Appraisal of Burnt Bricks As A Building Material in Ghana

Authors

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ABSTRACT

Bricks have been touted as one of the most durable and sustainable building materials ever present according to research dating back its usage as far back as 10,000 BC. Despite its superior advantages over the conventional cement based products, patronage in Ghana remains at less than 2%. About 85% of brick construction in the country is of the single leaf (a standard 102.5mm thick wall normally referred to as half brick thick wall). This study assesses the performance of some of these brick houses constructed to promote the material and occupied over the past fifteen years within the Kumasi metropolis. It also assesses the satisfaction levels of residents living in these houses. The case study approach was primarily used together with the multi-stage sampling procedure which was employed to solicit and gather information from three resettlement towns through a semi-structured questionnaire. A five Likert scale was used in determining the satisfaction levels with 5 being highly satisfied and 1 being highly dissatisfied Analytical statistical tools in SPSS were used in extracting data and analysis through simple frequencies and bar graphs. The study revealed that most residents were satisfied with the brick dwellings though they had reservations in the monotony of the brick colour. Again the condition of the house was very good in terms of construction, thermal insulation, maintenance and appearance. The study also revealed that major transformation occurred within the interior either to break the brick color monotony or introduce bright color to enhance day lighting. The study thus recommends that in view of the potential benefits of its usage government should devote more resources to make it available to the public building more public buildings with this material. Again artisans should be trained in their execution through the National Artisan Training Centre at Building And Road Research Institute, Kumasi.

Key Words: Burnt Bricks, Housing Satisfaction, Sustainable, Performance

INTRODUCTION

The construction industry is one of the most robust and growing sectors of our economy. As an emerging lower middle income country this sector provides the vital engine for economic growth. Indeed, the construction subsector contributed 9.7 percent to the 2012 GDP (Ghana Statistical Service, 2013). Brick
which has been proven over thousands of years to be of superior quality and affordable in terms of total life cycle cost of a building has not been used as much as alternative building material (0.6% out of total houses are built in bricks as against 75% for cement /Sandcrete blocks) due to various problems such as cost of production and construction, lack of skilled labour and availability of design data as well as government support. Sustainable construction requires a critical review of prevailing practices, techniques and sources for raw materials (Danso, 2013). Currently, there is over reliance on foreign and imported materials especially for building as the nation import about 80 per cent of construction materials at the expense of local content (Tamakloe, 2012). Danso alludes to this assertion by stating that there is an acute lack of affordable houses which is largely due to the high cost of the conventionally processed construction materials such as steel and Portland cement. The desire generated for these materials has a negative impact, leading to reduced value and perceived inappropriateness of locally available materials. This phenomenon drains the economy of dire needed foreign exchange which is needed for other developments.

The use of natural, locally-available materials makes good housing available to more people, and keeps money in the local economy rather than spending it on imported materials (Deboucha and Hashim, 2011). There abound many locally made building materials which are not being promoted let alone used in construction. One of these materials is the burnt bricks. Burnt bricks are found to be stronger due to the intensity of heat (a temperature ranging from 900 - 1200°C) that is used to dry them. This result is in line with Kim and Rigdon (1998) assertion that the firing process exposes the formed clay to high, prolonged heat, producing a hard, water-proof, permanent brick or tile. A study by the FAO (1986) contends that burnt bricks have good resistance to moisture, insects and erosion and create a good room environment. Although tenable, their longevity depends on the quality of ingredients, climate and skill of artisans.

In Ghana particularly Kumasi, most of the brick buildings which were put up during the colonial era are still standing and in habitable condition. The Ramseyer Memorial Presbyterian Church, Wesley Cathedral and Military Museum are testimonies to how durable brick buildings are. However, Ghanaians seem to prefer sandcrete blocks to burnt bricks even though burnt bricks exhibit numerous qualities. The 2010 Population and Housing Census therefore captured 0.7 percent of dwelling units as buildings constructed with burnt brick.

There is currently very low official and private commitment to the use of local building materials such as bricks. By the researcher’s observation there is low patronage of burnt brick in Ghana although it is readily available and abundant in many parts of the country. Putting the causes in perspective, firstly, the low demand of burnt bricks can be attributed to cost of construction. In a square metre, there are 60 bricks of standard metric bricks that are roughly 215 x 102.5 x 65 mm. On the other hand, there are 10 sandcrete blocks per square metre with a standard size of 450x215x100mm. Currently, in Ghana a square metre of burnt bricks and sandcrete blocks cost GH¢30 and GH¢16 respectively. Burnt bricks are comparatively expensive due to their size. Burnt bricks are smaller and twice as much or more is needed to build the
same house size as the cement blocks, thus if four hundred cement blocks were needed to build an average of one bedroom house, a thousand or more burnt bricks will be needed to build the same type of house (Damptey, 2006). This finding is parallel with the view of Danso (2013) that burnt bricks used for building houses are small in sizes and therefore require a lot of labour works to construct such houses.

Secondly, most people associate conventional building materials such as sandcrete block with prestige. In a survey on “building sustainably for good indoor climate in three residential areas of Accra” by Damptey (2006), a resident said “he would have liked to use burnt clay bricks but he would be the odd one out because everyone in the area had used cement blocks instead so he would rather prefer to use these building materials in the rural home”. It can be deduced that the sense of belonging has covered the better judgement of using the right materials despite what anyone thinks. Drawing on the premise of Damptey, it is quite easy to mention that there is a huge misconception or little understanding of the relatively better walling properties of burnt bricks over sandcrete blocks.

Additionally, the burnt brick industry is not well organized and is technically ill prepared with very little know-how about it and few engineers and scientists having taken interest in this industry (Egbert, 1993). In Ghana, there are few bricklayers with the technical know-how. Most of these bricklayers usually shift to sandcrete blocks as a result of low demand of burnt bricks by developers. Again, the publicity of burnt brick as a building material is poor in Ghana. Burnt brick factories are not well-known. It is hardly to see a bill board or a media advert of a burnt brick factory in the Ghanaian society. These all contribute to the low demand of burnt bricks.

In Ghana, the current NDC Government in its effort to promote the use of local building materials adopted a policy initiative in November, 2010 on the use of 60% local building materials in the construction of public buildings by 2015. The focus is, among others, to bring to the fore, the quality and best practices in the use of locally developed building materials. The CSIR-BRRI been a spearhead of the use of such materials has been producing and constructing brick buildings all over the country with a high concentration in Kumasi Metropolis and Bosomtwi Atwima-Kwawoma between the periods of 1999 and 2006.

![Figure 1: A Graph Showing People’s Preference of Bricks as a Walling Material](image)
These projects included schools, clinics, quarters and bungalows, libraries, hotels etc. The method of construction used was termed as a single leaf brick walling with 102.5mm thick. These buildings have been in occupation for all these years without any appraisal of their performance as well as user satisfaction information for the academia and construction professionals. The crux of this paper is thus; to investigate the performance of burnt bricks as a building material used in single leaf or thin wall construction. This will be achieved by focusing on indicators which concentrate on durability, strength, sustainability, and affordability and user satisfaction of burnt bricks.

**LITERATURE REVIEW**

**Brief History of The Brick Industry in Ghana**

The Scottish Missionaries first introduced bricks into the country in the late 50’s. Brick and tile factories were strategically set up in some regional centers in the late 1970s which was envisaged to be the beginning of a brick and tile revolution in the country. Some of the factories set up were at Asokwa near Fomena in the Ashanti region, GIHOC brick and tile at Weija, others were set up in Accra, at Prampram, at Kibi, and at Danyi, in the Volta region.

A committee was set up in 1976 by the then government with the aim of solving the housing problem facing the country through the development and use of local building materials[ Report of the committee appointed by the Ministry of Works. and Housing on “The development and use of Local Building Materials – August 1978]. The committees terms of reference were:

To examine critically and submit realistic and practical recommendations on how best and how effectively, local building materials could be developed and used extensively in national building programmes.

To ensure that the result of the recommendations could be used in the then financial year.

Among the recommendations were; as a short term measure, the improvement of the existing building materials industries especially brick and tile factories, such that they could increase their production capacities. For the medium term the development and use of some essential building materials was also most critical. These were burnt clay bricks, lime, pozzolana, natural stones stabilized earth blocks and wood products. Training of personnel both in the manufacture and their methods of use was also an essential prerequisite to the local building materials revolution. The long term phase was the general use of capital intensive methods of production. In the view of the committee these three factors were critical:

National assault on reducing the cost of building materials.

Ensuring a success in the national programme for development and use of local building materials

Making national building and construction industry self-reliant.
A recent survey (Danquah, 2009) amongst stakeholders in the building industry indicated amongst others in order of ranking the following defects and reasons for their preference of Sandcrete blocks to burnt bricks:

- Lack of design data on its use
- Non-availability of design and construction experts
- Initial cost of construction high
- Non-availability of the bricks on the market
- Irregularity in shape and colour
- Smaller and appears weaker than the Sandcrete block
- Flaky and algae formation

**Performance Indicators**

Contextually, the performance indicators outlined below are measuring instruments or properties used to evaluate the operation or functioning of burnt bricks as a building material. These indicators straddle durability, strength, sustainability, and affordability and user satisfaction of burnt bricks.

**Durability**

The durability of a material is its ability to undergo permanent deformation without cracking or fracturing. Durability is an important factor in analysing a building’s life-cycle costs. Materials that last longer will, over a building’s useful life, be more cost-effective than materials that need to be replaced more often (Kim and Rigdon, 1998). The durable nature of burnt bricks for building construction is obvious in Ghana. The surviving of structures in Kumasi most especially the Ramseyer Memorial Presbyterian Church, Wesley Cathedral and Military Museum, exhibits the durability qualities of burnt bricks. However as indicated earlier, burnt bricks’ longevity depends on the quality of ingredients, climate and the skill of artisans. This finding is consistent with the view of Riza et al. (2011) that most soil in their natural condition lack the strength, dimensional stability and durability required for building construction. The above indicates that soils used for burnt bricks, if not properly tested, may lack the desired strength and hence its flimsiness.

Brick is permanent. Once it’s built it remains weather proof and age proof. Brick doesn’t get tired like man-made materials, so it requires virtually no upkeep or repairs. Bricks don't rust or erode, rot or decay, bend, twist or warp (Think Brick, 2013).

Bricks are non-combustible and don't support the spread of fire, making them ideal for building in bushfire-prone areas. Clay bricks generally do not suffer any structural damage after a fire and can be re-used even as load bearing walls.

**Strength**

Strength is simply the quality or state of being physically strong. The strength of every building is important because it determines the durability and security of the building. Burnt bricks as a building material have an appreciable strength in compression. The compressive strength of burnt bricks is related to its density. This
finding is parallel with the view of Deboucha and Hashim (2011) that raw materials and manufacturing process affect bricks density, which could vary between 1300 - 2200 kg/m³. The density of bricks influences the weight of walls and the variations in weight have implications on structural, acoustical and thermal design of the wall. Also, burnt brick as a building material require low maintenance. This is due to the high strength of the material. Unlike mud buildings if not maintained regularly, they will deteriorate in some few years after their construction due to their vulnerability to weather such as rain and storm.

Sustainability

Sustainability is the capacity to endure. Bricks have thrived over thousands of years because of their longevity and a number of factors that contribute to their natural sustainability. They require almost no maintenance over time, create highly energy efficient buildings and reducing environmental impacts from other materials. Many concerns have been raised on the sustainability of the use of bricks on a large scale due to its energy demand on the environment. Energy consumption and pollution are the two important environmental and cost concerns related to the brick industry. Over the past thirty years the manufacture of bricks has improved significantly, contributing to the inherent sustainability of the product. According to Deboucha and Hashim (2011), consumption of fuels, combined with inefficient combustion process produces large quantity of hazardous gases that threaten the environment as well as those working in brick kilns. However, Danquah (2009) asserts that modern methods in the production of burnt bricks have actually reduced the energy demands as well as proper land management methods which preserve the land after the land mining. For example the use of woodlots for firing is being replaced with more environmentally friendly one like cow dung (organic manure), palm kernel shells, saw dust and liquefied petroleum. Again, land wining which resulted in land degradation is being managed by either carefully removing the top soil and later replacing or making it a landfill site for reclamation. Also, manufacturing plants have been re-engineered to make use of highly efficient tunnel kilns, fired using natural gas, and all waste clay and heat is recycled within the plant. Brick buildings are strong, durable and can resist extreme weather events through fire-resistant construction and resistance to impacts and wind-borne debris.

“Bricks can be reused or recycled in three ways. Firstly because of their longevity and durability, brick buildings can often be renovated for different purposes, removing the need to construct a whole new building with all its associated environmental impacts. Secondly bricks can be salvaged, cleaned and reused to build new buildings. Thirdly old bricks can be recycled into new bricks or into other building materials such as aggregate for concrete, for landscaping or as sub-base for pavements or roads” (Think Brick, 2013).

Affordability

Arumala and Gondal (2007) explained that soil is one of the oldest building materials readily available, cheap, among others. This result is confirmed by Danso (2013) that local building materials are not bought,
the cost incurred in obtaining them are for those who will fetch the materials. This makes it cheap and affordable for obtaining local materials for building houses. On the other hand, extensive labour work is required in constructing houses with burnt bricks due to the fact that the activities involved in preparing the bricks are considered part of the entire labour works. However, the labour works from the acquisition of the raw materials and their manufacturing for houses built with conventional materials are not considered as part of the labour works required for the construction of such houses.

**User Satisfaction**

Contextually, user satisfaction is a measure of how burnt bricks supplied meet or surpass customer expectation. It is an undeniable fact (especially in warm climate areas) that houses built with local materials have cool room temperature (Danso, 2013). Provision of cool room temperature is a major benefit of houses built with locally available material especially burnt bricks. However, observation shows that current market for burnt bricks is small. Developers have been reluctant to use burnt bricks because of the initial cost of construction and misinformation or prestige associated with burnt brick as a building material. These factors deter developers from choosing burnt bricks over Sandcrete blocks, hence contributed to the hindrance of appreciation and application of the material. It is juxtaposed that a material may be quality, strong and durable but if it is expensive, customers would prefer alternatives that are cheap and can perform the same functions.

**Checklist for Appraisal**

The following are the lists to be considered in the data collection and analysis. The checklist will help to ensure consistency and completeness in carrying out the research.

**Mortar Joint** : Consideration will be given to mortar joints of burnt brick structures. This will profoundly reveal the strength and durability of such structures. There will be checks on mortar joints with reference to the actual brick that has been used. The types of mortar joint that will be checked are round ironed, flush and raked or recessed.

**Brick Colour** : There will be checks on the brick colours. There are more than 800 different brick colours, from the lightest of whites and creams to the darkest blues and purples - and an unlimited opportunity to blend or accentuate. New generation colours offer a range of monochromatic tones for a more subtle appearance (Think Brick.com). The colours allow you to design a home with a very distinctive character. Clay brick pavers enhance any outdoor space with their natural appearance. This will be checked to ascertain the level of user satisfaction of burnt bricks.

**Crack** : Clay soils will hydrate with increased moisture content and shrink as they dry. However, when there is differential movement of clay below foundations cracking is likely to occur in the building above. The survey will also take into account cracks on burnt brick wall; it causes and effects. This will be done to understand the nature of strength and durability of the building material.
Texture: Bricks come in different natural textures that can set your home apart. Textures add contrast or define a feature like an alcove or porch. Textures can bring out the natural colours of bricks. Textures can add dimension throughout the day as the sun highlights them. Bricks give you many more textural choices than flimsier building materials (Think Brick.com). The survey will consider the textures of burnt brick to ascertain its strength, durability as well as user satisfaction.

**RESEARCH METHODOLOGY**

The paper the case study approach on the grounds that a case study requires in-depth information about a phenomenon within a limited period where a large scale survey may not produce the true results (Bell, 2004: p.10-11). Both quantitative and qualitative techniques were used in data processing. Multiple source of evidence such as observation and semi structured questionnaires was used to gather data from occupants. Data collected was analysed by the use of SPSS v20. A semi-structured questionnaire was distributed. A five point Likert Scale was used through the factor analysis method. The advantage of Likert scale is that it is easy to construct and it allows the respondents to answer the questionnaire according to their degree of feelings toward the statements (Barnett, 1991). Likert scale also provides a highly reliable scale compared to the open-ended question (Malik, Mushtag, Khalid, Khalik, & Malik, 2009). These were distributed personally to the house owners or household heads.

**FINDINGS AND DISCUSSIONS**

Demographic Characteristics of the Respondents

The average age ranged between 20-45 years fall under the economically active working force in Ghana. It was evident that, the youthful age had direct impact on the economy. The data gathered indicated that, 57% and 43% of the respondents were male and female respectively.

![Figure 2: A Graph Showing Gender of Respondents](image)

Source: Author., 2014
The educational level of the sampled respondents were 93% who have attained secondary and tertiary education and majority of them are literates, that is, they can read and write. This could be attributed to the fact that majority of the occupants were employees of the government.

Figure 3: A Graph Showing Occupational Source of Respondents

Source: Author. 2014

About 70% of the houses are owned and maintained by the same government through their respective ministries. Also, 66% and 26% of the sampled respondents are employed in both the Government and public sector respectively. The data gathered stressed that, 96% of the burnt brick houses were mostly residential. 70% and 26% of the respondents who live in the sampled areas were renters and caretakers respectively. Also, about 49% of the respondents have stayed in the houses between 2-5 years and 32% of the respondents have lived in their houses are between 6-10 years.

Transformation

This analysis were performed with the aim of exploring the nature, trend and the extent of transformations that, the respondents have made to their residences or buildings and related features. Majority (55%) of the respondents stressed that, they have made no changes or alterations in the form of transformation to their buildings. The reason was that they were not the owners of the houses. Yet a half (25%) of this indicated that they would have made changes if the ownership had reverted to them. Also, the remaining 45% of the respondents indicated that, they have made changes to their buildings. The major changes occurred mostly in the internal such as doors and windows, floors, plumbing works among others. The data further revealed that, the major factors that accounted for these transformations were: poor and inferior finishes (15%), aesthetics and beauty (35%), poor construction (15%), additional spaces (10%), and improvement in day lighting (25%). A notable feature of the transformation was the application of render to parts of brick walls both interior and exterior, and painting those surfaces to break the monotony of the brick colour as well as improve day lighting in the living spaces.

Building Features and Housing Conditions

The buildings were constructed with burnt bricks as the main walling material for the superstructure, mass concrete and Sandcrete block work for the substructure works. Fenestrations were mostly of louvered and
glazing to a lesser extent. The burnt bricks were laid as single brick thick or ½ brick thick as some would call it. The adoption of this was primarily to reduce cost of the wall construction. Most partition walls and interior brick surfaces in washrooms have been plastered and painted for both aesthetic and maintenance purposes. The openings have precast lintels (Plate 1) as against the usual ring beam on the conventional method of wall construction.

Plate 1: A picture showing a Semi-Detached Brick house at Kumasi Senior High School.

Source: Author 2014.

The conditions of the houses surveyed have been presented in Table 1. These conditions were categorised into four namely: very good, good, bad and worse.

<table>
<thead>
<tr>
<th>Criteria frequency (percentage)</th>
<th>Very good</th>
<th>Good</th>
<th>Bad</th>
<th>Worst</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall construction</td>
<td>14 (30)</td>
<td>33 (70)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mortar joints</td>
<td>26 (55)</td>
<td>21 (45)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Brick texture</td>
<td>31 (66)</td>
<td>15 (32)</td>
<td>1 (2)</td>
<td>-</td>
</tr>
<tr>
<td>Thermal comfort</td>
<td>15 (32)</td>
<td>29 (62)</td>
<td>3 (6)</td>
<td>-</td>
</tr>
<tr>
<td>Brick appearance</td>
<td>25 (53)</td>
<td>22 (47)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Overall level of satisfaction</td>
<td>17 (40)</td>
<td>21 (45)</td>
<td>9 (15)</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Author’s construct, 2014.

The table above emphasized that 70% of the houses surveyed were good with regard to the burnt bricks used in the wall construction of their buildings. This implied that, the cost of construction was reduced. 55% and 45% of the sampled houses indicated that, the mortar joints were very good and good respectively. It implied that, the mortar joints in burnt bricks were more concrete and resistant to the weather conditions prevailing in the country and this profoundly revealed the strength and durability of such structures. 66% of the respondents stressed that, the texture of bricks was very good and also 32% indicated the texture of the
burnt bricks was good. Textures add contrast or define a feature like an alcove or porch. Textures can bring out the natural colours of bricks. The texture and appearance of the bricks have not changed much since its construction about a decade ago. Thus the durability of the bricks was evident in this exposure.

Also, 62% of the respondents indicated that, the thermal comfort of the burnt bricks was good as compared to other building materials which they had lived in. 53% of the respondents stressed that, the appearance of the burnt bricks is very good.

Housing Satisfaction levels

In order to have a fairly balanced account of the performance of the brick houses, respondents were asked to rate their satisfaction levels of the various aspects of the house. This has been presented in Table 2.

**Table 2: Housing Satisfaction Levels.**

<table>
<thead>
<tr>
<th>Criteria (percentage)</th>
<th>Frequency</th>
<th>Highly Satisfied</th>
<th>Satisfied</th>
<th>Cannot tell</th>
<th>Dissatisfied</th>
<th>Highly Dissatisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>General construction quality</td>
<td></td>
<td></td>
<td>10 (21)</td>
<td>33 (70)</td>
<td>3 (6)</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Wall quality</td>
<td></td>
<td></td>
<td>9 (19)</td>
<td>34 (72)</td>
<td>3 (6)</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Interior comfort</td>
<td></td>
<td></td>
<td>14 (30)</td>
<td>24 (51)</td>
<td>9 (19)</td>
<td>-</td>
</tr>
<tr>
<td>Aesthetics /beauty</td>
<td></td>
<td></td>
<td>16 (34)</td>
<td>5 (10)</td>
<td>1 (2)</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Maintenance /sustainability</td>
<td></td>
<td></td>
<td>23 (49)</td>
<td>17 (36)</td>
<td>7 (14)</td>
<td>-</td>
</tr>
<tr>
<td>Durability</td>
<td></td>
<td></td>
<td>19 (40)</td>
<td>25 (53)</td>
<td>3 (6)</td>
<td>-</td>
</tr>
<tr>
<td>Affordability</td>
<td></td>
<td></td>
<td>23 (49)</td>
<td>17 (36)</td>
<td>7 (15)</td>
<td>-</td>
</tr>
<tr>
<td>Strength</td>
<td></td>
<td></td>
<td>26 (55)</td>
<td>14 (30)</td>
<td>6 (13)</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Overall satisfaction</td>
<td></td>
<td></td>
<td>22 (47)</td>
<td>24 (51)</td>
<td>1 (2)</td>
<td>-</td>
</tr>
<tr>
<td>Overall, how would you rate brick material as a building material</td>
<td></td>
<td></td>
<td>20 (43)</td>
<td>26 (55)</td>
<td>1 (2)</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Author’s construct, 2014.

The table above emphasized that 21% and 70% of the respondents were very satisfied and satisfied in terms of the general construction quality of the housing units. This is an indication that the construction quality was very attractive and mostly they have value for their money as compared to other building materials. 51% of the traders indicated that, the respondents were satisfied with the interior comfort of the burnt bricks as a building material. It implies that, bricks absorb and release heat slowly and thus reducing the stress load and keeping the house cool during daytime and warm during night time. 72% of the respondents stressed that, they are satisfied with the wall quality of the burnt bricks.

Further, 49% and 36% of the respondents indicated that, they are very satisfied and satisfied respectively with the maintenance and sustainability of the burnt bricks as a building material. They indicated that little or no maintenance works have been done on the brick walling itself. Again, 53% of the respondents stress that, they were satisfied with the durability (duration) of the building material. 49% and 36% of the respondents indicated that, they were very satisfied and satisfied respectively in terms of affordability as compared to other building material. This implies that, this makes it cheap and affordable for obtaining local
materials for building houses. On the other hand, extensive labour work is required in constructing houses with burnt bricks due to the fact that the activities involved in preparing the bricks are considered part of the entire labour works. Lastly, 55% and 30% of the sampled respondents emphasized that, with respect to strength they were very satisfied and satisfied respectively. Burnt brick as a building material require low maintenance. This is due to the high strength of the material.

CONCLUSIONS AND RECOMMENDATIONS

The use of natural, locally-available materials make good housing available to more people, and keep money in the local economy rather than spending it on imported materials. There abound many locally made building materials which are not being promoted let alone used in construction.

The study revealed that the brick houses have performed very creditably over the past ten years since their occupancy. This was in sharp contrast to the conventional wall material- Sandcrete Block, which showed considerable damage repair over the same period. However, people were concerned with the availability of the material and artisans. Again, some of the respondents emphasized on the need to improve the burnt brick as a building material. Some of the changes emphasized included: ensure smooth finishes, extra external treatment to the facades by polishing, improving upon the finished products and spraying or polishing the brick to resist moisture among others. Further, it was evident that the absence of a variety of colours in the bricks has given rise to the application of paints to the brick wall defeating the original purpose of its construction and function.

In view of the vast potential benefits of the brick industry to our economy the study recommends that government and other housing agencies should ensure that, the use of local building material such as burnt bricks should be used in constructing public or state buildings and that will attract individuals (private) to use the locally manufactured building materials.

Furtherance to this government should initiate and support the establishment of small and medium scale brick production centres within the districts to boost the utilisation of the material. Technical training centres such as the national artisan training centre should be given impetus in facilitating the training of existing artisans as well as new ones in brick construction.

REFERENCES


