

# PREFERENCE OF BUILDING PROFESSIONALS FOR THE USE OF INTERLOCKING BLOCKS OVER CONVENTIONAL BLOCKS IN NIGERIA

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## **Abstract**

This paper seeks to find alternative masonry blocks to the conventional types used in the building industry. It examines the preference of key professionals in the industry namely architects; engineers builders and quantity surveyors involved in the use of interlocking blocks and conventional types for construction of residential buildings. Data for the study were collected through questionnaire administration, visits to sites, observations and oral interviews. Findings from the results indicate that professionals show preference for the use of interlocking blocks in the construction of residential buildings in Nigeria.

## **Introduction**

The building industry in Nigeria, like in many developing countries, is plagued with many problems, which include uncontrollable prices of building materials, high transportation cost, devaluation of national currency (Naira), and particularly, the incapability of production companies to meet high demand for building materials resulting to the over dependency on the importation of building materials (Fasakin and Ogunsemi, 2003). Locally sourced building materials in Nigeria, which would have facilitated sustainable development remain underdeveloped to a socially and economically acceptable level owing to the underdeveloped state of the economy. Ghosh (2002) averred that the traditional and conventional technologies used for construction and maintenance of buildings is inefficient and resource wasteful due to enormous amount of resources consumed. This situation leads to an increasing demand for further development of their technologies. It was observed that more rational constructive processes can be implemented with the introduction of technologies that allow reduction of labour, materials, time and fund. Such reduction becomes possible through the use of materials initiative (Adedeji, 2007). Though, numerous studies have been conducted to find more environmentally-sustainable solutions, the gained results often require expensive advanced technology and an established standardized community system, which are not expedient in many developing countries like Nigeria.

Hence, the construction industry is admitting the strong need to accelerate the masonry construction process, as the traditional method is labour intensive and consequently slower due to the presence of a large number of mortar joints. There is the need for further acceleration of the rate of construction leading to the elimination of bedding mortar and thereby to the development of non-conventional methods of masonry construction techniques that involve special interlocking blocks as well as conventional blocks (Anand and Ramamurthy, 3999). Thus, elimination of bedding mortar from conventional masonry work and wastages associated as canvassed in this research accelerates construction, reduces labour and wastages thereby reducing cost.

## **Interlocking Block Masonry**

The search for more rapid and less workmanship dependent building procedures has led to the need to develop "dry stackable" block masonry units which can be laid without mortar. Introduction of interlocking or "dry stack" mortarless masonry systems in reinforced block masonry construction requires the development of efficient, easy to handle, and yet versatile blocks. Varied interlocking blocks developed for use include Sparlock system, Canada, (1986); Meccano system, Peru (1988); Sparfil system, Canada (1989); Haener system, U.S.A. and Canada (1991).

Besides, Solid Interlocking BLOCK (SILBLOCK) developed at the Indian Institute of Technology, Madras (HTM), also evolve with the following features: (1) simplicity of shape; (2) limited number of basic block shapes; (3) interlocking without thin tongue and groove or undercuts; (4) interlocking in horizontal and vertical directions; (5) discontinuity of bed joint and cross joint from inner to outer faces; and (6) economic production by conventional methods. The system is comprised of units of three basic shapes, i.e., stretcher, jamb, and corner blocks, with full-course (200 mm) and half-course (100 mm) high units.

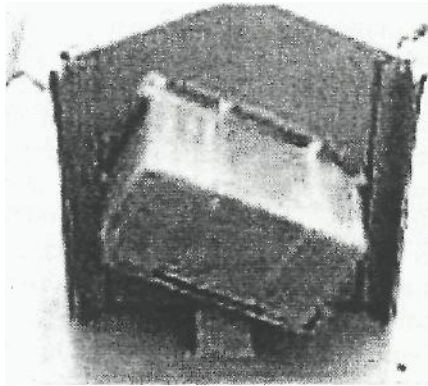
Tracing the development of interlocking blocks reveals that:

(1) many have complex shapes, which appear to have been deliberate, and such intricacies in block geometry (tongue and groove or undercut and dovetail arrangement) necessitate mechanized production methods; and

(2) the presence of continuity of horizontal and vertical joints from inner to outer face. On the basis of this assessment, a need for development of interlocking blocks with simple geometry and for a study of their structural behaviour and functional performance is found to be essential.

In Nigeria, the Nigerian Building and—Road Research Institute (NBRI) developed an

interlocking block making machine meant to produce solid interlocking block types. The blocks have a geometric size of 225 x 225 x 112 mm (Olusanya, 2003; Adedeji, 2005). This machine, which is meant to be launched in every local government in Nigeria produces solid interlocking blocks of laterite composition mainly and stabilised with cement material as shown in Plates 1 and 2.



**Plate 1: Block Cutter showing the Process of Cutting a Block**

*Source: Researcher's field survey (2005), Obasanjo low-cost housing estate, Ado-Ekiti.*



**Plate 2: Curing and Stacking of Interlocking Blocks**

*Source: Researcher's field survey (2005), Obasanjo low-cost housing estate, Ado-Ekiti.*

### **The Research Setting and Methodology**

The major materials investigated were conventional and interlocking blocks. This study was carried out in selected cities from four out of the six geo-political zones in Nigeria namely Lagos in the Southwest zone, Enugu in the Southeast zone, Port-Harcourt in the South-south zone and Abuja representing the North-central zones. The target population for this research are professionals in the building sector practising in these zones. Lists of practicing consultants within the study area were obtained from their respective professional institutions i.e. the Nigerian Institute of Architects, the Nigerian Institute of Quantity Surveyors and the Nigerian Society of Engineers. Relevant data on use

of materials and cost were obtained from the Nigerian Building and Road Research Institute (NBRRI) and professionals in the building industry through interactions, visits to sites and personal interviews.

Two sets of data were collected for this study. The first set of data was collected by means of well structured multiple-choice questionnaires, which were administered to professionals in the building industry distributed in four out of the six geo-political zones of Nigeria. The study collected information on unique projects executed by these professionals using the selected study material. Two hundred (200) respondents were randomly selected equally from the four geo-political zones out of which 120 were good for analysis. The second set of data was collected with the use of interview schedules, observations through visits to construction sites and completed projects, research institutes and institutions involved in the use of interlocking blocks within the study area. During the

interviews, information on projects size, specification of materials used, gangs of labour engaged, cost of interlocking blocks used, time expended for these operations and associated problems with the use of the material was collected.

### Analysis and Results

Descriptive statistics, which includes frequency, mean and percentage together with bar-charts was used to analyse the data obtained from the questionnaire as reflected in Tables in 1 -8.

### Cost Comparison Between Interlocking-blocks and Conventional Masonries

A comparative cost analysis of using both interlocking and the conventional are investigated empirically with the responses of respondents shown in Tables 1 and 2.

**Table 1: Cost Ratings of Conventional Masonry**

S/N	Cost of Conventional masonry	Frequency	Percentage
1	Very high	48	40
2	High	24	20
3	Moderately high	20	17
4	Cheap	18	15
5	Very cheap	10	8
	Total	120	100

S/N	Cost of Interlocking masonry	Frequency	Percentage
1	Very high	8	7
2	High	22	12
3	Moderately high	53	18
4	Cheap	23	44
5	Very cheap		19
	Total	120	100

*Source:* Researcher's field survey (2007), obtained from the four selected cities.

Results of the observations presented in Tables 1 and 2 reveal that while 60% of the respondents consider the prices of conventional masonry to be high, 63% observe that of interlocking masonry to be cheaper in comparison with the conventional type. Only 23% of the respondents favour the prices of conventional blocks to be cheap while the remaining 17% of the respondents are indecisive. It can be deduced that the population that will prefer the use of interlocking blocks for housing will continue to increase as more private and public agents patronise the material together with more publicity given to it.

### Strength Comparison of interlocking-and Conventional Blocks

The researcher carried out an empirical survey on the strength of interlocking blocks to allay fears on the use of the material due to the techniques of dry stacking the blocks. The result obtained from the survey is compared with that of conventional blocks. Common opinions of responses expressed in Tables 3 and 4 reveal that the strength of interlocking masonry is higher than that conventional masonry.

**Table 3: Strength Ratings of Conventional Blocks**

S/N	Strength of Conventional blocks	Frequency	Percentage
1	Very low	40	18
2	Low	125	57
3	Moderately high	20	9
4	High	23	10
5	Very high	12	6
	Total	220	100

*Source:* Researcher's field survey (2007), obtained from the four selected cities.

**Table 4: Strength Ratings of Interlocking blocks**

S/N	Strength of Interlocking	Frequency	Percentage
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1	Very low	10	5
2	Low	24	11
3	Moderately high	135	9
4	High	31	61
5	Very high		14
Total		220	100

Source:  
Researcher's

researcher's field survey (2007), obtained from the four selected cities.

This result affirms that the laboratory based observations of Anand, & Ramamurthy (2000) that the Solid Interlocking-Block Masonry system is a potential alternative to mortar-bedded masonry as it accelerates the construction process and also exhibits better or comparable structural performance as shown in Table 5.

**Table 5: Comparison of Output from Different Types of Masonry Works**

Type of masonry	Overall output (mVh)	Contributory Work time (as fraction)	Net output (m <sup>2</sup> /productive Hour)
Brick masonry	0.81	0.84	0.96
Hollow-block masonry	1.03	0.81	1.27
Dry-stacked, solid	1.69	0.72	2.33
Interlocking block masonry			
Mortar-bedded, solid	1.41	0.76	1.86
Interlocking-block masonry			
Thin-jointed, solid	1.47	0.78	1.89
Interlocking block masonry			
Dry-stacked, hollow	1.63	0.74	2.21
Interlocking block masonry			
Thin-jointed, hollow	1.33	0.78	1.71
Interlocking block masonry			

Source Anand and Ramamurthy

Based on the parameter investigated, it is observed that Solid Interlocking-Block Masonry results show higher strength than mortar-bedded masonry.

### Setting time Comparison Between Interlocking and Conventional Masonries

Comparative analysis of the frequency result on the opinions of respondents on the time for setting interlocking blocks and that of conventional blocks are as shown in Tables 6 and 7.

**Table 6: Setting time ratings of Conventional Masonry**

S/N-	Setting time of -Conventional blocks	Frequency	Percentage
1	Very long	27	3.3
2	Long	122	14.7
3	Moderately short	32	18.0
4	Short	11	54.0
5	Very short		8.0
Total		220	100.0

Source: Researcher's field survey (2007), obtained from the four selected cities.

**Table 7: Setting time ratings of Interlocking Masonry**

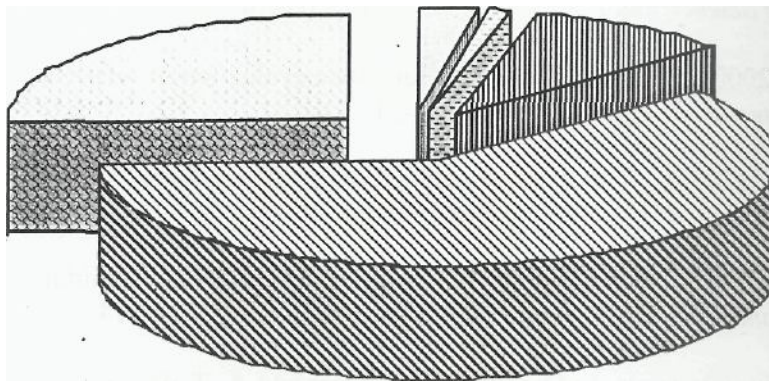
S/N	Setting time of Interlocking blocks	Frequency	Percentage
1	Very long	7	3.3
2	Long	32	14.7
3	Moderately short	40	18.0
4	Short	119	54.0
5	Very short	22	8.0

*Source:* Researcher's field survey (2007), obtained from the four selected cities.

From the results, 62% of the respondents show that the setting time of interlocking blocks is shorter as against the conventional types, which is 18% of the total number of respondents. This further corroborates an observation made by Anand and Ramamurthy (2003) on a study carried out on a comparison of the output from different types of masonry works.

### Respondents' Willingness to Use Interlocking Blocks

The tendency towards the preference for the use of interlocking-blocks masonry is further studied when testing the opinions of respondents about the willingness to use these materials in Figure 1. Most of the respondents show preference for interlocking blocks (83.4%) because it is faster in construction of walls, time-saving, use less labour and cost-efficient. The degree of preference for the use of the material will increase as more innovations and confidence level of users increases. Hence, the material is strongly recommended for use as an alternative to conventional blocks.



- Unwilling
- Rarely willing
- Moderate
- Willing
- V. Willing

**Fig.1 Willingness to use Interlocking Bocks for Construction of Housing**

*Source:* Researcher's field survey (2007), obtained from the four selected cities.

### Analysis of Types of Masonry in Use for Housing Projects

Analysis of respondents' opinions on the types of masonry in use currently in housing constructions indicated 55% for conventional masonry as against Interlocking bricks, blocks and concrete, which summed up to 34.9% combined, implying that the conventional masonry is the most popular type in use (Table 8).

**Table 8: Types of Masonry in Use for Housing Projects**

S/N	Masonry Types	Frequency	Percentage
1	Conventional	66	55.0
2	Inter-locking bricks	4	3.3
2	Inter-locking blocks	28	23.3
3	Inter-locking cone.	10	8.3
4	Others	If	9.2
5	No answer	1	0.8
Total		120	100.0

*Source:* Researcher's field survey (2007), obtained from the four selected cities.

This shows that interlocking masonries are not yet common despite their numerous advantages.

### Conclusion

This paper examined responses of professionals in the building industry towards the use of interlocking blocks and conventional bocks in masonry works in Nigeria. Based on the variables investigated which include cost ratings, strength and setting time ratings of the two materials, respondents indicated preference for the use of interlocking blocks in masonry works. Though conventional blocks are still dominant in the industry in Nigeria, interlocking blocks should be used as a preferred alternative to conventional blocks.

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