EFFECT OF RIVER SAND AND LAND EXCAVATED SAND ON THE COMPRESSIVE STRENGTH OF HOLLOW SANDCRETE BLOCK.

(A CASE STUDY OF YEWA SOUTH LOCAL GOVERNMENT AREA, ILARO, OGUN STATE)

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ABSTRACT

The high demand for sandcrete hollow block for the development of physical infrastructures in Nigeria makes it relevant in building and construction industry.Therefore, as a result of the overdependence on river sand for construction activities, there is a need to source for another readily available material with comparable strength when used for various purposes (such as sandcrete hollow blocks). This research evaluate the Comparion of river sand and land excavated sand on the compressive strength of hollow sandcrete block in Yewa south ilaro to meet the minimum strength (1.8N/mm^2) required by Nigeria Industrial Standard approved by Standard Organization of Nigeria (SON). A mixture of sand and cement in a circa 1:6 were used to produce 450mm x 225mm x 150mm block using manual method of production, the materials (sand and cement) were thoroughly mixed until a homogenous mix with uniform colour is obtained, same mixing ration were used for the two samples. Curing was done by spraying water in the morning and in the night for 28days and the compressive strength of the block was determined on the 7th, 14th, 21st, and 28th days respectively. The study reveals that the land excavated sand is finer than the river sand which makes it to be more compacted with minimal voids. The strength obtained at 28days showed that the land excavated sand has strength of 1.93N/mm^2 which is greater than that of river sand 1.44N/mm^2

Keywords: Compressive strength, Curing, Construction, Infrastructures, Sandcrete

INTRODUCTION

Housing is one of the requirements of man; the ambition of all people to own or have access to decent shelter is not a luxury but a necessity. Different materials are used around the globe for housing especially for walling. Ajagbe, Ganiyu and Adeniji (2013).

Free standing walls and building structures with load bearing walls are common in Nigeria because they are simple to construct and easily affordable. Sandcrete block can sometimes be used to provide aesthetic values to buildings and also, when adequately prepared, to control moisture infiltration and wind action. This utility value of sandcrete in comparisons to its cost and its adaptability to climatic factors is responsible for its wide application; cost especially in small to medium buildings in countries within tropical rainforests where a considerable amount of precipitation and high average temperature are predominant. Alohan (2002).

In Nigeria sandcrete hollow blocks are widely used as walling unit and over 90% of houses in Nigeria are being constructed of sandcrete blocks. This makes sandcrete blocks a very important material in buildings construction. Baiden and Tuuli (2004). Sandcrete block have been manufactured manually and mechanically to meet the need of building due to the discovery of cement. This was done without putting into consideration the strengths and durability of the blocks. Anosike and Oyebade (2011).

According to Nigeria industrial standard –NIS87:2000 Sandcrete block is composite material made up of cement, (ordinary Portland) sand in a circa (1:8) and water moulded into different sizes.

Sandcrete is usually used as hollow rectangular blocks similar to concrete masonry units, often 45cm (18”) wide, 15cm (5.9”) thick and 30cm (12”) high with hollow that run from top to bottom and occupy around one third of the volume of the block.

There are different sizes of sandcrete block used in modern buildings but the commonest one are 450mmx225mmx225mm (Hollow) for load bearing walls and 450x150mmx225mm for non load bearing walls 450mmx100mmx225mm(Solid) and 450mmx225x100mm(hollow).

METHODOLOGY

Sandcrete Block has been the major material used for wall construction in Yewa South Ilaro, There is need to evaluate the material used in producing this blocks to ascertain the best material for production of blocks.

The compressive strength was determined at 7, 14, 21 and 28 days after the hollow block has cured. The blocks were crushed on the compression machine to determine its strength at failure. All materials used for production of sandcrete hollow blocks for this work were obtained locally; Sharp sand obtain from Yewa South Local government was used as river sand and (pit sand) locally excavated sand which was free from deleterious substances.

The compacted material was demoulded and kept in a dry place for curing, curing was done two times in a day(morning and evening), and then crushing for compressive strength was carried out at age 7, 14, 21, and 28 days.

Materials Used

Cement

River sand

Pit sand

Manufacturing of Sandcrete Block

Batching

Mixing

Compaction

Curing stage A

Curing stage B

COMPRESSIVE STRENGTH TEST

Aim: To determine the compressive strength of the sandcrete hollow blocks.

Apparatus: Compression machine, two steel plates, weighing balance and the block samples.

Procedure: The sandcrete block was first weighed on the weighing balance so as to add the weight value to the compressive strength value read from the machine, and this sum is taken as the compressive strength value of the block sample. Then the compression machine is connected to the power source and the pointer on the reading calibration scale is adjusted to zero mark. The block was placed on the first metal sheet plate, while the second metal sheet plate was placed on top of the block to spread the load equally. The start button is depressed to initiate the electronic compression and as the compressive force is applied to the block, visible cracks appear on the block. Red pointer reading the compressive strength value in kilo-Newton (KN) gradually rises till it reached its peak and then the black pointer begins to drop back.

Block on machine

Placing of block into the machine

Visible cracks during compression

PRESENTATION AND ANALYSIS OF RESULTS

Compressive Strength Test Results.

The results of the compressive tests are shown below:

Table: 1
Source: Experimentation 2019

S/N	Age of Blocks	Weight of Blocks (kg)	Force of impact at failure (kg)	Load at Failure (N)	Area of Block (mm^2)	Load/Strength (N/mm^2)
1	7	18.280	4800	48000	40300	1.19
2	7	18.240	4600	46000	40300	1.14
3	7	18.200	4200	42000	40300	1.04

The table shows the Compressive Strength of Sandcrete Block on the 7^{th} Day for Sample A with an average mean strength of $1.12N/mm^2$

Table: 2
Source: Experimentation 2019

S/N	Age of Blocks	Weight of Blocks (kg)	Force of impact at failure (kg)	Load at Failure (N)	Area of Block (mm^2)	Load/Strength (N/mm^2)
1	7	18.800	5400	54000	40300	1.34
2	7	18.820	5000	50000	40300	1.24
3	7	18.700	5200	52000	40300	1.29

The table shows the Compressive Strength of Sandcrete Block on the 7^{th} Day for Sample B with an average mean strength of $1.29N/mm^2$

Table: 3
Source: Experimentation 2019

S/N	Age of Blocks	Weight of Blocks (kg)	Force of impact at failure (kg)	Load at Failure (N)	Area of Block (mm^2)	Load/Strength (N/mm^2)
1	14	17.560	5200	52000	40300	1.29
2	14	17.640	5100	51000	40300	1.27
3	14	17.500	5000	50000	40300	1.24

The table shows the Compressive Strength of Sandcrete Block on the 14^{th} Day for Sample A with an average mean strength of $1.27N/mm^2$

Table: 4
Source: Experimentation 2019

S/N	Age of Blocks	Weight of Blocks (kg)	Force of impact at failure (kg)	Load at Failure (N)	Area of Block (mm^2)	Load/Strength (N/mm^2)
1	14	17.800	5800	58000	40300	1.44
2	14	17.720	5500	55000	40300	1.36
3	14	17.740	5400	54000	40300	1.33

The table shows the Compressive Strength of Sandcrete Block on the 14th Day for Sample B with an average mean strength of 1.38N/mm^2

Table: 5
Source: Experimentation 2019

S/N	Age of Blocks	Weight of Blocks (kg)	Force of impact at failure (kg)	Load at Failure (N)	Area of Block (mm^2)	Load/Strength (N/mm^2)
1	21	17.500	5500	55000	40300	1.36
2	21	17.300	5400	54000	40300	1.34
3	21	17.400	5300	53000	40300	1.32

The table shows the Compressive Strength of Sandcrete Block on the 21th Day for Sample A with an average mean strength of 1.34N/mm^2

Table: 6
Source: Experimentation 2019

S/N	Age of Blocks	Weight of Blocks (kg)	Force of impact at failure (kg)	Load at Failure (N)	Area of Block (mm^2)	Load/Strength (N/mm^2)
1	21	16.900	7000	70000	40300	1.74
2	21	17.100	6400	64000	40300	1.59
3	21	17.200	6800	68000	40300	1.69

The table shows the Compressive Strength of Sandcrete Block on the 21st Day for Sample B with an average mean strength of 1.67N/mm^2

Table: 7
Source: Experimentation 2019

S/N	Age of Blocks	Weight of Blocks (kg)	Force of impact at failure (kg)	Load at Failure (N)	Area of Block (mm^2)	Load/Strength (N/mm^2)
1	28	17.400	6000	60000	40300	1.49
2	28	16.900	5600	56000	40300	1.39
3	28	17.100	5800	58000	40300	1.44

The table shows the Compressive Strength of Sandcrete Block on the 28th Day for Sample A with an average mean strength of 1.44N/mm^2

Table: 8
Source: Experimentation 2019

S/N	Age of Blocks	Weight of Blocks (kg)	Force of impact at failure (kg)	Load at Failure (N)	Area of Block (mm^2)	Load/Strength (N/mm^2)
1	28	17.300	7600	76000	40300	1.88
2	28	17.300	8000	80000	40300	1.99
3	28	17.400	7800	78000	40300	1.93

The table shows the Compressive Strength of Sandcrete Block on the 28th Day for Sample B with an average mean strength of 1.93N/mm^2

Table 9

Compressive Strength Results

Days	**SAMPLE A** **River sand** N/mm^2	**SAMPLE B** **pit sand** N/mm^2
7day	1.12	1.29
14day	1.27	1.38
21day	1.34	1.67
28day	1.44	1.93

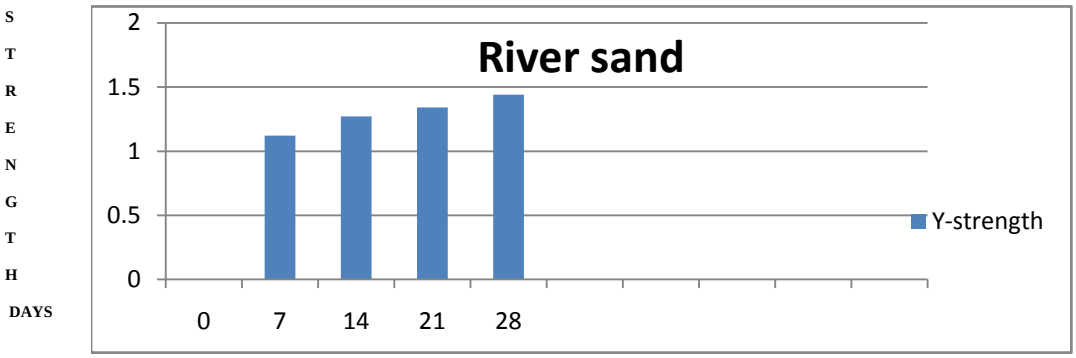
DISCUSSION OF RESULT

The result shows the summary of the compressive strength of hollow sandcrete blocks after curing and crushing in the 7, 14, 21 and 28 days. The compressive mean strength conducted on the sandcrete blocks for mix ratio (1:6) on the 7th day was 1.12N/mm^2which is lower than 1.29$N/mm.^2$

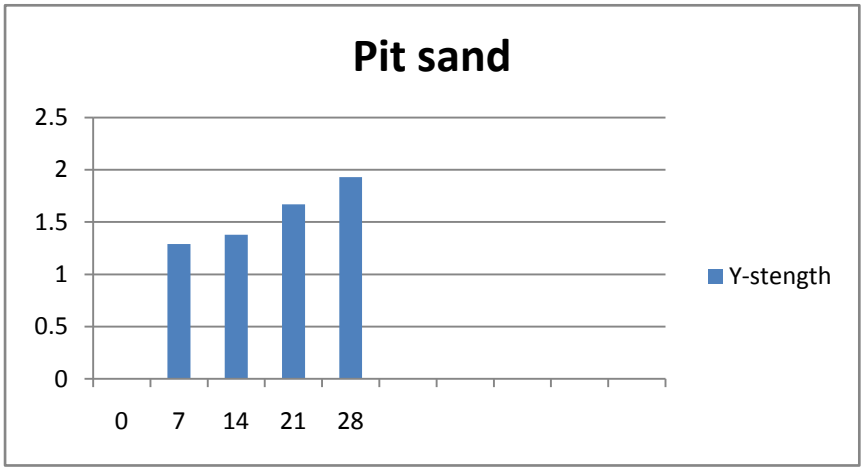
The compressive strength conducted on the sandcrete blocks on the 14th day was (1.27N/mm^2 which is lower than 1.38N/mm.[2)]

The compressive strength conducted on the sandcrete blocks on the 21st day was (1.34N/mm^2 which is lower than 1.67N/mm^2)

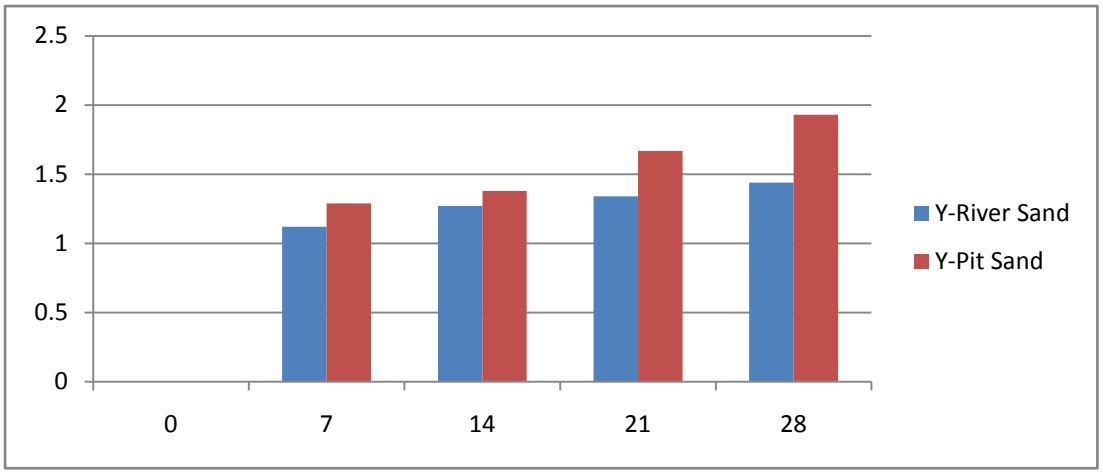
The compressive strength conducted on the sandcrete blocks on the 28th day was (1.44N/mm^2 which is lower than 1.93N/mm^2)



Compressive strength of river Sand Bar- Chart



Compressive strength of pit Sand Bar-chart



Comparism of Compressive strength of River Sand and Pit sand Bar Chart

From the compressive strength results, Bar chart are plotted to show the highest compressive strengths of river sand and pit from the 7th, 14th, 21st and 28th day test

CONCLUSION

Sandcrete block is becoming the backbone of infrastructural development of every country; ensuring quality is one of the major challenges confronting the sandcrete block making industry in Nigeria. From the experiment carried out on the hollow sandcrete block produced manually using river sand and pit sand at 7, 14, 21, and 28days shows that River sand (sharp sand) has a lesser strength than locally excavated sand (pit sand). The locally excavated sand (pit sand) has a mean strength of 1.93N/mm^2 which is higher than the minimum require at 28days (1.8N/mm^2) by Nigerian Industrial Standard (NIS 87 2004) standard for sandcrete blocks approved by Standard Organization of Nigeria (SON). This can be used in a structural design where higher compressive strength is required. While the blocks produced using river sand (sharp sand) at 28days has mean strength of 1.44N/mm^2 which is lesser than the minimum require by NIS 87 (2004) Approved by standard Organization of Nigeria (SON).

In conclusion, this investigation has revealed that Sandcrete blocks made with clean locally excavated sand is suitable for the production of hollow sandcrete blocks because it gave the highest compressive strength of 1.93N/mm^2.

RECOMMENDATION

It is advisable that the Standard organization of Nigerian (SON) and other affiliated bodies like Nigeria industrial standard (NIS), The Nigerian Institute of Building (NIOB), Council of Registered Builders of Nigeria (CORBON), Nigerian society of engineers etc. should have a body that test the strength of block at 28days with adequate curing before been use for construction to reduce the incessant building collapse in the country. And to check every block production industry periodically to know the strength of block produced by them if it is in conformity with the standard required by the body,

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