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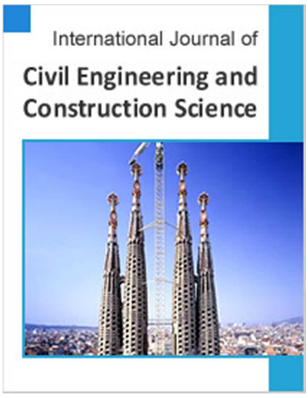

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The Compressive Strength of Segmental Interlocking Stones Used as Pavement Materials

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Abstract
Sandcrete is composed of aggregates embedded in a cement matrix which fill the space between the aggregates and bind them together. This project investigated the compressive strength of segmental interlocking stone used as pavement materials. The influence of mix proportion at three levels with varying water-cement ratio was also studied. Analysis of trial points and control points were considered. Sieve analysis and compressive strength test(s) were carried out appropriately. The sandcrete interlocking stones were cast with strict adherence to measurements of each constituent by using weighing scale. The sandcrete interlocking stones were cured and after 28 days, the compressive strength test was done by using compression test machine. The result of crushing test gave the maximum compressive strength of 20N/mm^2 with mix ratio 1.4670:8.0683 with water/cement ratio 0.8068 for three pieces. Also, the maximum compressive strength of 20N/mm^2 is below the limit specified for concrete interlocking stone according to BS code 6717 – 1 – 2001 which is 25N/mm^2. As there is no standard compressive strength interlocking stone, the mix ratio specified above will be economically viable.

1. Introduction

Sandcrete interlocking stones have been used for highways, airports, streets, local roads, parking lots, industrial facilities, and other types of infrastructure. When properly designed and built out of durable materials, sandcrete interlocking stones can provide many decades of service with little or no maintenance. "Sandcrete generally has a higher initial cost than asphalt but lasts longer and has lower maintenance costs [15]. In some cases, however, design or construction errors or poorly selected materials have considerably reduced pavement life. It is therefore important for pavement engineers to understand materials selection, mixture proportioning, design and detailing, drainage, construction techniques, and pavement performance. It is also important to understand the theoretical framework underlying commonly used design procedures, and to know the limits of applicabilily of the procedures. The first sandcrete pavement was built in Bellefontaine, Ohio, in 1891, by George Bartholomew. He had learned about cement production in Germany and Texas [2] and found pure sources of the necessary raw materials, limestone and clay, in central Ohio. Because this was the first sandcrete pavement, the city council required him to post a five thousand dollars bond that guaranteed the pavement would last five years. Over hundred years later, part of his pavement was still in use. The evolution of sandcrete has pass through plain sandcrete, reinforced sandcrete, precast sandcrete, pre-stressed sandcrete to the contemporary sandcrete. Plain sandcrete made of Portland cement, coarse and fine aggregate and water is usually called the first generation of sandcrete while the steel bar–reinforced sandcrete is the second generation sandcrete, [20]. Wider availability of automobiles led to increasing demand for paved roads. In 1913, 37km (23 miles) of sandcrete pavement was built near Pine Bluff, Arkansas, at a cost of one dollar per linear foot. It became known as the "Dollar way." The pavement was 2.7m (9ft) wide and 125mm (5in) thick. The remains of Dollar way is preserved as a rest area along US 6. This was followed in 1914, by 79kms (49 miles) of sandcrete pavement for rural country roads in Mississippi and by the end of 1914, a total of 3,778km (2,348 miles) of sandcrete pavement had been built in the United States [1]. Sandcrete plays important roles in construction process and a large quantity of sandcrete is being utilized in everyday construction activities. Sandcrete is a mixture of water, cement and aggregate (fine and coarse aggregate) the strength of which depends on the mixed proportion applied with water/cement ratio used to prepare it. This enhances the strength characteristic features of sandcrete interlocking stones with different shapes and thickness in terms of durability and aesthetics coupled with adequate and desire compressive strength to withstand the expected loads. Since 1995, the present evolving democratic dispensation in Nigeria have been accompanied with increased infrastructural development and the usage of sandcrete interlocking stone have been found to be increasing in recently constructed building structures both for private and public purposes. Moreover, sandcrete interlocking stones are usually applied on different areas such as building floors (exterior), warehouse, museum, art galleries, commercial garage, public hall, factories, municipal, etc. They are structural or decorative items used to cover floors, roofs and walls [10]. They could also be extended to include small flat pieces of surfacing material which is not ceramic such as carpet, wood, stone or cork. In the past, sandcrete interlocking stone had been used to enhance the outward appearance of building projects. Their unique features were that they were simple to replace together as they easily fitted into one another. They are produced in different sizes, shapes, colours and patterns. They are made from bricks, ceramics, glass and sandcrete materials. Sandcrete interlocking stones are loosely laid and do not need any adhesives. In fact, they can be removed or placed as the need arises. They are durable and easy to clean. The fact that they can be removed and replaced easily helps to ensure that no dirt or dust particles accumulate below the surface [6]. It was discovered that most of the sandcrete interlocking stone flooring for both public and private usage did not last despite the fact that most of the material used to produce them passed through test before they were used for these sandcrete interlocking stones production [15]. [16] reported that in sandcrete, aggregates and paste are the major factors that affect the strength of sandcrete. [10] stated that the strength of the sandcrete at the interfacial zone essentially depends on the integrity of the cement paste and the nature of the coarse aggregate. In both major and minor construction companies in Nigeria, the design specification for a particular project especially in the production of sandcrete interlocking stones, may state nominal mix proportion and maximum coarse aggregate size to be used for structural and non-structural sandcrete (e.g. 1:2:4 or 1:3:6 etc) but clarification is not usually made if the mix proportion is to be batched by mass or volume to achieve the specified characteristic strength. Also, the volume of water required for mixing is not often specified. The on-site practice is a visual assessment of the workability (consistence) of the sandcrete as water is added. Compressive strength that will be obtained by this practice may be quite less than the specified characteristic strength and may be different from batch to batch of the sandcrete produced if the consistence is not measured. Another problem is that most of the sandcrete interlocking stones used for both private and public building are of the same thickness. This is a waste of materials, workmanship as well as delivery time. This is not economically wise. Therefore, the objectives of this work are: to ensure that the required thickness of sandcrete interlocking stone that will sustain expected loads is used; to see that the produced Sandcrete interlocking stones are properly cured to avoid untimely breakage. And to ensure that adequate and desire strength is obtained using varying water to cement ratio

2. Methods

2.1. Water

In order to meet the requirement of international standard, the water to be used for experimental proceedings must be potable and must be within the PH range of 6.90 to 7.1. [5] [14]

Therefore, in this project, the water being used met above mentioned requirements. This water was also freed from sulphate and any other soluble salt [6] that was hazardous to compressive strength of sandcrete interlocking stone [2].

2.2. Cement

Since compressive strength of sandcrete interlocking stone depends largely on the strength of cement being used, therefore, in this project, the cement used (Dangote cement) had good finesse characteristics fresh and free of lumps. This is to ensure that rate of gain of strength is faster. This cement (Dangote cement) was in conformity to IS 456:2000. [19]

2.3. All-in-Aggregate

The aggregate used in this project is All-in-aggregate, that is to say, aggregate as it comes naturally from the river bed. When tested, it complied with IS: 383 – 1990 "specification for course and fine aggregate from natural source for CONCRETE". It was free from adherent coatings lumps, coal, coal residues and contained no organic or other admixture that might impair the strength and durability of the sandcrete interlocking stone [14], [19].

2.4. Sandcrete Segmental Interlocking Stone

Sandcrete segmental interlocking stones had been in mass production in Nigeria because the materials are readily available in the market. Many producers prefer to use the old style of mixing the raw materials to get a sandcrete by applying the mold release substance in the molder for easy removal after. This tends to cause bubbles sometimes in the paving stone if they leave excess oil in the mold [4]. Doing it locally will produce good result but it takes time and more hands will be needed which will attract more labour cost. In this project, the processes of molding, the interlocking stones used for this experiment, were done manually with the help of the equipments listed overleaf.

2.5. Sieve Analysis

2.5.1. Scope of analysis

This method covers the qualitative determination of the distribution of particle sizes in the soil used for this project. The distribution of the particles larger than 75Nm (No. 200) is determined by sieving while the distribution of particle size smaller than 75Nm is determined by a sedimentation process. Using of hydrometer is employed to obtain the necessary data. In this project, since the distribution of the particle size to be used is larger than 75Nm (No. 22), the sieving method is employed.

2.5.2. Apparatus

Drying oven, maintain at 110 ± 5°C (230 ± 9°F); Mechanical sieve shaker; Balance, class G2 in accordance with Tex-901-K, minimum capacity of 15kg (331b); Sample slitter; Standard U.S sieves, meeting the requirement of Tex-907-K; Pans; Brush; Tray/bucket

2.5.3. Procedure

This portion of 3/8” gravel retained after washing (with sodium hexametaphosphate) was weighed to be 100g and recorded. The appropriate sieve size for the test was set up with the one with the largest mesh on the top and the smallest at the bottom. The soil sample was deposited into the set of sieve and this was manually shaking thoroughly. The weight retained on each sieve was obtained and recorded. The particles which remained between the mesh openings were not pushed through the sieve instead a brush was used to remove them; soft brush for smaller sieve and hard brush for larger mesh openings with the weight retained known by weighing, the cumulative percentage of weighted retained was calculated. Thus percentage passing was obtained.

2.6. Compressive Strength of Sandcrete Test

2.6.1. Aim

To determine the compressive strength of sandcrete interlocking stones.

BS EN 12390 Part 1, 3, BS EN 12350: Part 1, BS 1881, Part 108 (1983) method was used.

2.6.2. Apparatus

Compression testing machine, rubber moulds (0.001197m^3), square mouthed shovel, head pan, mixing tray, steel tamping rod (16mm) diameter, measuring cylinder, weighing balance, cement, water, 3/8” gravel.

2.6.3. Theory

The compressive strength of sandcrete interlocking is one of the most important and useful properties of sandcrete. In most structural applications, sandcrete interlocking stone is employed primarily to resist compressive stresses. In those cases where strength in tension or in shear is of primary importance, the compressive strength is frequently used as a measure of these properties. Therefore, the sandcrete making properties of various ingredients of mix are usually measured in terms of the compressive strength. The compressive strength of sandcrete is generally determined by testing cubes or cylinders made in laboratory or field or cores drilled from hardened sandcrete at site or from the non-destructive testing of the specimen or actual structures. Strength of sandcrete is its resistance to rupture. It may be measured in a number of ways, such as, strength in compression, in tension, in shear or in flexure. All these indicate strength with reference to a particular method of testing. When sandcrete fails under a compressive load, the failure is essentially a mixture of crushing and shear failure. The mechanics of failure is a complex phenomenon. It can be assumed that the sandcrete in resisting failure generates both cohesion and internal friction. The cohesion and internal friction developed by sandcrete in resisting failure is related to more or less a single parameter i.e., w/c ratio. The modern version of original water/cement ratio rule can be given as follows:

For a given cement and acceptable 3/8” gravel, the strength that may be developed by workable, properly placed mixture of cement, 3/8” gravel and water (under the same mixing, curing and testing conditions) is influenced by:

Ratio of cement to mixing water; Ratio of cement to 3/8” gravel; Grading, surface texture, shape, strength and stiffness of aggregate particles; Maximum size of 3/8” gravel; In the above it can be further inferred that water/cement ratio primarily affects the strength, whereas other factors Vindirectly affect the strength of sandcrete by affecting the water/cement ratio.

2.6.4. Procedure

The rubber moulds to be used were selected, cleaned and the surfaces oiled lightly [7]. The moulds were placed on a rigid horizontal surface. The constituents of a 1:6 mixes (cement: 3/8” gravel) with water/cement ratio of 0.45 was weighed [12] estimated from the volume of three (3) 0.001197 mm cubical moulds and bulk density of 28 days fully hardened sandcrete which is 2400kgm^{-3}. This amounted to 0.6247kg of water, 1.3882 kg of cement and 8.3292 kg of 3/8” gravel. The 3/8” gravels was first measured with weighing scale [12] and deposited on a flat, rigid surface and spread evenly and the whole quantity of cement was poured on top of the sand. Shovel was used to mix these constituents thoroughly until a uniform mix was achieved. Water was measured and added to the mix constituents of 3/8" gravel and cement thoroughly mixed with shovel until a uniform mix was obtained [16].

The three moulds were quickly filled in layers [12] and tamped with the compacting bar, 35 strokes per mold. The strokes were distributed with the compacting bar in a uniform manner over the cross-section of the moulds while ensuring that the compacting bar does not penetrate significantly any previous layer nor forcibly strike the bottom of the mould when compacting the Sandcrete interlocking stone [17]. After compaction, the mould was struck off level and smoothened. The steps above were repeated for all the six (6) Trial experimental points and also for all the six (6) Control experimental points.

The moulds were set aside and stored for 24 hours [17] under damp conditions. The Interlocking stones were remove at the end of 24 hours and cured under water for 28 days [12]. At the end of 28 days, one interlocking stones were removed from water and excess moisture was wiped from the surface of the sandcrete before placement in the compression testing machine. All bearing surface of the testing machine was wiped clean and any loose grit or other extraneous material on the surface of the sandcrete interlocking stones that will be in contact with the platens was removed. The interlocking specimen was positioned so that load could be applied perpendicular [5] to the direction of casting of sandcrete with the toweled surface facing either side of the testing machine. The sandcrete is centered to an accuracy of ± 1% of the designated size of sandcrete interlocking stones. Select a constant rate of loading with the range of 0.2mpa/s (N/mm^2) or 4.5KN/s — 22.5KN/s and record the maximum load indicated. The load application is repeated for the other two cubes 28 days respectively and the load at failure is recorded.

3. Results

The results obtained from the experiments carried out are shown in tables 1 to 5 below. Similarly the matrix analysis used for the trial experimental and control experimental point details are also included

Table 1. *Particle Size Distribution of Fine Aggregate.*

Observation Sheet

IS Sieve Size	Weight of fine Aggregate Retained / Determination No I	II	III	Average	% Retained	Cumulative% Retained	% Passing
1	2	3	4	5	6	7	8
10mm	0	0	6	2	0.2	0.2	99.8
4.75mm	10	12	14	12	1.2	1.4	98.6
2.36mm	38	30	22	30	3.0	4.4	95.6
1.18mm	314	322	330	322	32.2	36.6	63.4
600mic	212	188	224	208	20.8	57.4	42.6
300mic	272	290	266	276	27.6	85.5	15.0
150mic	110	102	109	107	10.7	95.7	4.3
75mic	20	26	17	21	2.1	97.8	2.2
Pan	24	30	12	22	2.2	100.0	0

Total weight = 1000grams

REMARK: 3/8" gravel corresponds to grading zone is in zone II

Copmpressive Strenght Analysis

Mix Ratio

0.45: 1:6

0.50: 1:5

0.55: 1: 5.5

Legend

X_1 = proportion of water

X_2 = proportion of cement

X_3 = proportion of sand

NB: $\Sigma (X_1 + X_2 + X_3) = 1$

Table 2. *Experimental Points.*

S/No	Coded component X_1	X_2	X_3	Compressive strength	Real component S_1	S_2	S_3
Trial Experimental Points							
T_1	1	0	0	Y_1	0.45	1	6
T_2	0	0	0	Y_2	0.50	1	5
T_3	0	1	1	Y_3	0.55	1	5.50
T_4	0.5	0	0	Y_{12}	0.475	1	5.50
T_5	0.5	0.5	0.5	Y_{13}	0.50	1	5.75

S/No	Coded component			Compressive strength	Real component		
	X_1	X_2	X_3		S_1	S_2	S_3
T_6	0	0.5	0.5	Y_{23}	0.525	1	5.25
Control Experimental Points							
C_1	0.75	0.25	0	Y_1	0.4625	1	5.750
C_2	0.40	0.40	0.20	Y_2	0.490	1	5.50
C_3	0.30	0.50	0.20	Y_3	0.495	1	5.40
C_4	0.25	0	0.75	Y_{12}	0.525	1	5.625
C_5	0.45	0.05	0.50	Y_{13}	0.5025	1	5.70
C_6	0.35	0.60	0.05	Y_{23}	0.485	1	5.375

$$S = AX \quad (1)$$

A = co-efficient matrix
X = coded component

$$A = \begin{bmatrix} 0.45 & 0.50 & 0.55 \\ 1 & 1 & 1 \\ 6 & 5 & 5.5 \end{bmatrix} \quad (2)$$

$$X = \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} \quad (3)$$

$$S = AX = \begin{bmatrix} 0.45 & 0.50 & 0.55 \\ 1 & 1 & 1 \\ 6 & 5 & 5.5 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix}$$

Density of concrete = 2400kg/m^3
Volume of interlocking stone = 0.001197m^3
For Experiment No. 1
Total Ration = 7.45

$$\text{Water content} = \frac{0.45 \times 2400 \times 0.001197 \times 3 \times 1.2}{7.45} = 0.6247\text{kg}$$

$$\text{Cement content} = \frac{1 \times 2400 \times 0.001197 \times 3 \times 1.2}{7.45} = 1.3882\text{kg}$$

$$\text{Sand content} = \frac{6 \times 2400 \times 0.001197 \times 3 \times 1.2}{7.45} = 8.3292\text{kg}$$

For experiment No. 2

Total Ratio = 0.50 + 1 + 5 = 6.5

$$\text{Water content} = \frac{0.5 \times 2400 \times 0.001197 \times 3 \times 1.2}{6.5} = 0.7955\text{kg}$$

$$\text{Cement content} = \frac{1 \times 2400 \times 0.001197 \times 3 \times 1.2}{6.5} = 1.5910\text{kg}$$

$$\text{Sand content} = \frac{5 \times 2400 \times 0.001197 \times 3 \times 1.2}{6.5} = 8.6184\text{kg}$$

For Experiment No. 3

Total Ratio = 0.55 + 1 + 5.5 = 7.05

$$\text{Water content} = \frac{0.55 \times 2400 \times 0.001197 \times 3 \times 1.2}{7.05} = 0.8068\text{kg}$$

$$\text{Cement content} = \frac{1 \times 2400 \times 0.001197 \times 3 \times 1.2}{7.05} = 1.4670\text{kg}$$

$$\text{Sand content} = \frac{5.5 \times 2400 \times 0.001197 \times 3 \times 1.2}{7.05} = 8.0683\text{ kg}$$

For Experiment No. 4

Total Ratio = 0.475 + 1 + 5.5 = 6.975

$$\text{Water content} = \frac{0.475 \times 2400 \times 0.001197 \times 3 \times 1.2}{6.975} = 0.7043\text{kg}$$

$$\text{Cement content} = \frac{1 \times 2400 \times 0.001197 \times 3 \times 1.2}{6.975} = 1.4827\text{kg}$$

$$\text{Sand content} = \frac{5.5 \times 2400 \times 0.001197 \times 3 \times 1.2}{6.975} = 8.1550\text{kg}$$

For Experiment No. 5

Total Ratio = 0.5 + 1 + 5.750 = 7.250

$$\text{Water content} = \frac{0.5 \times 2400 \times 0.001197 \times 3 \times 1.2}{7.25} = 0.7132\text{kg}$$

$$\text{Cement content} = \frac{1 \times 2400 \times 0.001197 \times 3 \times 1.2}{7.25} = 1.4265\text{kg}$$

$$\text{Sand content} = \frac{5.75 \times 2400 \times 0.001197 \times 3 \times 1.2}{7.25} = 8.2023\text{kg}$$

For Experiment No. 6

Total Ratio = 0.525 + 1 + 5.25 = 6.775

$$\text{Water content} = \frac{0.525 \times 2400 \times 0.001197 \times 3 \times 1.2}{6.775} = 0.8014\text{kg}$$

$$\text{Cement content} = \frac{1 \times 2400 \times 0.001197 \times 3 \times 1.2}{6.775} = 1.5265\text{kg}$$

$$\text{Sand content} = \frac{5.25 \times 2400 \times 0.001197 \times 3 \times 1.2}{6.775} = 8.0142\text{kg}$$

Control Experimental Points
For Experiment No. 1

Total Ratio = 0.4625 + 1 + 5.750 = 7.2125

$$\text{Water content} = \frac{0.4625 \times 2400 \times 0.001197 \times 3 \times 1.2}{7.2125} = 0.6632\text{kg}$$

$$\text{Cement content} = \frac{1 \times 2400 \times 0.001197 \times 3 \times 1.2}{7.2125} = 1.4339\text{kg}$$

$$\text{Sand content} = \frac{5.75 \times 2400 \times 0.001197 \times 3 \times 1.2}{7.2125} = 8.2450\text{kg}$$

For Experiment No. 2

Total Ratio = 0.490 + 1 + 5.5 = 6.99

$$\text{Water content} = \frac{0.49 \times 2400 \times 0.001197 \times 3 \times 1.2}{6.990} = 0.7250\text{kg}$$

$$\text{Cement content} = \frac{1 \times 2400 \times 0.001197 \times 3 \times 1.2}{6.99} = 1.4796\text{kg}$$

$$\text{Sand content} = \frac{5.5 \times 2400 \times 0.001197 \times 3 \times 1.2}{6.990} = 8.1375\text{kg}$$

For Experiment No. 3

Total Ratio = 0.495 + 1 + 5.40 = 6.895

Water content = $\frac{0.495\times2400\times0.001197\times3\times1.2}{6.8950}$= 0.7425kg

Cement content = $\frac{1\times2400\times0.001197\times3\times1.2}{6.8950}$= 1.4999kg

Sand content = $\frac{5.4\times2400\times0.001197\times3\times1.2}{6.8950}$= 8.0997kg

For Experiment No. 4

Total Ratio = 0.525 + 1 + 5.625 = 7.15

Water content = $\frac{0.525\times2400\times0.001197\times3\times1.2}{7.1500}$= 0.7594kg

Cement content = $\frac{1\times2400\times0.001197\times3\times1.2}{7.1500}$= 1.4464kg

Sand content = $\frac{5.625\times2400\times0.001197\times3\times1.2}{7.1500}$= 8.1363kg

For Experiment No. 5

Total Ratio = 0.5025 + 1 + 5.70 = 7.2025

Water content = $\frac{0.5025\times2400\times0.001197\times3\times1.2}{7.2025}$= 0.7215kg

Cement content = $\frac{1\times2400\times0.001197\times3\times1.2}{7.2025}$= 8.1846kg

For Experiment No. 6

Total Ratio = 0.485 + 1 + 5.375 = 6.86

Water content = $\frac{0.485\times2400\times0.001197\times3\times1.2}{6.8600}$= 0.7312kg

Cement content = $\frac{1\times2400\times0.001197\times3\times1.2}{6.8600}$= 1.5076kg

Sand content = $\frac{5.375\times2400\times0.001197\times3\times1.2}{6.8600}$= 8.1033$kg$

***Table 3.** Summaries of Constituent Materials.*

S/No.	Water content (kg)	Cement content (kg)	Sand content (kg)
Trial Experimental Points			
T_1	0.6247	1.3882	8.3292
T_2	0.7955	1.5910	8.6184
T_3	0.8068	1.4670	8.0683
T_4	0.7043	1.4827	8.1550
T_5	0.7132	1.4265	8.2023
T_6	0.8014	1.5265	8.0142
Control Experimental Points			
C_1	0.6632	1.4339	8.2450
C_2	0.7250	1.4796	8.1375
C_3	0.7425	1.4999	8.0997
C_4	0.7594	1.4464	8.1363
C_5	0.7215	1.4359	8.1846
C_6	0.7312	1.5076	8.1033

Compressive Strength Results

***Table 4.** Compressive strength results for trial points.*

Trial Test Result Sheet.

	A			B			C			Average	
	Weight (g)	Load (N)	Strength (N/mm^2)	Weight (g)	Load (N)	Strength (N/mm^2)	Weight (g)	Load (N)	Strength (N/mm^2)	(N) Av. Load	(N/mm^2) Av. Strength
T_1	3113	206.92	10.40	3128	211.85	10.60	2969	209.20	10.50	209.30	10.50
T_2	3168	396.14	19.90	3194	398.90	19.99	3199	398.20	20.00	397.70	20.00
T_3	3000	182.99	9.20	3107	180.96	9.10	3019	186.00	9.30	183.30	9.20
T_4	3273	276.23	13.80	3105	284.50	14.30	3115	281.70	14.10	280.80	14.10
T_5	3033	209.53	10.50	3217	212.86	10.70	3166	214.60	10.80	212.30	10.70
T_6	3047	203.73	10.21	3081	206.30	10.30	2986	210.00	10.50	206.70	10.30

***Table 5.** Compressive strength results for control points.*

Control Experimental Points

	A			B			C			Average	
	Weight (g)	Load (N)	Strength (N/mm^2)	Weight (g)	Load (N)	Strength (N/mm^2)	Weight (g)	Load (N)	Strength (N/mm^2)	(N) Av. Load	(N/mm^2) Av. Strength
C_1	3156	243.60	12.20	3013	242.60	12.10	3242	250.00	12.50	245.40	12.30
C_2	2983	261.10	13.10	3205	267.70	13.40	3196	268.70	13.50	265.80	13.30
C_3	3034	223.40	11.20	3274	227.10	11.40	3187	230.40	11.50	227.00	11.40
C_4	3046	221.30	11.10	3052	226.60	11.40	2947	233.20	11.70	227.00	11.40
C_5	2916	224.50	11.30	3213	233.90	11.70	2848	226.80	11.40	228.40	11.50
C_6	3001	224.30	11.20	3302	231.00	11.60	3107	233.70	11.70	229.70	11.50

4. Discussion

With the values of compressive strength gotten in the tables 1-5 above, it can be referred that water/cement ratio have a very significant role to play in the extent to which a sandcrete interlocking stone can withstand the expected compressive load. It is the determinant factor of compressive strength. Therefore, for commercially produced sandcrete interlocking stone, the mix ratio specified and used in this research work would be economically viable as there is no international standard for compressive strength of sandcrete interlocking stone. This will enable the average people to be able to use sandcrete interlocking stone for their pavement flooring.

5. Conclusion

From the various experimental procedures and tests performed, the following conclusions can be drawn that: the mix proportion of trial experiment points number three (T3) can be effectively utilized in normal sandcrete interlocking stones where desired strength is required at 28 days. Sandcrete interlocking stone contributes to the structural capacity of the pavement system, a preliminary test be done to ascertain the exact volume proportion that will give the designed target strength rather than specifying an unconfirmed standard mix proportion which is mostly done in many construction sites. Provided that there is provision for 3/8" gravel, average people can use mix proportion suggested above (i.e. Trial experimental point 3) to produce Sandcrete interlocking stones for their pavement flooring, though they cannot avoid aggregate due to financial incapability. For commercially produced Sandcrete interlocking stones, the mix ratio specified and used in this project would be economically satisfied as there is no standard compressive strength for Sandcrete interlocking stone.

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