CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	**Date**	**Description and reason of revision**
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

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Technology Transfer mechanism – Introduction of Vertical Shaft Brick Kiln (VSBK) Technology at Vhavenda Brick – South Africa.

Version number 02

Date of document: 15/03/2012.

A.2. Description of the small-scale project activity:

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The purpose of the project activity:

The purpose of the project activity is the construction of fifteen (15) Vertical Shaft Brick Kilns (VSBK's) by VHAVENDA BRICKS (VB) at their existing brick plant in Thohoyandou for the firing of clay masonry products (bricks). The VSBK technology will replace the practice currently in use – of firing bricks in in-efficient, high emission clamp kilns.

Clamp kilns are non-permanent batch structures, made up of a series of layers of un-burnt bricks packed on top of layers of bricks packed to create voids – which voids are filled with lump coal (external fuel) to ignite the carbon fuel contained in the bricks to be fired. The un-burnt bricks packed into the clamp kiln are covered with layers of fired bricks, to both protect the unfired bricks from the elements before they are fired, and also to prevent the escape of energy to a degree and allow the energy release from bricks under firing conditions to pre-heat and ignite / fire bricks they are in direct contact with.

By comparison the VSBK is a fixed or permanent kiln, erected for the sole purpose of firing bricks continuously. The use of burnt bricks as described in the clamp kilns (so called "process bricks" – from the stock of fired bricks) falls away in the VSBK, as it is a permanent shaft through which bricks pass to be burnt, protecting the bricks that are inside all the time, and giving optimum heat retention of the heat energy escaping from the firing of the bricks – for this energy to be used inside the shaft to pre-heat and ignite unfired bricks. This assists in reducing the energy required to pre-heat and ignite the bricks (firing process) and removes the need to use bricks from fired stock to assist in the firing of un-fired bricks – increasing the yield of sellable bricks.

The climatic variables of wind and rain that effect quality and quantity of the yield out of a clamp kiln are removed by the VSBK, resulting in control of the firing process (absent in clamp kilns), and reducing firing losses considerably.

The VSBK, once fired – is fed with new unfired bricks at a constant tempo, while fired bricks are extracted at the same time / tempo. Due to this continuous firing process, the area / number of shafts needed to fire the production at VB will be far less than the area taken up on an intermittent basis by the construction of clamp kilns to fire the bricks.

The proposed switch – through a technology upgrade - is based mainly the aforementioned advantages. Whereas it is not the most cost effective technology upgrade available to offer these advantages, the combination of these advantages with the environmental advantages of the proposed project activity in terms of space utilisation, energy consumption and cleaner combustion – when compared to the alternative methods of firing clay bricks (which include the use of clamp kilns currently used at the said plant and which is the industry norm in the market) made VSBK the ultimate choice as the project activity.

Measures to be undertaken by the project activity:

VB identified a suitably central area within the existing brick factory to erect the VSBK. The area will be levelled and compacted, with a retaining wall built behind it, to further level and construct a working area from which the VSBK can be loaded with unfired bricks.

On the levelled area, trench foundations are to be cast for the VSBK, and pile foundations prepared for the upright support structures for a roof over the entire area housing the VSBK. A floor will be cast with concrete to create a stable, dust free working area around the VSBK and with parts purchased before, and with new material ordered a support framework will be constructed and placed on the foundations to carry the roof and to carry the modular sections making up the VSBK (some sections bought as new units, others manufactured on site).

All services required for loading the VSBK, unloading fired bricks and gas extraction will be manufactured or installed from purpose bought equipment to render the VSBK fully serviceable.

How the proposed project activity will reduce green house gas emissions:

The kiln or shaft resembles a chimney, and effectively work as a counter current heat exchanger, with the fire remaining in a fixed area of the kiln or shaft through control of loading and discharge – with air flowing upwards through the kiln with the bricks moving downwards through the kilns. The flow of air is reliant upon natural convection only, with the air entering from the bottom passing over the newly fired bricks, cooling them down, and entering the firing zone of the kiln as hot dry air, allowing for the most energy efficient combustion of the energy source to fire the bricks. The air flowing further upwards from the firing zone passes over the unfired bricks loaded in at the top and pre-heat them to the point just before combustion – making eventual combustion in the firing zone faster and in the process requiring less energy to fire the bricks.

The total firing cycle of the bricks inside the VSBK is typically 22- 24 hours, with a fired batch being discharged / a new batch being loaded every 1.5 – 2 hours.

In line with the South African national average for clamp kiln firing of 364 Kg / 1000 bricks consumed, the plant typically use 0.337 ton of carbon coal material to fire 1000 bricks at present through clamp kilns. The VSBK process by comparison will use only 0.075 ton of carbon coal material to fire the same number of bricks (1000) as no external fuel is used (refer to table 4.1 below).

Using a standard emission factor of 0.0946 ton of CO_2 / GJ (IPCC Guidelines Vol.2 Table1.4 – figure for 'Other Bituminous coal')[1] as a typical emissions factor where carbon coal is being used – and factored against research in South Africa that show the clay brick manufacturing industry to consume on average 8 GJ/1000 bricks vs. the kilns to be used by VHAVENDA BRICKS which uses 2.5 GJ/1000 bricks, the manufacture of non-facing plaster bricks in South Africa will therefore produce typically .565 ton of CO_2 per 1000 bricks vs. VHAVENDA BRICKS which will produce only .258 ton of CO_2 per 1000 non-facing plaster bricks it will produce.

By reducing waste and removing the need for fired bricks from stock to be used in the clamp kiln process, VB will have more bricks sellable from the same number of green bricks produced – or in order to maintain current sales volumes, less bricks have to be produced – reducing emissions. The aforementioned equation comparing energy consumption and emission levels for the industry (and the current scenario at VB) with the proposed project scenario show that VB will release 1 950 ton of CO_2 per month to fire 3 million bricks sellable (waste / use of fired stock for process bricks at current 15%), vs producing 797 ton of CO_2 to fire 3 million sellable bricks (anticipated 3% waste, no bricks from fired stock used in the kilns) = reduction in greenhouse gas emissions (CO_2) of 1 153 ton per month.

The differences between pre-project and post-project scenarios:

The project activity (VSBK) will not alter any existing installations, but introduce a completely new and alternative method of firing bricks. All other aspects, installations and functioning of the factory are to remain the same up to the point where the dried bricks that were removed to the area where a clamp kiln is under construction, will now be removed to a fixed area all the time (VSBK), where they will be fired in a much shorter time. The passage time of a brick from un-fired to fired through a VSBK will be around 24 hours, whereas the passage time from un-fired to fired through a clamp kiln is around two to three weeks (depending on the size of the kiln, climatic conditions etc).

All bricks fired through the VSBK that meets the quality standard (maximum wastage expected at 3%) will be sold – no more bricks for internal use (process bricks) to be used out of sellable stock. Up to half the carbon fuel used before to fire bricks in clamp kilns will no longer be purchased and used, and the resultant energy and emissions saving associated with the firing of this amount of carbon fuel will be in evidence. The production will be sellable faster as a result of de-creased firing time in the VSBK, and therefore the cost to carry large number of bricks as “work in progress” / bricks not fired and ready to be sold, will be reduced as a result of the faster firing time of the VSBK.

With a central kiln facility where the bricks are fired, travel of forklifts transporting bricks to be fired will be greatly reduced, as they will have not have to travel in different directions and further to areas where clamp kilns are often packed. This reduced travelling and travelling to a fixed spot will enable roads to be laid out and maintained – both factors that will reduce particulate emissions and CO_2 release by the machinery (forklifts) and heavier equipment used to clean up an area after a clamp kiln has been packed out / used to prepare a new area where a clamp kiln is to be packed.

(In following a conservative approach to calculating CO_2 emissions reductions for the project activity, this saving was not calculated and included in the reductions calculations).

The contribution of the project activity to sustainable development:

In addressing the project contribution to sustainable development in the host country (South Africa), the project contribution will be evaluated against the goals formulated by the DNA (Department of Energy) – as set out in the “CDM DNA Application Form” (PIN Application form) – in the format as in the said Application Form:

South Africa has identified the following sustainable development criteria and indicators against which each CDM project will be assessed. Please provide your interpretation of how this project will address each of these criteria and indicators where they are relevant to the project. If the space provided is not sufficient please append additional information as required.
NOTE: For all indicators which are of relevance to the project show how the performance of the project against these indicators can be objectively monitored and measured on an ongoing

basis.	
1. Economic: Does the project contribute to national economic development? Vhavenda Bricks has been in existence since the early 1980"s & has since significantly contributed to economic development in the Thohoyandou area as one of the major employers. As a consumer of energy especially it has contributed to the business of the various suppliers used over this time (including the use of electricity). A significant service industry in the area around the factory, as well as some national suppliers benefit from providing consumer goods to the factory. BY upgrading the firing process of the bricks to VSBK's, the life of the factory will be extended both in economic terms as well as in resource terms (clay reserves will be used at a reduced rate). This will result in the factory making its product available to the local community for a longer period. In the absence of the factory, local development will have to rely to bricks manufactured further from the point of use, and transported in at a significantly increased cost – impacting negatively on the local economy, and ultimately on national economic development. All the equipment to be used in the construction of the kilns as well as in the ultimate maintenance thereof will be of local manufacture – creating new demand, and stimulating the national economy in the process.	
2. Social: Does the project contribute to social development in South Africa? The reduced pollution will improve the quality of life of the residents in the vicinity of the factory. The removal of process bricks from the manufacturing cycle (used in building clamp kilns, will reduce the volume of clay needed to produce the same number of bricks – thus reducing the mining footprint of the factory. Improved quality will be passed onto the market, benefitting the end user, and the improvement in pollution levels emitted by the factory will make it easier for the factory to exist in the long run within the local community, or even to increase production to satisfy market demand. Vhavenda Bricks currently employ 368 workers. One of the main aims of selecting VSBK's as the vehicle for a technology upgrade, is that these kilns require labour to operate (it is an identified barrier, that is sought to be overcome by introducing pallets to fire the bricks on, to address the barrier without reducing the number of people employed). Whilst the construction phase will provide temporary employment for 12 workers, the total work-force will not be reduced. Should the VSBK's contribute to increase the monthly average sellable production at the factory, there is a possibility that more jobs can be created once the project is fully operational. The pallets referred to above will also stimulate auxiliary / service sectors in as far as a new product is being manufactured. The first order for pallets was placed with Natal Iron and Brass Foundry in Pietermaritzburg, as no foundry capacity is available close to the factory.	
3. Environmental: Does the project conform to the National Environmental Management Act principles of sustainable development? Please provide brief comment for each of these below.	
i) That the disturbance of ecosystems and loss of biological diversity are avoided, or where they cannot be avoided, are minimised and remedied	The applicant is an existing brick manufacturer. The project will utilize considerably less space to fire the bricks produced by the applicant – 60m² as opposed to the 2 145m² currently taken up by the clamp kilns.
ii) That pollution and degradation	As an existing brick factory switching from clamp kilns – targeted

of the environment are avoided, or where they cannot be altogether avoided, are minimised and remedied	in terms of section 5(2) National Environmental Management Act: Air Quality Act (Act 39 of 2004) in a list of activities which result in atmospheric emissions which have or may have a significant detrimental effect on the environment, including health, social conditions, ecological conditions or cultural heritage – the intended VSBK technology is recognized worldwide as the most energy efficient and most environmentally friendly way of firing clay bricks.
iii) That the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied	The Clamp kilns presently used by the applicant require up to 20% of the total number of bricks being produced as "process bricks" – bricks used in the building of the clamp kiln as floor bricks or cover bricks. These bricks will no longer be required with the VSBK's, therefore the amount of bricks to be produced in order to have the same amount of sellable bricks will be reduced, reducing the volume of clay mined for manufacturing purposes – causing less disturbance over time to the landscape.
iv) That waste is avoided, or where it cannot be altogether avoided, minimised and reused or recycled where possible and otherwise disposed of in a responsible manner	The amount of waste produced during the process of firing bricks in VSBK's is considerably less than during the process of firing the bricks in clamp kilns, as VSBK's allow for control over the firing process. This results in a more even firing of the bricks, reduced waste and better quality products. Coupled with the removal of process bricks as described above – waste is reduced, and what is still produced, can typically be sold as half bricks for paving purposes.
v) That the use and exploitation of non-renewable resources is responsible and equitable, and takes into account the consequences of the depletion of the resource	The use of carbon coal (small nuts) currently used in large volumes to ignite clamp kilns is removed as this is not required in the VSBK's. The bricks rely on internal fuel mixed in with the clay to fire – which product is a waste or by-product from coal mining.
vi) That the development, use and exploitation of renewable resources is responsible and equitable, and takes into account the consequences of the depletion of the resource.	Over time, the use of renewable resources like wood chips, nut shells etc can be experimented with as sources to augment or replace carbon coal as body fuel, as the VSBK's are flexible enough through the process control it allows to explore the use of such resources. At present, no renewable resources are being used in the process of firing clay bricks at the applicant, or in general in the industry in South Africa.
vii) That a risk averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions	The advantages of VSBK technology has been extensively researched by Governmental and non-governmental bodies internationally, and proven in practice. It is a safe, low risk alternative to clamp kilns and better alternative than any other existing technology available to fire clay bricks.
vii) That negative impacts on the environment and on people's environmental rights be anticipated and prevented, and	The existing negative environmental impacts of clamp kilns in terms of high levels of CO_2 emissions, particulate emissions and negative impacts on visibility will be greatly mitigated. The immediate impact of the introduction of this technology will be an

where they cannot be altogether prevented, are minimised and remedied	improvement to the immediate environment – also for the people residing in the immediate vicinity of the applicant's factory.
Other comments Please provide any other comments on how this project contributes to sustainable development in South Africa In terms of the project representing a technology upgrade, and mitigating negative environmental impacts of the existing clamp kilns, the life span of the factory will be increased. Better building products will be made available in an area where there is a continued need for housing and infrastructural development, thus job creation will be maintained. The maintenance of the VSBK's over time will require input from local businesses like engineering works, which will already benefit immediately from providing equipment during the construction phase.	

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

A.3. Project participants:

>> Table 1.

Name of party involved (*) ((host) indicates a host party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes / No)
South Africa (host)	Vhavenda Bricks (Pty) Ltd	No
* In accordance with the CDM modalities and procedures, at the time of making the CDM-PPD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the parties involved is required.		

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

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A.4.1.1. Host Party(ies):

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South Africa

A.4.1.2. Region/State/Province etc.:

>>
Limpopo Province

A.4.1.3. City/Town/Community etc:

>>
Thohoyandou

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

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The exact geographical location of the brick manufacturing plant is 23°00’17.22”S / 30°23’19.88”E. The plant is situated on the outskirts of Thohoyandou, on Mapate Road, Lwamondu, Thohoyandou – Limpopo Province, South Africa.

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

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AMS III.Z. Fuel Switch, process improvement and energy efficiency in brick manufacture

The project activity is categorised under Type III – OTHER PROJECT TYPES, and III. Z. Fuel Switch, process improvements and energy efficiency in brick manufacture, Technology Measure 1 – shift to an alternative brick production process, (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.......

Brick remains the preferred building material in South Africa, with clay bricks still leading the way. The majority of all clay bricks produced in South Africa are fired in clamp kilns – which have first been used more than 2 500 years ago to fire clay bricks. Even though this technology is not energy efficient and produce more emissions of CO and other greenhouse gasses than any of the other methods known to fire bricks, the capital cost of introducing alternative technologies in the firing of clay bricks are preventing operators from switching from clamp kilns.

In terms of energy efficiency and the resultant emissions, VSBK's have been proven to be the most desirable alternative in terms of both energy efficiency and emissions, due mainly to the fact that these kilns do not rely on heavy kiln equipment (like kiln cars in the case of tunnel kilns) and use most of the energy generated in the kiln through the process of natural draught to pre-heat bricks before entering the firing zone of the kiln. Through control of the loading and discharge of bricks the fire is kept static – unlike Transverse Arc kilns or Bulls Trench Kilns, where the fire are moved though the static bricks, causing energy loss and requiring the use of equipment to move massive volumes of air.

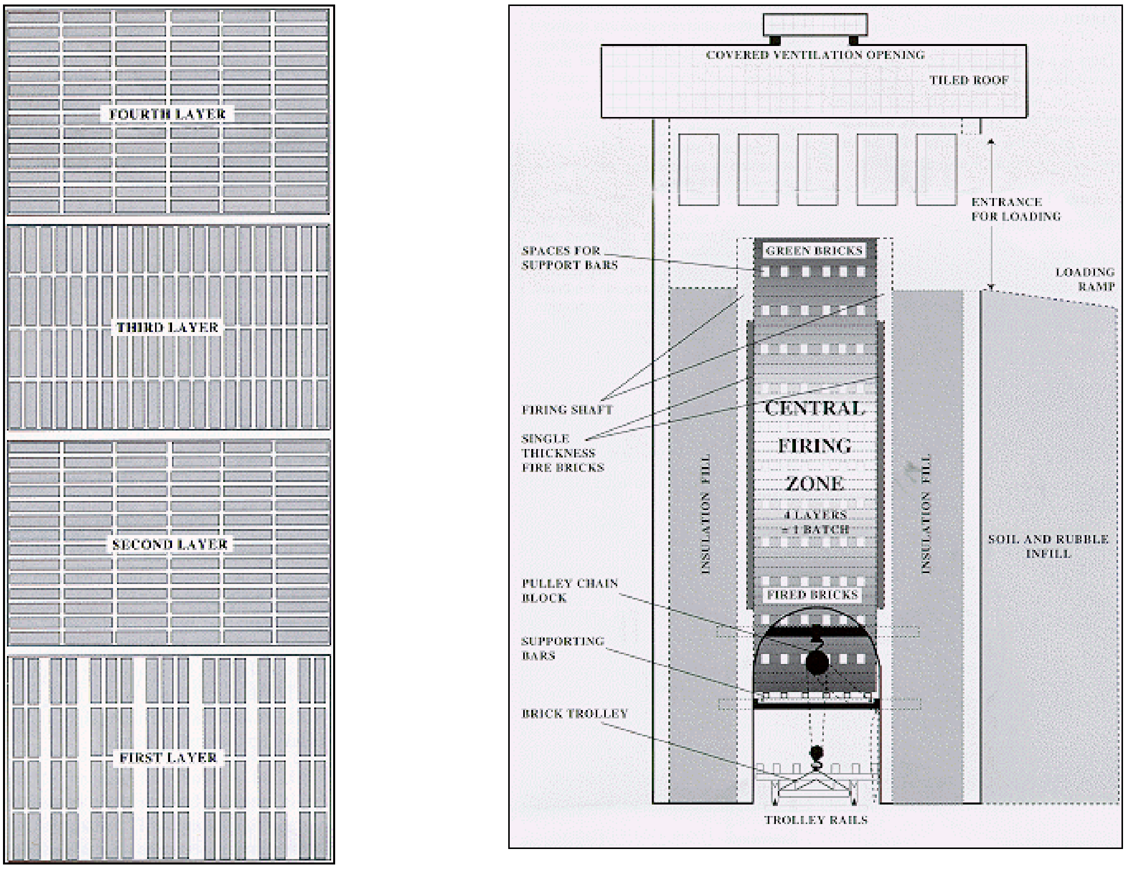
The use of VSBK's significantly reduce waste caused by breakage when compared to clamp kilns and bulls trench kilns for example, as less bricks are fired at a time, allowing for more care in handling the bricks and in enabling more control of the firing process – allowing for more even firing of the bricks.

How the environmentally safe technology and know-how will be transferred to the project participant: (Technology description and maintenance)

Different sources quote different dates as to when the first VSBK's were built. According to the TARA institute in India the VSBK technology was first developed in China in the late 1960's [2].
From there the use of the technology spread in Asia and VSBK's were constructed in Nepal, Vietnam, India and other countries in the region.

The first VSBK's were build in South Africa in 2004, and the first kilns were an adaptation of the Asian kilns, in as far as the size (area required to construct the kilns) were reduced by making the kilns modular in design, and casting the kilns segments from refractory cement, rather than building the shaft out of bricks. In addition, cast iron pallets were designed to enable bricks to be set on the pallets outside the kiln and then for the pallet to passed through the kiln (firing process) with the bricks set on it. These two critical design features of the South African VSBK's eliminate important barriers to the technology.

The drawings below indicate a typical 4 layer setting of bricks that will be entering / exiting the VSBK, and showing how the kiln is filled with rows / layers of bricks. The first layer shows the gaps to be left where the support beams will be pushed through – every 4th layer, supporting all the bricks in the shaft above it.



Drawing 1. Brick setting and layering of VSBK (Jones, 1995)

When the rows / layers of bricks are not properly or carefully packed, and the bricks move during firing (expansion and shrinking) the bricks move or brake and fall into / fill up the spaces where the support bars are supposed to go through when that particular row / layer is at the bottom of the kiln. When the bars cannot be pushed through, they have to be hammered through, which cause further shifting / breaking of bricks, causing the bricks above in the shaft to collapse downwards, making it impossible to draw brick from the kiln.

In events like these, the kiln must be left to burn through and then painstakingly packed out by hand – a total process that can take up to a week – before the kiln can be charged (filled) again and bricks can be burnt in the kiln / shaft. Even when the gaps can in some instances be cleaned and support bars can be inserted again, the time delay causes the fire inside the shaft to burn far up the shaft – out of the firing zone section in the middle of the shaft, and the shaft can take up to a day to stabilise again and get back into a proper firing rhythm.

The proper working of a shaft – achieved when bricks are set correctly – can be achieved with sufficient skills by the packers and through good supervision. This does however become very difficult with mass production – when 10 shaft or more for example must be packed, and when this must be done 24/7. The fact that the VSBK's are dependent upon proper setting 24 hours per day – during night shifts, over week-ends and during public and other holidays proved to be the most difficult barrier to the technology.

In finding a solution to overcome the barrier identified here, it was decided to have pallets cast from cast iron that should be able to withstand the temperature and load stresses inside the VSBK. The pallet should have sufficient voids to allow the passage of the upward draught / heat inside the VSBK, and allow for the contact ignition of bricks – reliant on heat transfer from bricks below.

The proposed project activity will be the first to utilise these pallets in order to overcome the barrier, and as such it is completely untried and untested technology.

The pallets will allow bricks to be set in the layers shown in figure 1 above on the pallet. Enough bricks will be set on pallets to enable the kilns to be loaded / discharged after hours with pre-set pallets, removing the need for manpower to work after hours to pack bricks into and out of the kilns. The pallets will be loaded into the kilns with the aid of an overhead gantry crane, and the whole operation will only require a few operators after hours to move pre-packed pallets up to and into the kilns with the crane, and the discharged bricks (on pallets) will be moved with a forklift truck to a sorting area, where the bricks will be packed off the pallets during normal working hours only.

Of equal importance, is the fact that the pallets will give stability to the bricks inside the kiln. It has been observed that that top layer in a VSBK sag in the middle – making it very difficult to set bricks neatly in straight rows onto them. This sagging is the result of the bricks centre of the kiln being hotter than the bricks on the sides for large sections inside the kiln – giving uneven sagging of the layer / row on the top. The resultant bad setting – exacerbated by bad workmanship encountered with afterhours provision of labour leads to the problem with the support bars as described and the resultant closing of kilns. The pallets will further aid in preventing these problems, as the support bars will now only have to support a pallet at the bottom of the kiln, and not individual rows of bricks on which the weight of the entire kiln (bricks inside the VSBK) is resting.

The functioning of the pallets is only been theoretically determined as well as the design and composition of the casting material. No proper estimations about the life cycle and productivity of these pallets could have been made and as such present a significant barrier in seeking finance for the project or for the pallets at least.

Vhavenda Bricks has purchased a set of construction drawings for the adopted kilns from the developer of the technology, together with detailed construction and operations instruction – in addition to which the developer of the technology will assist Vhavenda Bricks in a consultancy capacity to oversee the construction of and the commissioning of the kilns.

Once the project activity gets underway a maintenance schedule will be established and followed to ensure optimum functioning of the technology. In addition to emergency repairs to electrical and hydraulic components when required the maintenance schedule will focus on ensuring all draught parts remain properly sealed and clean / free of constraints.

To further ensure optimum availability, the hydraulic device to remove bricks fired bricks from the kiln as well as the gantry device for loading bricks into the kilns have been doubled, to ensure a stand-by unit is available at all times.

Regular wear on service items like pallets will be inspected daily upon re-use and un-suitable units will be withdrawn from use and replaced with functioning units.

As the technology to be used by VB as described herein is new, and relates to hardware, information and knowledge not available anywhere – it will therefore flow to VB from within the country, as such clearly constitute "technology transfer" as envisaged in the IPCC definition of "Technology Transfer" as contained in its Special Report on Methodological and Technological Issues in Technology Transfer.

The technology to be used by VB is environmentally safe in as much as it represents a fixed firing installation, where the bricks are to be fired by contact ignition – preferably without the aid of any external fuel. There will therefore be no carbon under firing / combustion conditions inside the kiln. The carbon under ignition will be contained inside the brick where it will emit even less into the atmosphere as there will be encapsulation taking place inside the brick.

The technology – even though it has been substantially modified from basic VSBK technology, still retains all the energy efficiency measures and resultant reduced emissions characteristics of the basic VSBK technology – which relies on the simple principle of upward convection of heat inside the shaft (VSBK) to pre-heat and ignite unfired bricks, using most of the available energy inside the shaft in the firing process.

As total fuel will be reduced in the technology, and no new sources of emissions will be added by the process, along with the other benefits like decreased travel of fuel burning vehicles – the safety to the environment will be enhanced.

[2]http://www.tara.in/tara/websitepages/..%5Cupload%5Cdocliberary%5CGenericdocuments%5CHistory_of_VSBK_technology.pdf

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

>> Table 2.

Years	Annual estimation of emissions reductions in tones CO_2 equivalent
2013	25 925.46
2014	25 925.46
2015	25 925.46
2016	25 925.46
2017	25 925.46
2018	25 925.46
2019	25 925.46
2020	25 925.46
2021	25 925.46
2022	25 925.46
Total estimated reductions tones of CO_2	259 254.60
Total number of crediting years	10
Annual average over the crediting period of amount of estimated reductions (tones of CO_2)	25 925.46

A.4.4. Public funding of the small-scale project activity:

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No public funding from parties included in Annex I is being received by this project. It can be evidenced and verified from the financial records of the PP that all funds for the small scale project spend, flowed from own funds.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

In accordance with Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities - DETERMINING THE OCCURRENCE OF DEBUNDLING – the small-scale project is not a debundled component of a large scale project activity in that there is not a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

· With the same project participants;
· In the same project category and technology/measure; and
· Registered within the previous 2 years; and
· Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

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AMS III.Z. – Version 03 Fuel Switch, process improvement and energy efficiency in brick manufacture [3]

B.2 Justification of the choice of the project category:

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The project category applied to this project activity is as follows:

- Type III – Other project types. It has been illustrated herein – see A.4.3 above - that the estimated emissions reductions for the project will not exceed 60kt CO_2 in any year of the crediting period.
- III.Z. – Fuel Switch, process improvement and energy efficiency in brick manufacture (Version 03)

[3] http://cdm.unfccc.int/filestorage/L/U/4/LU42I07KDBSO6C3XYZH59JMNAF8GWP/EB54_repan10_AMS-III.Z_ver03_0406.pdf?t=dTV8bHQ5a245fDBn4IBBrBELKoYV9GTXfBlR

Table 3.

The methodology AMS III Z can be applied if the following conditions are met:	**Justification**
The methodology comprises one or more technology/measures listed below in existing brick production facilities: • *Shift to an alternative brick production process; or* • *Partial substitution of fossil fuels with renewable biomass[1] (including solid biomass residues such as sawdust and food industry organic liquid residues[2]); or* • *Complete/partial substitution of high carbon fossil fuels with low carbon fossil fuels.*	Vhavenda Bricks is an existing brick production facility, having first started brick production in 1984. The project is aimed at the introduction of alternative brick production processes in as far as the method of firing bricks will be changed from clamp kilns to VSBK's. The same carbon fuel (coal) will be used as body fuel (mixed into the clay from which the bricks are produced) – the use of external fuel (small nuts) to fire each clamp kiln packed to fire bricks, will fall away as the VSBK's will not need external fuel once lit.
Fuel substitution and associated activities may also result in improved energy efficiency of existing facility; however project activities primarily aimed at emission reductions from energy efficiency measures shall apply AMS-II.D. Thus 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 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 baseline brick (see paragraph 8). Examples include pressed mud blocks (soil blocks) with cement or lime stabilisation[3] and other 'unburned' bricks that attain strength owing to fly ash, lime/cement and gypsum chemistry*.	No fuel substitution will take place in the proposed project. It is even anticipated that the fuel will be acquired from the same source during the project period as in the period used to calculate the baseline for the project. The project scenario will be different from the baseline scenario. The bricks will stay the same in terms of manufacturing method, materials used, and drying process, the change will be to the firing method. It is anticipated that the percentage body fuel used may be reduced in the project when compared to the baseline. Overall average brick quality will improve as a result of increased control over the firing process, resulting in a higher yield of bricks meeting quality standards – thus being sellable instead of being waste. Production statistics to be kept of bricks packed into VSBK's and bricks sellable from this number will prove this point. If changes are to occur in the extrusion method –

	from a solid brick being produced, to a perforated brick to be produced, this will not affect the description of the product as a "brick" in terms of this methodology.
The measures may replace, modify or retrofit[4] systems in existing facilities or be installed in a new facility.	The project will take place at an existing brick manufacturing facility, where the method of firing bricks will be changed from clamp kilns to VSBK's constructed for the purpose of replacing the clamp kilns.
New facilities (Greenfield projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the General Guidance for SSC methodologies.	The project activity was planned around the same amount of green bricks VB is currently producing – thus it does not involve any capacity addition as meant in the Guidelines (Version 17, EB 61, Annex 21). Due to a reduction in waste and the phasing out of "process bricks" the yield of sellable bricks will increase from the same amount of green bricks being produced. The methodology to be employed to achieve production levels during the firing stage in line with the installed capacity of the plant and equipment used to manufacture bricks to the point of firing – namely VSBK's – are not the norm in industry nor in the area. There are no other VSBK's in the Limpopo Province of South Africa, and all NFP / plaster bricks produced in the province are produced in clamp kilns.
The requirements concerning demonstration of the remaining lifetime of the replaced equipment shall be met as described in the General Guidance for SSC 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.	UNFCCC Methodological Tool "Tool to determine the remaining lifetime of equipment" (Version 01) provides a tool to calculate the remaining life time of base line equipment replaced by the project activity. Under the definitions (first definition) it clearly describes equipment to mean tangible movable equipment. The clamp kilns (base line activity) that are to be replaced by the VSBK's (project activity) does not constitute "equipment" as defined in the tool as it does not exist prior to being stacked with un-burnt bricks and disappears as soon as the bricks are burnt and packed away. It is therefore not possible to determine a life time for it and it is in fact infinite as it cannot degrade, wear away reach the end of a life or product cycle etc. - as they are made up entirely for the purpose of firing a specific batch of bricks (the bricks packed together fired

	and then unpacked) – see illustration of a clamp kiln and description in B.4 hereunder. The use of the 10 year project cycle instead of the 3 X 7 year renewable project cycle is therefore by implication the more conservative choice of project cycle.
In the case of existing facilities, this category is only applicable if it can be demonstrated, with historical data, that for at least three year prior to the project implementation, only fossil fuel (no renewable biomass) was used in the brick production systems, which are being modified or retrofitted.	Vhavenda brick has traditionally relied upon carbon coal to fire bricks at the facility. Purchase records for the required period are available to verify this fact.
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:	The raw material used to produce bricks gets mined on site and will continue to be mined there for the project life time. The clay ad-mixture will remain the same for the project activity as for the baseline activity. The ad-mixture was tested to demonstrate a plasticity index of 33.3 (which is considered very high) and has on average a silica (SiO_2) content of 52.73% and a alumina (Al_2O_3) content of 18.85%. These two chemicals constitute the major chemical components of any “clay” (raw material at VB). This can be validated from tests conducted for VB by CERMALAB C.C d/d March 2007.

This methodology is applicable under the following conditions: *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 (e.g., 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 6 months interval (at a minimum) and test certificates on compressive strength are made available for verification;* *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 3;* *Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.*	It is expected that the bricks to be produced in the VSBK's will show an increase in product quality due to the positive effects of decreased handling and improved control over the firing process afforded by the VSBK technology. The introduction of cast iron pallets on which bricks will be packed when passing through the VSBK to be fired will result in a significant reduction of the load stresses in the bricks during the vitrification process. Bricks produced during the project will be tested at the required interval at an accredited testing facility for compliance with SANS 227 which set the minimum national standards for burnt clay masonry products in South Africa. While green production will not increase, the yield of sellable bricks will increase due to less fired waste and process bricks (bricks needed to build floors under the clamp kilns and to cover the green unfired bricks that constitute the clamp kiln) no longer having to be taken from normal yield of the clamp kilns – as the VSBK's do not require these process bricks. The yield of sellable fired bricks will be closer to green production numbers. The project will therefore not increase the overall green production levels for the baseline of the project beyond the ±10% of the baseline capacity of the monthly production out of clamp kilns of 3.42 million bricks achieved during October 2008 and again in October 2010. The project activity was designed and will be constructed for the number of green bricks produced currently by VB only. The project is anticipated to achieve a reduction of just under 25 000 tons of CO_2 equivalent per annum.
This methodology is not applicable if local regulations require the use of proposed technologies or raw materials for the manufacturing of bricks unless widespread non compliance (less than 50% of brick production activities comply in the country) of the local regulation evidenced.	Clamp kilns are still the norm in South Africa and there are no regulations in place against the use of these kilns, nor legislating the use of any alternative firing method. Tunnel kilns are in fact the suggested method of technology switch to replace clamp kilns – as per Government Notice 270 of 2011- "Notice of intention to consider for approval the Highveld priority area air quality management plan" – published in Government Gazette 34250 of 5 May 2011.

The approved methodology AMS-III.Z states that activities involving a more energy-efficient brick production process and a switch to less carbon intensive production fall into category III.Z. The project meets the relevant conditions as set out therefore it is the appropriate methodology for the project activity.

B.3. Description of the project boundary:

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The AMS-III.Z defines the project boundary as the physical, geographical site where the project activity takes place during both the baseline and crediting periods. The project boundary is the area where bricks are being fired on the geographical site of VHAVENDA BRICKS (as described in A.4.1. above) – specifically the position / location of the 15 VSBK's (project activity).

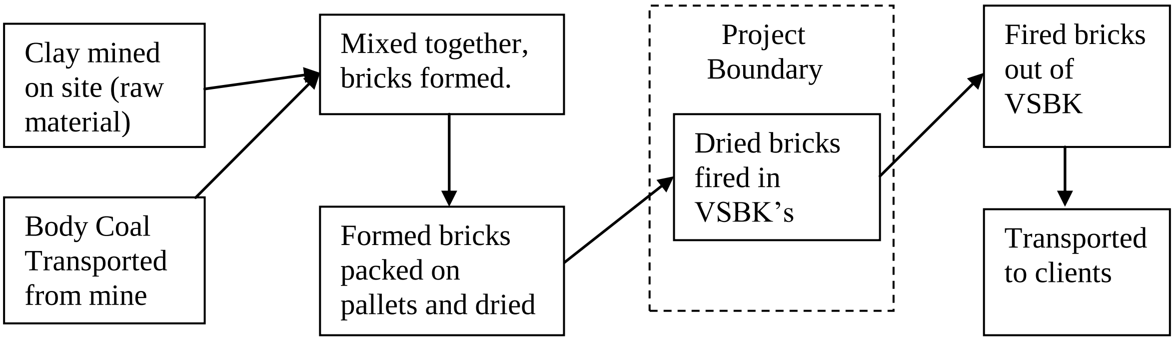

Table 5.

Emissions	Project Scenario	Baseline Scenario
Direct on-site	Sources: - Emissions from burning of fossil fuel (coal) to fire bricks in VSBK - Emissions from burning fossil fuel in internal combustion engines mobile machinery on site Considered: - Emissions from firing bricks Not considered: - Emissions from burning fossil fuel in engines of mobile machinery. Although there will be a reduction in use of such machinery associated with the VSBK, this was not calculated (following a conservative approach) and it was also not considered in the baseline as it will remain a source of emissions.	Sources: - Emissions from burning of fossil fuel (coal) to fire bricks in Clamp Kilns - Emissions from burning fossil fuel in internal combustion engines mobile machinery on site Considered: - Emissions from firing bricks - Emissions from burning fossil fuel in engines of mobile machinery.

Direct off-site	Source: - Emissions from the burning of fossil fuel in internal combustion engines used in the transportation of fuel (coal) from source to VB. Not considered.	Source: - Emissions from the burning of fossil fuel in internal combustion engines used in the transportation of fuel (coal) from source to VB. Not considered.
Indirect on-site	Sources: - Emissions associated with power generation in the National power grid Considered: - Emissions from firing bricks Emissions from electricity generation for the use with VSBK Not considered: - Emissions from electricity generation for use in the rest of the manufacturing plant, as this remains constant in both project and baseline scenario, and it was not considered in the baseline scenario	Sources: - Emissions associated with power generation in the National power grid Not considered: - Emissions from electricity generation for use in the rest of the manufacturing plant, as this remains constant in both project and baseline scenario, and it was not considered in the project scenario
Indirect off-site	Source: - Emissions associated with power generation in the National power grid in the manufacturing of goods (spares and parts) used by VB Not considered - Emissions from the burning of fossil fuel in internal combustion engines used in the transportation of goods (excluding coal) to VB and bricks from VB to customers. Not considered.	Source: - Emissions associated with power generation in the National power grid in the manufacturing of goods (spares and parts) used by VB Not considered. - Emissions from the burning of fossil fuel in internal combustion engines used in the transportation of goods (excluding coal) to VB and bricks from VB to customers. Not considered.

B.4. Description of baseline and its development:

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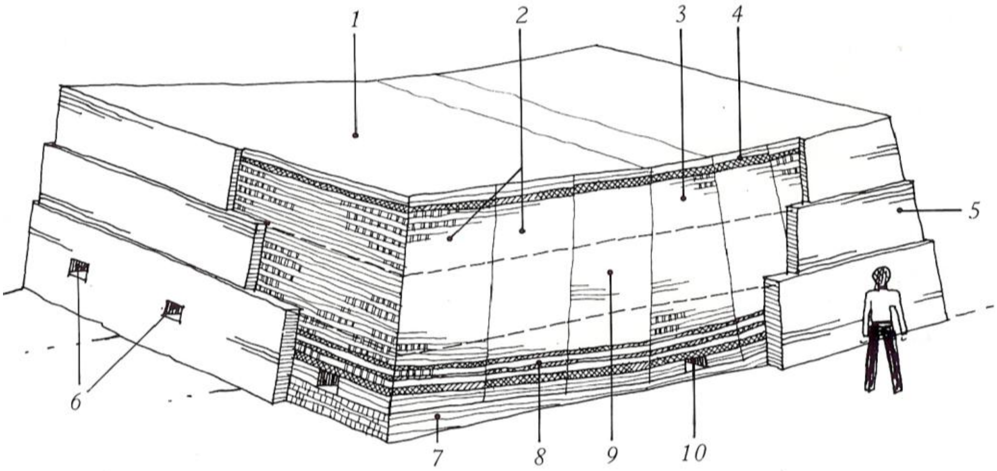
Description of the baseline

According to AMS-III.Z. the baseline emissions are the fossil fuel consumption related emissions (fossil fuel consumed multiplied by an emissions factor) associated with the system which were or would have otherwise been used, in the brick production facility in the absence of the project activity. The system currently used at VHAVENDA BRICKS is the burning of bricks in clamp kilns.

BRICK CLAMP



1 Old Brick and Clay Covering
2 Necks
3 Central Upright
4 Breeze
5 Wall of Old Bricks Daubed with Clay
6 Flues
7 Dished Base of Old Bricks
8 Layers of Breeze
9 Green Bricks
10 Firehole

External fuel usage / small nut coal.

The data was calculated using the following parameters:

- Standard size bricks were used as norm, with nominal dimensions of 224X110X73mm.
- When bricks are packed in a clamp kiln, length wise, you will pack 4 bricks in a meter, and width wise you will pack 13 bricks in a metre = 56 bricks per m² (number of bricks that can on average be packed into a m^2).
- Given that the average clamp kiln will be packed 33 layers of brick high, that implies 1 833 bricks per m² in a clamp kiln (top to bottom).
- The “skintel” or small nut coal placed under the “clamp” to ignite the internal fuel in the brick, is packed in a “herringbone” formation, using either un-burnt or process bricks (taken from normal stock) to form this “herringbone”. This formation implies 50% voids per m², which is then filled with coal (small nuts).
- Given the 56 bricks per m² when packed, 50% voids will translate to brick area equal to 28 bricks to be filled with coal, and when multiplied with the height of a brick of 110mm, it calculates to 0.05036 m³ of coal per m². Using a density factor of 1.346 (SG), this then calculates to 0.0677 tonnes per m² of coal (small nuts).
- Given an average of 3 layers of “skintel” under the clamp = 0.20 tonnes of coal per m² in the clamp.
- As that m² will have in it 1 833 bricks (top to bottom) = 0.11 tonnes of coal per 1000 bricks to be fired.

Internal fuel usage / “duff” coal or carbon fly ash (CFA)

The data was calculated using the following parameters:

- Average weight of a brick = 3 Kg.
- The internal fixed carbon (FC) % in the brick to be on average 4.5%.

- Given an average fixed carbon content for duff / fly ash of 38-40% = 16.66% by volume of the brick is either duff or CFA. Using a density factor 1.8 (SG) for clay and 0.833 (SG) for the duff or CFA would imply a mix ratio of 10:2 (10 parts clay:2 parts coal material) – which equates to 8.47% (by weight) of coal material per 1 000 bricks manufactured with internal coal fuel.

Industry calculation

The following production figures were obtained from the Clay Brick Association (CBA), then used to calculate external and internal fuel consumption as per the guidelines determined as set out above.

Table 6.1

Clay bricks produced annually	Bricks burnt annually in clamp	Non Facing Plaster (NFP) bricks
in South Africa	kilns in South Africa	burnt annually in clamps (RSA)
4 000 000 000	3 400 000 000	2 800 000 000
External fuel - small nuts/peas	Tons of coal annually	Tons of coal annually
	374 000	308 000
Internal fuel - duff/carbon fly ash	Tons of carbon annually	Tons of carbon annually
	863 940	711 480
Total carbon fuel annually	1 237 940	1 019 480
Total fuel per million bricks	364.1	364.1
Total fuel per 1000 bricks	0.364	0.364

The total fuel per 1 000 bricks being produced in the industry is therefore 0.364 tonnes.

Development of the baseline

The baseline was developed in accordance with the UNFCCC - Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories - General Guidelines to SSC CDM methodologies (Version 17), by analysing the available and practical alternatives to the project scenario, and in the process doing a barrier analysis on same alternatives.

Point 21 and the applicable content of point 19: Identification of alternatives to the project activity

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.

In order to determine which of the firing methods available to the project proponent delivers a comparable level of service, all alternatives were listed and evaluated against a series of variables the project proponent feels are indicative of the level of service. The values used were from data available from research of articles and from practice and from own estimations:

	CLAMP	VSBK	BULLS TRENCH	HOFFMAN	TUNNEL KILN
Fuel in MJ/ Kg/brick**	3	1	3.2	2.8	4.2
Firing fuel	Internal	Internal	Mainly extern	External	External
Est. Capex for 3 mi bricks	SAR 0	SAR 3 mio	SAR 1 mio	SAR 15 mio	SAR 60 mio
Repaym @ 12% / 120 mnths				SAR 215 206	SAR 860 825
Labour requirement	Single shift	24 hour	24 hour	24 hour	24 hour
Average waste expected	15%	3%	12%	3%	2%
Emissions (T/CO_2 mio bricks)*	565	113.5	290		
Maintenance (1 - 5 high)	0	1	5	3	1

** ENERGY CONSUMPTION

Shilderman and Mason (2009) quote earlier research by Mason (2001) citing figures of between 3 – 8 MJ/Kg for bricks fired in clamp kilns.[4]

Jones, 1995 quotes figures of 975 MJ/brick for VSBK's in China, and compares it to 2800 MJ/brick for Hoffman Kilns and 3116 MJ/brick for Bulls Trench Kilns.[5]

CERAMIN (2009) quote figures of between 4.2 – 9.2 MJ/Kg for tunnel kilns (at 1200°C – which is the typical firing temperature for these kilns firing facing bricks, what they are used for in a brick application).[6] COROBRIK in South Africa quoted figures of between 6.66 and 9.47 GJ/1000 bricks in their measurements for a tunnel kiln – as per a PDD document (version 6 d/d 22 July 2011 – Driefontein Plant, South Africa)[7].

* EMISSIONS

As far as emissions of CO_2 are concerned, the Asian Institute of Technology quotes figures of 113.5 tonnes per million bricks for VSBK's, 290 tonnes per million bricks for Bulls Trench Kilns and 565 tonnes per million bricks for Clamp Kilns.[8]

Criteria used to determine level of service:

- Fuel consumption (Fuel makes up normally about 40% of the cost of production input in brick manufacturing.
- Capital Expenditure Cost (Capex) is the estimated cost of erecting / building each of the firing methods available. This cost cannot be included in the production cost of the bricks, but has to be paid from the profit from sales. If the product sells for SAR 800 per 1000 and a net profit margin of 15% can be maintained (considered a good business model), then SAR 120 per 1000 profit can be realised and at 3 000 000 bricks sellable = R 360 000 profit per month. If 50% of profits (return on assets) are to be used to service capital cost SAR 180 000 per month will be available to finance the brick firing technology.
- Monthly repayments were calculated using 12% p/a interest rate (prevailing loan rate in South Africa) over a 10 year period (period allowable in terms of tax legislation to depreciate assets).

Findings in terms of the comparison to determine comparative service levels:

- Tunnel Kilns. Not considered as an alternative due to inability to service the capital required for this option. In addition very high in fuel consumption / cost as well.

- Hoffman kiln. Not considered due to inability to service capital required for this option. In addition the external fuel needs to be controlled by labour, which makes it a risky option in terms of potential waste and even damage to structure.
- Bulls trench kiln. Not considered as it offers no real advantages over the base line scenario. The waste figure is comparable, it uses more fuel, requires 24 hour supervision over a burning method that it extremely critical to human error (fire must be fed and draught (fan) moved with high precision to ensure a proper firing process and lastly it is not worth the emissions saving it offers for the mentioned negative factors to be off-set.

Options to be considered therefore being:

- Clamp Kilns.
- VSBK.

Step 2. Alternatives in Step 1 in compliance with local regulations

Both Clamp Kilns and VSBK are fully compliant with local regulations, with clamp kilns being the industry norm.

Step 3. Eliminate and rank the alternatives identified in step 2 taking into account barrier tests specified in attachment A to Appendix B of the simplified modalities and procedures of SSC CDM (Version 02)

The aforementioned state:

1. 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.

Based on the aforementioned criteria, the VSBK (as evaluated in the absence of CDM) disqualifies for consideration on all points (a) – (d), but in accordance with procedure (c) is singled out as the main barrier as clamp kilns represent the prevailing practice in South Africa. It is the current technology being employed at VB and it is well tried, tested and institutionalised.

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[4] http://www.bath.ac.uk/ace/uploads/BRE/NOCMAT2009/papers/Paper%2040.pdf

[5] http://www.greenstone.org/greenstone3/sites/nzdl/collect/hdl-old/import/basin/gbn09e/gbn09e.htm

[6] http://ceramin.eu/Ceramin/downloads/D7_Tutorial_Energy_saving_UK.pdf

[7] http://www.energy.gov.za/files/esources/kyoto/2011/2011-07-22-%20PDD_Fuel%20Switch%20at%20Corobriks%20Driefontein%20Brick%20Factory%20in%20South%20Africa(NoTrackChanges).pdf

[8] www.faculty.ait.ac.th/visu/.../BRICK%20AND%20CERAMIC.pdf

Step 4.

The only alternative that remains is clamp kiln – which corresponds to one of the baseline scenarios offered in the methodology, which therefore renders the project activity eligible under the methodology.

Table 6.4: Data on which key assumptions and rationale were based for the calculation of the baseline.

	Average brick weight	Weight million bricks	Clamp coal mill bricks	Body coal mill bricks	Energy mill bricks	Emissions mill bricks	Emissions body coal transp. / mill	Emissions clamp coal transp. / mill
	Kg	Tons	Tons	Tons	MJ	t/CO_2	t/CO_2	t/CO_2
Bricks fired in clamps in SA	3	3000	110	254.1	5 000 – 11 000	565	n/a	n/a
3 year average at Vhavenda	3.2	3200	116.76	220	1013	1068.85*	2.84	1.44
Figures for tunnel kilns	3	3000	n/a	n/a	4 200 – 94 700	n/a	n/a	n/a
Figures for TVA kilns	3	3000	n/a	n/a	2 800	n/a	n/a	n/a
Figures for BT kilns	3	3000	n/a	n/a	3 116 – 4 200	290	n/a	n/a
Figures for VSBK's	3	3000	n/a	n/a	975 – 1 280	113.5	n/a	n/a
Proposed project activity	3.2	3200	n/a	75	2 510**	257.6	2.84	n/a
* The coal used by Vhavenda are the closest and most cost efficient source – but both are extremely high quality, resulting in the high emissions factor calculated for the historic baseline. The volumes used were on par for the industry (clamp kilns) and reflect the inefficiency of these (clamp) kilns in terms of energy consumption.								
** The proposed project will be able to cut back drastically on body coal (external / clamp coal will fall away completely) due to the energy efficiency of the VSBK's. The energy per million bricks – though still higher than for VSBK's in general – is shown to be in line with the technology. The figure of 2 510 MJ/million was calculated using the anticipated 75 ton of body coal per million bricks x the 33.5 J calorific value of the product used.								

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

PRIOR CONSIDERATION

Prior consideration notification was lodged with the UNFCCC and the DNA[9] in August 2011 and the start date of the project activity was March 2011 when the design drawings and construction plans for the VSBK's were purchased – effectively the first capital expenditure towards the proposed project activity. The timeline places it within the 6 months in accordance with EB 49 Annex 22.

The timeline, decisions and documents in the Vhavenda Brick Technology Transfer mechanism – Introduction of Vertical Shaft Brick Kiln (VSBK) Technology at Vhavenda Brick – South Africa, is illustrated in the table below.

Table 7.

Sn #	**Date.**	**Action or decision.**
VB1	June 2010	Applicant decides during a board meeting to investigate alternative brick firing methods to replace the clamp kilns in use.
VB2	August 2010	On 13 August 2010 the applicant attended a workshop hosted by the Southern African Clay Brick Association (CBA), at which the Swiss Agency for Development and Cooperation (SDC), Swiss Contact and SKAT present the operation of Vertical Shaft Brick Kilns (VSBK's).
VB3	September 2010	Further desktop research into different alternatives to clamp kilns is conducted, factories visited where some of the alternative brick firing methods are in place, and opinions sourced in this regard. Contact is made with the developer of the first VSBK's built in South Africa.
VB4	December 2010	Factory in Namibia is visited where 10 new and unused VSBK's built by the company that constructed the first VSBK's in South Africa is available due to the fact that the factory there decided against replacing clamp kilns with VSBK's due to barriers identified during the commissioning demonstration of the VSBK's.
VB5	February 2011	Quotations are obtained for the construction of the VSBK's at the Applicants premises, including the casting of steel pallets on which the bricks are to be fired through the VSBK's – as a new design of the VSBK technology aimed at addressing the barrier identified at the abandoned project in Namibia.
VB6	March 2011	Construction plans and design drawings for a battery of VSBK's incorporating new design features to be erected at the premises of the project applicant is commissioned. This signify the decision to proceed with the technology switch of replacing clamp kilns with VSBK's and signify the first expenditure towards the project. The VSBK components in Namibia is purchased, these components of which are to be used to construct up to 15 kilns at the project applicant – the new design being a further design drift from traditional VSBK technology through the introduction of pallets inside the VSBK to fire the bricks on and providing for draught sections at the top and bottom of the VSBK's to be constructed on site.

VB7	April 2011	An order is placed for the casting of the first steel pallets for the proposed project – the early order necessary due to the long quoted manufacturing time – including a pattern that had to be manufactured first.
VB8	May 2011	An exemption application is submitted to the local Environmental Department in terms of EIA regulations, to get official approval for the technology switch to take place, without having to follow laid down requirements based upon 2010 amendments to the relevant legislation and the fact that the proposed activity is reducing emissions and improving the environmental impact of the existing plant.
VB9	June 2011	Preparatory, non invasive ground work preparations for the construction of the VSBK's are started. Contact is made with Nedbank to discuss the possibility of registering a CDM project.
VB10	July 2011	Meeting with Nedbank regarding a CDM project takes place in Johannesburg on 26 July 2011.
VB11	August 2011	Prior Consideration Notification given to the UNFCCC and the DNA. Exemption obtained from Limpopo Department of Environmental Affairs & Tourism (LEDET) from EIA procedures and requirements. Erection of the VSBK's commences.

[9] http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html

ADDITIONALITY

To demonstrate additionality Appendix B of the simplified modalities and procedures for small-scale CDM project activities - Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories, was used.

Attachment A to Appendix B

1. 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;

The prevailing practice in South Africa is to fire bricks through clamp kilns. This technology is still legal to operate in South Africa, and as such it is the most cost effective scenario, as the fluctuations in production (firing bricks in clamp kilns) can be compensated for by simply increasing the production area – clamp kilns area – and building more clamps to fire bricks in. This does not require additional capital cost, only additional labour and labour cost and energy cost. The equivalent increase in CO_2 emissions (as shown for the existing baseline in tons of CO_2 per quantity bricks fired) will result for the additional bricks to be fired through the clamp kilns.

Clamp kilns do pose constraints in terms of lack of firing control and in sensitivity / increased waste due to weather conditions.

The most cost effective alternatives to the present practice of firing the bricks in clamp kilns that were considered was bulls trench kilns (BTK's) – both in the traditional format of an excavation in the ground, filled with bricks and then closed on the top with a chimney moving along with the fire as it passes through the bricks, and the more modern version of the BTK build with two fixed side walls, filled with bricks closed on the top and with a chimney moving along the top as the fire progresses through the bricks.

Both prevailing practice (clamp kilns) and the most cost effective alternative to clamp kilns (BTK's) would have resulted in very high levels of emissions.

The baseline activity – burning bricks using clamp kilns – have no Capital Expenditure Cost (CAPEX), no additional shift labour and no require no fixed infrastructure to operate, but results in high emissions. In the project activity on the other hand is high CAPEX cost, require shift labour to operate – but have reduced 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.

Conclusion.

Based upon the satisfaction of steps 1 (c) it is concluded that the proposed project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The emission reductions for the project are calculated according to:

- AMS-III.Z. Methodology.
- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"[12]
- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"[13]

BASELINE EMISSIONS

Explanatory Note:

It calculating baseline emissions for the project, the two different sources and uses of carbon coal was not combined, but calculated separately, as the coal are from different sources with different values (energy values and hence emissions factors). They are identified as $_{BL,BC}$ (Base Line, Body Coal) representing fine coal sourced from Tshikondeni Mine for use as body fuel – coal fixed with the clay before the bricks are formed – thus being present in the body of the brick, and $_{BL,CC}$ (Base Line, Clamp Coal) representing lump coal (small nuts) sourced from the Groot Geluk mine – coal used as external fuel to ignite the clamp kilns. The relevant values for these two types of coal to be expressed in FC (Fixed Carbon) calculations and Q_y (Quantity Year) calculations. The combination of these two coal types represent the Base Line emissions calculated using the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"

Equation 1:

For baseline emissions the formula hereunder was used. It is based upon the present production technology (clamp kilns) and average past production levels as well as the production levels that are set to prevail in the absence of the project.

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

BE_y	the annual baseline emissions from fossil fuels displaced by the project activity in t CO_2 in year y (of the crediting period)
EF_{BL}	The annual production specific emission factor for year *y*, in t CO_2 / kg
$P_{PJ,y}$	The annual net production of the facility in year *y*, in kg

[12] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

[13] http://cdm.unfccc.int/Reference/tools/ls/meth_tool05_v01.pdf

Equation 2:

The annual production specific emission factor (EF_{BL}) is calculated as follows:

$$EF_{BL} = \Sigma (FC_{BL,j} \times NCV_j \times EF_{CO2,j})/P_{Hy}$$

$FC_{BL,j}$	Average annual baseline fossil fuel consumption value for fuel type j combusted in the production process using weight units
NCV_j	Average net calorific value of fuel type j combusted, MJ per unit volume or mass unit
$EF_{CO2,j}$	CO_2 emission factor of fuel type *j* combusted in the in the process *i* in t CO_2/ MJ
P_{Hy}	Average annual historical baseline brick production rate measured in units yielded that qualify as sellable bricks - in units of weight or volume, kg or m^3 – with weight in Kg chosen as the parameter.

Equation 3:

$$EF_{CO2} = (CC_j / NCV_j) \times MCF_{CO2}$$

$EF_{CO2,j}$	CO_2 emission factor of fuel type *j* combusted in the in the process *i* in t CO_2/ MJ
CC_j	Carbon content of fuel type j in tons C / tons coal
NCV_j	Average net calorific value of fuel type j combusted, MJ per unit volume or mass unit
MCF_{CO2}	Mole conversion factor from carbon to CO_2 (44 / 12 = 3.667)

PROJECT EMISSIONS:

The project emissions are the emissions resulting from the combustion of the reduced use of body coal. The project emissions are the baseline emissions that existed before the technology upgrade – when clamp kilns were used to fire bricks **less** the

- Emission reduction from no longer using small nuts (coal)
- Emission reduction from the reduced use of body coal

Plus the

- Emissions from the use of electricity from the grid in the project.

Equation 4:

$$PE_y = (FC_{BC,y} \times COEF_{BC})$$

PE_y	Project emission in year y in tons CO2/year
$FC_{BC,y}$	The quantity of body coal combusted in year y
$COEF_{BC}$	The CO_2 emission coefficient of body coal used in year y

$\boldsymbol{COEF_{BC} = NCV_{BC} \times EF_{CO2,j}}$

$COEF_{BC}$	The CO_2 emission coefficient of body coal used in year y
$NCV_{BC,y}$	Average net calorific value of body coal used in year y
$EF_{CO2,j}$	Average CO_2 emission factor of body coal in year y

Equation 5:

$\boldsymbol{PE_{EC,y} = EC_{pj,j,y} \times EF_{EL,j,y} \times (1+TDL_{jy})}$

Scenario A: Option A1 was followed, as it was to calculate project emissions / leakage for electrical consumption from the grid.

$PE_{EC,y}$	Project emission in year y in tons CO_2/year for electrical consumption
$EC_{pj,j,y}$	Quantity of electricity consumed in year y in mWh
$EF_{EL,j,y}$	Emission factor for electricity generated in tons CO_2/mWh- using combined margin grid emission factor for calculation of project emission due to on-site electricity consumption.
TDL_{jy}	Average technical transmission distribution loss for provided electricity to source j in year y

EMISSION REDUCTION:

Equation 6:

$\boldsymbol{ER_y = BE_y - PE_y + PE_{EC,y}}$

ER_y	The emission reduction in year y
BE_y	The baseline emissions in year y
PE_y	Project emission in year y
$PE_{EC,y}$	Project emission in year y in tons CO_2/year for electrical consumption

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	**$FC_{BL,CC}$**
Data unit:	Tons
Description:	Average annual baseline fossil fuel consumption value for clamp coal combusted in the clamp kiln production process using weight units
Source of data used:	Vhavenda brick small nut purchase records from 2008 to 07/2011
Value applied:	3466.52
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data from the period August 2008 to July 2011 (3 years) was averaged to get the monthly consumption of small nuts to fire clamp kilns.
Any comment:	

Data / Parameter:	**NCV_{CC}**
Data unit:	MJ/t
Description:	Average net calorific value of coal combusted, MJ per unit volume or mass unit
Source of data used:	Analyses of the product as supplied
Value applied:	28.25
Justification of the choice of data or description of measurement methods and procedures actually applied :	The supplier – EXXARO coal – supply laboratory analysis of the product supplied. The average for a period of 17 days between 04/06/2011 and 31/07/2011 was calculated and used. The variations of the daily tests are small enough to take the aforementioned average to apply to the baseline – with 0.02763 being the lowest value and 0.02898 being the highest value.
Any comment:	

Data / Parameter:	**$EF_{CO2,CC}$**
Data unit:	t CO_2 / MJ
Description:	CO_2 emission factor of coal combusted in the in the production
Source of data used:	Formula used from IPCC Guidelines Vol.2 Table.1.4: $EF_{CO2} = (CC_j / NCV_j) \times MCF_{CO2}$ - see Equation 3 above
Value applied:	0.11034
Justification of the choice of data or description of measurement methods and procedures actually applied :	The variable inputs were available from the supplier and were applied to the IPCC formula to calculate the exact factor.
Any comment:	

Data / Parameter:	**$FC_{BL,BC}$**
Data unit:	Tons
Description:	Average annual baseline fossil fuel consumption value for body coal combusted in the clamp kiln production process using weight units
Source of data used:	Vhavenda brick body coal (duff) purchase records from 08/2008 – 07/2011
Value applied:	6054

Justification of the choice of data or description of measurement methods and procedures actually applied :	The data from the period August 2008 to July 2011 was averaged to get the monthly consumption of body coal (duff) to mix into the bricks fired in the clamp kilns. 7.5% was deducted from the figure as a conservative approach, to compensate for "green" losses – waste generated prior to the bricks being fired in the clamp kilns – as the body fuel is mixed with the clay prior to extrusion (forming bricks).
Any comment:	

Data / Parameter:	**NCV_{BC}**
Data unit:	MJ/t
Description:	Average net calorific value of coal combusted, MJ per mass unit
Source of data used:	As the supplying mine did not have testing facility on site during the analysis period to provide values for the supplied material, the test results from the source product done for a Masters of Science Thesis was used.
Value applied:	33.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data from Masters of Science (Chemical Engineering) dissertation conducted of Tshikondeni coal by Puphelei Milingoni Robert – University of Pretoria April 2007
Any comment:	

Data / Parameter:	**$EF_{CO2,BodyCoal}$**
Data unit:	t CO_2 / MJ
Description:	CO_2 emission factor of coal combusted in the production process
Source of data used:	As the supplying mine did not have testing facility on site during the analysis period to provide values for the supplied material, the test results from the source product done for a Masters of Science Thesis was used. The values from this source was used as allowed) in the Formula from IPCC Guidelines Vol.2 Table.1.4: $EF_{CO2} = (CC_j / NCV_j) x MCF_{CO2}$ - see Equation 3 above (due the high quality of the product used / high energy value, it would not have been accurate to use the standard IPCC factors even though a conservative approach was followed in calculating emissions for the baseline / reductions).
Value applied:	0.10257
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data from Masters of Science (Chemical Engineering) dissertation conducted of Tshikondeni coal by Puphelei Milingoni Robert – University of Pretoria April 2007 and applied to the IPCC formula to calculate the exact factor.
Any comment:	Although both the mines from which the clamp coal was supplied (Groot Geluk) and the mine from which the body coal is supplied Tshikondeni belong to the same group (Xarro), Tshikondeni only switch to a fully computerised despatch and record keeping system in June 2011 – hence the same quality records were not available for both sources. The most accurate records of the qualities of Tshikondeni coal were found in the Masters Dissertation quoted above.

Data / Parameter:	**P_{Hy}**
Data unit:	Kg
Description:	Average annual historical baseline brick production rate
Source of data used:	Vhavenda production records
Value applied:	95 003 958
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data from the period August 2008 to July 2011 (3 years) was averaged to get the monthly production out of clamp kilns. This was multiplied by the average weight of the fired bricks (3.2 kg).
Any comment:	

Data / Parameter:	**$Q_{CC,y}$**
Data unit:	tons / year
Description:	The quantity of clamp coal combusted in the project activity during year y
Source of data used:	Vhavenda Bricks production records
Value applied:	3466.52
Justification of the choice of data or description of measurement methods and procedures actually applied:	The tons of coal delivered to site from the period of August 2008 to July 2011 was added up from delivery notes and divided by 3 to get an annual average.
Any comment:	

Data / Parameter:	**$Q_{BC,y}$**
Data unit:	tons / year
Description:	The quantity of body coal combusted in the project activity during year y
Source of data used:	Vhavenda Bricks production records
Value applied:	6053.88
Justification of the choice of data or description of measurement methods and procedures actually applied:	The tons of coal delivered to site from the period of August 2008 to July 2011 was added up from delivery notes and divided by 3 to get an annual average. From this average 7.5 % were deducted to compensate for green losses – as the coal gets mixed with clay prior to manufacturing losses at extrusion and during drying were calculated at 7.5 % using a conservative or inflated approach.
Any comment:	

Data / Parameter:	**CT_{CC}**
Data unit:	Tons / truck
Description:	Average load of clamp coal per truck
Source of data used:	During the statistical period (August 2008 – July 2011), 10 399.55 tons of coal (small nuts) were delivered to Vhavenda Bricks. According to the despatch records at the mine, this was done with 322 loads – giving an average of 32.3 tons per load.
Value applied:	32.3
Justification of the	

choice of data or description of measurement methods and procedures actually applied:	The weighing of trucks as they enter the mine empty and deducting this weight from the laden weight when they leave the mine, provides the most accurate indication of tonnages of coal purchased / consumed by VB.
Any comment:	

Data / Parameter:	$\mathbf{CT_{BC}}$
Data unit:	Tons / truck
Description:	Average load of body coal per truck
Source of data used:	During the statistical period (August 2008 – July 2011), 19,634,210 tons of coal (duff) were delivered to Vhavenda Bricks. According to the despatch records at the mine, this was done with 540 loads – giving an average of 36.29 tons per load.
Value applied:	36.29
Justification of the choice of data or description of measurement methods and procedures actually applied:	Weights of loads as per delivery notes were used.
Any comment:	

Data / Parameter:	$\mathbf{EF_{EL,j,y}}$
Data unit:	TCO_2/MWh
Description:	Combined margin emission factor for electricity from the national grid.
Source of data used:	Calculated for the South African national grid in accordance with the emission figures quoted in Eskom's annual report 2011
Value applied:	0.99
Justification of the choice of data or description of measurement methods and procedures actually applied:	The exact emission from the burning of carbon coal is calculated by Eskom (South African Power Utility) using the volume of coal consumed the energy values of the coal and the characteristics of the different power stations and expressed against the power produced in total.
Any comment:	The grid emission factor will be fixed for the duration of the project on an *ex ante* basis, as is allowed for by the tool.

Data / Parameter:	**$TDL_{j,y}$**
Data unit:	fraction
Description:	Average technical transmission distribution loss for providing electricity
Source of data used:	Eskom's annual report 2011
Value applied:	0.083
Justification of the choice of data or description of measurement methods and procedures actually applied:	Eskom (the state electricity utility in South Africa) measures the loss factor every year and publish it in their annual report, and the 2011 loss factor will be used for the calculation throughout the project activity.
Any comment:	

Data / Parameter:	**Input raw material (clay) Quality**
Data unit:	No unit
Description:	The plasticity index of the clay and the chemical composition of the clay ad-mixture represent the best indicators of the quality of the clay used.
Source of data used:	Tests on all the clays mined, used and blended on site by CERMLAB - a SANS accredited testing facility to determine the aforementioned parameters.
Value applied:	Plasticity index = 33.3. average a silica (SiO_2) content of 52.73% and a alumina (Al_2O_3) content of 18.85%. These two chemicals constitute the major chemical components of any "clay"
Justification of the choice of data or description of measurement methods and procedures actually applied:	Plasticity Index testing in accordance with the "Pfefferkorn technique" measuring deformation at different stages of water addition – combined with a particle size determination done by means of the Hydrometer method for sub 75 micron particles and a wet sieve analysis for the sizes plus 75 microns to 2000 microns. The chemical composition of the clay was determined by means of a X-ray fluorescence (XRF) analysis.
Any comment:	The quality of the clay represents a true indication of all the in-situe clays available on site, and will not vary over the project period from the quality of clays used during the baseline period.

B.6.3 Ex-ante calculation of emission reductions:

>>

BL **Equation 1:** $BE_y = EF_{BL} \times P_{PJ,y}$

Baseline emissions for period 2008 - 2011 averaged

Year	BE_y	EF_{BL}	$P_{PJ,y}$
	tons CO_2	tons CO_2/ kg	kg
2008-2011	29880.75	0.0003145	95003958

Calculating the historical baseline for the period 08/2008 – 07/2011 averaged using:

$EF_{BL} = \Sigma (FC_{BL} \times NCV_{coal} \times EF_{CO2,coal})/P_{Hy}$

Year	EF_{BL}	$FC_{BL,CC}$	NCV_{CC}	$EF_{CO2,CC}$	P_{Hy}	$FC_{BL,BC}$	NCV_{BC}	$EF_{CO2,BC}$	P_{Hy}
	tons CO_2/kg	Tons	MJ/ ton	ton CO_2/ MJ	Kg	tons*	MJ/ ton	ton CO_2/MJ	Kg
08/2008 - 07/2011	0.0003145	3466.5	28.25	0.1103	95 003 958	6054	33.5	0.1026	95 003 958

$EF_{CO2,coal}$ in the above equation calculated for the two different types of coal used (small nuts = clamp coal or CC and duff = body coal or BC), using the following equation:

$EF_{CO2} = (CC_j / NCV_j) \times MCF_{CO2}$

Year	$EF_{CO2,CC}$	CC_{CC}	NCV_{CC}	MCF	$EF_{CO2,BC}$	CC_{BC}	NCV_{BC}	MCF
	tons CO_2/ kg	% / 100	MJ / ton		tons CO_2/ kg	% / 100	MJ / ton	
08/2008 – 07/2011	110.33	0.85	28.25	3.667	102.57	0.937	33.5	3.667

The scenario relevant to the project was calculated as follows:
Equation 1: Baseline emissions

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

Projected baseline for the 10 years in absence of the project activity.

Year	BE_y	EF_{BL}	$P_{PJ,y}$
	tons CO_2	tons CO_2/ kg	kg
2013	35226.37	0.0003145	112000000
2014	35226.37	0.0003145	112000000
2015	35226.37	0.0003145	112000000
2016	35226.37	0.0003145	112000000
2017	35226.37	0.0003145	112000000
2018	35226.37	0.0003145	112000000
2019	35226.37	0.0003145	112000000
2020	35226.37	0.0003145	112000000
2021	35226.37	0.0003145	112000000
2022	35226.37	0.0003145	112000000

Equation 2:

$EF_{BL} = S\ (FC_{BL} \times NCV_{coal} \times EF_{CO2,coal})/P_{Hy}$

Year	EF_{BL}	$FC_{BL,CC}$	NCV_{CC}	$EF_{CO2,CC}$	P_{Hy}	$FC_{BL,BC}$	NCV_{BC}	$EF_{CO2,BC}$	P_{Hy}
	tons CO_2/kg	tons	MJ/ ton	ton CO_2/ MJ	kg	tons*	MJ/ ton	ton CO_2/MJ	Kg
2013	0.0003145	4086.7	28.25	0.1103	112 000 000	6545.0	33.5	0.1026	112 000 000
2014	0.0003145	4086.7	28.25	0.1103	112 000 000	6545.0	33.5	0.1026	112 000 000
2015	0.0003145	4086.7	28.25	0.1103	112 000 000	6545.0	33.5	0.1026	112 000 000
2016	0.0003145	4086.7	28.25	0.1103	112 000 000	6545.0	33.5	0.1026	112 000 000
2017	0.0003145	4086.7	28.25	0.1103	112 000 000	6545.0	33.5	0.1026	112 000 000
2018	0.0003145	4086.7	28.25	0.1103	112 000 000	6545.0	33.5	0.1026	112 000 000
2019	0.0003145	4086.7	28.25	0.1103	112 000 000	6545.0	33.5	0.1026	112 000 000
2020	0.0003145	4086.7	28.25	0.1103	112 000 000	6545.0	33.5	0.1026	112 000 000
2021	0.0003145	4086.7	28.25	0.1103	112 000 000	6545.0	33.5	0.1026	112 000 000
2022	0.0003145	4086.7	28.25	0.1103	112 000 000	6545.0	33.5	0.1026	112 000 000

* From the consumption figures for body coal as per the delivery notes to site for the last 3 years, the average per year was 6544.74 tons.
Using the historical baseline information above, the consumption for the expected production average for the period set out calculated to 7 700 tons and then 7.5% was deducted for "green waste" – prior to firing bringing the figure back to 6 545 tons (following a conservative approach).

Equation 3:

$EF_{CO2} = (CC_j / NCV_j) \times MCF_{CO2}$

Year	$EF_{CO2,CC}$	CC_{CC}	NCV_{CC}	MCF	$EF_{CO2,BC}$	CC_{BC}	NCV_{BC}	MCF
	tons CO_2/ kg	% / 100	MJ / ton		tons CO_2/ kg	% / 100	MJ / ton	
2013	110.33	0.85	28.25	3.667	102.57	0.937	33.5	3.667
2014	110.33	0.85	28.25	3.667	102.57	0.937	33.5	3.667
2015	110.33	0.85	28.25	3.667	102.57	0.937	33.5	3.667
2016	110.33	0.85	28.25	3.667	102.57	0.937	33.5	3.667
2017	110.33	0.85	28.25	3.667	102.57	0.937	33.5	3.667
2018	110.33	0.85	28.25	3.667	102.57	0.937	33.5	3.667
2019	110.33	0.85	28.25	3.667	102.57	0.937	33.5	3.667
2020	110.33	0.85	28.25	3.667	102.57	0.937	33.5	3.667
2021	110.33	0.85	28.25	3.667	102.57	0.937	33.5	3.667
2022	110.33	0.85	28.25	3.667	102.57	0.937	33.5	3.667

For the proposed project activity, the following scenario will apply:
Equation 4:

$PE_y = (FC_{BC,y} \times COEF_{BC})$

Year	*PE_y*	*$FC_{BC,y}$*	*$COEF_{BC}$*
	tons CO_2/year	*tons*****	
2013	9019.44	2625	3.44
2014	9019.44	2625	3.44
2015	9019.44	2625	3.44
2016	9019.44	2625	3.44
2017	9019.44	2625	3.44
2018	9019.44	2625	3.44
2019	9019.44	2625	3.44
2020	9019.44	2625	3.44
2021	9019.44	2625	3.44
2022	9019.44	2625	3.44

** A reduction in the use of body fuel for the project scenario has been planned in accordance with the required body fuel (carbon and CV) for optimum VSBK performance.

$COEF_j = NCV_j \times EF_{CO2,j}$

This option was used, as the material used is not constant in sizing and sometimes needs screening and crushing at other times it is <1mm in particle size. As a result, no constant average mass fraction and average mass density is available / can be determined with accuracy.

Year	*$COEF_{BC}$*	*NCV_{BC}*	*$EF_{CO2,BC}$*
		MJ / ton	*tons CO_2/ kg*
2013	3.34	33.5	0.10257
2014	3.34	33.5	0.10257
2015	3.34	33.5	0.10257
2016	3.34	33.5	0.10257
2017	3.34	33.5	0.10257
2018	3.34	33.5	0.10257
2019	3.34	33.5	0.10257
2020	3.34	33.5	0.10257
2021	3.34	33.5	0.10257
2022	3.34	33.5	0.10257

Equation 5:

$PE_{ec,y} = EC_{pj,j,y} \times EF_{EL,j,y} \times (1+TDL_{jy})$

Scenario A: Option A1 was followed, as it was to calculate project emissions / leakage for electrical consumption from the grid.

Year	***$PE_{ec,y}$***	***$EC_{pj,j,y}$***	***$EF_{EL,j,y}$***	***TDL_{jy}***
	tons CO_2/year	***mWh/year****	***tons CO_2/mWh***	***1 + fraction (factor)***
2013	281.47	262.52	0.99	0.083
2014	281.47	262.52	0.99	0.083
2015	281.47	262.52	0.99	0.083
2016	281.47	262.52	0.99	0.083
2017	281.47	262.52	0.99	0.083
2018	281.47	262.52	0.99	0.083
2019	281.47	262.52	0.99	0.083
2020	281.47	262.52	0.99	0.083
2021	281.47	262.52	0.99	0.083
2022	281.47	262.52	0.99	0.083

* The size of electrical motors installed in the equipment to operate the VSBK's is used. The kW size X the expected number of hours the motors will operate = kWh X 0.001 = mWh_y

Equation 6:

$$ER_y = BE_y - PE_{Project,y} - PE_{ELEC,y}$$

Year	***ER_y***	***BE_y***	***PE_y***	***$PE_{EC,y}$***
	tons CO_2/year	***tons CO_2/year***	***tons CO_2/year***	***tons CO_2/year***
2013	25925.46	35226.37	9019.44	281.47
2014	25925.46	35226.37	9019.44	281.47
2015	25925.46	35226.37	9019.44	281.47
2016	25925.46	35226.37	9019.44	281.47
2017	25925.46	35226.37	9019.44	281.47
2018	25925.46	35226.37	9019.44	281.47
2019	25925.46	35226.37	9019.44	281.47
2020	25925.46	35226.37	9019.44	281.47
2021	25925.46	35226.37	9019.44	281.47
2022	25925.46	35226.37	9019.44	281.47

NB: Figures used in the tables may not add up exactly, as they were copied from the work sheets using more decimal numbers in factors and coefficients. Worksheets (excel) attached.

B.6.4 Summary of the ex-ante estimation of emission reductions:

>> Table 8.

Year	Estimation of project activity emissions. (tones CO_2 equiv)	Estimation of baseline emissions (tones CO_2 equiv)	Estimation of leakage (Electricity cons) (tones CO_2 equiv)	Estimation of overall emission reductions (tones CO_2 equiv)
1	9019.44	35226.37	281.47	25925.46
2	9019.44	35226.37	281.47	25925.46
3	9019.44	35226.37	281.47	25925.46
4	9019.44	35226.37	281.47	25925.46
5	9019.44	35226.37	281.47	25925.46
6	9019.44	35226.37	281.47	25925.46
7	9019.44	35226.37	281.47	25925.46
8	9019.44	35226.37	281.47	25925.46
9	9019.44	35226.37	281.47	25925.46
10	9019.44	35226.37	281.47	25925.46
Total (tones of CO_2)	**90194.40**	**352263.70**	**2814.70**	**259254.60**

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	$P_{PJ,y}$
Data unit:	Kg
Description:	The annual net production of the facility in year *y*
Source of data to be used:	Monthly brick production records at VHAVENDA BRICKS
Value of data applied for the purpose of calculating expected emission reductions in section B.5	112 000 000
Description of measurement methods and procedures to be applied:	The number of bricks fired through the kilns and deemed as sellable will be recorded monthly and multiplied by the average brick weight. This average weight will be established from records of bricks submitted three monthly for quality testing in terms of SANS standards. All bricks tested are weighed and have their weight recorded and the average will be used for verification. The scale on which bricks are weighed – like all other testing equipment – must be calibrated in accordance with SANS standards and prescribed procedures for testing facilities that has and want to maintain their SANS accreditation. While the testing facility is not fixed, a SANS accredited testing facility like SOILCON c.c will at all times be used, or SANS itself.
QA/QC procedures to be applied:	Average brick weight will be determined through recorded weights of bricks submitted for periodic quality testing.
Any comment:	If there are significant differences between the measured values of the bricks and the historic average weight then it must be justified in the monitoring report.

Data / Parameter:	**$FC_{BC,y}$**
Data unit:	tons/year
Description:	The average quantity of coal combusted in the project activity during the year y
Source of data to be used:	Daily deliveries of body coal purchased will be recorded records at Vhavenda Bricks, with weights indicated / shown for every load delivered, added up monthly in a consumption record, which will be added up over each year of the project period.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2625 (More body coal was estimated than what the consumption for VSBK's show in research, as a conservative approach was followed).
Description of measurement methods and procedures to be applied:	The daily consumption of coal used for the brick production process is measured per load despatched from the mine on the basis of the weight of the truck leaving the mine, less the weight of the truck entering the mine = payload / weight of the coal loaded recorded in kilogram. Total usage will be calculated from the weighbridge slips and invoices from the mine.
QA/QC procedures to be applied:	Weigh bridge calibration certificates will be requested annually from the mine – which calibration is to be conducted and the results recorded in accordance with SANS procedures.
Any comment:	The coal used will be cross checked with the coal delivery notes and the on-site stockpile. If there are significant differences then these must be justified in the monitoring report.

Data / Parameter:	**$NCV_{BC,y}$**
Data unit:	GJ/ton
Description:	Average net calorific value of the body coal in year y
Source of data to be used:	Values supplied by the fuel supplier in invoices will be used (or provided by the supplier as a sheet printed relating to the product sold to the project participant will be used) – where this data may not be available the project participant will sample deliveries and have it measured / tested.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	33.5
Description of measurement methods and procedures to be applied:	The supplier will record the Calorific Value (CV) of the product in an on-site testing facility and express the findings in MJ/Kg as the standard in South Africa requires. The testing is done in accordance with ASTM Standard D1989-97 / ISO Standard 1928:1995 – using an Advanced Bomb Calorimeter (or similar device such as an Isoperibol or Static Jacket Calorimeter) that is calibrated before every test is conducted in accordance with the equipment and standard specification. While the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Version 02)" specify tests for every load delivered, due to the consistent nature of the product and the volume of consumption this may prove difficult and a deviation may occur where daily or weekly analysis may be asked for – from which weighted annual averages will be calculated.
QA/QC procedures to be applied:	Laboratory results from suppliers will be used – which laboratory will comply with ISO 17025 (or will justify that they can comply with a similar standard),

	and where or when not available, known averages will be used.
Any comment:	

Data / Parameter:	$\mathbf{EF_{CO2,j}}$
Data unit:	t CO_2 / MJ
Description:	the weighted average CO_2 emission factor for body coal in the year y
Source of data to be used:	Values supplied by the fuel supplier in invoices will be used (or provided by the supplier as a sheet printed relating to the product sold to the project participant will be used) – where this data may not be available the project participant will sample deliveries and have it measured / tested. From this data, the emissions factor will be calculated in accordance with the formula provided for Methodological Tool “Tool to calculate project or leakage CO2 emissions from fossil fuel combustion” (Version 02)” if the emission factor was not indicated in the values obtained as per the above.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.10257
Description of measurement methods and procedures to be applied:	The supplier will record the total carbon of the product in an on-site testing facility and express the findings in MJ/Kg as the standard in South Africa requires. The testing is done in accordance with ASTM Standard D1989-97 / ISO Standard 1928:1995 – using an Advanced Bomb Calorimeter (or similar device such as an Isoperibol or Static Jacket Calorimeter) that is calibrated before every test is conducted in accordance with the equipment and standard specification. The data from the supplier will be used in the formula from the IPCC Guidelines Vol.2 Table 1.4 to calculate the CO_2 emissions factor for the coal.
QA/QC procedures to be applied:	It will be verified that the results obtained are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of 2006 IPCC guidelines. If the values fall below this range additional information will be collected from the testing laboratory to justify the results or additional measurements will be conducted. Laboratory results from suppliers will be used, and where or when not available, known averages will be used. Laboratories will have ISO 17025 accreditation or justify that they can comply with a similar standard.
Any comment:	

Data / Parameter:	$\mathbf{Q_{coal,y}}$
Data unit:	tons / year
Description:	The quantity of coal combusted in the project activity during year y
Source of data to be used:	Vhavenda Bricks daily production records will be used to calculate the quantity of coal used during in the production volumes for each day – first added up monthly and then combined for a 12 month period to give annual consumption.
Value applied:	2625
Description of measurement methods and procedures to be applied:	The coal used for the brick production process will be measured on site on a daily basis, to verify the projected figure calculated for the required amount of carbon and energy to fire a VSBK. The daily figures will be checked against the loads despatched from the mine on the basis of the weight of the truck leaving the mine, less the weight of the truck

	entering the mine = payload / weight of the coal loaded recorded in kilogram. Total usage will be calculated monthly from the weighbridge slips and invoices from the mine and compared with daily usage recorded volumes for accuracy.
QA/QC procedures to be applied:	The coal used will be cross checked with the coal delivery notes and the on-site stockpile. If there are significant differences then these must be justified in the monitoring report.
Any comment:	

Data / Parameter:	**$EC_{el,j,y}$**
Data unit:	MWh
Description:	Quantity electrical consumption by project per year in year y.
Source of data used:	The current supplied to the project will be measured at the distribution box for the exclusive supply to the project.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	262.52
Description of measurement methods and procedures to be applied:	An electricity supply meter such as an Enermax LT will be installed to provide daily consumption for the VSBK. The meter will cater for applications requiring basic kWh and kVA demand measurement and is fully programmable for user configuration and system settings. The meter has an accuracy class of Wh: IEC 62053-22 (class 0,5) and Varh: IEC 62053-23 (class 2,0), and conforms to IEC 62052
QA/QC procedures to be applied:	The meter is a digital meter (as opposed to an electro-mechanical meter) and according to the supplier does not need re-calibration. In accordance with the manufacturers recommendations the meters accuracy will be verified at the set periods contracting the supplier to connect a verification meter in serie with the installed meter and verifying the reading of the installed meter. If a discrepancy is found, the factor is certified and the readings from the installed meter will be adjusted in accordance with the certified variable.
Any comment:	Meter is pre-calibrated with extreme accuracy before installation.

Data / Parameter:	**Brick Quality**
Data unit:	No unit
Description:	Brick quality determined through testing in accordance to the standard set out in SANS 227 – for the category Non-Facing Plaster (NFP) bricks, being the product being manufactured by the project participant (VB).
Source of data used:	Results on samples tested in accordance with SANS 227 by an accredited testing facility or SANS itself.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	SANS guideline for minimum nominal compressive strength for NFP bricks = 3.5 MPa – 7 MPa. This value does not impact on emission reductions in section B5, but is expected to indicate the degree to which the project activity contribute to at least maintaining the same product quality as was obtained in the baseline, but hopefully increase same.
Description of	Brick samples are collected randomly and independently by the accredited

measurement methods and procedures to be applied:	testing facility on site and removed for testing. Compressive strength is tested and recorded / expressed in MPa (Mega Pascal's). The individual and average brick sizes and weights are also recorded and expressed in mm (size) and Kg (weight).
QA/QC procedures to be applied:	Bricks will be tested 3 monthly. The testing facility will use a testing machine that at least complies at least with regards to accuracy and repeatability to the requirements of BS 1610 (for a Grade B machine) or with BS 1881:Part 115 for any other machine and that are capable of a rate of loading of approximately 15 MPa/min (calculated using the area of the bed-face). All other tools and devises and test preparation and conducting as per the prescribed method contained in SANS 227.
Any comment:	Calibration and accuracy of equipment is set and determined in terms of the accreditation procedure set out by SANS for facilities to carry accreditation.

B.7.2 Description of the monitoring plan:

>>

In accordance with the records that are to be kept and made available for verification by inspectors as set out in AMS 111Z, the project applicant will maintain and keep the following records:

- Production records.

  A register will be kept of daily production records starting with bricks produced and bricks packed into each VSBK and bricks packed out of each VSBK.
  - The register will be updated manually every day in which the totals from the previous day will be captured. From the manual sheets the data will be transferred weekly onto an electronic sheet on which all categories of data to be collected for verification purposes will be stored.

- Raw material records.

  - Records of all the deliveries of body fuel to the plant.
    - All fuel deliveries are entered into an entry register at the plant gate. The delivery notes are captured manually into a delivery book, stating dated, time, truck identification and truck payload. These records are matched against each other (gate entry sheets and delivery notes, and the data will be captured electronically daily first, then added weekly and monthly onto the sheet on which all categories of data to be collected for verification purposes, will be stored. (These records will be kept for at least two years).
  - All principal raw material (clay ad-mixture) usage records will kept daily, calculated on the number of bricks extruded each day by multiplying the number of bricks with the known weight of raw material clay (total weight less body coal addition). This will be added up weekly, monthly and annually and kept on the data sheet on which all records required for verification purposes will be stored. These records will be kept for a minimum of two years.

- Power consumption data.

  - Provision will be made in the register where daily production is logged, to register the reading of the power supply meter to the project activity on a daily basis. Overall

usage will be verifiable on the actual meter reading at any time an inspection is made.
- The register will be updated manually every day in which the consumption totals from the previous day will be captured. From the manual sheets the data will be transferred weekly onto an electronic sheet on which all categories of data to be collected for verification purposes will be stored.

- Product performance criteria – compressive strength data. In accordance with the requirement, compressive strength test will be done at least six monthly on the bricks fired through the VSBK's. The tests will be conducted at a SANS (South African National Standards) accredited testing facility, and the records will be kept in a testing file where it can be accessed by any inspection/ verification personnel.
  - From the test results the data will be captured onto the electronic sheet on which all categories of data to be collected for verification purposes will be stored.

- The applicable standard for compressive strength is SANS 227 and compressive strength is the only laid down criteria presently for non-facing plaster (NFP) bricks.

- Emissions records. Stack monitoring will be conducted on CO_2 emission levels by way of a monitoring device to be inserted in the stack and record the emissions released. Three X 20 minutes samples at a time should be sufficient to obtain emission levels, and the frequency of such measurements will be decided with the occupational hygiene service provider who already conducts particulate emission monitoring on site.

  - The exact test and sampling procedure will be in accordance with SANS, and reports from the service provider will be kept separate for inspection and verification purposes.
    - From the result sheet submitted by the accredited occupational hygiene service provider, the emissions data will be captured onto the electronic sheet on which all categories of data to be collected for verification purposes will be stored.

- Although VHAVENDA will not contribute to but will reduce air pollution through the technology switching mechanism, it is recommended that stack monitoring be conducted quarterly for every year of the project activity.

Management structure for data collection

All production data will be captured by the production / shift foreman on duty the morning of the data being entered manually in the production sheets.

The production sheets / register are submitted to the production manager for checking and verification.

Where applicable, the gate entry logs used for cross reference of the fuel deliveries is kept by the gate security and the production manager verify these records against the delivery notes of the material.

All data collected manually will after final verification be captured electronically by the factory manager.

Data storage and archiving

Manual registers are kept at the factory premises. The registers in current use is kept by the production / shift foremen and the full ones stored in the factory office, in with the factory manager. The data captured weekly in the electronic format is kept firstly on the laptop of the factory manager, and monthly copies of the electronic sheets are submitted to a administrative office in the town of Makado, where internal bookkeeping is done and the records used accordingly.

In the administrative office, the data is kept on a server.

Storage duration

No manual production records or electronic copies of such records have as yet been destroyed and the records from the project activity will be kept for a minimum of 15 years in both formats.

Auditing of data

Data is audited annually by the appointed company auditors – they use electronic data for the purposes and in accordance with audit practices they routinely conduct audits of manual records for verification of the accuracy of the electronic records.

Verification of product data will as far as possible use records that were audited by the company appointed financial auditors. Where needed or applicable, they can audit the electronic records directly relevant to the project activity directly, with similar cross-referencing to manual records for accuracy.

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>31/08/2011.
Anton de Jager – anton@clayfusion.co.za / cell. + 27 (0)82 4453323
Barbara Ostermann – babsl_O@gmx.net / cell. +27 (0)82 3322352 / + 43 (0)699 017 44087

Neither of the responsible persons are project participants.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>> 04/06/2012

C.1.2. Expected operational lifetime of the project activity:

>>+ 25 years 0 months

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

>>

C.2.1.2. Length of the first crediting period:

>>

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>01/08/2012 or 01/09/2012 – whichever the later.

C.2.2.2. Length:

>>10 years 0 months

SECTION D. Environmental impacts

>>No negative impacts on the environment envisaged – reduction of existing impacts.

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

>>An environmental assessment or any related activity in terms of the National Environmental Management Act (NEMA) is not required.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>An environmental assessment or any related activity in terms of the National Environmental Management Act (NEMA) is not required. This was confirmed in terms of a record of exemption granted by the Limpopo Department of Economic Development, Environment & Tourism (LEDET) under reference 12/1/9/E-V117 d/d 16/08/2011.

SECTION E. Stakeholders' comments

>>Register of Interested and Affected Parties.

CDM PROCESS VHAVENDA BRICKS - REGISTER OF INTERESTED AND AFFECTED PARTIES.			
NAME	**REPRESENTING**	**ADDRESS**	**CONTACT**
Me. Marie Helm	Private	P.O. Box 1489, Makado, 0920	mariehelm@hotmail.com
Me. Hester Bayers	Soutpansberg District Agricultural Union	P.O. Box 3885, Makado, 0920	sdlu@xnets.co.za
Mr. Fritz Ahrens	Louis Trichardt Agricultural Union	P.O. Box 3885, Makado, 0920	neuhof@xnets.co.za
Mr. Fanus Viviers	Levubu Farmers Union	P.O. Box 191, Levubu, 0929	0824081131@vodamail.co.za
Khosi T.J. Ramovha	Mulenzhe Development Trust (10 Villages)	P.O. Box 301, Mulhenze, 0947	krmdb@mweb.co.za
Robert	Vhembe District Municipality		nemakhavhantir@thulamela.gov.za

E.1. Brief description how comments by local stakeholders have been invited and compiled:

>> The public participation process was driven in accordance with the guidelines contained in and relating to the EIA Regulations in South Africa.

Notice of intent given to possible interested and affected parties by:

- Fixing a notice board at a conspicuous place to the public at the boundary or on the fence of the site where the activity will take place or to which the notice relates.
- Given written notice to owners and occupiers of land adjacent to the site or where the activity is to take place / to within 100 meters of the boundary.
- The municipal councillor of the area / ward and the municipality having jurisdiction.
- Government Department(s) having jurisdiction.
- Placing an advert in one local newspaper and in at least one provincial or national newspaper.

To give effect to the aforementioned, the PP did:

- Affix notices were affixed at the entrance to the factory, as well as to a brick distribution point in the town of Thohoyandou.
- Placed notices in 184 private post boxes in Lwamondo and a total of 19 notices were hand delivered to individuals staying on the land adjacent to the factory where the activity is to take place, and owners and occupiers of land within a 100 boundary of the site – who signed receipt of said notices.
- A notice was also delivered to the local municipal office and the ward councillor.
- The workers and workers representatives were notified.
- Advertisements were placed in the LIMPOPO MIRROR (a provincial newspaper) and in the ZOUTPANSBERGER (a regional newspaper). From the notices in the newspaper, a total of four individuals responded and requested to be added as interested and affected parties and they were provided with the full PDD.
- In an addition, one local Chief requested to be added as an interested and affected party, and he was accordingly provided with the PDD.

Content of notice:

- The notice identified the proposed activity as “Proposed Vertical Shaft Brick Kiln (VSBK) technology upgrade of Clamp Kilns at Vhavenda Bricks Thohoyandou, Limpopo Province.
- Gave the exact location of the proposed activity.
- Indentified the applicant.
- Clearly stated why the notice was given.
- Gave a clear and concise aim of the project as: “The aim of the project is to reduce Greenhouse Gas (GHG) – in particular CO2 emissions – by replacing clamp kilns as means of firing clay bricks at Vhavenda Bricks with Vertical Shaft Brick Kilns (VSBK’s). Reducing CO2 emissions will globally contribute to a reduction of GHG and locally improve atmospheric quality in and around the factory for the benefit of the local community as well.”
- Invitation to comment was made in a clear and transparent manner – “Parties and stakeholders wishing to comment on the validation requirements of the project under consideration can view the Project Design Document (PDD) at the under-mentioned location. Anybody wishing would like to register as an Interested and/or Affected Party for the VSBK project, please contact Anton de Jager on 0824453323, or by e-mail: anton@clayfusion.co.za. Alternatively contact Pieter Lordan on 0825775406 or vhavenda@mweb.co.za .”
- All notice were given before or on 12 September 2011 notifying all interested and affected parties of a 30 day period of public participation and at the same time giving notice of an intended public

meeting to be held on 8 October 2011 (more than the 2 week prior notification required for such a notice).

The aforementioned public meeting was scheduled for 8 October 2011 on the factory premises, but nobody attended. A separate meeting was arranged with the local municipality, who only requested the PDD on 7 October 2011. This meeting was arranged for 12 October 2011, but they failed to attend. When approached telephonically after the failure to attend, they indicated that they are in favour of the project.

E.2. Summary of the comments received:

>>

CDM PROCESS VHAVENDA BRICKS - REGISTER OF INTERESTED AND AFFECTED PARTIES.		
NAME	**REPRESENTING**	**COMMENTS**
Me. Marie Helm	Private	Will come back with feedback – but do not envisage problems. It is a good project.
Me. Hester Bayers	Soutpansberg District Agricultural Union	None received.
Mr. Fritz Ahrens	Louis Trichardt Agricultural Union	None received.
Mr. Fanus Viviers	Levubu Farmers Union	None received.
Khosi T.J. Ramovha	Mulenzhe Development Trust (10 Villages)	Company important to area. Upgrade positive. Represent progress and reduced pollution will be benefit.
Robert	Vhembe District Municipality	Represent progress and is welcome in the area – more such initiatives needed. Viewed entirely in a positive light.

E.3. Report on how due account was taken of any comments received:

>>None required, only positive feedback received, no changes to PDD or project needed or no further consideration required that needed to be addressed.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Vhavenda Bricks (Pty) Ltd
Street/P.O.Box:	
Building:	-
City:	Makado
State/Region:	Limpopo Province
Postcode/ZIP:	0915
Country:	South Africa
Telephone:	
FAX:	
E-Mail:	vhavendabricks@mweb.co.za
URL:	-
Represented by:	
Title:	Director / Program Manager
Salutation:	Mr.
Last name:	Lordan
Middle name:	Johannes
First name:	Petrus
Department:	-
Mobile:	+27 (0) 82 577 5406
Direct FAX:	+27 (0) 15 516 5990
Direct tel:	-
Personal e-mail:	vhavendabricks@mweb.co.za

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding was used for the project.

Annex 3

BASELINE INFORMATION

	Parameter	Variable	Values	Units	Remarks
	Project Related Parameters				
	Emission factor for coal used in the production process	$EF_{CO2,BC}$	0.1042	t CO_2 / MJ	Formula used from IPCC Guidelines Vol.2 Table.1.4: $EF_{CO2} = (CC_j / NCV_j) \times MCF_{CO2}$
	Emission factor for electricity used in the production process	$EF_{EL,j,y}$	0.99	Ton CO_2 mWh	The exact emission from the burning of carbon coal is calculated by Eskom (South African Power Utility) using the volume of coal consumed the energy values of the coal and the characteristics of the different power stations and expressed against the power produced in total.*
	Average technical transmission distribution loss for providing electricity	$TDL_{j,y}$	0.083	Fraction	Figure calculated by Eskom. *
	Baseline Related Parameters				
	Parameter	**Variable**	**Values**	**Units**	**Remarks**
	Emission factor for clamp coal used in the production process	$EF_{CO2,CC}$	0.1103	t CO_2 / MJ	Formula used from IPCC Guidelines Vol.2 Table.1.4: $EF_{CO2} = (CC_j / NCV_j) x MCF_{CO2}$ The values used were taken from laboratory analysis supplied by Exarro – the supplier – for the period 04/06 – 31/07/2011 and averaged for the period.
	Carbon to CO_2 conversion factor.	MCF	3.667	tCO_2/tC	Ratio of the molecular weight of carbon and of CO_2.

* Eskom Annual report 2011 **http://financialresults.co.za/2011/eskom_ar2011/add_info_tables.php**

Annex 4

MONITORING INFORMATION

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