Dear Reader

It is our pleasure to present this report on the Informal Clay Brick Making Sector in the Eastern Cape and hope it will provide valuable information and a deeper understanding of the sector.

Building and overall brick making is a significant sector in the South African economy. The sector is responsible for economic development and creation of jobs, but also for a substantial part of air pollution, particularly CO₂ emissions. As part of this sector, the Clay Brick market is responsible for around 3,6 billion Brick Equivalents (BE).

While the formal clay brick sector is well regulated and monitored, very little is known about the informal clay brick sector in South Africa. To counter this, a first study was done in 2011-12 by the DEDEAT Eastern Cape Province, which proved very useful in revealing the size, locations and relevance of the informal brick makers. It was found that while there are 13 formal sector brick makers with all the required licences, there are probably more than 200 informal ones operating without any licences. Also within the province, some district municipalities - mainly in the North and East of the province - have a higher presence of informal operators.

The next step was to better understand the sector itself, as well as the challenges faced and possible interventions. This second study was therefore commissioned and supported by various interested parties: the National and Provincial governments of South Africa; the Clay Brick Association of South Africa (CBA) and its members. This study was funded by the Swiss Agency for Development and Cooperation (SDC) as part of the SA-VSBK Project implemented in South Africa by Swisscontact, in collaboration with SKAT. The current second phase of this intervention is the Energy Efficient Clay Brick (EECB) Project, funded by SDC and implemented by Swisscontact.

The study confirms the demographics obtained in the first study and further provides an overview of the status of the informal clay brick sector in the technical / operational, social, economic, environmental and legal areas. The typical market structure is revealed, including a description of the full value chain, as well as the obstacles which would need to be unblocked in order to achieve optimum operation and quality.

The information provided by this study is intended to help develop a road map to assist the various role players to improve and formalise their operations, while at the same time reducing their environmental impacts. It also aims to help government to craft legislation that is sensitive to the realities of economic development.

The DEDEAT would have access to key information about the informal clay brick sector in the Eastern Cape province, which will allow them to make decisions on possible interventions and develop a strategy and action plan for such interventions.

In a nutshell, this study is intended to provide in-depth and comprehensive information on the informal brick making sector in the Eastern Cape Province, with the ultimate goal of facilitating positive, sustainable change within the sector. Within the SA-VSBK Project, we are proud of having funded and been actively involved in this very interesting study and we hope this will be a useful tool to make a change in supporting long term sustainability in the market of this important building material.

On behalf of the Energy Efficient Clay Brick (EECB) Project
John Volsteedt
Project Manager
The informal clay brick maker in the Eastern Cape has supplied affordable construction materials to the local community for many decades. However, no integrated data (such as the number of operating units, operation methods, institutional and legal aspects, socio economic and financial aspects and labour and marketing aspects) is available.

Such information is required to support future development of policies and programmes required to overcome hurdles and improve the informal clay brick makers’ current operational, technical and quality performance.

Cermalab was commissioned by Swisscontact in June 2013 to conduct desktop and field research to produce an overview of the status of the informal clay brick sector in the Eastern Cape. This involved a survey of a large number of informal clay brick makers in four districts of the Eastern Cape.

The survey identified key challenges and risk areas, suggestions and recommendations for possible intervention activities in future.
### Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>BCMM</td>
<td>Buffalo City Metropolitan Municipality</td>
</tr>
<tr>
<td>CBA</td>
<td>Clay Brick Association of South Africa</td>
</tr>
<tr>
<td>DEA</td>
<td>Department of Environmental Affairs</td>
</tr>
<tr>
<td>DEDEAT</td>
<td>Eastern Cape Department of Economic Development, Environmental Affairs and Tourism</td>
</tr>
<tr>
<td>DMR</td>
<td>Department of Mineral Resources and Tourism</td>
</tr>
<tr>
<td>EC</td>
<td>Eastern Cape Province</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GVA</td>
<td>Gross Value Added</td>
</tr>
<tr>
<td>IMF</td>
<td>International Monetary Fund</td>
</tr>
<tr>
<td>ILO</td>
<td>International Labour Organisation</td>
</tr>
<tr>
<td>LED</td>
<td>Local Economic Development Managers for local Municipalities</td>
</tr>
<tr>
<td>MPa</td>
<td>Mega Pascal (strength and pressure unit)</td>
</tr>
<tr>
<td>TLB</td>
<td>Excavation vehicle consisting of a tractor, loader and backhoe</td>
</tr>
<tr>
<td>SDC</td>
<td>Swiss Development Corporation</td>
</tr>
<tr>
<td>TVA Kilns</td>
<td>Transverse Arch Kilns used to fire clay bricks</td>
</tr>
<tr>
<td>VSBK</td>
<td>Vertical Shaft Brick Kiln used to fire clay bricks</td>
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### Executive Summary

**Introduction**

The informal clay brick makers in South Africa are not officially regulated or monitored and therefore very little is known about the various aspects of the sector, such as the size of the sector, production methods used and environmental, commercial and social impact.

In an attempt to start addressing the above problem, a workshop was held on 10 July 2013 in Pretoria. The workshop was attended by Swisscontact, DEDEAT (Eastern Cape Department of Economic Development, Environmental Affairs and Tourism), the CBA (Clay Brick Association of South Africa), DEA (Department of Environmental Affairs), DMR (Department of Mineral Resources), SDC (Swiss Development Corporation), Cermalab (ceramics laboratory), Qualitec (a consultancy business for small businesses) and LED managers (Local Economic Development managers from the Eastern Cape local municipalities).

During the workshop, a decision was made to conduct an overview of the state of informal clay brick making in the Eastern Cape and the study was allocated to Cermalab. Due to the large number of informal brick makers in the Eastern Cape, it was agreed that only four areas with different dynamics will be considered, which will represent the whole province.

### Findings

**Effect on the Eastern Cape economy**

The estimated number of informal brick making operations in the Eastern Cape is 1042, producing an estimated total of 118,6 million saleable bricks per annum. At an estimated average selling price of R1046 per 1000 bricks, a total of R124,055 million is generated by the informal brick makers in the Eastern Cape and ploughed back into the economy. The informal brick making operations give employment to around 5210 people who support a further 30,218 dependents. The average monthly income per worker is R826, meaning the informal brick makers contribute a further R4,3 million in wages to the Eastern Cape economy. An estimated 1564 related-activity jobs are also created by the informal brick making operations. These include ash accumulators, informal coal miners, informal brick layers, moulders and transporters of bricks, coal and ash.

**Institutional aspects**

At national government level, there are no coherent policies specifically tailored to support the informal economy, although recently, the LED of the local municipalities has introduced the brick making co-op initiative in an attempt to generate jobs and income.
There is also no association or local group of informal brick makers in the Eastern Cape to set and enforce standards, lobby or attempt to access and disseminate knowledge and information that would be useful to brick makers.

Lack of knowledge and skill

The informal brick makers lack knowledge of basic accounting principles needed to determine production costs, profits and cash flows, or to be able to draw up budgets and business plans.

There is also distinct lack of knowledge and skills in other areas of the business, including management, bookkeeping, administration, record-keeping, procurement, marketing and sales.

Many of the shortcomings associated with bricks from the informal brick making sector (non-uniformity of quality, under-fired bricks, high wastage etc.) can be traced back to problems occurring during the production process. This indicates a general lack of knowledge, skill and basic understanding of the ceramic materials and processes.

Lack of funds

The informal brick makers find it almost impossible to raise funds to make much-needed improvements to their operations. Lending institutions need collateral before they will extend a loan and in the informal brick makers’ case, this is often non-existent. Informal brick making in the Eastern Cape is not considered an industry, so manufacturers do not have access to special loan arrangements for industrial activities. The brick makers have to rely on either their own funds for capital or on the “informal” banking sector, which includes family members, friends and money lenders.

As a result, the informal brick makers’ development remains more or less at a standstill.

Technical aspects

The sector has seen very little change from the present manual processes to those used 50 years ago. To grow both the industry and the markets where their bricks could be sold (i.e. to government agencies and large construction companies), far larger volumes will need to be produced – and at a consistent quality, conforming to the SANS 227:2007 quality standard.

The following improvements to production processes need to be considered:

- Mining methods and equipment to obtain the best raw materials available;
- Raw material stock piling and mixing methods;
- Raw material preparation methods and equipment;
- Making equipment;
- Improved drying methods;
- Improved firing methods and kilns;
- Quality control and testing methods;
- Sourcing of better quality fuels.

Marketing aspects

The main competitors of the clay brick sector as a supplier of formal building materials are the cement block producers. Despite being more expensive than clay bricks, cement blocks have attained a market share in several of the areas because they build faster due to their bigger size, and because only single skin walls need to be built.

No formal advertising, marketing or promoting of clay products exist amongst the informal clay brick operations. The main reason for this is the small volumes produced by the operations, which can normally be sold quickly by word of mouth in their local community. Another problem is the poor quality of the handmade products, which are only used by the local township home owners and not bought by government agencies or big building contractors.

Conclusions

Proposed interventions:

- To change the informal brick makers’ perspective, they must first and foremost be trained in basic accounting principles so that they are able to make sound business decisions. A basic business and financial course, developed specifically to cater to the needs of the informal brick makers and their operations would be enormously useful.

- It is suggested that the issue of raising funds be investigated further to try to find a method whereby informal brick makers can apply for loans, possibly through government. This might be more possible if they are accepted as an informal industry.

- There is a real need to improve operational processes and equipment, in order to improve quality and volume. This could be done by the following:

  o Improving the purchasing of fuels by contracting reputable suppliers and transport contractors, and making long term price agreements with them.
  o Contracting a reputable mining contractor, skilled in the mining of clays and who can mine the correct clay when required. This must include the discarding of unsuitable top soil and overburden, as well as the building of layered clay stock piles with only suitable quality raw materials.
  o Testing the in-situ raw materials to identify the suitability of the various clay layers.
  o Introducing a mechanical size-reduction process for the raw materials.
  o Introducing a mechanical pug mill to mix all the clay material, additives and water.
  o Sourcing of the material a day before moulding and storing this mixture overnight, under cover.
1. Introduction

1.1 Reason for the study

As with most of the informal sectors in South Africa, the informal clay brick makers are not officially regulated and monitored and therefore very little is known about this sector - the exact size of the sector, production methods used and environmental, commercial and social impact are unknown.

To start addressing the problem, a workshop was held on 10 July 2013 in Pretoria at the Swisscontact offices. The workshop was attended by DEDEAT, the CBA, DEA, DMR, SDC, Swisscontact (an agency for the SDC), Cermalab (ceramics laboratory), Qualitec (a consultancy business for small businesses) and LED managers were in attendance. Cermalab won the tender to do a study on the state of informal clay brick making in the Eastern Cape. Four areas in the Eastern Cape with different dynamics were considered and will represent the whole province.

1.2 An overview of the formal industrialised and informal clay brick sectors in South Africa

There are approximately 112 formal industrialised clay brick making units operating in the major urban areas of South Africa. These factories produce on average between 0,5 million and 14 million bricks per unit, per month. Of these factories, only 14 produce less than a million bricks per month.

These bricks are produced according to SANS 227:2007 quality standard, which includes: at least a cold crushing strength of 7 MPa for plaster bricks and 17 MPa for face and semi face bricks; a water absorption of between 8% and 20%; dimensions falling inside specific size tolerances and soluble salt contents falling inside specified efflorescence tolerances.
By contrast, informal clay brick making in South Africa and particularly in the Eastern Cape are very small, manually operated businesses that are traditional and have seen very few changes in the past 50 years.

In rural areas such as Molteno, Indwe, Sterkstroom and Dordrecht, these businesses do not operate in the winter months, due to cold weather and limited demand. The informal units operating in urban and semi-urban areas (such as Umtatha, Mdantsane, Aliwal North, Queenstown, Ilinge and Whittlesea) where the demand is higher, can operate all year round.

The informal clay brick units produce on average 11,074 saleable bricks per unit, per month, which can range from 4,036 to 48,454 saleable bricks per operation, per month.

The estimated number of total informal brick making operations in the Eastern Cape is 1042, producing an estimated total of 118,6 million saleable bricks per annum. The red bricks (plaster bricks) have an average strength of 2,5 MPa with water absorption in excess of 20%. The blue bricks (semi-face bricks) have an average strength of 5 MPa and water absorption values of about 13%. These values can vary greatly from unit to unit.

Dimensions can also vary greatly within a unit and between different units. The efflorescence normally exceeds the SANS 227 requirements, due to the ash or poor quality coal used.

1.2.1 Clay mining

The formal industrialised clay brick making units mine their raw materials using mechanical equipment, including hydraulic excavators, loaders, bulldozers and mechanical scrapers. They then transport the product to factories using dumpers and trucks. The material is pre-tested.

Selective mining enables the discarding of the top soil and overburden. The suitable clay materials are stockpiled either in individual or layered stockpiles. This operation is done either seasonally, during winter when there is no rain - or for smaller operations on a daily basis.

Due to the manual nature of the operation the mining depth is only around two metres. The mining is usually done near river beds or dams (although not exclusively) where natural water is also available. No stockpiling is done. Only sufficient material is mined for the next day’s production.

Occasionally the brick makers may hire a TLB (a tractor/loader and backhoe and is used for small scale building and excavation type work) to do the mining. A brick maker may hire the machine on his own or several brick makers may jointly hire the TLB. The TLB excavator will only mine for a couple of hours at a time for each informal clay brick producer to supply one to two months of raw materials. This material is stockpiled (heaped) at the moulding area.

1.2.2 Clay preparation

The raw material preparation plant of the formal industrialised clay brick producers can consist of primary, secondary and tertiary comminution equipment, screens, feeders, conveyors and mixers to produce a fine, consistent and uniform raw material over a long period of time. Storage of prepared material and souring bins will often be provided to improve workability.

The informal clay brick makers do not do any further size reduction after mining. The raw material is mixed with sand (when required), ash and/or duff coal. An adequate amount of water is added and the mixture is left to sour overnight.

1.2.3 Shaping

De-airing extruders that can produce up to ninety tons of product per hour are used to shape the bricks in formal industrialised clay brick factories. The extruded column is automatically cut by push-through or reel cutters to produce the individual green bricks. The green bricks are either packed manually or automatically on pallets, dryer cars or kiln cars and transported mechanically by forklift truck or tractor-trailer combination to hack lines or automatically pushed into tunnel dryers.

With informal clay brick making, shaping is exclusively by slop moulding where a clot of wet material - containing 25% to 30% moisture - is thrown into a wooden mould, compressed by hand into all corners of the mould. The excess material is skimmed off and the bricks are de-moulded onto a level piece of ground and left to dry.

1.2.4 Drying

In South Africa 70% of formal industrialised clay brick producers make use of natural air drying, where bricks are packed on pallets and put in hack lines to dry. It can take two to four weeks or longer to dry the bricks to between 3% and 6% moisture. The remaining factories make use of fixed dryers such as chamber dryers or tunnel dryers. With these types of dryers, the drying can take three days or less to obtain less than 1% moisture. The heat supplied is usually waste heat from the kilns, with additional heat sometimes supplied using a chain grate stoker.

Drying in the informal brick making sector is exclusively by natural drying in hack lines. The bricks are de-moulded onto a level piece of ground and when sufficiently dry after two days, are packed into hacks for further drying.

1.2.5 Burning

The majority (68%) of the formal industrialised clay brick producers make use of clamp firing to burn their bricks. The remaining operations make use of TVA kilns, Zigzag kilns, VSBK kilns and tunnel kilns.
Burning in the informal brick making sector is exclusively by small clamp firing.

1.2.6 Sorting

The sorting process of the clamp operations in the formal industrialized clay brick factories are done manually during the de-hacking process. Bricks are usually sorted into FBA, NFP, utilities and half bricks (the well fired half bricks are often sold for cobble paving and the not so good half bricks for filling).

The informal brick makers sort their products into red bricks (softer-fired bricks used as plaster bricks) and blue bricks (the harder-fired bricks used as non-plaster bricks). Often the over-fired bricks are sold as klinkers and the under-fired are sold as "vaal" bricks.

1.3 Informal sector information

The informal clay brick making sector in South Africa falls within the category of "survivalist enterprises", where the income generated is less than the minimum income standard or poverty line. The asset value of the enterprise is minimal. The brick making activity is directed at providing minimal means to keep the unemployed and their families alive.

The informal clay brick makers lack formality in terms of the licensing laws, tax laws, labour laws and environment health regulations. These operations are small scale, mostly family or household-based enterprises that are unregulated by government institutions.

They can be identified as those small and often scattered clay brick making operations that have not been able to organise themselves in pursuit of their common interests, largely due to constraints such as:

- inadequate capital and access to credit;
- poor technical skills and equipment;
- lack of basic accounting management skills;
- and marketing problems.

The present informal clay brick makers have an important role to play in job-creation and in meeting the demand for product for low income population groups.

1.4 Areas considered for the Survey

Since the informal clay brick sector in South Africa is not regulated and monitored, it is impossible to ascertain its size. It is however a fact that the largest concentration of informal brick makers is in the Eastern Cape.

The Eastern Cape Province is divided, for local government purposes, into two metropolitan municipalities and six district municipalities. The district municipalities are in turn divided into thirty seven local municipalities, of which the following regions were targeted in the survey:

- Chris Hani district municipality, Queenstown area;
- Buffalo city metropolitan municipality, East London area;
- OR Tambo district municipality, Umtitha area;
- Maletswai local municipality, Aliwal North area.

These areas were chosen for the following reasons:

- They have the highest concentration of clay brick operations in the Eastern Cape;
- The four municipalities were chosen to cover as wide an area as possible in the province;
- Both high and low density population areas were included to take into account different market dynamics and social differences;
- The chosen areas include operations in rural, urban and semi-urban areas;
- Maletswai local municipality might be small in all the above criteria but there are at least 80 informal brick manufacturers concentrated in the area and it thus warranted inclusion.

Table 1: Metropolitan and district municipalities chosen for the survey

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Classification</th>
<th>Population</th>
<th>Population density</th>
<th>Area (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chris Hani</td>
<td>District</td>
<td>716 461</td>
<td>21,7</td>
<td>36 695</td>
</tr>
<tr>
<td>Buffalo City</td>
<td>Metro</td>
<td>755 200</td>
<td>297,8</td>
<td>2 536</td>
</tr>
<tr>
<td>OR Tambo</td>
<td>District</td>
<td>1 364 943</td>
<td>55,5</td>
<td>15 968</td>
</tr>
<tr>
<td>Maletswai</td>
<td>Local</td>
<td>43 800</td>
<td>10,1</td>
<td>4 358</td>
</tr>
</tbody>
</table>

17-24 Chris Hani District Municipality

B Buffalo City Metropolitan Municipality

29-33 OR Tambo District Municipality

26 Maletswai Local Municipality

[Image of brick-making process]

[Map showing the areas surveyed]
The following towns were considered in each municipality area. The number of operations surveyed in each area was determined by the number of people available or willing to supply information on the day the survey was done.

Table 2: Towns chosen for the survey

<table>
<thead>
<tr>
<th>Town</th>
<th>District Municipality</th>
<th>Local Municipality</th>
<th>Estimated No. of operations in the area</th>
<th>No. of operations surveyed</th>
<th>Surveyed %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mthatha</td>
<td>OR Tambo</td>
<td>King Sabata Dalindyebo</td>
<td>100</td>
<td>20</td>
<td>20,0</td>
</tr>
<tr>
<td>Mdantsane</td>
<td>Buffalo City</td>
<td>Buffalo City</td>
<td>15</td>
<td>15</td>
<td>20,0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>435</td>
<td>112</td>
<td>25,7</td>
</tr>
</tbody>
</table>

Confirmation of previous study

From the 122 informal operations on the study list, ± 40% could not be contacted or confirmed to still exist. The previous study does not indicate whether the volumes produced were green bricks or saleable bricks.

Our findings are that annual volumes between 60,000 and 200,000 saleable bricks are produced per operation. In most instances production volumes showed above 200,000 bricks on the previous study list are over-stated. Some of the informal operations showed very low annual volumes, for example 10,000 or 12,000 bricks. These are monthly green production volumes and are understated on the study list. Some of these operations also operate effectively only eight to 11 months per year and not a full 12 months.

The quantity of fuel used per operation varies greatly and makes no sense as it does not indicate whether this is measured in kilograms or tons, whether the usage is per 1000 bricks, per clamp, per delivery or per year. A large number showed no coal consumption figures at all. Our findings were that most operations use a large amount of ash as internal fuel which does not feature anywhere in the previous study. We can confirm, however, that none of the informal operations have an Atmospheric Emissions License.

2. Methodology

2.1 Methodology of data collection

Data was collected for the study by means of desktop research and field research and followed the following steps:

- A questionnaire was compiled and used as a template for gathering all the relevant information from the informal clay brick makers. The template consisted of questions regarding the operational, institutional, environmental, labour, gender, socio-economic and marketing issues experienced by the informal clay brick makers.
- A separate questionnaire was drawn up for local government officials to verify answers from the first questionnaire as well as to better understand the government’s role in the informal sector.
- The informal brick makers in the various areas were invited to attend the questioning session and did so of their own free will. Each questionnaire took about 50 – 60 minutes to complete. As the information was not always readily available, cross checking of answers within each group and area were done immediately after each questioning session.
- Several of the brick makers’ operations were visited by appointment to see first-hand the operations in action and verify the processes and technical information gathered from the questionnaire.
- Samples from raw materials, ash and coal used in the brick making process were obtained and analysed at the Cermalab laboratory.
- Samples of final products were also obtained from various informal clay brick makers and tested against the SANS 227: 2007 quality standard.
- The value chain of the operation was determined and evaluated, and recommendations made on how to improve this.
- Interaction by telephone conversation were made to:
  o fuel suppliers, such as coal and dust; o municipalities, regarding the supply of services like clay mining and water; and o potential purchasers of bricks, including hardware stores and municipalities.
- Results were statistically compiled into tables, with an average value and range per area.

Desktop research was mainly used to collect information and data related to the various municipalities, for instance the demographics.

During the collection of data, the following challenges were presented:

- In most areas only a limited number of informal clay brick makers attended the questioning sessions. This is thought to be due to scepticism, as well as a lack of transport. It was made clear from the start of each questioning session that the information is to be used in an attempt to identify problems and thereby improve their living and operating circumstances, rather than for the government to impose laws or restrictions.
- The questioning sessions were done in both English and Xhosa, since many of the participants did not understand English well.
Completing the questionnaire took between 50 and 60 minutes.

The participants had kept no recorded information relating to costs, profits or volumes and information given was from memory only. It is our belief that figures given are likely to be the most recent values and probably not representative of the whole year. The accuracy of these figures is therefore questionable.

When visiting the operations, there were times when very little action took place, making it difficult to verify the processes.

During the study two distinct types of operations were identified: private operations and the co-ops.

2.2 Private operations

A private operation is typically a small scale, one-man, family-owned or household based enterprise, where all the main functions of the business - the ordering of fuel, decisions on the methods of operation, marketing and selling - are performed by the owner.

The owner can be male or female and will make use of family or hired labour when and where required. Production quantities are typically in the range of 10,000 to 20,000 green bricks per month.

When comparing with the SANS 227:2007 quality standard for clay masonry units, the quality of the bricks produced is poor, but adequate for use in local residential applications. The owner will typically be involved in all the production processes and will perform most of them him or herself.

Apart from the moulding process, which is often done by hired/contracted moulders, the production processes are performed by the owners. The local government provides the land, water and infrastructure, including an open sided shed, water tanks and piping, fencing, hand tools (wheelbarrows, shovels and picks), and a level operating area for the hack lines and clamp kilns.

A few months of raw material is sometimes supplied to start the process. The members are also paid a stipend of approximately R60 per day for the first six months to get the process going. The local government also assisted in trying to get the members trained in the art of clay brick making and made attempts to improve the brick quality by trialling a different making method, using hand operated brick presses. The income generated by the co-op is shared between the members.

Apart from the infrastructure provided by the local government, the present assets are only hand tools and no other production equipment or automated machinery is used. The capital input required from each member is either nil or very small, irrespective of the number of members, the production quantities for the co-ops were, at the time of the study, around 20,000 units per month. This concept seems to be recently introduced and has not been tested and proven.

Failures of the present co-ops include:

- From an outsider’s point of view, the operation looks chaotic and the members’ roles are not clearly defined. There seem to be no clear leaders who can organise and give direction to the purpose of the operation.
- Although the informal method of brick making is a simple and uncomplicated process, the members lack the basic technical skills and know-how to operate at maximum quality / minimum waste and cost levels, to optimise profitability.
- Members lack the necessary management skills to manage a big operation in terms of the number of labour present.
- The members lack the accounting skills necessary to keep track of the income and expenses of the operation.
- The volumes produced are very low and not in balance with the number of members in the co-op.
- Profit shares are extremely low and not sustainable as a livelihood income.
- Many of the members seem to be part of the co-op only to receive the stipends. They arrive for “work”, but produce nothing for the day.
3. The Survey

3.1 Institutional aspects

3.1.1 Characteristics of the informal clay brick makers’ business

• No official registration of the business, no formal record keeping, low fixed costs, reliance on family and/or neighbours and friends labour and the use of informal financial markets for credit.

• No association or local group of informal brick makers to set and enforce standards, disseminate research information, lobby government, self-regulate production volumes and gain access to knowledge and information.

• Due mainly to a lack of funds and unity, they do not employ specialised agencies for troubleshooting, assistance with choosing appropriate equipment, doing energy audits and implementing quality control systems. (The formal industrialised clay brick makers attempt to get this done through the Clay Brick Association of South Africa, but the informal brick makers are not members.)

• Although they do not organise official regional meetings to discuss problems and develop a unified policy position, groups within the informal sector do occasionally discuss and agree on issues of a common nature, for example the price structure. The operations in each area are situated close to each other and such decisions are made on an informal basis.

• There are no identifiable leaders prepared to co-ordinate the efforts to improve the situation.

3.1.2 Government’s point of view

The informal economy is recognised by all levels of government as representing a real and significant component of the South African economy, with their estimated contribution being between 7% and 12% of national GDP. Despite this, there appear to be no coherent policies specifically tailored to support the informal economy at government level. At a provincial and local government level, studies have been commissioned to map the informal economies of some provinces and certain measures have been proposed, for instance urban planning that provides opportunities for small businesses in the informal economy to have access to centrally located and affordable premises. In terms of implementation, the performance of different provinces and municipalities in supporting their informal sectors varies greatly. Overall, the informal economy does not appear to enjoy large-scale, coordinated and proactive government support. Besides the LED, the government is not organised in any other way with regards to the informal clay brick makers.

3.1.3 Legal aspects

To register a company as a legal entity, the company must be registered with the South African registrar of companies, as well as with the authorities that regulate VAT (vendor tax), employee tax, provincial and regional service levies, workman’s compensation and the UIF. Companies and individuals must register for income tax purposes. Business licenses are also required for certain activities.

The informal brick maker’s opinion on legal issues
are that some form of licensing is acceptable, but that they cannot afford the cost of the present licenses and taxes imposed on companies.

3.1.4 Findings from the institutional survey

Officially, the basic aim of the Local Economic Development (LED) Manager is to increase economic growth and employment opportunities at local government level. The clay brick makers in the Eastern Cape however reported that in general they receive very little support from the local governments.

The type of support and/or non-interference given to the brick makers are:

- An area of government owned land or tribal land where they can mine and make bricks at will;
- No taxes or levies imposed on the raw material, water or space used;
- No ground rules as far as depth of mining and rehabilitation of mined areas is concerned;
- No restrictions on the amount of fuel used.

Local government authorities reported that they perceived the informal clay brick makers as an opportunity for job creation, generation of income and the provision of low cost building materials to the local community. They do not see them as a nuisance or a burden but rather as an opportunity to alleviate poverty. The LED Managers claim they created the co-op initiative in an attempt to boost job creation. Recently, in Molteno and Sterkstroom, they initiated the formation of co-ops and provided them with free water tanks, shelters, fencing, water supply and piping, initial wage payment of six months, operating equipment and free training as a means to get the operations started. Local authorities in Lukhanji and Inkwanca reported that on occasion bricks they have bought from the local informal brick makers to be used for low cost housing.

The private brick makers claim however that little or no interaction takes place between the local governments and the brick makers and that they receive no government support. Local government is also not getting involved with the standardising of products, provision of technical services, and introduction of new products or the upgrading of existing plants.

3.2 Technical aspects

3.2.1 Production

Informal clay brick making in the Eastern Cape consists of very small, traditional, manually operated businesses that have seen very few changes to the processes in the last 50 years. The production techniques employed are simple, manual operations where raw materials are predominantly mined manually; green bricks are made by hand, dried in the open in hack lines, and fired in simple clamps using coal nuts, ash and - on occasion - wood. The techniques employed by the different units and different areas of the Eastern Cape show no major differences between them. The production units are situated on tribal or government owned land in rural, semi-urban or urban areas.

The capital equipment employed in the production units are worth from a few hundred rand to R1000 and consists mainly of hand tools such as picks, shovels, wheelbarrows, buckets and wooden or steel moulds. This is all the equipment used to mine raw materials, transport material and bricks and make green bricks.

The units produce anything from 4036 to 48,454 saleable bricks per operation, per month. Bricks are produced from eight months of the year in some areas, to 11 months in other areas. On rainy days the informal brick operations do not operate since they have no under-roof protection for workers or enough covering for the green and dry bricks and the clamp kilns.

3.2.1.1 Clay extraction

Only local raw materials are used to produce bricks and no clay material is imported. Sand is sometimes added to get the right properties. No prior testing of the raw materials is done and the mix is prepared by trial and error.

For this survey, Cermalab tested the raw materials used by the informal brick makers in Molteno, Sterkstroom, Indwe and Dordrecht to gather information on the properties.

Some conclusions drawn and recommendations made to this operation were:

- The Molteno material is a fine-grained material, containing sufficient amounts of fluxing alkalis and high iron content. The material showed low plasticity and low drying shrinkage, but high dry strength. The material is not sensitive to harsh drying conditions, has a long firing range with low firing shrinkage and adequate fired strengths.

- The Sterkstroom material is a coarser-grained material, with low amounts of fluxing alkalis and iron content. The material has medium plasticity, high drying shrinkage and adequate dry strength. The material is sensitive to harsh drying conditions, has a long firing range with low firing shrinkage and adequate fired strengths.

- The Molteno materials’ properties can be improved through the addition of a sandy material. This will reduce the drying shrinkage, reduce the drying sensitivity and increase the firing range.

The addition of more fluxing material will reduce the vitrification temperature and improve the fired strength. With better mining practices, e.g. deeper mining of material containing less overburden, this can possibly be achieved.

- The Dordrecht material is a coarse-grained material, containing sufficient amounts of fluxing alkalis and low iron content. The material showed low plasticity and low drying shrinkage, but high dry strength. The material is not sensitive to harsh drying conditions, has a long firing range with low firing shrinkage and low fired strengths up to 1100°C. It develops a light red to red colour, even though the iron content is relatively low.

The Dordrecht material properties can be improved through the addition of a finer-grained, more plastic and less sandy material, which will improve the plasticity and workability, improve the compaction density of the product, reduce the refactoriness and increase the fired strength at lower and more economical temperatures.
The informal clay brick makers usually have a clay pit measuring up to four square metres. The clay pit’s lifetime can vary from less than five years to more than ten years after which it is abandoned and the unit moves to a new location.

The brick making units are all located within 10 metres from the clay pit due to the manual transport of the material. Generally, the informal brick makers use whatever soil is available nearby for brick production. They will excavate topsoil, overburden and clay material in one go. They do not separate these three layers and do not select and use only the good brick making soil. Due to these malpractices, the quality of bricks produced is often inferior, with a low strength (on average 2 MPa compared to 7 MPa for normal machine produced plaster bricks) and poor surface finish (the surface is rough, deformed and contains large pebbles).

In the majority of cases, after only the vegetation is removed, the brick making material is mined by hand with pick and shovel and transported by bucket or wheelbarrow to the moulding area. This involves hard physical labour and is only done by the males. No topsoil conservation takes place. The topsoil layer (i.e. the first 300 mm to 500 mm of soil) contains organic matter which is highly fertile and necessary for vegetation growth. This soil should be stock piled separately and reused for land restoration after the required soil for brick making has been excavated.

Some operations hire a TLB once or twice a month at a rate of R250 to R450 per hour, to do the mining of the raw materials. The hiring rate is determined by the owner of the vehicle and depends on factors such as the volumes to be mined, the traveling distance to the brick making operations and age of the machine. For each operation 20 m³ to 40 m³ are usually mined at a time which will last for a month or two. No selective mining takes place. The material is mined from top to bottom and stockpiled near the moulding area. The TLB can be hired by individual brick makers or collectively by a number of brick makers. This is the only mobile equipment hired by the brick makers and is often available from the local private enterprises in nearby towns.

The informal brick maker seems to be increasingly attracted to mechanical mining, mainly due to the human resource management problem and the competition among the brick makers for producing quality bricks. The use of mechanical excavators is gaining popularity among them, since large volumes can be mined quickly and stored to weather and sour. In areas such as Mdantsane, mechanical excavation is almost exclusively used. Some brick makers in the Molteno, Alwal North and Indwe areas are also increasingly making use of mechanical excavation.

3.2.1.2 Raw material storage

When manual mining is employed, no stockpiling of material takes place and only a sufficient amount is mined at a time to be used the next day. When mechanical excavation is employed, stockpiles can be built near the moulding area. Often the material is simply pushed into a heap with the bucket attachment at the front of the TLB. These small stockpiles often last for two months or longer.

The material is not selectively mined and therefore stockpiling is not done by a selective and systematic layer-by-layer method. When done properly, raw material stockpiles serve several functions. This includes the balancing out of fluctuations in the arrival of the material from the mine, improved blending of the material and the ageing function or opening up of the soil body which improves the workability of the material.

Typical problems experienced by the informal brick makers include no production on rainy days, poor uniformity and inconsistency of brick quality, and often high waste.

3.2.1.3 Clay preparation, mixing and tempering (pugging)

In the informal operations no further size reduction (crushing, grinding or screening of the raw materials) takes place after mining.

Before the mixing and tempering process, brick makers should first remove all foreign particles like stones, half bricks, plastic, wood, tree roots and so on. If this process is not done properly, soil lumps of various sizes remain within the clay mix, causing cracks in the green bricks during the drying and firing processes (major cause of breakage), and reducing the strength of the fired bricks.

The informal clay brick maker mixes the clay, ash and/or fine dust coal with a shovel by hand on the ground. A controlled amount of water is added and mixed by hand (tempering). This material should be covered with plastic sheeting to prevent it from drying out. This buffer allows the material to sour (water penetrates the clay particles and improves lubrication, which in turn improves the workability of the material) for another 12 to 15 hours before use.

In the informal operations, no pugging, manually by foot or mechanically by pug mill is done. This mix is then used the next day to mould the bricks.

To achieve the best green brick quality for informal brick making, mechanised pugging is required. In this way, the soil is properly mixed, giving good uniformity, density, consistency and workability of the clay, further resulting in uniformity of shape and size of the green bricks and an increase in strength. This obviously leads to improved quality and a reduction in waste.

The formal industrialised clay brick operations will make use of crushing and grinding equipment, which can consist of primary, secondary and tertiary crushers to prepare the material to a uniform consistency with a maximum particle size of less than 2 mm. The pugging and tempering processes will be done in large single or double shaft mixers to ensure uniform moisture contents.

3.2.1.4 Moulding

The wet clay mix is placed in a mould which forms it into the shape of a brick. The bricks can be made either by hand slop moulding or by mechanical hand pressing using a manual operated press.

Slop moulding is the traditional method of brick
making and is used by all the informal clay brick makers in South Africa. This method is cheap and requires no expensive machinery. Only wooden hand moulds are required, which can be made by local carpenters. With this method the brick is formed in a rectangular mould which has no bottom or top. The mould is wetted with water, placed on the ground and filled with a very wet clay mixture (usually between 20% and 30% moisture). A stick or wire bow is used to remove the excess clay and smooth the top of the brick. The mould is then lifted off, leaving the brick on the ground to dry.

Because of the excess water used both in the mixing of the clay and the wetting of the mould, this method often produces poor quality bricks. The clay mixture becomes so wet and soft that the newly made brick begins to deform under its own weight.

Bricks are also marked or deformed if accidentally touched or moved before drying properly. The excess water results in high shrinkage, which can also cause the brick to crack and break during drying. If the raw material mix is not consistent, variations in the size of the final brick will occur. This is a typical quality problem experienced in the informal brick making sector in South Africa. Forming and throwing the clay mix into the mould is a skill. Experience has shown that it may take up to hundreds of practice throws before a new brick moulder is able to make a moulded brick correctly.

This process requires hard physical labour and is therefore only done by males. The informal clay brick makers hire local male moulders who move from operation to operation, producing around 1000 bricks per day. The green bricks weigh around 4kg each, meaning the workers handle around four tons of material per day. Some of the brick makers make their own green bricks and due to less skill, the volumes can vary from 500 to 1000 bricks per day in those operations.

On rainy days, the informal brick makers will not mould bricks. In most cases, the freshly moulded bricks and the previous day’s moulded bricks are not protected (often due to a lack of funds to purchase plastic covering) and get damaged by the rain. The brick makers do not have a shed under which they can do the moulding and therefore they will simply not come to work.

Mechanical hand pressing can make good consistent quality clay bricks when using well prepared soil that contains sufficient amounts of clay material. Depending on the composition of the soil, mechanical hand pressing uses material containing between 10% and 15% moisture.

This method produces more consistent quality and lower waste. The lower moisture contents results in lower shrinkages. Less waste is produced due to less cracking, warping and deformation occurs due to stacking and handling. The higher forming pressures results in more dense and therefore stronger green, dry and fired products.

Operating the hand operated press requires no special skills and production outputs can be a lot higher than with slop moulding – in the region of 2000 to 2500 bricks per day.

These mechanical presses are not locally manufactured and have to be imported from abroad. For the local informal clay brick maker this is simply too expensive to consider.

The formal industrialised brick makers in South Africa make use of extruders to produce their bricks. The shaping equipment is expensive and produces large volumes of bricks in a short space of time. It requires a lot of electrical power and a large volume of well-prepared raw material to function properly.

De-moulding of slop moulded bricks: After the soil is properly compacted in the mould, the green brick is de-moulded. The brick must be released from the mould with great care. After being de-moulded onto the ground, it is pressed gently with the bottom of the mould, ensuring that all corners are straightened and the edges are sharp.

These little details are often not seen in the informal brick making operations in South Africa. The lack of these little details results in the manufacture...
of poorer quality bricks. The green slop moulded bricks are first laid on the ground for two days and, depending on local atmospheric conditions, are turned from the flat position to the upright position (i.e., on edge) and dried for a further two days. This will ensure the green brick dries uniformly from all directions. The brick makers do not always follow these principles and warped bricks are often the result.

3.2.1.5 Drying

After about four days the bricks are packed into hack lines. These should have a width of only two brick stretchers or brick lengths to allow for proper drying. The stacking must be uniform and proper spaces must be provided between bricks to ensure uniform drying. The brick surfaces should never be in contact with each other otherwise the contact area will always remain moist. There should always be a gap of 3cm to 4cm between the bricks to allow for proper airflow.

The stacking area base must be level. One layer of fired bricks is laid on the flat clean surface to protect it from storm water. The fired brick surfaces must be absolutely level in order to prevent green brick breakages caused by the weight of the brick stacks. During any indication of rain, the stack is covered with a plastic sheet to protect the green bricks from being damaged.

Drying seems not to be of main importance amongst the informal clay brick makers in South Africa and the above principles are not always adhered to. Proper plastic covering is frequently not available and hack lines are often built with a width of four or more stretchers and insufficient spaces between bricks, resulting in improper drying. Uneven hack line floor bases are common practice. Basic training is needed to rectify a lot of these malpractices.

High moisture content within the green bricks from slop moulding (20 - 30%) take longer to dry, while green bricks made with lower moisture contents, e.g., through mechanical handpressing, take a shorter time to dry. The more water used to mould the soil, the more porous the brick will be and hence the lower the dry and fired strength.

The drier the green bricks, the less energy required to fire them. Also, the drier the green bricks are, the lower the damages will be during the heating up phase in the kiln. The proper drying of green bricks is important since even a small amount of free moisture present means that a lot of the heat input energy could be wasted. The informal brick makers do not test the dry bricks for moisture content, with the result that a lot of chattering occurs in the kilns during firing and a lot of energy is wasted.

The building of hack lines requires a careful and more delicate hand, where individual bricks are packed one at a time rather than four bricks thrown in the hack at a time. The nature of this type of work is more suited for females.

3.2.1.6 Firing

Heat treatment of the dry bricks is necessary in order to produce a usable masonry product with properties such as durability, adequate strength, adequate porosity, standard dimensions and acceptable colours. Good quality bricks can be produced by firing the dry bricks in a coal fired clamp kiln (field kiln). The clamp kiln is the most basic type of firing system since no permanent kiln structure is built. It consists essentially of a pile of green bricks interspersed with combustible material. The kiln is cheap and is easy to construct. The clay from which the bricks are moulded also includes fuel material. In the informal brick sector, the number of bricks fired in a clamp kiln is between 10,000 and 20,000 bricks. They will pack a clamp only when at least 10,000 dry bricks are available. When more than 20,000 dry bricks are available, a new clamp will be packed.

Other types of firing systems are presently not used and this can be attributed to the following:

- High cost of such systems and lack of funds;
- Relatively low demand for high quality bricks in the area;
- The nature of most of these kilns requires continuous supply of product and the present manual shaping systems do not support this;
- The supply of fuel other than coal can be very expensive;
- The availability of electrical power in the region;

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can be problematic;
The more costly and technologically advanced systems will result in higher clay brick prices (when comparing prices with the present formal industrialised clay brick manufacturers), which the local population cannot afford.

Constructing the clamp kiln typically involves several stages. First, the levelling and cleaning an area of ground of approximately 6m by 6m.

The first layer, called the table, is built on this level area. The bricks are placed on edge in a row (2 bricks wide) and 50mm apart to form channels along the boundary that marks the kiln. This is the foundation layer of the clamp kiln.

Bricks are then packed flat on top of the edge bricks and slightly apart (5mm), to form a flat roster. For slower firing, this layer of bricks can be packed tightly together, i.e. with no gaps between them. This is the grate layer of the clamp kiln.

The table serves several purposes:

- It provides a drainage facility for rain and storm water and prevents water from soaking into the un-fired brick setting;
- The table allows the supply of air and thus oxygen required for combustion to the coal in the skintels (fire layers);
- The table provides a flat, even and strong foundation for the rest of the clamp setting.

The skintles or fire layers are built directly onto the table. These are dry bricks packed on edge in diagonal rows and with 50mm spacing between them. All spaces between these bricks are filled with small nut-size coal. Two or more of these skintle layers are built depending on the top temperature required - i.e. the higher the required temperature, the more skintles are packed.

The setting of green bricks is placed on the last fire layer and is packed on edge. Any small gaps that may occur are packed with small coal. The casing of this layer is the same dimensions as the clamp base. The rest of the layers are closed-packed, but in alternating directions. Each second layer is reduced in size. Depending upon the strength of the dry bricks, up to 25 layers can be added. On top of the last layer are two layers of soft-fired bricks.

**Insulation:** The sides of the kiln are covered with soft-fired bricks from previous firings and plastered with clay to reduce heat loss. The plaster also prevents more air than necessary from entering the kiln. If the kiln is well sealed with plaster, the only place that air can enter for combustion is through the lower layers, i.e. the table.

**Firing the kiln:** With a clamp kiln, the fuel is built into the kiln and no more fuel is added during the firing. However, the disadvantage is that you have very little control over the firing process. Once the fire is started, there is little to be done other than wait until the kiln has finished firing and the fires die out themselves.

Fireboxes are built with soft-fired bricks at the openings left in the fire layers and filled with small nuts. The fire is started by placing hot coals on top of the coal in the fire boxes. Once the kiln is burning briskly, the fire boxes are removed and the fire openings are closed with bricks and mud plaster. All air entering the kiln should now be coming through the table.

As the heat of the kiln increases, it is not unusual for the plaster to crack and fall off. This must be repaired or heat will escape and the kiln will not reach the correct temperature. The top of the kiln must not be covered with plastic sheets as this will stop the steam generated from escaping and the bricks might be destroyed.

The kiln must be allowed to fire until all the fuel inside the kiln is finished.

The length of time for this will depend on:

- the quantity and quality of the fuel used and
Because it is difficult to control the heat of the fires, it is important to have the bricks as dry as possible before building and firing the kiln.

**Cooling:** It is important that the clamp kiln be allowed to cool down as slowly as possible. This means that the kiln should not be opened for at least two weeks and preferably four weeks after the kiln has been completely sealed. If it is opened too soon, some of the bricks may be cracked by the cool air rushing into the kiln. The bricks will obtain a higher strength if the kiln was fired and sealed well and allowed to cool slowly and naturally. Clamp kilns should not have more than 10% of unacceptable bricks, i.e. bricks that are over-fired or under-fired, cracked or broken. The whole operation of constructing, packing, insulating and lighting of the clamp kilns is done by both males and females.

### 3.2.1.7 Clamp kiln de-hacking and sorting

The fired bricks are visually sorted into hard-fired blue bricks (usually 30-40% of saleable production) and softer-fired red bricks (usually 60-70% of saleable production). Some units also select products such as klinkers (over-fired) and vaal bricks (under-fired). Some units include the klinkers in the blue range and some either include the vaal into the red range or completely reject the vaal bricks to be used for the clamp casing (for insulating bricks).

### 3.2.1.8 Selling

The bricks are marketed only by word of mouth directly to the local public and sold on a cash basis at the factory. In general, bricks are not sold through wholesale or retail shops. The customer is responsible for organising his own transport. The average sales price, which is determined collectively by the majority of brick makers in the area, varies greatly from area to area and is mainly determined by the production costs and in particular the fuel costs in the area.

The informal brick maker can stockpile only one month’s production (due to limited funds) and have to sell these products first before further production can take place. During this time, hired workers cannot work at the brick maker’s operation and have to find something else to do. The brick maker may lose staff as a result and have to recruit new workers. Bricks will not be made on order and customers will come to the factory, pick and pay for their bricks when they are available.

### 3.2.1.9 Improving the efficiency of clamps

In general, the energy consumption in field clamps is high compared with any other type of kiln. Clamp firing also results in a low rate of first grade bricks mainly due to very poor kiln insulation, dense packing of green bricks and the uncontrolled influx of cold air into the firing holes which are open during the firing process.

**Good insulation of the clamp walls and better loose brick stacking will ensure thorough burning of all bricks, including those placed on the outer stacks and edges of the clamp.**

**Energy efficiency of clamps can be improved by:**

- “Jacketing” the outer clamp walls with broken or soft-fired bricks and plastering with a thick layer of mud, as well as frequent maintenance of the mud cover layer during the firing process;
- Covering the top of the kiln with two layers of soft-fired bricks;
- Stacking bricks with a ± 3mm space between them to allow vapour to escape and kiln heat to reach up to the top courses;
- Covering the fire holes immediately after the ignition stage;
- The use of good quality coal, which will improve the quality of ignition, the firing speed and firing consistency.

### 3.2.2 Observations made from the technical survey

- From observations made during the study, many of the above basic principles are not adhered to and simple basic training can correct many of these faults.
  - The kiln floor base is seldom level, resulting in additional waste.
  - The table channels are often blocked, depriving the kiln of oxygen, which in turn results in a high amount of second grade and soft bricks.
  - The skintles (fire layers) are not properly filled with coal, preventing proper ignition and resulting in pillars of under-fired product.
  - The coal/ash in the skintles (fire layers) contains excessive fines which smothers the fire preventing proper ignition and results in pillars of under-fired bricks.
  - Too few skintles are packed, resulting in too low firing temperatures and low volumes of first grade brick yields.
  - Poor insulation or poor maintenance of the insulation results in low volumes of first grade brick yields.
  - Opening of kilns before they have properly cooled down leads to low first grade yields.
green bricks (which have low strength at that stage) are generated from operations where bricks are
made and three tons of duff coal per 10,000 green bricks made. The average amount of
fuel used was one ton per 10,000 dry bricks packed, and two tons of ash per
10,000 dry bricks packed. These figures were used for calculation purposes since accurate
consumption figures could not be supplied by the informal brick makers. From observation,
these can vary greatly between individual operations.

• The quality of the fuel seems to vary greatly from
batch to batch and the consumption volumes
are continuously adjusted by the brick makers.

• The average amount of dry waste obtained
during setting of the clamps, was 5%. Although
this figure seems to be low, the green and dry
bricks were carefully handled by female workers
who worked at a fairly slow pace. Bricks were
packed one at a time and placed in the correct
spot.

Compared to the informal brick making process,
the dry waste in formal industrialised operations
are generated from operations where bricks are
hand-off-set from conveyor belts at high speed,
usually resulting in the throwing of bricks onto packs.
Green bricks (which have low strength at that
stage) are packed on wooden pallets which can
bend when picked up by forklift truck, resulting in
further damage. The green bricks are being
transported by forklift truck often for kilometres
over uneven terrain to the hack lines. On de-
hacking these dry bricks, much higher waste is
therefore evident.

From observations, fired waste from clamp kilns
was estimated at 15%. This included the broken
bricks, under-fired and over-fired bricks that were
not sold by the operations. These figures were
obtained by physically counting during the field
research and visits to the operations.

Compared to the informal brick making
process, the fired waste in formal
industrialised operations can be below 10%
for well managed operations and is regarded
as average to poor at 15%.

• All the operations reclaim some of the un-
burnt coal from their clamps and mix this into
their body mix.

Quality of final product:
The formal industrialised brick makers in South
Africa make use of the SANS 227:2007 quality
standard for burnt clay masonry units (fired clay
bricks) as a guide to standardise the quality of
their products. This is basically an agreement
between the clay brick producers stating that the
product which each one produces will have the
same characteristics. This means that the end
user of the bricks can design and construct
buildings with products from any number of
producers and expect to receive a brick with a
standard shape, size and strength.

Architects, builders and contractors do not like
to use bricks made by informal clay brick makers
because the bricks can vary a great deal in form,
size and strength. A large contractor may need
500,000 bricks annually, yet many small producers
will only have 100,000 bricks available to sell each
year. If the contractor bought 100,000 bricks from
5 different producers who each produced a
different brick, it would cause many problems.

Another advantage of standardising the bricks
is being able to accurately calculate the number
of bricks needed to construct a building. It also
means that the size of the openings (e.g. doors
and windows) can be calculated and can be made
before the building is complete.

The informal clay brick makers in the Eastern
Cape do not conform, as a sector, to the SANS

3.3 Environmental aspects

The land used for brick making by the informal
brick makers is mostly situated in or next to the
residential areas. These operations are for most
part clustered together within two hundred metres
away from the nearest residence. The operations
are not situated in specially allocated industrial
areas.

All the land used for informal brick making in the
Eastern Cape is either government owned land
or tribal land. Traditionally the brick makers were
located in areas in close proximity to water, as
water is required for the brick making process and
the alluvial clays next to the rivers are suitable brick
making material. The local governments now allow
the brick makers to pursue their businesses on
this land free of charge. A brick maker will allocate
a specific plot to himself unofficially by way of
habit. On tribal land, the local traditional leader will
normally allocate an area to the brick makers. In
this case some form of payment is required. This
is not necessarily money - other forms of goodwill
are often used as payment too. The amount to be
paid is not clear and is an agreement between the
traditional leader and the brick maker.

In the immediate area where the brick makers
operate, there are no services such as drinking
water, electricity, sanitation and refuse removal
facilities provided. Access to such amenities is
by way of the local residential area but keeping
in mind that their own dwelling may be as far as
a kilometre away from the operation. In normal industrial areas in South Africa, all these services plus other infrastructure such as access roads will be provided.

Since the informal operations are not officially regulated and monitored by government authorities, the implementing and monitoring of safety methods and procedures and the reporting of accidents are solely the responsibility of the owner(s) of the brick making operation. Such procedures and methods are non-existent in the informal brick making operations.

No rehabilitation plans are in place. Mostly, the top soil is mined as part of the raw material mix. In some instances, it is discarded but not stockpiled separately for later rehabilitation. Although there is no official legislation that restricts mining to a certain depth, the nature of extracting the raw materials by hand limits the depth to about two metres.

The volumes of raw materials mined per annum in the various regions are shown in table 4 on page 74. Once the raw material has been removed, the pit is simply abandoned and the land is lost for animal grazing.

Although some of the nearest dwellings are only about 10 metres away from the production units, residents are not seriously affected by dust and noise as a result of the manual nature of the mining and manufacturing operations. However, smoke, sulphurous fumes and particle matter from the clamps can be a hazard and a nuisance to residents in the residential areas.

**Sources of fuel:** The body fuel used by the operations in Molteno, Dordrecht and Aliwal North is screened ash obtained from the old ash dumps in Molteno. The external fuel is un-screened ash from the same source. The ash is reclaimed by informal private entrepreneurs and sold to the brick making operations.

The body fuel used by the operations in Queenstown, Illinge, Whittlesea and Mdantsane is ash obtained from the old ash dumps in Molteno. The external fuel is un-screened ash obtained from the Queenstown farmer’s co-operation in Queenstown by informal private coal miners in Indwe. This is sold to the brick makers as mixed-sized coal, which they screen themselves.

The body fuel and external fuel used by the operations in Indwe, Dordrecht and Mthatha is coal obtained from informal private coal miners in Indwe. This is sold to the brick makers as mixed-sized coal, which they screen themselves.

The energy used varies a great deal, and since the informal clay brick makers could not supply accurate (recorded) coal consumption figures, the above figures are calculations based on estimates given during the survey.

Fuel is delivered to the production units by the bakkie load and the resulting dust pollution due to moving vehicles is minimum.

### 3.4 Social aspects

#### 3.4.1 Demographic data

**Table 5: Demographic data of the areas surveyed**

<table>
<thead>
<tr>
<th>Demographic Information</th>
<th>Inkwenza</th>
<th>Emalahleni</th>
<th>Lukhanji</th>
<th>Malaeswai</th>
<th>King Sabata Dalindyebo</th>
<th>Buffalo City</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>21 971</td>
<td>119 460</td>
<td>190 723</td>
<td>43 800</td>
<td>451 710</td>
<td>755 000</td>
</tr>
<tr>
<td>Area</td>
<td>3 584km²</td>
<td>3 441km²</td>
<td>3 813km²</td>
<td>4 358km²</td>
<td>3 027km²</td>
<td>2 536km²</td>
</tr>
<tr>
<td>Population density</td>
<td>61/Am²</td>
<td>35/Am²</td>
<td>50/Am²</td>
<td>10/Am²</td>
<td>150/Am²</td>
<td>300/Am²</td>
</tr>
<tr>
<td>Age structure</td>
<td>Under 15</td>
<td>31,00%</td>
<td>35,1%</td>
<td>30,5%</td>
<td>32,4%</td>
<td>25,4%</td>
</tr>
</tbody>
</table>

**The quality of the ash source is as follows:**

<table>
<thead>
<tr>
<th>CV(MJ/kg)</th>
<th>Ash (%)</th>
<th>Volatiles</th>
<th>Fixed Carbon</th>
<th>Sulphur</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,27</td>
<td>79,9</td>
<td>10,9</td>
<td>5,6</td>
<td>0,12</td>
</tr>
<tr>
<td>Fired brick weights (kg)</td>
<td>3,00 kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy used (MJ/kg of fired brick)</td>
<td>1,27</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**The quality of the coal from the Queenstown farmer’s co-operation is estimated to have a CV value of 19 MJ/kg.**

The body fuel and external fuel used by the operations in Indwe, Dordrecht and Mthatha is coal obtained from informal private coal miners in Indwe. This is sold to the brick makers as mixed-sized coal, which they screen themselves.
Demographic Information | Inkwanca | Emalahleni | Lukhanji | Maletsaw | King Sabata Dalindyebo | Buffalo City
--- | --- | --- | --- | --- | --- | ---
15 to 64 | 62,6% | 55% | 62,6% | 62,1% | 59,9% | 67,6%
Over 65 | 6,5% | 9,9% | 6,9% | 5,5% | 5,1% | 6%
Dependency ratio/100 | 59,9,100 | 81,8,100 | 59,8,100 | 61,1,100 | 66,8,100 | 47,9,100
Sex ratio males/ females | 94,5,100 | 90,1,100 | 90,5,100 | 89,9,100 | 85,3,100 | 90,4,100
Population growth/annum | 0,82% | -0,2% | 0,48% | 1,6% | 0,82% | 0,69%
Unemployment rate | 39,3% | 46,3% | 38,8% | 26,7% | 38,2% | 35,1%
Youth (15-34) unemployment rate | 47,6% | 55,3% | 47,3% | 35% | 48,3% | 45,1%
Education (aged 20+):
No schooling | 13,4% | 18,8% | 7,8% | 11% | 14% | 4,9%
Higher education | 7,2% | 3,9% | 11,4% | 10,1% | 10,7% | 13,8%
Matric | 15,2% | 11% | 22,1% | 21,8% | 18,9% | 27,1%
Household dynamics:
No. of households | 6 228 | 31 681 | 51 173 | 12 105 | 105 240 | 223 568
Avg. household size | 3,4 | 3,7 | 3,5 | 3,40 | 4,00 | 3,20
Female headed households | 44,6% | 53,8% | 48,6% | 44% | 57,3% | 45,8%
Formal housing | 97,3% | 56,1% | 88,4% | 89,6% | 60,2% | 72,5%
Housing owned | 45,8% | 61,3% | 59,9% | 44,5% | 55,7% | 49,8%
Household services:
Flush toilet connected to sewage | 86,1% | 11,8% | 64,9% | 70,1% | 26,1% | 68,8%
Weekly refuse removal | 83,2% | 8,3% | 57,6% | 83,5% | 24,6% | 70,4%
Piped water inside dwelling | 29,1% | 8,7% | 49,9% | 49,1% | 19,1% | 52,6%
Electricity for lighting | 91,7% | 78,5% | 90,9% | 84,2% | 73,3% | 80,9%
Racial makeup:
Black African | 89,1% | 98,5% | 92,6% | 85,3% | 98,0% | 85,1%
Coloured | 4,1% | 0,6% | 3,8% | 7,4% | 0,8% | 6%

Below are some of the important demographic data of the local municipalities in the Eastern Cape in which the study group of brick makers operates:

### 3.4.2 An overview of the Eastern Cape Socio performance

The Eastern Cape is home to about 6.7 million people, equivalent to 12.7% of the National population. It is comprised of a relatively young population, a declining (but higher than average) fertility rate, a working age population that is increasingly female, and a below average life expectancy rate.

The province faces significant social challenges, including poverty, income inequality, food insecurity and unemployment. The Eastern Cape is frequently measured as the poorest province in South Africa in terms of employment, education, access to water and sanitation, refuse removal, dwellings, lighting, heating and cell phones.

The province is also characterised by high levels of food insecurity with almost 78% of households classified as “food insecure”. It was found that the majority of food-insecure people are African, reside in rural areas (which are largely underserved in terms of municipal services) and have large families, headed by women.

The gender composition of the population is weighted towards females in all the district municipalities in the Eastern Cape. While males outnumber females at lower age groups, females outnumber the males at higher age groups including the working age groups (16 to 64). This can partially be explained by patterns of migration, where males tend to leave in search of better opportunities in richer provinces.

Unemployment in the Eastern Cape is high at an average rate of 28.8%. The majority of the 1.3 million people employed in the province are employed in one of three sectors: community services (26.1%), trade (23.5%) and manufacturing (12.2%). The province accounts for 9.7% of the national employment rate. The portion of individuals who fall within the working age (16-64) is increasing throughout the Eastern Cape. More than half of the people employed are located in metro areas, with the majority working in the elementary occupations (un-skilled and semi-skilled).

The labour force participation rate, measured as the ratio of the labour force to the working age population, was 56.7% in 2012 and the absorption rate, measured as the ratio of employment to the working age, was 39.7% in the same year. According to the International Labour Organisation (ILO), a 70% or more labour absorption rate is
considered good, while a rate of less than 50% is considered low. This is very revealing of the poor employment prospects in the Eastern Cape Province.

Life expectancy for males in the Eastern Cape is 50.2 years, compared to the national average of 52.1 years. Female life expectancy is 54, compared to the national average of 56. Tuberculosis is the major cause of natural deaths in the Eastern Cape at 15%, compared with the national average of 13%. HIV is the 8th highest leading cause of death in the Eastern Cape at 3.1%, compared with the national average of 3.4%. However, it is important to note that tuberculosis, influenza and pneumonia (4.99%) are all HIV opportunistic diseases; death should ultimately be attributed to HIV in a large proportion of cases.

3.4.3 Labour aspects of the informal brick maker

Many of the informal brick makers inherit the brick making operations from their families. A person with brick making skills can start an operation himself by simply obtaining a piece of land from the local municipality (free of charge) or from the local tribal chief when required. Besides a wooden mould, pick and shovel, wheelbarrow and a bucket, hardly any other capital equipment is required. No formal legal registrations or licenses are required.

The majority of the informal brick makers do not appear to find it difficult to attract labour, despite poor working conditions and low wages. However, younger male workers are more difficult to attract (they tend to migrate to other provinces looking for better opportunities). Women also seem to be more suited to work where care is required, for example the handling of green and dried bricks. The remuneration is the same for men and women when doing the same job.

Female workers often bring their young children to work, to be able to take care for them. The informal brick makers claimed that no child labour is used in the operations and none was observed during the survey.

The number of people estimated to be employed in the informal brick making sector in the various areas surveyed in the Eastern Cape is depicted in table 7 on page 77. The earnings range from as little as R750 per month for casual work to R3000 per month for the brick moulders.

One of the main reasons for the high age of the labour force is the fact that the younger males tend to migrate to richer provinces in search of better opportunities. Workers of all ages perform all the different functions in the operation and specific jobs are not allocated to specific age groups.

3.4.4 Comments on Leadership in the Informal brick making operations

The informal brick making operations are extremely informal and apart from the brick makers in the various towns meeting unofficially once in two to three years to determine brick prices, there are no official informal brick maker’s associations, industrial groups or even meetings where common interests are discussed by the members. At present, there are no government policies tailored to relate to the informal brick makers and therefore there is no need to consult or negotiate with leaders in this “informal industry”. The main focus of the individual informal brick maker is only to provide food on the table for his family. As a result, there has not been a need for them to take up leadership roles. Natural leaders will evolve when the informal brick makers are coordinated into an “Industry”.

3.5 Economic aspects

3.5.1 The South African GDP growth rate

According to the IMF, the GDP in South Africa expanded an annualised 0.7% in the third quarter of 2013 over the previous quarter. Statistics South Africa reports that from 1993 until 2013, South Africa’s GDP growth rate averaged 3.2%, reaching...
an all-time high of 7.6% in March of 1996 and a record low of -6.3% in March of 2009.

South Africa’s export-based economy is the largest and most developed in Africa. The country is rich in natural resources and a leading producer of platinum, gold, chromium and iron. From 2002 to 2008, South Africa grew at an average of 4.5% year-on-year, its fastest expansion since the establishment of democracy in 1994. However, in recent years, successive governments have failed to address structural problems and as a result, the recession in 2008, South Africa’s growth has been sluggish and below African averages. The forecasted annual GDP growth rate up to 2016 is expected to be on average 2.17% in South Africa, in the Sub-Saharan African it is estimated at 6.6%.

Despite its many achievements since the transition to majority rule, South Africa, and in particular the Eastern Cape, struggles with low growth, widespread unemployment and sharp social tensions. According to the IMF, in order to boost growth and create jobs for a growing population, South Africa needs to pursue structural reforms – for instance, the widening gap between rich and poor, low-skilled labour force, high unemployment rate, deteriorating infrastructure and high corruption and crime rates.

Other issues of concern include high levels of youth unemployment, increased dependency on social grants and social unrest due to low levels of service delivery.

A number of factors influence the production costs and productivity of the informal operations:

1. Production volume: The monthly saleable production volumes in the informal clay brick operations can vary from as little as 4,030 to as much as 48,454 saleable bricks between the different operations. The monthly production volumes can also vary greatly in each individual operation, depending on the demand for bricks, weather conditions and availability of funds. Obviously, the larger the volume produced, the higher the turnover and thus the income.

2. The number of production months per annum: As shown in table 11 on page 79, in areas such as Molteno, Sterkstroom, Aliwal North and Dordrecht, the clay brick operations only work mainly due to the very cold winter months in the

3.5.2 The estimated size of the construction industry in the Eastern Cape

According to economic forecasts from the IMF, the value of the South African GDP is estimated to be in the region of 2076,876 billion ZAR (393,966 billion USD) for 2013. The latest calculated Eastern Cape GDP contribution value is 4.2% of the South African GDP or 87,229 billion ZAR per annum.

The construction sectoral share of the Gross Value Added (GVA) to the Eastern Cape GDP is 2.46% or 2145,809 million ZAR. The table below provides a summary of the sectoral shares (%) of the nine activities in each District Municipality / Metro in the Eastern Cape. The activities are classified into three aggregated sectors (primary, secondary and tertiary) which are further classified into sub-sectors.

The contribution of the tertiary sector (community services, financial services, transport and trade) is the largest in all District Municipalities and Metros, followed by the secondary sector (manufacture, electricity and construction) with the tertiary sector (agriculture and mining) contributing the least.

3.5.3 Production costs

All the raw material volumes, energy volumes, waste volumes and cost figures used for the production costs calculations were supplied by the interviewees from memory and no recorded information could be supplied. Table 10 on page 78 provides a summary of the production costs of the informal clay brick operations from the figures supplied.


<table>
<thead>
<tr>
<th>District municipality / Metro</th>
<th>Agriculture (%)</th>
<th>Mining (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cacadu</td>
<td>8.6</td>
<td>0.0</td>
</tr>
<tr>
<td>Amatole</td>
<td>2.5</td>
<td>0.1</td>
</tr>
<tr>
<td>Chris Hani</td>
<td>4.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Ukhahlamba</td>
<td>7.2</td>
<td>0.0</td>
</tr>
<tr>
<td>OR Tambo</td>
<td>4.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Alfred Nzo</td>
<td>2.5</td>
<td>0.4</td>
</tr>
<tr>
<td>NMBM</td>
<td>0.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Buffalo City</td>
<td>1.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>District municipality / Metro</th>
<th>Manufacture (%)</th>
<th>Electricity (%)</th>
<th>Construction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cacadu</td>
<td>7.7</td>
<td>2.1</td>
<td>3.6</td>
</tr>
<tr>
<td>Amatole</td>
<td>12.7</td>
<td>0.5</td>
<td>1.9</td>
</tr>
<tr>
<td>Chris Hani</td>
<td>4.6</td>
<td>1.1</td>
<td>2.9</td>
</tr>
<tr>
<td>Ukhahlamba</td>
<td>9.5</td>
<td>0.6</td>
<td>2.1</td>
</tr>
<tr>
<td>OR Tambo</td>
<td>3.1</td>
<td>0.6</td>
<td>2.0</td>
</tr>
<tr>
<td>Alfred Nzo</td>
<td>2.2</td>
<td>0.6</td>
<td>2.0</td>
</tr>
<tr>
<td>NMBM</td>
<td>21.7</td>
<td>1.0</td>
<td>2.2</td>
</tr>
<tr>
<td>Buffalo City</td>
<td>16.0</td>
<td>1.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>District municipality / Metro</th>
<th>Trade services (%)</th>
<th>Transport (%)</th>
<th>Finance (%)</th>
<th>Community (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cacadu</td>
<td>13.6</td>
<td>6.0</td>
<td>19.0</td>
<td>29.8</td>
</tr>
<tr>
<td>Amatole</td>
<td>11.8</td>
<td>3.1</td>
<td>17.0</td>
<td>39.2</td>
</tr>
<tr>
<td>Chris Hani</td>
<td>13.5</td>
<td>5.2</td>
<td>13.7</td>
<td>45.4</td>
</tr>
<tr>
<td>Ukhahlamba</td>
<td>7.9</td>
<td>3.1</td>
<td>12.2</td>
<td>45.5</td>
</tr>
<tr>
<td>OR Tambo</td>
<td>16.2</td>
<td>3.3</td>
<td>17.8</td>
<td>44.2</td>
</tr>
<tr>
<td>Alfred Nzo</td>
<td>20.5</td>
<td>2.2</td>
<td>6.7</td>
<td>50.5</td>
</tr>
<tr>
<td>NMBM</td>
<td>11.4</td>
<td>1.1</td>
<td>19.9</td>
<td>20.2</td>
</tr>
<tr>
<td>Buffalo City</td>
<td>12.0</td>
<td>7.0</td>
<td>25.0</td>
<td>25.0</td>
</tr>
</tbody>
</table>
area and the low demand for bricks during this time. All the other operations work 11 months of the year, the larger portion of December is regarded as holidays.

3. Number of people employed: The number of people employed in the private and co-op operations can vary greatly from operation to operation as shown in table 6 on page 76. The owner in the private operation decides on the number of people employed in his operation. The members of the co-ops decide how many people to employ. Other factors governing the number of people employed include the demand for bricks, availability of funds and productivity of the workers.

4. The price of fuel: The price of the fuel used by the various informal brick makers can vary greatly from region to region. Table 4 on page 74 shows the type of fuel (and price paid) in the various regions.

5. The method of mining employed: When the raw material is mined with a TLB, a fee must be paid to the TLB owner, which affects production costs.

For the purpose of explaining the production costs, the operations are divided into the private operations and the co-ops.

Private Operations

The monthly production volume per private operation ranges from 4,036 to 48,454 saleable units and the annual production volume from 44,400 to 533,000. (The production of bricks over 11 months in some areas and 8 months in others is the main reason for the difference in the annual production volumes.)

As shown in table 12 on page 80, the average number of man hours required to produce 1000 saleable bricks per area in the private operations, ranges between 59.4 to 86.8. The average number of saleable bricks produced per man, per month, per area in the private operations ranges from 2,018 to 2,624 bricks. (The main reason for these differences is the number of people employed and volumes produced per operation.)

Labour is one of the major expenses in the informal clay brick maker’s operation. Table 10 on page 78 shows the average labour cost percentages per area for the private operations (ranging from 33.1% to 67%). Labour costs are determined according to the number of people employed per operation and the piece work rates paid in the various areas, as shown in table 6 on page 76. Another reason for the labour cost percentage differences between private operations in different areas is the ratio to the fuel costs, which is the other major cost within the operation.

The energy (fuel) costs of the private operations constitute on average between 23.8% and 66.6% of the total production costs of the operations. The main reason for this difference is the price paid per ton of fuel in the various areas. Fuel prices can vary from R150 per ton in Molteno to R900 per ton in Mthatha. The fuel consumption, fuel type and fuel price in the different areas are shown in table 4 on page 68.

Other costs (including overhead costs, maintenance costs and equipment costs) constitute a very small proportion of production costs for the informal brick makers and costs are similar for all operations.

As shown in table 10 on page 78, the cost per 1000 saleable bricks for the private operations varies greatly between the various areas, due largely to the differing fuel price.

Co-op Operations

The monthly production volume per co-op ranges from 8,075 to 20,187 saleable units and the annual production volume per co-op from 64,600 to 161,500. (The main reason for the difference in the annual production volumes is the production of bricks over 11 months in some areas and 8 months in others.)

As shown in table 12 on page 80, the average number of man hours required to produce a 1000 saleable bricks per area in the co-ops, generally range between 128 and 195. The average number of saleable bricks produced per man per month per area in the private operations ranges from 621 to 1,128 bricks. (The main reason for these differences between co-ops are the number of people employed and volumes produced per co-op.)

In the cost calculations for the co-ops, labour costs were recorded as nil since all the workers are members of the co-ops and are paid a share of the profit. As mentioned above, the labour force employed is four to six times larger than those in the private operations for similar production volumes produced. This seriously affects the man hours per 1000 bricks produced and the bricks per man per month produced - as shown in table 12 on page 80.

The energy (fuel) costs of the co-ops constitutes on average between 67% and 91.3% (labour costs are excluded) of the total production costs of the operations. The major reason for the difference is the price paid per ton of fuel in the various areas. This price can vary from R150 per ton in Molteno to R900 per ton in Mthatha. The transport cost of the fuel is the major cause of the difference in price. The fuel consumption, fuel type and fuel price in the different areas are shown in table 4 on page 74.

As shown in table 10 on page 78, the cost per 1000 saleable bricks of the co-ops also varies greatly between the various areas, due to the difference in the price paid for fuel in the various areas. The difference in the cost per 1000 saleable bricks between the private operations and the co-ops is due to labour costs, since workers are all members of the co-op and share in profits rather than taking a wage.

3.5.4 The Market and competitors

In the majority of areas the only real competitors for the informal clay brick makers are other informal clay brick makers. Cement bricks and blocks are made and sold in some areas as shown in table 14 on page 82, but, as depicted in tables 13 and table 14, are generally more expensive per m2 of wall build than the locally manufactured clay bricks. The cement blocks are used to build single skin walls only, while the bricks (clay and cement bricks) have to be built in double skin for outer walls and inner support walls (walls that will support roof trusses). Hence, those who buy cement blocks do so because they can build faster, but also because they are perceived to be stronger, more uniform in shape and more dimensionally consistent than the clay bricks.

The clay bricks are generally bought by individual home owners or small contractors and builders who use them to build dwellings in the local community. Bricks are not normally bought by the government or large construction companies, due to small volumes per producer, poor quality and variation in quality between the producers.

The bricks are sold from the factory only, none through wholesalers or retailers. Customers are further responsible for arranging their own transport of the bricks.

A limited range of products are available: a hard-fired blue brick (or klinker) that can be used for non-plastered applications and a softer-fired red brick mainly used for plastered applications. The type and price of available products in the different areas is shown in table 13 on page 81.
Without money, improvements in production systems and equipment cannot be made, and development remains more or less at a standstill.

Brick making, as practiced in the Eastern Cape, could have positive effects on employment figures, not only in the sector itself but also as a result of its add-on effect. However, most brick makers are hampered in their operations due to a lack of financial resources.

The informal brick makers do however contribute substantially to the economy. The estimated number of informal brick making operations in the Eastern Cape is 1042, producing around 118,6 million saleable bricks per annum. At an estimated average selling price of R1046 per 1000 bricks, that means a total of R104,055 million is generated by the informal brick makers in the Eastern Cape. They also give employment to around 5210 people who support a further 30,218 dependents. The average monthly income per worker is R826, which gives opportunities for family support. It is used as working capital for the next months’ operations in the various areas is governed by the production costs and in particular fuel costs.

3.5.5 Marketing

In general, no formal marketing of any kind is done and customers become aware of availability of bricks via word of mouth. The informal brick makers are aware of the principle of advertising and marketing, but a lack of knowledge, skill and funds prevents them from implementing this as part of the business.

Although they do not perceive other brick makers as competitors, the informal brick makers do not market their products collectively to consumers, architects and contractors, largely due to variations in quality of their products, but also due to a lack of know-how.

3.5.6 Financial aspects

The annual profits made by the production operations in the various areas are shown in table 12 on page 80. Some of the monthly income is used as working capital for the next months’ production and the remaining income does not appear to enable the brick makers to re-invest and upgrade their equipment.

Most of the informal clay brick makers have problems with the availability of working capital. They can only often produce when they have received an order and sold their bricks; they cannot otherwise obtain money to buy fuel and pay for labour. Most lending institutions need collateral before they will extend a loan and in the brick makers’ case, collateral is mostly non-existent.

Informal brick making in the Eastern Cape is not considered an industry, so manufacturers do not have access to special loan arrangements for industrial activities. They have to rely on their own funds or loans from family members and friends.

The difference in the price of the bricks in different areas is governed by the production costs and in particular fuel costs.

### 3.6 Value Chain Analysis of the informal brick makers’ operation

#### 3.6.1 Primary Business functions

Table 15: The value chain

<table>
<thead>
<tr>
<th>Inbound Logistics</th>
<th>Activity</th>
<th>Value Factor</th>
<th>Opportunity for change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier colliery, ash collectors, informal coal miners.</td>
<td>Ordering and delivering of fuel (coal and ash). Present suppliers are informal coal miners and ash collectors.</td>
<td>1. On time and consistent delivery of the correct volume and correct quality of fuel. 2. Stable prices for long periods.</td>
<td>1. Contract reputable suppliers and transport contractors. 2. Make long term price agreements with reputable suppliers and transport contractors. 3. Agree with supplier to test the fuel on a regular basis and supply test results.</td>
</tr>
<tr>
<td>Owner / manager of the brick factory.</td>
<td>Inventory control of fuel stocks.</td>
<td>1. Fuel stocks must be replenished before they are depleted, i.e. fuel must always be available.</td>
<td>1. Ordering of fuel must be done on time and at the best price. 2. Financial operating methods such as budgets, income statements and cash flow controls must be introduced to be able to operate effectively.</td>
</tr>
<tr>
<td>Owner / manager of the brick factory.</td>
<td>Ordering of the TLB raw materials.</td>
<td>1. Availability of the TLB at the correct time is required.</td>
<td>1. Contract a reputable supplier of the TLB.</td>
</tr>
<tr>
<td>Owner / manager of the brick factory.</td>
<td>Inventory control of mixed clay stocks (only where TLB is used).</td>
<td>1. Mixed clay stocks must be replenished before they are depleted, i.e. mixed clay must always be available.</td>
<td>1. Ordering of the TLB must be done in time. 2. Financial systems must be introduced to be able to pay for the use of a TLB when required.</td>
</tr>
<tr>
<td>Owner / manager of the brick factory.</td>
<td>Ordering of a brick moulder to produce green bricks.</td>
<td>1. Good quality moulded bricks are essential.</td>
<td>1. Make an agreement with a trustworthy brick moulder.</td>
</tr>
<tr>
<td>Responsible entity</td>
<td>Activity</td>
<td>Value Factor</td>
<td>Opportunity for change</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Owner / manager of the brick factory.</td>
<td>Ordering brick moulds (where necessary).</td>
<td>1. The availability of a good brick mould during production is essential for producing good quality bricks.</td>
<td>1. Keep a good spare brick mould in stock.</td>
</tr>
<tr>
<td>TLB operator.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner / manager of the brick factory.</td>
<td>Selection of the raw material to be used.</td>
<td>1. The production of good quality bricks consistently over a long period of time, i.e. about six months.</td>
<td>1. Remove top soil and stockpile separately. Remove unsuitable overburden.</td>
</tr>
<tr>
<td>TLB operator.</td>
<td></td>
<td></td>
<td>3. Test the in-situ raw materials to identify the suitability of the various layers for brick making.</td>
</tr>
<tr>
<td>Owner / manager of the brick factory.</td>
<td>Stock piling of raw materials. Presently a small amount of material is mined per day manually. When done by TLB excavator, material is not mined and stock piled selectively.</td>
<td>1. The production of good quality bricks consistently over a long period of time.</td>
<td>1. Stockpile large volumes of raw materials (3 to 6 months) in a systematic manner. Replace manual mining by mechanical mining.</td>
</tr>
<tr>
<td>TLB operator.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crusher operator.</td>
<td>Size reduction of raw materials. In the informal brick making operations, size reduction after mining is not done.</td>
<td>1. Fine (-0mm) raw material with no soil lumps in the mix is required to produce good quality bricks consistently.</td>
<td>1. Introducing a mechanical size reduction process for the raw materials.</td>
</tr>
<tr>
<td>Pug mill operator</td>
<td>Mixing, pugging and tempering of the raw materials. The pugging process is not employed by the informal brick makers.</td>
<td>1. Improving the workability of the raw material, which will improve the quality and consistency of the bricks and reduce production waste.</td>
<td>1. Introducing a mechanical pug mill.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Responsible entity</th>
<th>Activity</th>
<th>Value Factor</th>
<th>Opportunity for change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pug mill assistant.</td>
<td>Sourcing of the prepared material.</td>
<td>1. Improving the workability of the raw material, which will improve the quality and consistency of the bricks and reduce production waste.</td>
<td>1. Preparing the clay a day before moulding and storing this overnight and under cover, to improve the workability. 2. When all the preparation processes are carried out under roof, the process can continue even on rainy days.</td>
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<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>1. A moulder is presently shaping the bricks by hand.</td>
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<tr>
<td></td>
<td>2. In mechanised operations a press / extruder operator will shape the bricks.</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Hand moulding of green bricks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Green bricks must have a good shape, appearance and strength. Too much water will cause deformation during handling and cracking during drying.</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>1. The making process can be improved by introducing mechanical pressing or extrusion. 2. Mechanical making improves the appearance and strength of the bricks and assists in standardising the products. 3. Providing a shed to protect the making process. This will enable bricks to be made on rainy days.</td>
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<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>1. Presently bricks are transported by hand by all workers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Forklift truck drivers can mechanically transport the bricks.</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Manual transportation of the green bricks from the making area to the de-moulding yard and then manually to the hack lines.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Large volumes of bricks can be transported faster over larger distances in a short time.</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Bricks can be stacked on a pallet in an open formation and mechanically transported to the hack lines by forklift truck where the pallet with bricks remains until dry (± 3 to 4 weeks). Dry bricks can be transported in the same way from the hack lines to the kilns.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Drying is done naturally by the sun and wind.

Drying of the bricks in hack lines.

1. Stacking of bricks immediately after making in hack lines without deformation.
2. Fast drying times.
3. No cracking must occur during drying.
4. No rain damage must occur.

1. Due to the high moisture contents, hand moulded bricks must be pre-dried for a number of days before they can be stacked in a hack line. Mechanically formed bricks can be stacked directly after making into hack lines.
2. Mechanically made bricks contain less moisture and thus dries quicker.
3. Due to less moisture, mechanically formed bricks deform and crack less, i.e. better quality and less waste.
4. A drying shed which simply consists of a permanent floor and a transparent roof can be introduced which reduce the risk of rain damage.

1. Kiln packers build and fire the clamp kiln.
2. Firemen will operate fixed kilns.

Manually packing bricks into a clamp kiln and protection of the clamp from rain damage during the early stages of firing.

1. A high yield of first grade bricks and low waste is required.
2. The minimum amount of fossil fuel consumption is required.
3. Low GHG (greenhouse gas) emissions required.

1. Different types of fixed kilns can be used including the VSBK.
2. Much faster firing rates are employed and less dry brick stock is required.

Sorters.

Manual sorting of bricks into quality categories after firing and packing bricks in stacks.

1. Consistent selection of bricks into categories.
2. Manual sorting of fired bricks from fixed kilns is still required but a sorting belt can be implemented resulting in better sorting quality.
3. Fired bricks can be packed on pallets or in cubes of 500 at a time to enable faster loading and unloading.

Owner / manager and factory workers.

Production volumes.

1. Sufficient numbers of bricks must be produced daily to make the operation feasible.

1. Implementation of the above equipment and processes will ensure volumes of at least 10,000 per day.

<table>
<thead>
<tr>
<th>Marketing and Sales</th>
<th>Responsible entity</th>
<th>Activity</th>
<th>Value Factor</th>
<th>Opportunity for change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing and sales manager.</td>
<td>Advertising: The informal brick makers advertise their products by word of mouth only and have limited knowledge of the marketing and sales function of an organisation.</td>
<td>1. Knowledge of and understanding of consumers' needs. 2. Knowledge of the market segments and size. 3. Consumer's awareness of available product, specifications and price. 4. Quicker selling of larger volumes of bricks.</td>
<td>1. Making use of the local media (newspapers). 2. Display posters in the local township. 3. Distribution of flyers. 4. Inform retailers and other possible distribution outlets. 5. Do basic marketing and sales training.</td>
<td></td>
</tr>
<tr>
<td>Marketing and sales manager.</td>
<td>Promotions: Product promotions are not used by the informal brick makers.</td>
<td>1. Consumer's awareness of available product, specifications and price. 2. Selling the product.</td>
<td>1. Introduce promotions such as Christmas and other types of specials.</td>
<td></td>
</tr>
<tr>
<td>Marketing and sales manager.</td>
<td>Product pricing: Product pricing is usually fixed by the informal brick makers in an area.</td>
<td>1. Consumer's awareness of available product, specifications and price.</td>
<td>1. Make use of a discount percentage per volume bought.</td>
<td></td>
</tr>
<tr>
<td>Marketing and sales manager.</td>
<td>Product mix: The product mix of the informal brick makers are all the same in a specific area due to the similar nature of the raw materials and production process.</td>
<td>1. Supply a larger spectrum of the market.</td>
<td>1. Produce a larger size perforated product to compete with the cement blocks. 2. Produce bricks with different textures. 3. Produce 52mm pavers.</td>
<td></td>
</tr>
<tr>
<td>Marketing and sales manager.</td>
<td>Selling of products is made on a cash basis only.</td>
<td>1. Increase sales. 2. Increase number of customers.</td>
<td>1. Consider selling on credit to bigger contractors with discount opportunities when payments are made with in time limits.</td>
<td></td>
</tr>
<tr>
<td>Marketing and sales manager.</td>
<td>Retail and consignment management: Informal brick makers do not sell to retailers or on a consignment basis.</td>
<td>1. Increase sales. 2. Increase the number of customers.</td>
<td>1. Negotiate the selling of bricks to retailers and other outlets. 2. Consider the selling of products on consignment.</td>
<td></td>
</tr>
<tr>
<td>Marketing and sales manager.</td>
<td>Product volume: Informal brick makers individually produce small volumes each but do not market their products collectively.</td>
<td>1. Increase sales. 2. Broaden the customer base.</td>
<td>1. Standardise the products in an area and market large volumes collectively to bigger contractors and government agencies.</td>
<td></td>
</tr>
<tr>
<td>Marketing and sales manager.</td>
<td>Customers (present customers are local residents and small builders).</td>
<td>1. Increase sales. 2. Broaden the customer base.</td>
<td>1. Market bricks through architects, large contractors, government agencies, retailers and other distribution agencies.</td>
<td></td>
</tr>
</tbody>
</table>

### Outbound Logistics

<table>
<thead>
<tr>
<th>Responsible entity</th>
<th>Activity</th>
<th>Value Factor</th>
<th>Opportunity for change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Marketing and sales manager. 2. Transport contractors.</td>
<td>In the informal operations the transportation of the finished product to the customers are arranged by the customers themselves.</td>
<td>1. Good customer relations. 2. Increase the number of customers. 3. Good service to customers.</td>
<td>1. Contract reputable transport owners to do all the delivery functions of the operation.</td>
</tr>
<tr>
<td>Marketing and sales manager.</td>
<td>Distribution outlets are not utilised by the informal brick makers.</td>
<td>1. Improve the ease for customers to obtain bricks. 2. Increase the customer base and range.</td>
<td>1. Distributing the products through hardware stores, brick and tile centres etc.</td>
</tr>
</tbody>
</table>

### Marketing and sales manager.

| Order fulfilment. The informal brick makers produce small volumes at a time and often cannot supply a full order at a time. | 1. It is important for the business to have integrity with customer. 2. This ensures future sales. |

### Services

<table>
<thead>
<tr>
<th>Responsible entity</th>
<th>Activity</th>
<th>Value Factor</th>
<th>Opportunity for change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing and sales manager.</td>
<td>Informal brick makers do not actively entertain any form of after sales service.</td>
<td>1. Maintain the integrity of the business. 2. Ensure future sales. 3. Enhance the product’s value.</td>
<td></td>
</tr>
</tbody>
</table>

### Technology management

<table>
<thead>
<tr>
<th>Responsible entity</th>
<th>Activity</th>
<th>Value Factor</th>
<th>Opportunity for change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner / manager of the brick factory.</td>
<td>No official procurement systems and schedules are used in the informal brick making operations.</td>
<td>1. Add value by having the correct volume of raw material and fuel of the correct quality at the correct time. This can reduce costs and ensure the availability of the right product at the right time.</td>
<td>1. Consider introducing the changes to the inbound logistics mentioned above.</td>
</tr>
</tbody>
</table>

### 3.6.2 Support Functions

<table>
<thead>
<tr>
<th>Responsible entity</th>
<th>Activity</th>
<th>Value Factor</th>
<th>Opportunity for change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner / manager of the brick factory.</td>
<td>In the informal clay brick operations, no research and development, process automation or process design is considered.</td>
<td>1. Technology can be used to reduce costs, develop new products, improve working conditions, reduce pollution etc.</td>
<td>1. Consider introducing the operational changes mentioned above.</td>
</tr>
</tbody>
</table>
### Human resources management

<table>
<thead>
<tr>
<th>Human Resources Manager</th>
<th>No planned recruitment, human development, training or the proper compensation of human resources takes place.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Motivate employees and create a happy working environment. This ensures the attainment of the overall business objectives.</td>
<td></td>
</tr>
<tr>
<td>1. Recruiting of potentially trainable employees.</td>
<td></td>
</tr>
<tr>
<td>2. Training employees in the various aspects of business and brick making such as administration systems, bookkeeping and accounting systems, marketing and sales, operational management.</td>
<td></td>
</tr>
<tr>
<td>3. Become a legal, registered company and follow the legal requirements.</td>
<td></td>
</tr>
</tbody>
</table>

### Infrastructure

<table>
<thead>
<tr>
<th>Owner / manager of the brick factory. Administration manager.</th>
<th>Functions such as a legal framework, financing and accounting, quality management and general management do not exist in the informal operations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. These functions are required to drive the business forward to meet its objectives.</td>
<td></td>
</tr>
<tr>
<td>1. Legalise the business.</td>
<td></td>
</tr>
<tr>
<td>2. Introduce basic training in business, accounting, management and brick making.</td>
<td></td>
</tr>
<tr>
<td>3. Introduce a quality management system.</td>
<td></td>
</tr>
</tbody>
</table>

---

### 3.7 The informal brick makers’ concerns

#### 3.7.1 Specific concerns of the informal brick makers in the various towns.

The specific concerns raised by the majority of the informal clay brick makers in the various towns surveyed are shown in table 16 on page 83. These concerns are classified into three levels of seriousness: major concerns, concerns and no problem.

- **Major concerns** refer to continuously problematic areas, which need immediate and often professional attention. These issues seriously affect the operations.
- **Concerns** are issues that are for the most part only occasionally problematic. Attention is needed to level out the variables.
- **No problem** refers to issues which the brick makers regard as needing no immediate attention.

The specific concern areas considered for the survey are:

- **Lack of skilled labour**: Refers to labour skilled in manual mining, mixing and tempering of raw materials, moulding of bricks, clamp kiln building, firing and sorting of bricks.
- **Labour shortages and strikes**: Refers to the daily attendance and absenteeism of workers in the operations.
- **Rain**: Refers to the problems caused by rain – these include no work on rainy days, damage to green bricks on the de-moulding floor and hack lines, and the damaging effect on clamp kilns.
- **Fuel availability**: This refers to the ability to obtain body fuel for the bricks and external fuel for the clamp kilns. This is affected by the availability of fuel from the supplier (mainly informal operations) and the availability of transport from transport contractors (informal operations).
- **Fuel quality**: Many of the informal brick operators make use of ash from old ash dumps, with the quality varying from delivery to delivery.
- **Increase in fuel costs**: The demand for the fuel is high and prices and increase rates are not fixed, with suppliers changing prices as they feel necessary.
- **Low output of first grade bricks**: This is dependent on a number of variables, including each of the brick making processes, fuel quality, weather conditions and worker skills.
- **Financing**: This refers to the availability of funds and the ability of the informal brick maker to secure credit.
- **Marketing**: Refers to the knowledge of and availability of funds needed to do the whole spectrum of marketing functions, including advertising, posters and flyers, use of distribution channels and outlets, promotions, product mix and product pricing, selling, retail and consignment management, deliveries and order fulfilment.
- **Availability of a TLB**: This refers to the availability (when required) of a TLB vehicle for the mining of raw materials. These are often hired by the informal brick makers from private contractors in their towns.

#### 3.7.2 General concerns raised

These are summaries of the concerns raised by the all the individual operations and may not necessarily agree with the specific concerns of the majority of brick makers in a specific town or area.

The informal brick makers (both private and co-ops) regard the following issues as the main barriers to the growth of individual operations and the industry:

- **Lack of effective marketing**;
- **Lack of funds**;
- **Low demand for the hand moulded clay bricks**;
- **Small market size**;
- **Lack of necessary equipment**;
• Poor quality raw materials;
• Lack of reliable water supply;
• High fuel price;
• Poor fuel quality;
• Lack of protection against poor weather conditions;
• Lack of funds for customers to purchase bricks;
• High transport costs;
• Lack of financial support from local government;
• Lack of skilled labour.

Other obstacles that the informal brick makers (private and co-ops) experience in the day to day operation of the units:

Concerns shared by both private operators and the members of the co-ops in all areas include a lack of fencing and security, the land areas given to them being very small, lack of ablution facilities, and too many clay brick makers.

Circumstances that the private brick makers and the members of co-ops would like to see changed:

• Financial assistance and support from government;
• The availability of transport for the delivery of fuel and final products;
• Reliable water supply services;
• Government and big contractors buying their products;
• Assistance with know-how and funds for the marketing;
• Financial assistance with the supply of better plant, equipment and machinery;
• Subsidy the price of coal by government;
• Supply of better raw materials;
• Provision of toilets;
• Provision of better roads;
• More reliable coal supply and price;
• Development of the clay brick market.

According to the informal brick makers, the reason they try to maintain the brick making operation is mainly because it is a source of income, which enables them to feed their families. They want to see the industry grow along with their operation, and see their business as an opportunity for others to work too.

What do the private informal operators think of working in a co-op?

Advantages:
The private brick makers think that co-ops are receiving more financial support from government (e.g. the initial payment of stipends and supply of infrastructure); it is seen as an advantage that members share the investment moneys required for the operation and that members can make use of communal equipment supplied by the government. In general, they are under the impression that co-ops make better profits.

Disadvantages:
Some of the private brick makers think it is better to work alone, since certain people in the co-ops are not prepared to work but want to share in the profits. The co-ops represent a new and untested system and must still prove that they can work. Most of the individual brick makers were not exposed to a co-op operation and therefore do not know whether it will be advantageous or not.

About 30% of the private operators in Mthatha believe that a co-op is better because of the potential of government financial support. 30% on the other hand, believe co-ops will increase corruption, in that certain people will only go to work to receive the stipend, but will not work for it. The rest of them adopt a wait and see attitude as the co-ops have not proven themselves yet.

The Mdantsane private operators think it could be better because of more government support. However, at present they do not see any improvement in their existing operations.

What do the co-op informal members think of working in a co-op?

Advantages:
Members of the co-ops said that operating in a co-op is better for them than operating as a private brick maker because it is easier to make bricks when you are sharing the work load. It is also felt that members in a co-op train each other, and share ideas and the fruits of the labour.

Disadvantages:
Members of co-ops said that you have to make a financial contribution, which is sometimes difficult to do. Members are also made responsible for the debt of the co-op. Other issues include a lack of co-operation in sharing the work load, a lack of cohesion amongst members and no supervision of the work being done.

Workers in Indwe remember a survey of a similar nature. This one was conducted in that area by the Cape Town Government sometime in the past but no information regarding the survey could be found. In other areas workers do not remember surveys being done.
4.1 Technical aspects

As mentioned earlier in the report, the informal clay brick making sector has seen little change from the present manual operations over the last 50 years. To grow the industry and potential markets, larger volumes of consistently high quality (conforming to the SANS 227:2007 quality standard) bricks will need to be made.

To achieve this, improvements need to be considered in the following production processes:

Raw materials

- Good quality clay must be used for the production of clay bricks.
- Laboratory testing of the raw materials in the clay pit is necessary to determine which clay layers are suitable for brick making and to determine the depth of these layers.
- Top soil and overburden (which will be identified from the raw material test analyses) are not suitable brick making raw materials and must be discarded from the raw material mix.
- This will involve better and deeper mining practices than presently employed by the informal brick makers in order to expose suitable clay layers for brick making.
- The topsoil must be stockpiled separately for later rehabilitation of the mined area.
- The overburden can be dumped back into the mined out areas of the clay pit as part of the rehabilitation process.
- Once exposed, the suitable brick making clays can be extracted systematically. The clay deposits are likely to vary in composition from side to side and top to bottom in the clay pit and needs to be mined in a systematic manner to ensure the supply of consistent quality bricks over a long period of time.
- These activities cannot be done properly by manual mining and mechanical mining using suitable excavation machinery will have to be employed. This part of the process is a necessity and a top priority if consistent quality is to be achieved.
- Additional costs to the informal brick maker to perform these activities includes the testing of raw materials (around R15,000 per raw material type) and the hiring of a mechanical excavator (which can range from R1000 an hour for hydraulic excavators to around R250 an hour for TLBs), plus relocation costs for these equipment.

Stockpiling

As clay layer deposits can vary greatly, a means of blending material from different areas of the clay pit is needed. This could be achieved by building layered stockpiles that represent all the different layers and areas of the working face in the clay pit. The stockpiles are constructed horizontally and mined vertically to ensure blending of all the layers in the stockpile. The stockpiling process also results in the weathering or ageing of the mined material, i.e., it enables the natural breakdown of coarse particles and the uniform penetration of moisture between clay particles, which improves the workability of the raw material. Proper stockpiling is a necessity if consistent quality is to be achieved within an operation. The cost of building such a stockpile will depend on variables such as the depth of the top soil, overburden and suitable clay layers, hardness of the material, distance from the clay pit, size of the stock pile and equipment used.

The operations of the informal brick makers in
the same towns are often clustered in the same area. A six month stock pile for the individual brick maker will contain about 500m3 of material, which is not enough to act as a proper blending pile. Common and large raw material stockpiles of 10,000m3 to 15,000m3 can be built and shared between the brick makers to help standardise the product quality.

Raw material preparation

A consistent, fine (1-2mm) clay material with uniform particle size distribution - containing no large soil lumps or other impurities - is required. This can only be achieved with mechanical crushing, grinding and often screening of the raw materials to provide a clay material that yields less waste and more consistent workability, shrinkage and strength. The informal operations do not employ a size reduction process after mining. Proper size reduction of the raw material is a top priority if consistent quality, low waste and high yields are to be achieved in an operation.

The common size reduction machinery manufactured in South Africa is mainly electrically driven. This equipment is expensive and costs in the region of R500,000 for equipment handling 60 tons per hour. No electrical supply is available at present at the operations. Diesel operated crushing and grinding machinery could possibly be imported from overseas.

Blending

The informal brick maker blends, mixes, and tempers (addition of water) the raw materials manually by shovelling. This does not result in a mix with uniform material and moisture distribution and these inconsistencies lead to variations in the quality of the products. If the hand moulding process is to be continued, then a mechanically operated pug mill is essential to obtaining better mixing and blending. Such equipment will probably have to be imported and is estimated to cost in the region of R400,000. For the extrusion process, electrically powered mixers are required - these cost in the region of R500,000.

Shaping

Informal brick makers make use of the stop moulding (soft-mud) shaping method exclusively. In order to improve brick quality and specifically to improve brick strength to 7MPa (and thereby be able to supply government and large projects), mechanical shaping methods such as pressing or extrusion are essential. These methods make use of electrical power driven equipment and, depending on the volume produced, can cost as much as three to four million rand for outputs of 13,000 bricks per hour.

Manually operated presses producing on average 2,500 bricks per day can be imported at a cost of about R400,000 per machine. The strength of these bricks will however depend on the type of material available and the preparation processes.

The shaping areas of the informal brick operations are for most part not protected from the weather and making the bricks under cover will ensure more consistent production volumes and better profitability. Sheds are essential to these operations and cost in the region of R1500 per m2.

Drying

Making use of drying sheds instead of open air hack lines will result in more consistent production volumes and less risk of damage to work in process. Constructing a drying shed with a transparent roof and paving will cost around R3000 per m2. This equipment is not essential and not considered a top priority.

Fixed chamber or tunnel driers are electrically powered, need waste heat from fixed kilns and, depending on size, these would cost anywhere from about R10 million and are not considered for informal brick making at present.

Kilns

Informal clay brick makers make use of clamp kilns only. These kilns are for most part fuel inefficient, highly air polluting, high waste generating with variable quality yields dependent on weather conditions. Other types of kilns suitable for low volume production - such as the VSBK (vertical shaft brick kiln) or the BTK (bulks trench kiln) - can be considered in the production process of the informal clay brick maker. A VSBK will cost in the region of R0,5 million per shaft. These kilns may not be essential or a number one priority, but will go a long way in reducing fossil fuel consumption, reducing greenhouse gases and reducing waste. The operation of these kilns requires a continuous supply of a large volume of dry bricks. A communal kiln can be built that is supplied by dry bricks from a number of brick makers. Operation of these kilns is relatively simple and the knowledge can be acquired easily.

Other types of fixed kilns, such as tunnel kilns and TVA kilns, require very large volumes of product (millions per month) to be operated, as well as very large investments (between R40 million and R90 million). Highly skilled operators and artisans are further required to operate and maintain these kilns. At present these are not considered for informal brick making purposes.

Better quality and more consistent quality fuel

Most of the informal brick makers make use of low and variable quality ash and coal supplied by informal ash and coal collectors. This results in inconsistent ignition of the clamps and inconsistent and poor firing of the bricks. Buying coal from reputable suppliers may be a solution, but much higher prices are to be expected. The colliery in Indwe plans to start the formal production of coal in the near future (2014) and spiral waste from the washing process is traditionally good and cheap brick making fuel.

Informal clay brick production volumes in the Eastern Cape

It is estimated that approximately 1042 informal clay brick manufacturers operate in the Eastern Cape, producing an average of 11,074 saleable bricks per month, per operation. This amounts to an estimated 118,6 million bricks produced by the group per annum in the Eastern Cape.

Approximately 250 of the operations in the Joe Gqabi and Chris Hani districts operate only eight months of the year, while the rest operate 11 months of the year.

4.2 Institutional aspects

At national government level there are no coherent policies tailored to support the informal clay brick makers, neither does the informal clay brick making “industry” appear to enjoy large-scale, coordinated and proactive government support. Besides the LED introducing and supporting the co-ops, the government is not attempting to assist the informal clay brick makers in any way.

From the information obtained it is obvious that there is a need for the informal brick makers to become more organised, for instance by forming an active association or local group that can set and enforce standards, negotiate supplier prices and lobby government to ensure that they receive a fair level of support, in relation to other industries.

The lack of available expertise within the Eastern Cape is hampering the growth and possibly even the long term existence of the informal brick maker. In principle, solutions are available for most of the producers’ problems, but without access to knowledge and information, technically good solutions won’t make a difference. As a group or association, it will be easier to gain access to and share this much-needed knowledge.

4.3 Economic and financial aspects

The Eastern Cape informal brick makers operate in an economy where the size of the construction sector (the market which they supply) is only 2,46% of the GDP of the Eastern Cape, which in turn contributes only 4,2% of the GDP of South Africa. The forecast for the immediate future is an expected GDP growth rate of only 2,17%, with the obvious conclusion that not much of a growth opportunity for the informal brick maker exists in the immediate future.

The informal brick makers experience problems with the availability of working capital. They can often only produce when they have received an order and sold their bricks, and cannot access loans without collateral. They therefore have to rely on their own funds for working capital, making improvements in production systems and equipment practically impossible.

One may conclude that were it not for the lack of finance, brick making could have positive effects on employment generation, not only in the sector itself but also as a result of its follow-on effect.

Production costs: The cost per 1000 saleable bricks of the private operations and between the co-ops varies greatly between the various areas, mainly due to the variation in fuel price, and to a lesser extent due to the number of workers employed by the operation.

Difference in productivity between private operators and co-ops: The main reason for the large difference in productivity between the private operations and the co-ops is the much higher labour force employed by the co-ops for similar production volumes produced. The main reason for differences between co-ops is the number of people employed and volumes produced per co-op.

The operation of the co-ops as practiced at present is not sustainable. Introducing the co-ops maybe a good initiative to create jobs and generate income, but core issues need to be addressed. These include the number of people employed in relation to the volume of bricks produced, identifying leaders and allocating tasks.

4.4 Social aspects

The Eastern Cape is frequently measured as the poorest province in South Africa, with almost 78% of the province’s households classified as “food insecure”.

The gender composition of the population is weighted towards females in all the district municipalities and can be partially explained by patterns of migration of males in search of better opportunities in other provinces.

Unemployment in the Eastern Cape is high at an average rate of 28,8%.

The HIV percentage is the 8th highest cause of death in the Eastern Cape - 3,1%, compared to the national average of 3,4%.

4.5 Labour aspects

In general, there is a lack of skill and basic understanding of ceramic materials and processes. Many of the shortcomings associated with bricks from the informal brick making sector be traced back to the production process. A sound knowledge of ceramic principles can overcome many of these problems.

There is also a lack of skills in other areas of the business, including bookkeeping, accounting, administration, management, procurement, marketing and sales.

Attempts should be made to try to attract younger people with literacy skills. This will only be done by securing jobs, improving remunerations and improving the working conditions in the informal brick making operations.

It can be concluded that real improvement could be possible if a basic training system (probably in Xhosa) be developed to upgrade the capacities of workers.

4.6 Environmental aspects

Clay is obtained from land which also has an animal grazing value. In practice, the topsoil is mined with the clay material and used in the mix to
make bricks. Once the clay has been removed or the pit becomes too deep to manually operate, the pit and land are abandoned and lost for agriculture and grazing. With prudent practice, there need not be a negative impact on grazing. The topsoil can be removed and set aside to be returned after clay removal. The introduction of laws by government to enforce this practice is necessary.

Another important raw material is fuel, used in the form of ash, coal and - to a lesser extent - wood. All of these have serious environmental drawbacks. The challenge for the brick maker is to make use of the best technologies and methods available, and that consume the least amount of these fuel sources.

4.7 Marketing aspects

The main competitors of the clay brick sector as a supplier of formal building materials are the cement block producers. Despite being more expensive than clay bricks, cement blocks build faster due to their bigger size. They are also more uniform in size and perceived to be stronger than clay bricks. The mortar required for a wall made out of cement blocks is said to be about 50% less than that required for a wall made of solid clay bricks.

To counteract the pros of cement products, an increase in the size of the products should be considered, for example, blocks of 222mm x 140mm x 75mm. This would also mean that for low cost housing single skin walls can be built. This however needs to be investigated properly. Besides production problems, there are also concerns for downstream activities. The construction industry would need to be informed on how to use these products, and bricklayers would need to be dealt with.

4.8 Legal aspects

It is felt that some form of coordinated and proactive government support for the informal brick maker should be applied, which may include some form of registration of the business and registration of workers for compensation. When legally registered, it may become easier for the business to obtain loans and credit and to market and sell products to government agencies, architects and large construction companies. The informal brick maker’s opinion is that some form of licensing is acceptable, but not at the current costs.

Due to the small size of the informal brick making operations, Environmental Impact Analysis and Atmospheric Emissions Licenses are required but not implemented or enforced. It is suggested that the level of compliance be revised for the small brick maker by the DME and DEA.

It is recommended that operations producing 500,000 saleable bricks per month or less be regarded as small brick manufacturers who will not need to apply or pay for these licenses. (The formal brick makers produce from around 500,000 to 14 million saleable units per operation per month.)

4.9 Data availability

One of the difficulties experienced during the survey was the lack of integrated data. It is concluded that collecting the following information can be beneficial to the future development of policy and programs for the informal clay brick makers.

- Statistics on the production of clay bricks by all the rural brick makers in the Eastern Cape. (This report was a survey of four areas, comprising only a small part of the whole Eastern Cape.)
- Statistics on the production costs, sales prices and profitability of all the rural brick makers in the Eastern Cape. During the survey, values were given from memory.
- Attempts should be made to get informal brick makers to keep records of actual costs and sales to establish a more accurate database.
- An in-depth socio-economic study for all the rural brick makers in the Eastern Cape is required. (This report was a survey of four areas out of a potential 39.)

4.10 Possible partners for implementing interventions

To coordinate and implement an informal brick maker’s association:

- CBA
- Identified informal brick maker leaders

Access of funding (for training, equipment, infrastructure etc.):

- Local government represented by LED Officers – funding for equipment, infrastructure and training
- SEDA – Funding for training
- ECDC (Eastern Cape Development Corporation) – bank for small business establishment
- DBSA (Development Bank of South Africa) – bank for business establishment, equipment etc.
- IDC (Industrial Development Corporation) – bank for industrial business development
- DCD and Swisscontact – funds for business development

Environmental, legal, business registration and legalizing:

- Local government and LED Officers
- DMR (Department of mineral resources) at provincial level
- DEA (Department Environmental Affairs) at provincial level

Training Providers:

- Cermalab – Technical and process development, Technical operations, business skills
- FET (Further Educational Training) institutions

Suppliers of equipment:

- Cermalab
- Local engineering works (to be identified)

Department of housing – at local and provincial level

Department of Public Works – at local and provincial level

NGOs (Non-governmental organisations):

- African Business and Manufacturing Development Association – An economic development initiative geared to stimulate the small micro and medium enterprises in South Africa
- Project Literacy – An adult basic literacy training organisation
5. Proposed Interventions

5.1 Training

In some instances, the informal brick operations have been operating for almost 50 years and are today still survival businesses. To change the informal brick makers’ perspective, they must first and foremost be trained in basic accounting principles, so that they are able to determine the production costs, profits and cash flows, and be able to draw up budgets and business plans. Understanding these principles will enable brick making entrepreneurs to determine whether the operation is feasible, at what the operation costs are, at what price the product should be sold to make the desired profit and what cash flow balances are necessary to make improvements.

Business and accounting courses, full time, part time and correspondence courses are available in South Africa, but are of a very general nature. The standard of education of most of the informal brick makers is too low to allow them to be register for these courses. It is therefore proposed that a basic business and financial course be developed to cater to the specific needs of the informal brick maker.

5.2 Funding

To be able to make improvements or to implement new strategies and methods, the brick maker almost always needs funds. As they have no access to loans or means of raising funds themselves, it is suggested that this issue be further investigated in an attempt find a method whereby brick makers can apply for loans, possibly through the government. Funds will enable them to purchase better equipment and introduce better operating methods that will in turn result in better quality products. Better quality products can be sold into new markets such as to government agencies, architects and big building contractors which will enable larger production volumes to be produced, with better profitability.

5.3 Workable model

It is suggested that a workable model of the ideal small clay brick operation for the Eastern Cape conditions be designed. It is felt that the product quality needs to be improved first in order to open new and larger markets, which will enable the operations to become feasible.

The identified potential improvements are:

- Reputable fuel suppliers and transport providers should be contracted, with long term price agreements. The fuel supplier should agree to test the fuel on a regular basis and supply the test results. This will ensure consistent supply of acceptable quality coal at acceptable prices, which in turn will result in consistent quality products at a fixed price.

- A reputable mining contractor needs to be hired to deliver the equipment on time. This contractor must be skilled in the mining of clay materials, in order to obtain the best raw materials available.

- Before mining, the in-situ raw materials should be tested to identify the suitability of the various clay layers. This will ensure consistent quality of the products over a long period of time.

- The mining method should involve the removal of top soil, which is stockpiled separately for later rehabilitation. The unsuitable overburden is dumped back into the mined-out areas of the clay pit. Removal of these unsuitable materials from the mix will enable better quality bricks to

• Enough usable clay should be mined and stockpiled in a systematic method (i.e. three to six months) to ensure consistent quality of the products over a long period of time.

• Introducing a mechanical size reduction process for the raw materials will improve the quality and consistency of the bricks and reduce waste.

• Introducing a mechanical pug mill which mixes all the additives and water will improve the quality of products over a long period of time.

• Preparing the clay a day before moulding and storing this mixture overnight and under cover will improve workability and improve quality aspects such as appearance and strength. As an extension to the operation, all the preparation processes can be carried out under cover and the operation do not have to stop on rainy days.

• The shaping process can be improved by introducing mechanical pressing or extrusion. In this way, much larger volumes can be produced in a shorter period of time and quality aspects such as appearance and strength will be improved and assist in standardising the products.

• Instead of manual transportation, the bricks can be stacked on a pallet in an open formation and mechanically transported by forklift truck or tractor-trailer combination to the hack lines, and mechanically transported by forklift truck or tractor-trailer combination to the hack lines, and mechanically transported by forklift truck or tractor-trailer combination to the hack lines, and mechanically transported by forklift truck or tractor-trailer combination to the hack lines, and mechanically transported by forklift truck or tractor-trailer combination to the hack lines.

• Due to the high moisture contents, individual hand moulded bricks must be pre-dried for a number of days before they can be stacked in a hack line. Mechanically formed bricks can be stacked into hack lines directly after making, without the risk of deformation. Mechanically made bricks contain less moisture and dry quicker. Due to less moisture, these bricks also deform and crack less. A drying shed, consisting simply of a permanent floor and a transparent roof, can be introduced to reduce the risk of rain damage.

• Instead of manual transportation, the dry bricks on pallets can be mechanically transported from the hack lines to the clamp kilns.

• Different types of fixed kilns can be used, including the VSBK and BTK (bull’s trench kiln). Less fossil fuel will be required, less greenhouse gases are emitted, faster firing rates are employed and less dry brick stock is required.

• Manual sorting of fired bricks from fixed kilns is still required, but a sorting belt can be implemented which will result in better sorting quality. Fired bricks can be packed on pallets or in cubes of 500 at a time to enable faster loading and unloading of trucks.

• Consideration should be given to a system with dedicated firemen who own the fixed kilns, buy the dry bricks from the brick makers, fire them collectively and sell the final products to a marketing person.

• For the informal operations to be feasible, larger production volumes are required. It is believed that the aim should be at least 10,000 units per day.

• The SABS quality control system should be introduced to control the quality process, including the testing of final products.

• A basic brick making course designed specifically for the informal brick maker would give workers the know-how to be able to produce high quality bricks.

• Efforts should be made to obtain the services of young people with literacy skills in the informal operations. These people will be able to master the training information needed for accounting, bookkeeping marketing and sales much easier than the present senior labourers.

• Workers in the informal brick making operations should be trained in the use of marketing and sales principles and given the know-how to implement these methods. With good quality products, implementing and maintaining these principles and methods will enable the establishment of a sizeable customer base and ensure the regular sales and income critical for the business. Sales and marketing courses are available as full time, part time and correspondence courses in South Africa, but are of a very general nature. It is therefore proposed that a basic sales and marketing course be developed to cater to the specific needs of the informal brick maker.

• Marketing for the informal brick maker should include:

  o Advertising the product quality and price in the local media (newspapers), on display posters and flyers distributed in the local township, as well as informing retailers and other possible distribution outlets. This will increase the customer base, improve sales and improve the cash flow balance.

  o Introducing promotions, for instance Christmas specials or special prices on “job lots” that do not meet colour standards.

  o Making use of a percentage discount per volume sold. This will encourage sales, increase the customer base and improve the cash flow balance.

  o Producing larger products, e.g. 222mm x 140mm x 75mm blocks, which will allow single skin walls to be built for low cost housing; bricks with different textures and 52mm pavers. This will create a larger customer spectrum and therefore a larger customer base.

  o Selling on credit to bigger contractors with discount opportunities when payments are made within certain time limits.

  o Negotiating the sale of bricks to retailers and other outlets, and considering the sale of products on consignment.

  o Standardising the quality of products from the area, enabling informal brick makers to market larger volumes collectively to bigger contractors, architects, government agencies, retailers and other distribution agencies.

  o Contracting reliable transport owners to do all the final product deliveries of the operation, instead of leaving the customer to arrange his own transport.

  o Supplying after-sales technical information, for example how to deal with efflorescence and staining on brick work, dealing with customer complaints with site visits and replacing products when necessary.

  o Considering a business model where a dedicated, qualified marketing person buys the final products from brick makers and markets them collectively.

• Assistance needs to be given to the brick makers to form an association or local group. The present operations do not have access to technical, business or market information related to the industry (such as new production methods, new types of products, better ways to market bricks etc.).

• The feasibility of introducing an informal brick making model where the brick maker concentrates only on the production operations should be considered. In this way, the brick maker can produce a standardised high quality dry brick, which he sells to the kiln operators. The kiln operators fire the dry bricks and sell the final products to marketing specialists, who do all the advertising, promotions, pricing, delivery
6. Annexes

and after sales service of the products.

6.1 List of definitions

**Bloat** – the permanent expansion of some clay when heated within their melting range, caused by the formation of gas bubbles by entrapped gases.

**Clamp kiln** – a kiln constructed of the bricks that are to be fired, together with combustible fuel.

**Comminution equipment** – size reduction equipment.

**Chain grate stoker** – coiler using coal as fuel.

**Dry bricks** – clay bricks in the condition after it has been dried but before it has been fired.

**Efflorescence** – Soluble salts that have crystallized on or near the surface of a unit.

**Firing range** – the range of temperatures bricks are fired to achieve partial melting.

**Fluxing alkalis** – a substance (oxides) that, even in small quantities, lowers the fusion point of material in which it is naturally present.

**Fixed dryers** – Industrial plant used to dry wet bricks.

**Green bricks** – clay bricks in the condition after it has been shaped but before it has been dried and fired.

**Hack lines** – natural air drying where bricks are packed on pallets and put in hack lines to dry.

**Hand moulding** – the manual shaping of soft clay into bricks using wooden moulds.

**Informal clay brick makers** – Clay brick making operations that are not legally and officially regulated and monitored.

**Layered stockpiles** – a raw material stockpile constructed in layers of various different materials.

**Overburden** – the unsuitable layer of material overlaying the usable material.

**Plaster bricks (NFP)** – units suitable for general building work that is to be plastered.

**Semi-face bricks (FBA)** – units that are selected or produced for their durability and aesthetic effect deriving from non-uniformity of size, shape or colour.

**Plasticity** – the characteristic property of moist clay that permits it to be shaped without cracking.

**Pugging** – the use of an auger mixer machine that consolidates plastic clay into a firm body.

**Refractoriness** – the ability of a material to withstand high temperatures.

**Soluble salts** – salts present in some clays which become soluble when in contact with water.

**Skintles** – fire grate of clamp kilns.

**Stop moulding (soft-mud moulding)** – a process of shaping of building bricks from clay at a high moisture content.

**Souring** – the process in which crushed moist clay is stored under cover for a period to permit the water to become more uniformly dispersed thus improving the workability of the material.

**Top soil** – top humus-rich layer of material where vegetation grows and where most plant roots, earthworms, insects and micro-organisms are active.

**Tempering** – the addition of water and subsequent mixing of a clay material.

**Vitrification** – the progressive fusion of clay as a result of the firing process.

**Water absorption** – the percentage of water, by weight, that a fired clay brick can absorb.

**Weathering (ageing)** – storing the raw material in an open stockpile which allows for the opening up of the soil body that improves the workability of the material.
### 6.2 Tables

**Table 4: Summary of the volume of raw materials and fuel, fuel type and fuel price of the informal clay brick operations in the Eastern Cape (2013)**

<table>
<thead>
<tr>
<th>Location area</th>
<th>Raw material (m³/annum)</th>
<th>Fuel type</th>
<th>Fuel price (R per ton)</th>
<th>Total fuel consumption (tons per annum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molteno Private</td>
<td>144 - 576</td>
<td>Body fuel: Ash (Molteno) Ext.fuel: Ash (Molteno)</td>
<td>R150 R150</td>
<td>56 - 224</td>
</tr>
<tr>
<td>Indwe Private</td>
<td>198 - 396</td>
<td>Body fuel: Coal dust (Indwe) Ext.fuel: Coal nuts (Indwe)</td>
<td>R225 R275</td>
<td>60 - 121</td>
</tr>
<tr>
<td>Queenstown Private</td>
<td>99 - 396</td>
<td>Body fuel: Ash (Queenstown) Ext.fuel: Coal dust (Queenstown)</td>
<td>R150 Ash – R150 Coal - R775</td>
<td>38 - 119</td>
</tr>
<tr>
<td>Ilinge Private</td>
<td>198 - 287</td>
<td>Body fuel: Ash (Queenstown) Ext.fuel: Coal dust (Queenstown)</td>
<td>R150 Ash – R150 Coal - R775</td>
<td>77 - 115</td>
</tr>
<tr>
<td>Whittlesea Private</td>
<td>158 - 396</td>
<td>Body fuel: Ash (Queenstown) Ext.fuel: Ash/coal (Queenstown)</td>
<td>R150 Ash – R150 Coal - R775</td>
<td>61 - 154</td>
</tr>
<tr>
<td>Maitiswal Local Municipality</td>
<td>86 - 360</td>
<td>Body fuel: Ash (Molteno) Ext.fuel: Coal dust (Molteno)</td>
<td>R250 R250</td>
<td>30 - 126</td>
</tr>
<tr>
<td>OR Tambo District Municipality Mitsubishi Private</td>
<td>158 - 275</td>
<td>Body fuel: Coal dust (Indwe) Ext.fuel: Coal nuts (Indwe)</td>
<td>R900 R900</td>
<td>61 - 192</td>
</tr>
<tr>
<td>Buffalo City District Municipality Mntamazane Private</td>
<td>198 - 396</td>
<td>Body fuel: Ash (Queenstown) Ext.fuel: Ash (Queenstown)</td>
<td>R275 R300</td>
<td>77 - 154</td>
</tr>
<tr>
<td>Molteno Co-op</td>
<td>198</td>
<td>Body fuel: Ash (Molteno) Ext.fuel: Ash (Molteno)</td>
<td>R150 R150</td>
<td>77</td>
</tr>
<tr>
<td>Sterkstroom Co-op</td>
<td>198</td>
<td>Body fuel: Ash (Molteno) Ext.fuel: Ash (Molteno)</td>
<td>R250 R250</td>
<td>77</td>
</tr>
<tr>
<td>Indwe (Co-ops)</td>
<td>198 - 396</td>
<td>Body fuel: Coal dust (Indwe) Ext.fuel: Coal nuts (Indwe)</td>
<td>R225 R275</td>
<td>60 - 121</td>
</tr>
<tr>
<td>Dordrecht (Co-op)</td>
<td>144 - 288</td>
<td>Body fuel: Coal dust (Indwe) Ext.fuel: Coal nuts (Indwe)</td>
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<td>44 - 110</td>
</tr>
<tr>
<td>OR Tambo District Municipality Mitsubishi (Co-op)</td>
<td>198 - 396</td>
<td>Body fuel: Coal Dust (Indwe) Ext.fuel: Coal nuts (Indwe)</td>
<td>R900 R900</td>
<td>77 - 154</td>
</tr>
</tbody>
</table>

**Table 5: Summary of the number of workers and piece work rate per area**

<table>
<thead>
<tr>
<th>Item</th>
<th>Molteno Private</th>
<th>Sterkstroom Private</th>
<th>Indwe Private</th>
<th>Queenstown Private</th>
<th>Ilinge Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of workers</td>
<td>3 to 11</td>
<td>Average 3</td>
<td>3 to 6</td>
<td>Average 4</td>
<td>4 to 6</td>
</tr>
<tr>
<td>Mining and mixing (R/1000)</td>
<td>R30 to R60</td>
<td>R36</td>
<td>R35 to R45</td>
<td>R20 to R50</td>
<td>R130 to R150</td>
</tr>
<tr>
<td>Moulding (R/1000)</td>
<td>R120 to R150</td>
<td>R150</td>
<td>R50</td>
<td>R150</td>
<td>R30</td>
</tr>
<tr>
<td>Packing into back lines (R/1000)</td>
<td>R30 to R50</td>
<td>R25</td>
<td>R20 to R55</td>
<td>R30 to R50</td>
<td>R30</td>
</tr>
<tr>
<td>Packing into clamp (R/1000)</td>
<td>R30 to R50</td>
<td>Owners R20</td>
<td>R30 to R50</td>
<td>R40 to R80</td>
<td></td>
</tr>
<tr>
<td>Packing the casing around clamp (per clamp)</td>
<td>R30 to R60</td>
<td>Owners R50</td>
<td>R50 to R200</td>
<td>R30 to R80</td>
<td></td>
</tr>
<tr>
<td>Plastering the clamp (per clamp)</td>
<td>R15 to R30</td>
<td>Owners R50</td>
<td>R40 to R80</td>
<td>R30 to R70</td>
<td></td>
</tr>
<tr>
<td>Packing of the top layer on the clamp (per clamp)</td>
<td>R20 to R50</td>
<td>Owners R30 to R50</td>
<td>R30 to R60</td>
<td>R40 to R90</td>
<td></td>
</tr>
<tr>
<td>Take off the casing after firing (per clamp)</td>
<td>R20 to R50</td>
<td>Owners R20</td>
<td>R50 to R100</td>
<td>R30 / 1000</td>
<td></td>
</tr>
<tr>
<td>Sorting the fired bricks (R/1000)</td>
<td>R30 to R50</td>
<td>R20</td>
<td>R20</td>
<td>R30 to R50</td>
<td>R30 to R120</td>
</tr>
<tr>
<td>Clean up after firing (per clamp)</td>
<td>R30 to R70</td>
<td>R100</td>
<td>R20</td>
<td>R50 to R70</td>
<td>R130 to R150</td>
</tr>
<tr>
<td>Total monthly labour costs R/1000</td>
<td>R7275 to R10160</td>
<td>Average R3700</td>
<td>R1200 to R6440</td>
<td>Average R2713</td>
<td>R1751 to R3393</td>
</tr>
</tbody>
</table>

Average R3843
### Table 6: Summary of the number of workers and piece work rate per area

<table>
<thead>
<tr>
<th>Item</th>
<th>Whittlesea Private</th>
<th>Maletswal Local Municipality Aliwal North Private</th>
<th>O R Tambo District Municipality Mthatha Private</th>
<th>Buffalo City District Municipality Mdantsane Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of workers</td>
<td>3 to 6</td>
<td>2 to 9</td>
<td>3 to 11</td>
<td>4 to 7</td>
</tr>
<tr>
<td></td>
<td>Average 5.5</td>
<td>Average 5</td>
<td>Average 4.4</td>
<td>Average 4.8</td>
</tr>
<tr>
<td>Mining and mixing (R/1000)</td>
<td>R50 to R50</td>
<td>R100</td>
<td>R90 to R90 / clamp kiln</td>
<td>R120 / 1000</td>
</tr>
<tr>
<td>Moulding (R/1000)</td>
<td>R110</td>
<td>R100 to R150</td>
<td>R150</td>
<td>R120 / 1000</td>
</tr>
<tr>
<td>Packing into hack lines (R/1000)</td>
<td>R30 to R50</td>
<td>R60</td>
<td>R30 to R50</td>
<td>R50 to R60</td>
</tr>
<tr>
<td>Packing into clamp (R/1000)</td>
<td>R30 to R50</td>
<td>R60</td>
<td>R30 to R50</td>
<td>R50 to R60</td>
</tr>
<tr>
<td>Packing the casing around clamp (per clamp)</td>
<td>R50</td>
<td>R200 to R400</td>
<td>R50</td>
<td>R50 to R60</td>
</tr>
<tr>
<td>plastering the clamp (per clamp)</td>
<td>R50</td>
<td>R60 to R120</td>
<td>R50</td>
<td>R50 to R60</td>
</tr>
<tr>
<td>Packing of the top layer on the clamp (per clamp)</td>
<td>R30 to R50</td>
<td>R60 to R150</td>
<td>R30 to R50</td>
<td>R50 to R60</td>
</tr>
<tr>
<td>Take off the casing after firing (per clamp)</td>
<td>R20 to R50</td>
<td>R60 to R120</td>
<td>R40 to R50</td>
<td>R50 to R60</td>
</tr>
<tr>
<td>Sorting the fired bricks (R/1000)</td>
<td>R30 to R50</td>
<td>R60 to R70</td>
<td>R30 to R50</td>
<td>R50 to R60</td>
</tr>
<tr>
<td>Clean up after firing (per clamp)</td>
<td>R50 to R60</td>
<td>R150 to R200</td>
<td>R30 to R50</td>
<td>R50 to R60</td>
</tr>
<tr>
<td>Total monthly labour costs</td>
<td>R290.1 to R620.7</td>
<td>Average R4057</td>
<td>R204.8 to R690.55</td>
<td>Average R4035</td>
</tr>
</tbody>
</table>

### Table 7: Summary of the estimated profits made and number of people directly employed per area

<table>
<thead>
<tr>
<th>Location</th>
<th>Estimated profit (per annum)</th>
<th>Number of months operating per annum operations</th>
<th>Estimated number of people employed by operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molteno Private</td>
<td>R10,142 - R94,088</td>
<td>8</td>
<td>300</td>
</tr>
<tr>
<td>Sterkstroom Private</td>
<td>R94,298 - R43,652</td>
<td>8</td>
<td>60 to 70</td>
</tr>
<tr>
<td>Queenstown Private</td>
<td>R24,772 – R54,604</td>
<td>11</td>
<td>270 to 290</td>
</tr>
<tr>
<td>Ilinge Private</td>
<td>R15,045–R168,074</td>
<td>11</td>
<td>230 to 240</td>
</tr>
<tr>
<td>Sterkstroom Co-op</td>
<td>R42,050-R108,867</td>
<td>11</td>
<td>100</td>
</tr>
<tr>
<td>Molteno Co-op</td>
<td>R43,000</td>
<td>8</td>
<td>320 to 340</td>
</tr>
<tr>
<td>Sterkstroom Co-op</td>
<td>R41,000</td>
<td>8</td>
<td>600</td>
</tr>
<tr>
<td>Plettenberg Co-op</td>
<td>R45,364 – R102,289</td>
<td>11</td>
<td>90 to 100</td>
</tr>
<tr>
<td>Buffalo City District Municipality Mthatha Private</td>
<td>R63,153 - R150,117</td>
<td>11</td>
<td>Average R107,487</td>
</tr>
</tbody>
</table>
Table 10: Summary of the production costs and profitability of the informal clay brick operations in the Eastern Cape (2013)

<table>
<thead>
<tr>
<th>Location area</th>
<th>Cost per 1000 bricks (Rands)</th>
<th>Energy (%)</th>
<th>Labour (%)</th>
<th>Other costs (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mthatha (Co-op)</td>
<td>R483 - R513</td>
<td>21 – 27</td>
<td>62 – 73</td>
<td>5 – 16</td>
</tr>
<tr>
<td>Sterkstroom Private</td>
<td>R441 - R572 Average R486</td>
<td>38 – 49</td>
<td>42 – 59</td>
<td>3 – 10</td>
</tr>
<tr>
<td>Queenstown Private</td>
<td>R509 – R651 Mostly R539</td>
<td>32 – 40</td>
<td>54 – 64</td>
<td>3 – 6</td>
</tr>
<tr>
<td>Ilinge Private</td>
<td>R438 – R784 Average R690</td>
<td>26 – 47</td>
<td>47 – 70</td>
<td>2 – 6</td>
</tr>
<tr>
<td>Whitfieldsea Private</td>
<td>R541 – R650 Average R610</td>
<td>32 – 38</td>
<td>58 – 64</td>
<td>3 – 4</td>
</tr>
<tr>
<td>Maletswe Local Municipality</td>
<td>R725 – R955 Average R858</td>
<td>29 – 43</td>
<td>48 – 58</td>
<td>6 – 13</td>
</tr>
<tr>
<td>OR Tambo District Municipality</td>
<td>R980 - R1,297 Average R1,177</td>
<td>60 – 79</td>
<td>18 – 38</td>
<td>2 – 3</td>
</tr>
<tr>
<td>Buffalo City District Municipality</td>
<td>R651 – R796 Average R719</td>
<td>40 – 48</td>
<td>48 – 57</td>
<td>3 – 4</td>
</tr>
<tr>
<td>Molteno Co-op</td>
<td>R191</td>
<td>67</td>
<td>Nil</td>
<td>32</td>
</tr>
<tr>
<td>Sterkstroom Co-op</td>
<td>R278</td>
<td>78</td>
<td>Nil</td>
<td>22</td>
</tr>
<tr>
<td>Indwe (Co-ops)</td>
<td>R184</td>
<td>80,5</td>
<td>Nil</td>
<td>13,4</td>
</tr>
<tr>
<td>Dordrecht (Co-op)</td>
<td>R184</td>
<td>80,5</td>
<td>Nil</td>
<td>13,4</td>
</tr>
<tr>
<td>OR Tambo District Municipality</td>
<td>R792 – R804 Average R798</td>
<td>65 – 98,4</td>
<td>Nil</td>
<td>1,5 – 33</td>
</tr>
</tbody>
</table>

Table 11: Summary of the saleable annual output, saleable monthly output, operating months per year, and workers per operation of the informal clay brick operations in the Eastern Cape (2013)

<table>
<thead>
<tr>
<th>Location area</th>
<th>Saleable Output (units/ annum)</th>
<th>Saleable Output (units/ month)</th>
<th>Operating months per year</th>
<th>No. of workers per operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mthatha (Co-op)</td>
<td>64,600 to 258,400 Mostly 64,600</td>
<td>8,075 to 32,300 Mostly 8075</td>
<td>8</td>
<td>3 to 11 Mostly 3</td>
</tr>
<tr>
<td>Sterkstroom Private</td>
<td>52,000 to 129,000 Average 102,288</td>
<td>6,500 to 16,125 Average 10,228</td>
<td>8</td>
<td>3 to 6 Average 4</td>
</tr>
<tr>
<td>Indwe Private</td>
<td>88,800 to 177,600 Average 144,331</td>
<td>8,075 to 16,125 Average 13,121</td>
<td>11</td>
<td>4 to 6 Average 5</td>
</tr>
<tr>
<td>Queenstown Private</td>
<td>44,400 to 533,000 Mostly 88,825</td>
<td>4,036 to 48,454 Mostly 8075</td>
<td>11</td>
<td>2 to 16 Mostly 4</td>
</tr>
<tr>
<td>Ilinge Private</td>
<td>88,800 to 133,200 Average 96,211</td>
<td>11,100 to 121,09 Average 8,147</td>
<td>11</td>
<td>4 to 5 Average 4</td>
</tr>
<tr>
<td>Whitfieldsea Private</td>
<td>71,000 to 177,000 Average 129,679</td>
<td>6,454 to 10,090 Average 11,789</td>
<td>11</td>
<td>3 to 6 Average 5,5</td>
</tr>
<tr>
<td>OR Tambo District Municipality</td>
<td>39,400 to 161,500 Average 91,260</td>
<td>4,800 to 20,200 Average 11,400</td>
<td>8</td>
<td>2 to 9 Average 5</td>
</tr>
<tr>
<td>OR Tambo District Municipality</td>
<td>71,000 to 222,000 Average 111,914</td>
<td>6,454 to 20,181 Average 10,174</td>
<td>11</td>
<td>3 to 11 Average 4,4</td>
</tr>
<tr>
<td>Buffalo City District Municipality</td>
<td>88,000 to 177,000 Average 119,273</td>
<td>8,075 to 16,150 Average 10,843</td>
<td>11</td>
<td>4 to 7 Average 4,7</td>
</tr>
<tr>
<td>Molteno Co-op</td>
<td>64,600</td>
<td>8,075</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>Sterkstroom Co-op</td>
<td>64,600</td>
<td>8,075</td>
<td>8</td>
<td>23</td>
</tr>
<tr>
<td>Indwe (Co-ops)</td>
<td>88,825 to 177,375 Average 133,243</td>
<td>8,075 to 16,125 Average 12,113</td>
<td>11</td>
<td>Members: 7 to 25 Average 12,8</td>
</tr>
<tr>
<td>Dordrecht (Co-op)</td>
<td>64,600 to 161,500 Average 121,120</td>
<td>8,075 to 20,187 Average 15,140</td>
<td>8</td>
<td>Members: 6 to 28 Average 18,5</td>
</tr>
<tr>
<td>OR Tambo District Municipality</td>
<td>88,825 to 177,650 Average 142,109</td>
<td>8,075 to 16,150 Average 12,919</td>
<td>11</td>
<td>6 to 24 Average 13,2</td>
</tr>
</tbody>
</table>

The average volume produced per operation in the Eastern Cape is 11,074 saleable units.
Table 12: Summary of the man hours per 1000 saleable bricks, production per man per month and profit per annum of the informal clay brick operations in the Eastern Cape (2013)

<table>
<thead>
<tr>
<th>Location area</th>
<th>Man hours per 1000 saleable bricks</th>
<th>Production per man per month (saleable bricks)</th>
<th>Profit per annum</th>
<th>Profit share per person per month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mdantsane Private</td>
<td>53 to 119 Mostly 59,4</td>
<td>2,018 to 3,028 Mostly 2,692</td>
<td>R10,142 - R94,088 Mostly R14,265</td>
<td>n/a</td>
</tr>
<tr>
<td>Sterksboom Private</td>
<td>59 to 74 Average 64,3</td>
<td>2,018 to 2,700 Average 2,557</td>
<td>R24,228 - R43,052 Average R32,616</td>
<td>n/a</td>
</tr>
<tr>
<td>Indwe Private</td>
<td>59 to 79 Average 66</td>
<td>2,018 to 2,691 Average 2,264</td>
<td>R24,772 – R54,904 Average R43,505</td>
<td>n/a</td>
</tr>
<tr>
<td>Queenstown Private</td>
<td>452,8 to 113,2 Mostly 86,8</td>
<td>1,413 to 3,028 Mostly 2,018</td>
<td>R15,045–R168,074 Mostly R25,102</td>
<td>n/a</td>
</tr>
<tr>
<td>Ilage Private</td>
<td>66 to 79 Average 76,8</td>
<td>2,018 to 2,422 Average 2,186</td>
<td>R13,785 - R66,805 Average 29,628</td>
<td>n/a</td>
</tr>
<tr>
<td>Whittlesea Private</td>
<td>759 to 79 Average 69,8</td>
<td>2,018 to 2,691 Average 2,143</td>
<td>R42,050-R108,907 Average R89,245</td>
<td>n/a</td>
</tr>
<tr>
<td>Naletswe Local Municipality Aliewa North Private</td>
<td>36,6 to 99,1 Average 73,9</td>
<td>1,000 to 4,037 Average 2,264</td>
<td>R40,61 – R44,192 Average R98,259</td>
<td>n/a</td>
</tr>
<tr>
<td>OR Tambo District Municipality Mthatha Private</td>
<td>52,8 to 118,9 Average 68,8</td>
<td>2,018 to 4,037 Average 2,112</td>
<td>R26,499-R16,572 Average R43,946</td>
<td>n/a</td>
</tr>
<tr>
<td>Buffalo City District Municipality Mntamango Private</td>
<td>55 to 99 Average 73,9</td>
<td>1,615 to 2,907 Average 2,258</td>
<td>R30,481 – R65,118 Average 50,952</td>
<td>n/a</td>
</tr>
<tr>
<td>Molleno Co-op</td>
<td>128</td>
<td>621</td>
<td>R43,156</td>
<td>R414</td>
</tr>
<tr>
<td>Sterksboom Co-op</td>
<td>455,7</td>
<td>351</td>
<td>R40,786</td>
<td>R221</td>
</tr>
<tr>
<td>Indwe (Co-op)</td>
<td>108 to 247 Average 151</td>
<td>646 to 1,468 Average 1,128</td>
<td>R45,364 – R102,289 Average R79,288</td>
<td>K371 to R786 Average R605</td>
</tr>
<tr>
<td>Dordrecht (Co-op)</td>
<td>118 to 277 Average 184</td>
<td>576 to 1,345 Average 818</td>
<td>R65,277 – R165,569 Average R99,408</td>
<td>R473 to R1,104 Average R818</td>
</tr>
<tr>
<td>OR Tambo District Municipality Mthatha (Co-op)</td>
<td>69 to 475 Average 195</td>
<td>336 to 2,907 Average 978</td>
<td>R76,152 - R150,117 Average R107,437</td>
<td>R288 to R1,949 Average R1,062</td>
</tr>
</tbody>
</table>

Table 13: Summary of informal clay brick prices per area in the Eastern Cape (2013)

<table>
<thead>
<tr>
<th>Location area</th>
<th>Klinkers per 1000 bricks</th>
<th>Blue bricks per 1000 bricks</th>
<th>Red bricks per 1000 bricks</th>
<th>Vaal bricks per 1000 bricks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molleno Private</td>
<td>R900/1000</td>
<td>R54/m2 single R108/m2 double</td>
<td>R800/1000</td>
<td>R500/1000</td>
</tr>
<tr>
<td>Sterksboom Co-op</td>
<td>R900/1000</td>
<td>R54/m2 single R108/m2 double</td>
<td>R800/1000</td>
<td>R500/1000</td>
</tr>
<tr>
<td>Sterksboom Private</td>
<td>R950/1000</td>
<td>R57/m2 single R114/m2 double</td>
<td>R850/1000</td>
<td>R51/m2 single R102/m2 double</td>
</tr>
<tr>
<td>Sterksboom Co-op</td>
<td>R950/1000</td>
<td>R57/m2 single R114/m2 double</td>
<td>R850/1000</td>
<td>R51/m2 single R102/m2 double</td>
</tr>
<tr>
<td>Indwe Private</td>
<td>R750/1000</td>
<td>R45/m2 single R90/m2 double</td>
<td>R650/1000</td>
<td>R39/m2 single R78/m2 double</td>
</tr>
<tr>
<td>Indwe (Co-op)</td>
<td>R750/1000</td>
<td>R45/m2 single R90/m2 double</td>
<td>R650/1000</td>
<td>R39/m2 single R78/m2 double</td>
</tr>
<tr>
<td>Dordrecht (Co-op)</td>
<td>R1100/1000</td>
<td>R60/m2 single R132/m2 double</td>
<td>R950/1000</td>
<td>R57/m2 single R114/m2 double</td>
</tr>
<tr>
<td>Queenstown Private</td>
<td>R1000/1000</td>
<td>R90/m2 single R120/m2 double</td>
<td>R900/1000</td>
<td>R54/m2 single R108/m2 double</td>
</tr>
<tr>
<td>Ilage Private</td>
<td>R1000/1000</td>
<td>R90/m2 single R120/m2 double</td>
<td>R900/1000</td>
<td>R54/m2 single R108/m2 double</td>
</tr>
<tr>
<td>Whittlesea Private</td>
<td>R1300/1000</td>
<td>R78/m2 single R144/m2 double</td>
<td>R1200/1000</td>
<td>R72/m2 single R144/m2 double</td>
</tr>
<tr>
<td>Naletswe Local Municipality Aliewa North Private</td>
<td>R1100/1000</td>
<td>R65/m2 single R132/m2 double</td>
<td>R1000/1000</td>
<td>R80/m2 single R120/m2 double</td>
</tr>
<tr>
<td>OR Tambo District Municipality Mthatha Private</td>
<td>R2000/1000</td>
<td>R120/m2 single R240/m2 double</td>
<td>R1500/1000</td>
<td>R90/m2 single R180/m2 double</td>
</tr>
<tr>
<td>OR Tambo District Municipality Mthatha (Co-op)</td>
<td>R2000/1000</td>
<td>R120/m2 single R240/m2 double</td>
<td>R1500/1000</td>
<td>R90/m2 single R180/m2 double</td>
</tr>
<tr>
<td>Buffalo City District Municipality Mntamango Private</td>
<td>R1200/1000</td>
<td>R120/m2 single R240/m2 double</td>
<td>R1100/1000</td>
<td>R65/m2 single R132/m2 double</td>
</tr>
</tbody>
</table>

- 60 bricks are used per m2 single skin wall and 120 bricks per m2 double skin wall.
- Standard brick dimensions 222mm x 106mm x 73mm.
- The cost per m2 refers to the brick costs only and do not include the cost of labour and mortar.
Table 14: Summary of informal cement brick and block prices per area in the Eastern Cape (2013)

<table>
<thead>
<tr>
<th>Cement product competition</th>
<th>Price of cement products</th>
<th>Price of cement products per m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes/No</td>
<td>(Yes/No)</td>
<td>(Yes/No)</td>
</tr>
<tr>
<td>Molteno</td>
<td>No</td>
<td>Nil</td>
</tr>
<tr>
<td>Sterkstroom</td>
<td>No</td>
<td>Nil</td>
</tr>
<tr>
<td>Indwe</td>
<td>Yes</td>
<td>R7 per block</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R140 per m²</td>
</tr>
<tr>
<td>Dordrecht</td>
<td>Yes, a number of small producers</td>
<td>R1,10 per cement brick</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R66/m² single</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R132/m² double</td>
</tr>
<tr>
<td>Queenstown</td>
<td>Yes</td>
<td>R7.50 per block</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R150 per m²</td>
</tr>
<tr>
<td>Ilinge</td>
<td>No</td>
<td>Nil</td>
</tr>
<tr>
<td>Whittlesea</td>
<td>Yes</td>
<td>R7.50 per block</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R140 per m²</td>
</tr>
<tr>
<td>Molteno Co-op</td>
<td>No</td>
<td>Nil</td>
</tr>
<tr>
<td>Sterkstroom Co-op</td>
<td>No</td>
<td>Nil</td>
</tr>
<tr>
<td>Indwe Co-op</td>
<td>Yes, a number of small producers</td>
<td>R7 per block</td>
</tr>
<tr>
<td></td>
<td></td>
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• 20 cement blocks are required per m² single skin wall. Cement blocks are only used for single skin walls.
• Cement block sizes are 283 mm x 142 mm x 190 mm.
• 60 cement bricks are used per m² single skin wall and 120 cement bricks per m² double skin wall.
• Standard cement brick dimensions 222 mm x 106 mm x 73 mm.
• The cost per m² refers to the brick costs only and do not include the cost of labour and mortar.
• The cement products are used in plastered applications only and the price per m² should be compared to the plaster clay brick prices only.

Table 15: Specific concerns of the informal brick makers with regard to kiln operations

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