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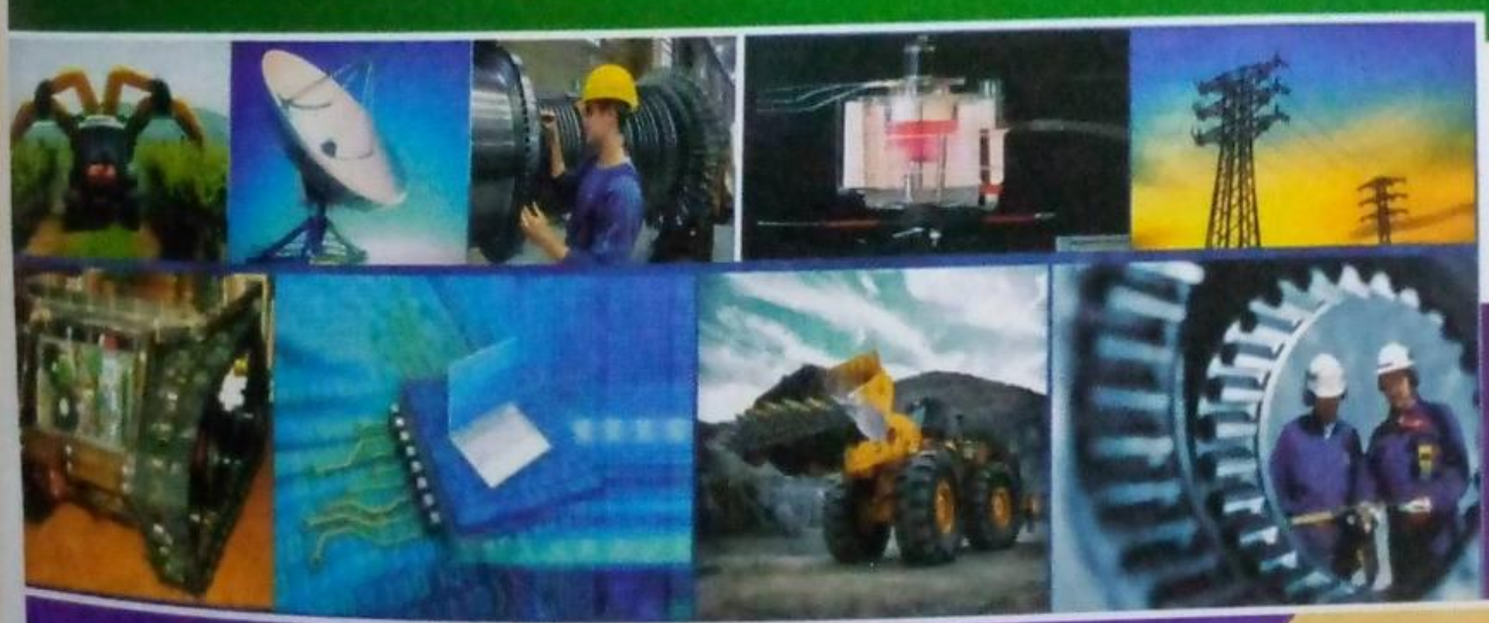

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Characteristics of Sandcrete Blocks: A Review

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ABSTRACT
This paper presents the review of the characteristics of sandcrete blocks. Sandcrete blocks are extensively used in the construction of buildings and other structures used for the service of man. It is therefore, a very important construction material and its quality should be of great concern to all designers, builders and users of these structures. Safety is one of the basic consideration put in place in every engineering work, strength definition of sandcrete block is not something that can be overlooked. Hence the production and characteristic requirements of sandcrete blocks as specified in NIS 587:2007 should be strictly adhered to and followed for better quality of sandcrete blocks.

Keywords: *Compressive Strength, Density, Dimension, Sandcrete Blocks, Water Absorption.*

1 INTRODUCTION

Oyetola and Abdullahi (2006) defined Sandcrete blocks as comprising of sand, water and binder, stating that cement as a binder, is the most expensive input in to the production of sandcrete blocks. According to Hamisu and Mohammed (2014) Sandcrete hollow block is made from a mixture of sharp sand, cement in the ratio of 1:6 with the minimum amount of water, in some cases with admixture, moulded and cured. The quality of sandcrete blocks are influenced by so many factors such as the constituent materials, the process adopted in manufacture, duration of curing, and size of blocks (Akeem and umar, 2013). Safety with respect to shelter plays a great role in ensuring adequate shelter as a result the best of checks should be done so as not to endanger the people life. Sandcrete blocks have been in use in many nations of the world including Nigeria for a long time (Oyekan and Kamiyo, 2008). Sandcrete blocks are the commonest and most masonry walling units in Nigeria. The most essential and expensive constituent of the block is cement needed to give acceptable quality required by various standards (Okafor and Ewa, 2012). Abdullahi (2005) stated that sandcrete blocks possess an intrinsic low compressive strength making them susceptible to any tragedy such as seismic activities. According to Alohan (2012) the majority of sandcrete blocks used in the Nigerian building industry fall short of minimum specification. Akeem and Umar (2013) confirmed it by stating that the production of low quality blocks may have led to the increase in collapsed buildings in recent times. In many parts of Nigeria, sandcrete blocks forms one of the major cost component of the most common buildings (Oyekan and Kamiyo, 2011).

The quality of blocks produced however, differs from each manufacturer depending on the production method and constituent materials hence it is not surprising that buildings and structures fail to stand the test of time. The frequent failure of buildings in Nigeria is a concern to all stakeholders. In the past incessant building failures have been reported resulting in the loss of lives and properties in Nigeria (Oyekan 2008). The global concerns for sudden collapses of buildings across the world, and in Nigeria in particular demand that materials used for construction of buildings meet minimum requirement (Ukpata, 2006). Among the objectives of the Nigeria Industrial Standard (NIS) document are to ensure that all block manufacturers meets a minimum specified standard, as well as to control the quality of blocks produced by these manufacturers. Quality of Sandcrete blocks depends on the characteristics such as appearance, dimension, compressive strength, water absorption and density of the blocks. The Characteristics affect the properties of the blocks which must conform to the minimum stipulated standards for effective performances. The characteristics reflect the state of affairs of the production while, the properties reflect the average quality of the blocks.

2. Previous research efforts.

Anosike and Oyebade (2011) researched on the quality management of sandcrete blocks in building industry in Nigeria. Experimentation and results obtained revealed very low compliance with that stated by NIS with as low as 0.66N/mm^2 compressive strength value and as much as 16.95% water absorption capacity. The study revealed that poor quality control, poor selection of constituent materials and inadequate curing period by the manufacturers contributed to the poor results obtained.

Odeyemi et al (2015) investigated and compared the strength of manual with machine compacted sandcrete hollow blocks using Dangote and Elephant (Ordinary Portland) cement brands in Nigeria. The result revealed that the 28th day compressive strength of the blocks produced manually with the Dangote and Elephant brands of cement were 2.83N/mm^2 and 2.89N/mm^2 respectively, while the 28th day compressive strength of machine compacted blocks from Dangote and Elephants brands of cement were 2.96N/mm^2 and 3.03N/mm^2 respectively. The result revealed that machine compacted blocks have a

higher compressive strength than the manually compacted blocks. They concluded that the result obtained for all the samples of the sandcrete blocks were within the Nigeria Industrial standard (NIS 87:2000) specification.

Nwaigwe et al (2015) looks into the quality of blocks produced by block industries in Owerri, Imo state, Nigeria to ascertain its water absorption ratio and compressive strength. The analysis of results they obtained was compared with the Nigerian industrial standard (NIS). The absorption rate of the sandcrete blocks was found to be higher than the 12% minimum requirement of the NIS; 2007. The compressive strength values of the sandcrete blocks ranges from 0.81N/mm^2 and 1.25N/mm^2 which when compared with NIS, was found to be below the minimum requirement of the NIS; 2007. They observed that inadequate mix ratio to be one of the factors of poor quality sandcrete block production in the area.

Ewa and Ukpata (2013) investigated the compressive strength properties of sandcrete blocks produced within the Calabar metropolis. The results show that the 28-day compressive strength of sandcrete blocks produced in Calabar block industry range between 0.23N/mm^2 and 0.58N/mm^2. Which are below the minimum requirements of 1.75N/mm^2 by the Nigerian National Building Code (2006) for individual block, and 2.0N/mm^2 by the British Standard for non-load bearing walls.

Adeyeye (2013) investigated the strength properties of Sandcrete blocks in Ado-Ekiti, Akure and Ile-Ife, Nigeria. On crushing the Sandcrete blocks he discovered that the compressive strength of the blocks was below the standard recommended by Nigerian Institute of Standards (NIS) 87.2000. The compressive strength of the individual blocks was between 0.31N/mm^2 and 1.35N/mm^2. He recommended careful selection of the constituent materials and proper curing to improve the quality of commercial Sandcrete blocks.

Abdullahi (2005) investigated the strength characteristics of sandcrete blocks in Bosso and Shiroro areas in Minna, Nigeria. The test result revealed that the aggregates used are suitable for block making. The compressive strength of the sandcrete blocks is below standard recommended by Nigerian Industrial Standard (NIS) 87: 2000. The compressive strength of individual blocks was between 0.11 N/mm^2 and 0.75 N/mm^2 and the average compressive strength of the blocks were between 0.14 N/mm^2 and 0.66 N/mm^2. He recommended that proper curing and suitable selection of constituent materials should be done to improve on the quality of sandcrete blocks.

Ezeokonkwo (2012), worked on optimisation of cavity sizes in hollow sandcrete blocks. He concluded that a non-linear relationship exists between strength and centre web to end web ratio, and the strength increases exponentially as the average solid thickness of block increases. He further concluded that the strength decreases geometrically as the cavity volume increases.

Aiyewalehinmi and Tanimola (2013) worked on Strength Properties of Commercially Produced Sandcrete block In Akure: Ondo State. The results confirmed that the aggregates used for production were suitable for all the blocks that were purchased. However, the result of compressive strength for all the Sandcrete blocks was below the Standard recommended by Nigerian Industrial Standard (NIS) 87:2000. The comprehensive strength of individual blocks was between 0.45N/mm^2 and 0.87N/mm^2 against minimum recommended standards of 3.45N/mm^2.

Oladeji and Awos (2013) investigated the variability in strength characterization of sandcrete blocks and the roles played by materials and process variables, as well as to establish the degree of compliance with the required regulatory specifications. The results show that the grading curves obtained from the representative soil samples used in the production contains wide range of grain sizes. The ranges of values obtained for compressive strength are 0.26 -1.62 N/mm^2 and 0.35-1.66 N/mm^2, for six and nine inches blocks respectively, compared to the required regulatory standard of between 2.5 and 3.45 N/mm^2. Corresponding density values are 1.95 - 2.05g/cm^3 and 1.67-2.02 g/cm^3, compared to the required minimum density value of 1.5 g/cm^3. The sandcrete blocks appear to possess adequate density values however the compressive strength has an over-riding influence due to its domineering determining factor for flexural members. Factors which include profit orientation, mix ratio, period of curing, and level of literacy, appear to have been responsible for the observed sub-standard products. They recommended enforcement of compliance monitoring and basic education to ensure improved production of good quality sandcrete blocks.

Ajagbe et al (2013) carried out a research to assess the engineering properties of sandcrete blocks produced in Ibadan and its environs. The 28th day dry compressive strength test result obtained for the sampled blocks ranges between 0.39- 2.34N/mm^2. For the control block samples, the average 28th day dry compressive strength of the three tested blocks was 3.02N/mm^2. They observed that the sandcrete blocks produced in major parts of Ibadan were of low quality and substandard; while the control samples were of adequate strength.

Mohammed and Anwar (2014) research was aimed at studying the strength properties of the commercial sandcrete blocks produced in Kano State. The compressive strength was found to be between 0.25 N/mm^{2}and 0.92 N/mm^2 which are far below the specified

values (2.5 N/mm^2 to 3.45N/mm^2 respectively) in the Nigerian Industrial Standard (NIS 87, 2000). They concluded that the commercially produced sandcrete blocks in Kano State are of lower standard than expected. They recommended that workshop should be organised periodically to enlighten the producers of sandcrete blocks and adhering to standard specifications should also be emphasised and strict penalties be meted out to erring producers by the Nigerian Industrial Standard Organisation.

Baiden and Tuuli (2014) focused on the impact of quality control practices by suppliers on the quality of blocks produced in the Kumasi metropolis. Sandcrete blocks were taken from suppliers and tested for compressive strength, bulk density, water absorption, and dimension tolerances. The study confirmed that mix ratio, quality, and mixing of the constituent materials affected the quality of sandcrete blocks. They concluded that Blocks produced were to be unsuitable for use as load bearing walls.

Awolusi et al (2015) examined the quality of machine-vibrated hollow sandcrete blocks used on construction sites in Lagos metropolis. The results obtained revealed that the compressive strength of the blocks obtained from manufacturers ranged from 0.21N/mm^2 to 1.26N/mm^2 for 225mm wide blocks and from 0.28N/mm^2 to 0.95N/mm^2 for 150mm wide blocks which are far below the minimum NIS requirements of 3.45N/mm^2 and 2.5N/mm^2 respectively. They recommended that the regulatory bodies should be empowered to control production processes and implement effective strategies such as mobile testing to ascertain the quality of sandcrete blocks.

Alohan (2012) researched on the impact of Vibration Time on Compressive Strength of Hardened Sandcrete Building Blocks using six fine aggregate deposits found within Benin City. He found out that the utility value of sand can be improved when the weaker and commonly used sands were combined with those that are better, more expensive and less frequently used at different vibration periods and ratios. His Findings further revealed that sand types and the sand combination approach adopted were very significant to grading parameters and strength; at a much higher vibration time the compressive strength and durability properties were also considerably improved.

Akeem (2013)[4] researched on the quality assurance of hollow sandcrete blocks produced by block moulding factories in Gombe metropolis. He concluded that Factors such as the use of obsolete equipment, engagement of unskilled labour, low level of workmanship and use of inadequate mix ratio were observed to contribute to the poor quality of produced sandcrete blocks. He therefor recommended that there should be close monitoring of block moulding factories by appropriate government Agency to enforce the required standard.

3.0 Conclusion

Various production parameters affect the quality and general characteristics requirements of sandcrete blocks produced. It is therefore necessary to study the various ways by which the quality of sandcrete blocks can be improved to meet up with the standard as stipulated by NIS 587: 2007, as this will provide clue on the causes of inconsistence and lack of adherence to the methods of production of sandcrete blocks. Researched carried out on sandcrete blocks production under controlled conditions in respect to proper method of production, curing and storage, yields positive result in terms of compressive strength., with most of the samples with compressive strength within the range as specified by NIS 587:2007, while those produced in various block industries fails to meet up the standard. Hence the production and characteristic requirements of sandcrete blocks as specified in NIS 587:2007 should be strictly adhered to and followed for better quality of sandcrete blocks.

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