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HOUSING CONSTRUCTION
An Interdisciplinary Task

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References


Affordable Housing Production: The Influence of Traditional Construction Materials

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Abstract

An aspect of the problems of sustainable housing technology in Nigeria like many other developing countries of the world is the escalating cost of conventional materials input to construction. These materials are not wholly produced locally, often in short supply, involves importation and hence not affordable to the poor masses. One of the paths to sustainable housing technology appears to be production of affordable housing using traditional construction materials which are adjudged to be cheaper and in abundant supply locally. Comparative construction cost analysis between the use of conventional and traditional materials was therefore performed on existing low-income building in an estate in the town of Ile-Ife, Nigeria. The result showed that the cost of two and three bedroom units reduced by 12.5% and 15.44% respectively when cement stabilized earth block was used for the wall construction, deep hardwood section for lintels, palm kernel shells (Kemenfrazu) for floor finish and wood casement window as replacement for glass louvres. It was recommended that the application of these locally sourced materials be standardized and backed up by large scale production so that prospective home owners, housing cooperatives and private developers can buy at affordable prices.
1 Introduction

Inadequate housing provision is a common phenomenon in many developing countries of the world. In Nigeria with a population of about 120 million people and rapid urbanization, population growth in the urban centers and supply of housing stock have inadvertently assumed the dimension of a one-sided race. While the population densities in urban centers continue to surge astronomically, the rate of increase in housing delivery by government (federal, state and local), private developers and individuals lags behind demand.

A wide range of problems contributing to the near collapse of housing programmes in the country have been identified by researchers from different viewpoints. Some of these views include: inconsistency in government policy [1]; lack of adequate data relating to housing and non-implementation of habitat recommendations [2]; non-consideration of gender issues in housing programmes [3]; inadequate housing finance market [4]; inappropriate project management practices [5] and non-development of traditional construction materials to reduce cost [6, 7, 8].

Research efforts into traditional construction materials are predicated on the assumption that locally sourced materials are cheaper and hence serve as good replacement for expensive conventional materials. To this end, a number of potential construction materials ranging from various species of timber to some agricultural wastes and residues have been investigated and found suitable in terms of strength and durability. However, the cost implication of using these traditional materials as replacement for conventional materials is usually not given. This paper therefore has as its objective to evaluate the cost implications of replacing conventional construction materials with traditional construction materials in the drive towards affordable and sustainable housing technology.

2 Research Methodology

Certain authors, Basavangini and Raju [9] have indicated that in the analysis of a traditional house, the three principal components of a construction made up of walls, roof, doors and windows are responsible for about 75% of the total cost of the building. To reduce cost and accelerate construction, therefore, durable and cheaper materials of construction are required for these three components in addition to optimum structural shape.

In order to meet the requirement of optimum structural shape, prototype rectangular bungalow buildings on Moremi low-income housing estate in Ile-Ife, Osun State, Nigeria were selected for this research. The estate was constructed by Osun State Property Development Corporation (OSPDC) with conventional construction materials. The objective of constructing the estate was to provide low cost houses at affordable tenement rate to low income earners. The estate is made up of two building typologies: two and three bedroom bungalows (fig. 1 and 2). The buildings were constructed with concrete base and traditional strip foundation on which sandcrete hollow block walls were raised. The roof comprises of corrugated roofing sheets on hard wood truss (fig. 3). For construction cost reduction evaluation, possible substitutes for conventional construction materials were compiled based on plethora of research findings on traditional construction materials. The possible substitutes and those applied in this research are shown in table 1. The cement stabilised hollow earth blocks used as replacement for sandcrete hollow blocks were those with optimum mix of 4% cement and water content respectively with a compressive strength of 2.12 N/mm² at 28 days. The Nigerian Standard Organisation (2010) specified a strength of 2.10 N/mm² at 28 days for sandcrete hollow blocks. To determine construction cost of both conventional and traditional construction materials on the two building typologies, the following procedure were followed:

i. Taking off of quantities
ii. Abstracting
iii. Billing of quantities

The billing of quantities was performed in accordance with the prevailing materials' cost and labour rates in Ile-Ife around January, 2000.

3 Results and Discussion

The results of the billing of quantities at each stage of construction using the conventional materials and traditional materials are shown comparatively in Tables 2 and 3 for the two-bedroom and three-bedroom typologies respectively. In the substructure, a saving of 8.33% was obtained for the two-bedroom bungalow and 8.23% for the three-bedroom bungalow. The substructure works quantified includes excavation, hard-core filling, lateritic filling, concrete work and blockwalling. The use of traditional construction materials was only possible in the blockwalling of strip foundation where cement stabilised earth brick was substituted for concrete block. The use of cement stabilised earth brick for the foundation work gave 41.67% savings over the use of sandcrete block for this operation.

In the construction of the superstructure the operations quantified were blockwalling, installation of screen wall, lintels (concreting, reinforcement and formwork), hard-core door and window frames, roof frames, roofing sheets and concrete roof ridge. The operations that showed appreciable reductions in cost were blockwalling with 41.67% reduction in both typologies and lintels with a staggering 80% to 80.9% reduction in the respective typologies. The traditional material substituted in the blockwalling of the superstructure was the same as that of the substructure. The substitution of traditional construction materials in the superstructure gave a reduction of 26.64% in the two-bedroom typology and 30.55% in the three-bedroom typology.
The operations considered for the finishes were rendering and plastering of walls, floor finish, window glazing, door fixing and locks, ceiling, woodwork painting and polishing and wall painting. However, traditional materials were substituted for floor finish and window glazing only. Palm kernel shells otherwise referred to as kernelrazzo was substituted for floor finish. This finish was devised in the Department of Building, Obafemi Awolowo University, Ile-Ife as part of the ongoing research into traditional construction materials. This finish gave 34.47% reduction for the three-bedroom typologies respectively. Wood casement windows were found to compete favourably with the conventional terrazzo both in strength and durability [11]. The use of this material gave 34.47% for glass louvre and this gave a saving of 7.47% for glass and 34.47% for the three-bedroom typology. The overall percentage reduction for finishes was 7.43%.

The operations considered under services were plumbing fixtures and electrical installations. No traditional materials were found suitable for these items and hence no reduction in the cost was obtained for this element of work. The situation is the same for the preliminaries. For all the substitutions made, it was found that a two-bedroom typology would cost 12.59% less when traditional construction material is used than the conventional construction materials. Similar reduction for three bedroom typology was found to be 15.44%.

### 4. Conclusions and Recommendations

Cost analysis has shown that traditional construction materials have high potentials in reducing the construction cost of low-income houses. This is more evident in the construction...
Ecomaterials in Construction: Confection of Recycled Concrete with Rubbles

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Key words: recycled aridis, concrete with rubble

Abstract

This article shows the statements which have led us to search about Ecomaterials and specially concrete made of residues from construction or rubbles. It also shows a proposal which has been made by the group of research on Sustainable Construction and Technological Management - CONCET - about the conventional technical rules in order to determine the absorption percentages in recycled aridis. Furthermore, the results obtained about resistance to effort of the compression at different ages in recycled concrete mixtures and their comparison with a conventional concrete from natural aggregates are shown, as well as its economical feasibility to the academic and scientific community.

1 Introduction

The approach to the investigation of a recycled material, which implementation is feasible technically and financially for the construction of optimal concrete one, studying in turn, the methodology adopted to determine the percentages of absorption of the recycled aridis coming of the generation of solid residues in the construction.

2 Justification

The cities are born, are constructed and transform, some of them are destroyed. Inside the process of transformation and growth that experience these cities, many of the constructions are reformed or demolished, as result of these two activities, there appears the generation of high quantities of solid residues coming of the construction, which we will call for effect of a more agile reading rubbles. These rubbles not alone are generated in the reforms or demolitions, also they are produced in the new constructions, the quantities are really worrying, so according to information of the Empresa Varías of Medellín in this city are produced about 600 daily tons of rubbles, of which only there is bad record of a final utilisable disposition of 25% , the remaining percentage is taken to throw out clandestine, gully and edges of the roads.

References