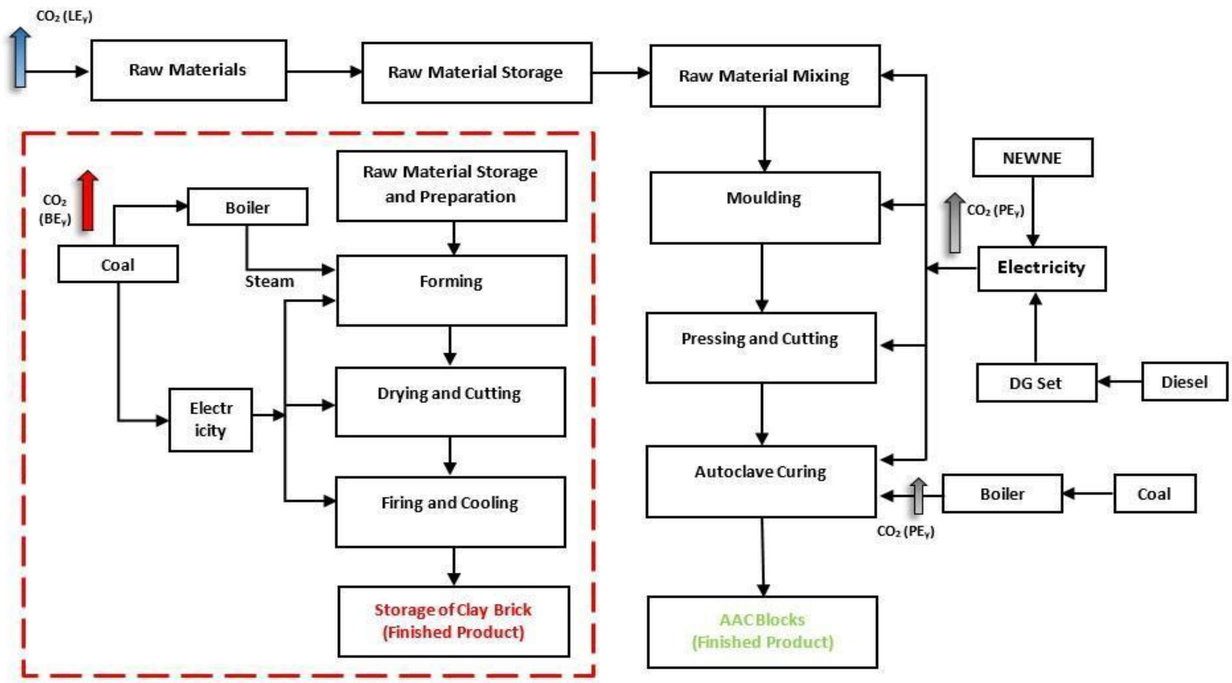
## B.4. Project boundary, sources and greenhouse gases (GHGs)>>

As per paragraph 19 of methodology AMS.III. Z. Fuel Switch, process improvement and energy efficiency in brick manufacture 6.0[10], the project boundary is the physical, geographical site where the brick production takes place during both the baseline and crediting periods. It also includes all installations, processes or equipment affected by the switching. In cases where the renewable biomass is sourced from dedicated plantations it also includes the area of the plantations. In cases involving thermo-mechanical processing of the biomass (e.g. charcoal; briquettes; syngas) the sites where these processes are carried out shall be within the project boundary.

In both Baseline and Project Scenario, boundary is depicted diagrammatically as below:

| 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 |
| | | Other | No | Neglected for simplicity |
| **Project** | Electricity consumption for operating plant Machinery | **$CO_2$** | **Yes** | **Main emission source** |
| | | $CH_4$ | No | Neglected for simplicity |
| | | $N_2O$ | No | Neglected for simplicity |
| | | Other | No | Neglected for simplicity |
| | Coal consumption in autoclave Boiler | **$CO_2$** | **Yes** | **Main emission source** |
| | | $CH_4$ | No | Neglected for simplicity |
| | | $N_2O$ | No | Neglected for simplicity |
| | | Other | No | Neglected for simplicity |
| | Diesel consumption for plant operations | $CO_2$ | No | **Minor emission source** |
| | | $CH_4$ | No | Neglected for simplicity |
| | | $N_2O$ | No | Neglected for simplicity |
| | | Other | No | Neglected for simplicity |

10 https://cdm.unfccc.int/methodologies/DB/VLZZ1DVT1QI3KHZKSM6QECOAKNSCXZ




## B.5. Establishment and description of baseline scenario

### B.5.1. Baseline Emissions

The baseline emissions are the fossil fuel and NRB consumption related emissions 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.

The emissions are calculated as below:

$$\mathbf{BE_y = SEC_{BL} \times EF_{BL} \times P_{PJ,y}}$$

Where:

| | | |
|---|---|---|
| $BE_y$ | = | The annual baseline emissions from fossil fuels or NRB displaced by the project activity in t $CO_2e$ in year y (of the crediting period) |
| $SEC_{BL}$ | = | Specific energy consumption of brick production in the baseline, TJ per unit volume or mass unit (kg or $m^3$) |
| $EF_{BL}$ | = | The emission factor of baseline fuel(s), in t $CO_2$/TJ |
| $P_{PJ,y}$ | = | The annual net production of the facility in year y, in kg or $m^3$ |

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 one of the options below:

(a) Using manufacturers" specifications such as for brick production rate, energy consumption in the process;
(b) Using specifications of comparable units having similar techno-economic parameters;
(c) Using reference plant approach.

In the project activity scenario annual production specific emission factor for installation of systems in a new facility is determined using option (b) as stated above. Indian Brick Industry falls under the unorganized small and medium enterprise category, wherein the economic considerations are comparable.

The baseline emission factor shall be calculated from emissions data of other brick manufacturing plants of capacity 250,000 $m^3$/annum and using the common practice technology. As mentioned in section A6 of the PCN, the common practice technology in this sector is red clay fired clay bricks, across all plant capacities in India. For this project activity, the lower range of the emission factor of 195 gCO2/kg[15] of brick has been directly sourced from the research paper. So, only the density of AAC blocks produced in the project plant is different from that of baseline bricks. So, the emission factor of 195 gCO2/kg of brick has been converted into a volumetric emission factor as follows:

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

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

| | | |
|---|---|---|
| $EF_{BL}$ | = | The annual production specific emission factor for year y |
| $EF_{CO2,brick}$ | = | CO2 emission per baseline brick produced (as obtained from third party documents) |
| $W_{brick}$ | = | Weight of each baseline brick produced |
| $D_{brick}$ | = | Density of each baseline brick produced |

The annual production specific emission factor ($EF_{BL}$) = 195 gCO2/kg*(1950kg/$m^3$/1000)
= 0.38025 tCO2/$m^3$

The annual baseline emission ($BE_y$) = 182466m3/year*0.38025 tCO2/$m^3$
= 69383 tCO2/year

**Estimated Total baseline emission reductions (*$BE_y$*) = 69383 $tCO_{2eq}$/yr**

### B.5.2. Project Emissions

Project emissions shall be calculated using the following equation:

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

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 $CO_2$e)
$PE_{CH4,y}$ = Project emissions due to the production of charcoal in kilns not equipped with a methane

recovery and destruction facility in year y (t $CO_2$e)

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

**Project emission from electricity consumption:**

Referring to, "Tool to calculate baseline, project and/or leakage emission from electricity consumption, version no. 03"[11], 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 the 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 default emission factor of 1.3 tCO2/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:

$$PE_{EC,y} = \sum_{j} ECPJ_{,j,y} \times EFEF_{,j,y} \times (1 + TDL_{j,y})$$

Where;

$PE_{EC,y}$ = Project emissions from electricity consumption in year *y* (t CO2 / yr)

$ECP_{J,j,y}$= Quantity of electricity consumed by the project electricity consumption source *j* in year *y* (MWh/yr)

$EF_{EF,j,y}$ = Emission factor for electricity generation for source *j* in year *y* (t CO2/MWh)

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

$TDL_{j,y}$ = Average technical transmission and distribution losses for providing electricity to source $j$ in year $y$

**Project Emission from fossil fuel consumption:**

Sources of fossil fuel consumption in the project activity include coal consumption in the autoclave boiler. Consumption would be conservatively accounted for, by considering the default project emission factor of: 1.3 tCO2/MWh[12]; for all sources of electricity supplied from the grid.

Thus, fossil fuel consumption in the project activity boiler is the only source of project emissions from fossil fuel consumption that has been accounted using the "Tool to calculate project or leakage CO2 emission from fossil fuel combustion"[13]. The project emission from furnace oil and/or natural gas combustion in boilers has been calculated as follows:

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

Where:

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

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

$CO_{EFi,y}$ = Is the CO2 emission coefficient of fuel type $i$ in year $y$ (tCO2/mass or volume unit)

$i$ = Are the fuel types combusted in process $j$ during the year $y$

As per the tool, the CO2 emission coefficient can be calculated using one of the options, depending on the availability of data

Option A: Based on the chemical composition of the fossil fuel type i
Option B: Based on the net calorific value and the CO2 emission factor of the fuel 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 CO2 emission co-efficient as follows:

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

Where:

$COEF_{i,y}$ = Is the CO2 emission coefficient of fuel type $i$ in year $y$ (tCO2/mass or volume unit)

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

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

| | | |
|---|---|---|
| $NCV_{i,y}$ | = | Is the weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit) |
| $EF_{CO2,i,y}$ | = | Is the weighted average CO2 emission factor of fuel type *i* in year *y* (tCO2/GJ) |
| $i$ | = | Are the fuel types combusted in process *j* during the year *y* |

The values derived from the aforementioned equations are as follows:

Project emission due to electricity consumption $PE_{elec,y}$ = **1531 t $CO_2$e**
Project emission due to Fuel consumption $PE_{fuel,y}$ = **12330 t $CO_2$e**
Project emissions from cultivation of biomass in a dedicated plantation $PE_{cultivation,y}$ = **0 t $CO_2$e**
Project emissions due to the production of charcoal in kilns not equipped with a methane recovery and destruction facility $PE_{CH4,y}$ = **0 t CO2e**

**Total Project emission $PE_y$ = 13861 t $CO_2$e**

### B.5.3. Leakage Emissions

As per the paragraph 29 and 30 of the methodology, Leakage emissions can be calculated by following below two options:

| Source of leakage emission | Relevant/Not relevant to the project activity |
|---|---|
| Leakage emissions on account of the diversion of biomass residues from other uses (competing uses) shall be calculated as per the "General guidance on leakage in biomass project activities". Specifically, where NRB is involved, the leakage specified in leakage section of AMS-II.G. shall also be considered. | Not Relevant to the Project activity. |
| 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 involves the use of fly ash, cement, lime, gypsum, and a small amount of aluminum powder as raw materials. In contrast, the baseline method utilizes clay sourced from the project site for producing baked clay bricks. Consequently, the project necessitates the transportation of various raw materials to the site. Additionally, considering that cement, lime, and other materials are employed in the production of AAC blocks, it is essential to account for emissions stemming from their manufacturing process. The project activity takes into consideration two sources of emissions:<br>i. Emissions related to the transportation of fly ash, cement, lime, gypsum, and aluminium powder procurement.<br>ii. Emissions originating from the consumption of cement, lime, gypsum, and aluminium powder (note that fly ash is a waste product |

| | |
|---|---|
| | and does not contribute to additional emissions during its production). To calculate emissions linked to transportation, we will use monitored parameters, while emissions tied to production will be determined by monitoring the consumption of raw materials and then multiplying the monitored values by predefined default GHG emission factors. |

The applicable equation is as below for calculating the leakage emission:

$$LE_y = LE_{rm,prod,y} + LE_{TR,m}$$

Where,

$LE_y$ = Leakage emissions associated with consumption and transport of raw and/or additive materials in the year y.

$LE_{rm,prod,y}$ = Leakage emissions associated with consumption of raw and/or additive materials in the year y

$LE_{TR,m}$ = Leakage emission associated with transportation of raw and/or additive materials in the year y

**<u>Leakage emissions due to raw material consumption:</u>**

$$LE_{rm,prod,y} = Q_{cement,y} * EF_{cement} + Q_{lime,y} * EF_{lime} + Q_{Aluminium,y} * EF_{Aluminium} + Q_{Gypsum,y} * EF_{Gypsum}$$

Where,

$LE_{rm,prod,y}$ = Leakage emissions associated with consumption of raw and/or additive materials in the year y

$Q_{cement,y}$ = Quantity of cement consumed for the production of AAC blocks in the year y

$EF_{cement}$ = CO2emission factor of the cement production

$Q_{lime,y}$ = Quantity of lime consumed for the production of AAC blocks in the year y

$EF_{lime}$ = CO2emission factor of the lime production

$Q_{Aluminium,y}$ = Quantity of Aluminium Powder consumed for the production of AAC blocks in the year y.

$EF_{Aluminium}$ = CO2emission factor of the Aluminium production

$Q_{Gypsum,y}$ = Quantity of Gypsum consumed for the production of AAC blocks in the year y.

$EF_{Gypsum}$ = CO2emission factor of the Gypsum production

**Leakage emission due to raw material transportation:**

As per the methodological tool "Project and leakage emissions from road transportation of freight" Version 01[14] the emissions due to the raw material transportation can be calculated as below:

$$LE_{TR,m} = \sum D_{fm} * FRf,m \times EF_{CO2,f} \times 10^{-6}$$

Where,

$LE_{TR,m}$ = Leakage emission from road transportation of freight monitoring period m (tCO2)

$D_{fm}$ = Return trip road distance between the origin and destination of freight transportation activity f in monitoring period m (km)

$FR_{f,m}$ = Total mass of freight transported in freight transportation activity f in monitoring period m (t)

$EF_{CO2,f}$ = Default CO2emission factor for freight transportation activity f (t CO2e/km)

F = Freight transportation activities conducted in the project activity in monitoring period m

The values derived from the aforementioned equations are as follows:

Leakage emission due to raw material consumption $LE_{rm,prod,y}$ = **17937 $tCO_2e$**
Leakage emission due to raw material transportation $LE_{TR,m}$ = **2559.90 $tCO_2e$**

**Total leakage emission $LE_y$ = 20497 $tCO_2e$**

### B.5.4. Emission Reduction

Emission Reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where;

ERy = Emission reductions in year y (t CO2e)

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

| | | |
|---|---|---|
| BEy | = | Baseline emissions in year y (tCO2e) |
| PEy | = | Project emissions in year y (tCO2e) |
| LEy | = | Leakage emissions in year y (tCO2e) |

**ERy = 69383- 13861- 20497= 35025 tCO2e**

Thus, as per the ex-ante calculations the project will displace heat generation from coal consumption leading to an emission reduction of **35025 tCO2e** equivalent every year. In the absence of the proposed project activity, the steam demand would have been supplied to the processing plants by the coal-based boiler.

## B.6. Prior History>>

The project activity has not applied to any other GHG program for generation or issuance of carbon offsets or credits for the said crediting period.

## B.7. Changes to start date of crediting period >>

There is no change in the start date of crediting period.

## B.8. Permanent changes from PCN monitoring plan, applied methodology or applied standardized baseline >>

As this is the first version, there are no methodology deviations applied. Hence, this section is not applicable to the project.

## B.9. Monitoring period number and duration>>

First Issuance Period: 06 years 10 months 12 days – 20/02/2018 to 31/12/2024

## B.8. Monitoring plan>>

USE THE FOLLOWING TABLES TO FOR PARAMETERS BEING MONITORED OR USED IN EMISSION REDUCTIONS DETERMINATION

| Data / Parameter: | **$EF_{BL}$** |
|---|---|
| Data unit: | t $CO_2/m^3$ |
| Description: | The annual production specific baseline emission factor |
| Value Applied | 0.38 |
| Source of data: | Calculated based on data taken from:<br>1. "$CO_2$ emission factor for clay brick" taken from https://www.sciencedirect.com/science/article/abs/pii/S09596 52616308381 |

| | |
|---|---|
| | 2. "Density of bricks" taken from http://aerconindia.com/aac-vs-bricks.html |
| Justification of choice of data or description of measurement methods and procedures applied | The value is calculated value. It is derived based on $CO_2$ emission per weight of brick data which is simplified value and density of brick. The values taken are from an authentic source and can be verified further. |
| Purpose of Data: | For the calculation of baseline emission. |
| Any comment: | The value is the derived value. |

| | |
|---|---|
| Data / Parameter: | **$EF_{cement}$** |
| Data unit: | t CO2/t |
| Description: | CO2 emission factor of cement production |
| Value Applied | 0.576 |
| Source of data: | https://aeee.in/emission-reduction-approaches-for-the-cement-industry/ |
| Justification of choice of data or description of measurement methods and procedures applied | Alliance for an Energy Efficient Economy (AEEE) published the data using The International Energy Agency (IEA), Cement Sustainability Initiative (CSI), and World Business Council for Sustainable Development (WBCSD) as a reference. So, the source is reliable. |
| Purpose of Data: | Calculation of leakage emissions |
| Any comment: | The value is fixed ex-ante |

| | |
|---|---|
| Data / Parameter: | **$EF_{aluminium}$** |
| Data unit: | t $CO_2$/t |
| Description: | $CO_2$ emission factor of aluminium production |
| Value Applied | 1.7 |
| Source of data: | IPCC report of 2006 on NGGI[15] (Vol. 3, Ch. 4, Pg. No. 4.47, Table 10) |
| Justification of choice of data or description of measurement methods and procedures applied | The IPCC Report is a reliable source of information. Additionally, Prebake and Soderberg, two available processes for producing aluminium, are chosen for leakage emission since they are more emission intensive. |
| Purpose of Data: | For the calculation of leakage emission. |
| Any comment: | - |

[15] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/3_Volume3/V3_4_Ch4_Metal_Industry.pdf

| | |
|---|---|
| Data / Parameter: | **$EF_{lime}$** |
| Data unit: | t $CO_2$/t |
| Description: | $CO_2$ emission factor of lime production |
| Value Applied | 0.75 |
| Source of data: | IPCC Guidelines 2006 for NGGI (Vol 3 Ch 2 Eqn 2.8)[16] |
| Justification of choice of data or description of measurement methods and procedures applied | IPCC report is a reliable source of information which is acknowledged worldwide. |
| Purpose of Data: | For the calculation of leakage emission. |
| Any comment: | |

| | |
|---|---|
| Data / Parameter: | **$EF_{gypsum}$** |
| Data unit: | t $CO_2$/t |
| Description: | $CO_2$ emission factor of gypsum production |
| Value Applied | 0.01 |
| Source of data: | EU ETS post 2012 Sector report for the gypsum industry (4.2, Pg. No. 9)[17] |
| Justification of choice of data or description of measurement methods and procedures applied | The European Union Emissions Trading System (EU ETS) Report is a reliable source of information which is acknowledged worldwide. |
| Purpose of Data: | For the calculation of leakage emission. |
| Any comment: | - |

| | |
|---|---|
| Data / Parameter: | **$EF_{CO2,f}$** |
| Data unit: | g CO2/t-km |
| Description: | Default CO2 emission factor for freight transportation activity f |
| Value Applied | Light Vehicles - 245<br>Heavy Vehicles - 129 |
| Source of data: | Based on the methodological tool " Tool to calculate Project and leakage emissions from road transportation of freight."(Version 01.0.0)<br>For raw material (Fly ash, Gypsum, Cement, Lime, Aluminium Powder) transportation generally heavy vehicles |

[16] https://climate.ec.europa.eu/system/files/2016-11/bm_study-gypsum_en.pdf

[17] https://climate.ec.europa.eu/system/files/2016-11/bm_study-gypsum_en.pdf

| | |
|---|---|
| | are being used. So PP has considered the values for emission factor of Heavy vehicles. |
| Justification of choice of data or description of measurement methods and procedures applied | Default value as provided in the methodological Tool no : 12, “Tool to calculate Project and leakage emissions from road transportation of freight (version 1.1)", para 5.3, table no 01 |
| Purpose of Data: | For the calculation of leakage emission. |
| Any comment: | The values are default. |

| Data / Parameter: | $\mathbf{D_{brick}}$ |
|---|---|
| Data unit: | kg/m3 |
| Description: | Density of each baseline brick produced |
| Value Applied | 1950 |
| Source of data: | Aercon India report on “Comparison between AAC BLOCKS VS. CLAY BRICKS”[18] |
| Justification of choice of data or description of measurement methods and procedures applied | This is a default data as provided by Aercon India and is an authentic source of data. |
| Purpose of Data: | For the calculation of baseline emission. |
| Any comment: | |

| Data / Parameter: | $\mathbf{EF_{CO2,brick}}$ |
|---|---|
| Data unit: | $gCO_2$/kg of brick |
| Description: | $CO_2$ emission factor for clay brick |
| Value Applied | 195 |
| Source of data: | Report by Journal of Cleaner Production on “Carbon footprint of solid clay bricks fired in clamps of India”[19] |
| Justification of choice of data or description of measurement methods and procedures applied | This is a default data as provided by Journal of Cleaner Production and is an authentic source of data. |
| Purpose of Data: | For the calculation of baseline emission. |
| Any comment: | - |

| Data / Parameter: | $\mathbf{EF_{EL,plant,y}}$ |
|---|---|
| Data unit: | $tCO_2$/MWh |
| Description: | Emission factor for electricity used in project plant in year y |
| Value Applied | 1.3 |
| Source of data: | ***“Tool to calculate baseline, project and/or leakage emission from electricity consumption and monitoring of electricity generation (Version 03.0)”*** (Pg. No. 7, Para 20) |

18 https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/3_Volume3/V3_2_Ch2_Mineral_Industry.pdf

19 https://www.sciencedirect.com/science/article/abs/pii/S0959652616308381

| | |
|---|---|
| Justification of choice of data or description of measurement methods and procedures applied | Higher of the $CO_2$ emission factor for captive source (DG set) or the regional grid. Emission factor data for captive source taken from ***"Tool to calculate baseline, project and/or leakage emission from electricity consumption and monitoring of electricity generation, (Version 03.0)"*** and emission factor of NEWNE grid taken from CEA database. |
| Purpose of Data: | For the calculation of project emission. |
| Any comment: | 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: | $\mathbf{P_{PJ,y}}$ |
| Data unit: | $m^3$ |
| Description: | The annual production of the facility in year y. |
| Value Applied | 2,50,000 |
| Source of data: | Plant Records |
| Justification of choice of data or description of measurement methods and procedures applied | The production is monitored manually. Volume of blocks manufactured can be known by converting the number of cakes into volume using the standard volume of each cake. |
| Purpose of Data: | For the calculation of baseline emission. |
| Any comment: | - |

| | |
|---|---|
| Data / Parameter: | $\mathbf{NCV_{coal,y}}$ |
| Data unit: | TJ/kT |
| Description: | Average Net Calorific Value of coal in the year y. |
| Value Applied | 25.8 |
| Source of data: | IPCC Guidelines 2006 on NGGI (Vol. 2, Ch. 1, Pg. No. 1.18, Table 1.2)[20] |
| Justification of choice of data or description of measurement methods and procedures applied | Net Calorific Value is a default value taken from IPCC Report. |
| Purpose of Data: | For the calculation of project emission. |
| Any comment: | |

| | |
|---|---|
| Data / Parameter: | $\mathbf{Q_{cement}}$ |
| Data unit: | Tonne |

[20] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf

| | |
|---|---|
| Description: | Quantity of cement used in AAC Block production. |
| Value Applied | To be monitored |
| Source of data: | Plant records |
| Justification of choice of data or description of measurement methods and procedures applied | Load cell installed at cement batcher inlet. |
| Purpose of Data: | For the calculation of leakage emission. |
| Any comment: | All the 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: | $Q_{flyash}$ |
| Data unit: | Tonne |
| Description: | Quantity of fly ash used in AAC Block production. |
| Value Applied | To be monitored |
| Source of data: | Plant records |
| Justification of choice of data or description of measurement methods and procedures applied | Load cell installed at fly ash batcher inlet. |
| Purpose of Data: | For the calculation of leakage emission. |
| Any comment: | All the 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: | $Q_{lime}$ |
| Data unit: | Tonne |
| Description: | Quantity of lime used in AAC Block production. |
| Value Applied | To be monitored |
| Source of data: | Plant Records |
| Justification of choice of data or description of measurement methods and procedures applied | Load cell installed at lime batcher inlet. |
| Purpose of Data: | For the calculation of leakage emission. |
| Any comment: | All the 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: | **$Q_{gypsum}$** |
| Data unit: | Tonne |
| Description: | Quantity of cement used in AAC Block production. |
| Value Applied | To be monitored |
| Source of data: | Plant records |
| Justification of choice of data or description of measurement methods and procedures applied | Load cell installed at cement batcher inlet. |
| Purpose of Data: | For the calculation of leakage emission. |
| Any comment: | All the 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: | **$Q_{aluminium}$** |
| Data unit: | Tonne |
| Description: | Quantity of aluminium used in AAC Block production. |
| Value Applied | To be Monitored |
| Source of data: | Plant records |
| Justification of choice of data or description of measurement methods and procedures applied | Load cell installed at lime batcher inlet. |
| Purpose of Data: | For the calculation of leakage emission. |
| Any comment: | All the 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. |
| Value Applied | To be Monitored |
| Source of data: | Plant records of electricity consumption data |
| Justification of choice of data or description of measurement methods and procedures applied | – |
| Purpose of Data: | For the calculation of project emission. |
| Any comment: | |

| Data / Parameter: | $D_{f,m, flyash}$ |
|---|---|
| Data unit: | Km |
| Description: | Return trip road distance between the origin and destination of fly ash transportation activity f in monitoring period m |
| Value Applied | 86 |
| Source of data: | Records of vehicle operator or records by project participants |
| Justification of choice of data or description of measurement methods and procedures applied | Number of trips aggregated monthly |
| Purpose of Data: | Calculation of leakage emission |
| Any comment: | |

| Data / Parameter: | $D_{f,m, gypsm \& POP}$ |
|---|---|
| Data unit: | Km |
| Description: | Road distance between the origin and destination of gypsum and POPtransportation activity f in monitoring period m |
| Value Applied | 290 |
| Source of data: | Records of vehicle operator or records by project participants |
| Justification of choice of data or description of measurement methods and procedures applied | |
| Purpose of Data: | Calculation of leakage emission |
| Any comment: | |

| Data / Parameter: | $D_{f,cement}$ |
|---|---|
| Data unit: | Km |
| Description: | Road distance between the origin and destination of cementtransportation activity f in monitoring period m |
| Value Applied | 370 |
| Source of data: | Records of vehicle operator or records by project participants |
| Justification of choice of data or description of measurement methods and procedures applied | |
| Purpose of Data: | Calculation of leakage emissions |
| Any comment: | |

| Data / Parameter: | $D_{f,m,lime}$ |
|---|---|
| Data unit: | Km |

| | |
|---|---|
| Description: | Road distance between the origin and destination oflimetransportation activity f in monitoring period m |
| Value Applied | 474 |
| Source of data: | Records of vehicle operator or records by project participants |
| Justification of choice of data or description of measurement methods and procedures applied | |
| Purpose of Data: | Calculation of leakage emissions |
| Any comment: | |

| Data / Parameter: | $D_{f,m\ Aluminium}$ |
|---|---|
| Data unit: | Km |
| Description: | Road distance between the origin and destination of aluminium transportation activity f in monitoring period m |
| Value Applied | 845 |
| Source of data: | Records of vehicle operator or records by project participants |
| Justification of choice of data or description of measurement methods and procedures applied | |
| Purpose of Data: | Calculation of leakage emissions |
| Any comment: | - |