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Study On Compressed Stabilized Earth Blocks By Using Chemicals

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Abstract: *One of the governing factors on which safety of civil engineering structure depends is material used in construction. Materials used for the construction of walls are normally required to possess adequate strength and erosion resistance. The study investigates the suitability of stabilized laterite soils for the production of compressed earth blocks for low-cost housing construction. The materials which is used for this experiment is red soil and some chemicals. The results of the study revealed that the specific gravity, bulk density, moisture content and plasticity index of the sample showed satisfactory performance. This experimental mainly deals with the manufacture of compressed stabilized earth blocks by using chemicals. The blocks are tested under CTM for compressive strength. The cost comparison with the conventional bricks has revealed that compressed cement stabilized soil block is preferred because it is more economical walling material in itself and permits the use of economical building techniques.*

Keywords*-Soil stabilization, Algiplast 210N, Conplast SD110, Water absorption, Compressive Strength*

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I. Introduction

A compressed earth block also known as pressed earth block or compressed soil block, is a building material made primarily from damp soil compressed at high pressure to form blocks. If the blocks are stabilized with a chemical binder such as Portland cement they are called Compressed stabilized earth block (CSEB) or Stabilized earth block (SEB).Constructed earth blocks are masonry elements, which are small in size and which have a regular and verified characteristic obtained by the static or dynamic compression of earth in a humid State followed by immediate remoulding. Earth construction is very cost effective, energy efficient (excellent thermal properties and low energy input required for production), environmentally friendly, and safe, qualities which are particularly relevant and important with the ever growing need for increased awareness to reduce energy consumption worldwide.

The investigation of alternative materials for the construction of low cost housing has been the focus of many studies in many developing countries. The present rate of construction in developing countries according to is generally sufficient to meet the needs of only 10% of the net increase in population per year. This is partly due to the unavailability and the soaring costs of conventional building materials. As this shortage of building is becoming worse, more efforts are being made to develop cheap, serviceable and energy efficient construction materials for the construction of affordable sustainable buildings.Masonry is one of the most popular materials for housing construction due to its useful properties such as durability, relatively low cost, good sound and heat insulation, acceptable fire resistance, adequate resistance to weathering and attractive appearance. The global interest about the environment according to has increased the use of earth as a building material. The direct use of earth without modification for wall construction in any form has the disadvantage of low performance. The shortcomings principally are low mechanical characteristics, unsatisfactory resistance to weathering and liability to volume change especially in the case of clay. These disadvantages can be improved to make the material compatible with desired application in construction by combined chemical and mechanical action technically known as stabilization.

CompressedStabilized Earth Blocks (CSEB) offer a number of advantages which includes increased utilization of local material and reducing the cost of transportation as the production is in situ, makes quality housing available to more people, and generates local economy rather than spending for import materials. Other advantages are faster and easier construction method resulting in the lesser requirement of skilled labour, good strength, insulation and thermal properties, less carbon emission and embodied energy in the production phase, create extremely low level of waste and cause no direct environmental pollution during the whole life cycle. Earth bricks have the ability to absorb atmospheric moisture which creates healthy environment inside a

building for its occupants. One of the drawbacks of using earth alone as a material for construction as posited by is its durability which is strongly related to its compressive strength. Because most soil in their natural condition lack the strength, dimensional stability and durability required for building construction. These properties can be enhanced through stabilization.

II. Headings

1. SYSTEM model

Traditional earth construction techniques such as wattle and daub, cob and adobe need continuous maintenance in order to keep them in good condition. Current research, carried out at Saradka region in Kasaragod District, Kerala, aims to increase the durability of earth as a construction material. Their work has led to the improvement of rammed earth and compressed stabilized earth blocks as building techniques. Unfortunately the quality of compressed stabilized earth blocks in some construction schemes is far from adequate and often materials are wasted in the production process. To extend the use of compressed stabilized earth building blocks to all types of housing e.g. low-cost housing in rural and urban areas and middle income housing in urban areas, production techniques need to be further improved so as to achieve better quality and reduce production costs. In order to do this the following points need to be considered carefully:

- Proportions between soil and stabilizer need to be optimized, taking into consideration the specific characteristics of the soil,
- Compaction pressure applied to the moist soil mix needs to be sufficient so as to produce blocks that are dense and strong with regular surfaces and edges.
- Block surfaces need to be smooth so that they have the potential to be used without an additional surface coating or render.

Good quality compressed stabilized earth blocks improve hygiene (e.g. there will be less surface cracks for insects to lodge in), reduce maintenance and repair costs and, in general, prolong the life span of a building.

2. Previous work

Study on Compressed Stabilized Earth BlockShivnath Jangid, Milind DaradeThe Present Study is used to analysis the soil which is better for stabilized earth block. The Engineering behaviour of Compress stabilized sand block (CSSB) such as compression strength, durability, water absorption etc. are depends on the types of soil and stabilized material as binder. Here the soil will be mixed with suitable proportion of stabilized such as lime, fly ash, cement , coir and Chemicals will be compressed manually or mechanically From literature review it find that by adding different stabilizer in soil upto some fixed proportion will increase technical properties of soil block. The Block produced will have more strength than conventional burnt clay brick. Soil tested and regarded as favourable for CSSB on the basis of density index which manufacture by Block Cotton Soil. It Concluded that the soil have more Compressive strength than normal brick but cannot satisfy the Condition of water absorption.

Properties of Compressed Stabilized Earth Blocks (CSEB) For Low-Cost Housing Construction: A Preliminary Investigation

Baba Shehu Waziri, Zanna Alhaji Lawan, MustaphaMaterials used for the construction of walls are normally required to possess adequate strength and erosion resistance. The study investigates the suitability of stabilized laterite soils for the production of compressed earth blocks for low-cost housing construction. Soil samples for the experiment were obtained at two different locations. Sample I was obtained at a borrow pit along Gujba road in Damaturu Yobe state while Sample II was taken at a borrow pit near lake Alau in Borno sate, Nigeria. The results of the study revealed that the specific gravity, bulk density, moisture content and plasticity index of both samples showed satisfactory performance. Different cement stabilization levels of 0%, 2.5%, 5% and 7.5% were used to prepare the specimens for testing. The blocks were moulded using hand operated CINVA-Ram machine.The maximum compressive strength of 2.48N/mm2 was obtained with stabilization level of 7.5% with sample I at 28 days curing. The strength of the specimens increases with increasing cement content with an average value of 0.35N/mm2. For higher strength requirements different stabilization options can be considered

III. Indentations and Equations

Specific gravity of cement

Mainly Specific Gravity is the is the ratio of the density of a substance to the density of a reference substance at a fixed temperature. On the other words, it is the ratio of the mass of a substance to the mass of a reference substance. And the theme is also same for cement. Specific Gravity of cement is the ratio of the density or mass of cement to the density or mass of a reference substance.But in both of the state's density or mass, the volume should be same. If the volume does not remain same the specific gravity has no existence then. Because the mass or density will be changed of the substance or reference substance.

We calculate specific gravity of any substance to know the behavior of the material in water. And we can know the material will sink or floats in the water. All of the materials in our environment have a fixed specific gravity. The usual range is 1-100. If the specific gravity is greater than 1, then it sinks in water. If the specific gravity Is less than 1 it floats in water. So if the specific gravity of any substance is known to us we can use the materials in suitable place of any work.

Specific gravity of cement $= W_5 \times (W_3 - W_1)$
$((W_5 + W_3 - W_4) \times (W_2 - W_1)$

Where W_1= mass of empty bottle
W_2=Mass of empty bottle + Water
W_3=Mass of empty bottle +kerosene
W_4=Mass of empty bottle +kerosene+cement
W_5 =Weight of cement

Specific gravity of soil sample

The specific gravity of solid substances is the ratio of the weight of a given volume of material to the weight of an equal volume of water (at 20^0C).In effect, it tells how much heavier the material is than water. For exact analysis, the specification require distilled or demineralized water and all measurements of water and solids should be made at stated temperature.

$$G = \frac{W_2 - W_1}{(W_2 - W_1) - (W_3 - W_4)}$$

W_1 = Empty weight of Pycnometer
W_2 =Empty weight of Pycnometer + 1/3rd of soil
W_3 = Empty weight of Pycnometer + 1/3rd of soil + Water
W_4 = Empty weight of Pycnometer + Water

IV. Figures and Tables

Fig. 2.1 Breaking of CSEBs in CTM

Tests

For Cement

- Specific gravity
- Normal consistency
- Setting time

a.Initial setting time
b.Final setting time
For soil

- Specific gravity
- Sieve analysis
- Liquid limit & Plastic limit
- Compaction Test

For soil blocks

- Total water absorption test
- Compressive strength test

TABLE 1. **TESTS FOR SOIL**

Specific gravity of soil sample	2.23
Modified proctor compaction test 1.Maximum dry density 2.Optimum moisture	 1.44 gm/cc 10%
Liquid limit	32.75%
Plastic limit	50%

TABLE 2. **TESTS FORSOIL BLOCKS**

Water absorption test 1.For 7 days 2.For 14 days 4.For 28 days	 23.19% 22.38% 21.54%
Compression test 1.For 7 days 2.For 14 days 4.For 28 days	 4.545 mpa 4.696 mpa 4.949 mpa

TABLE 3. **TESTS FOR CEMENT**

Specific gravity	3.18
Standard consistency	33%
Setting time 1.Initial 2.Final	 45 min. 600 min.

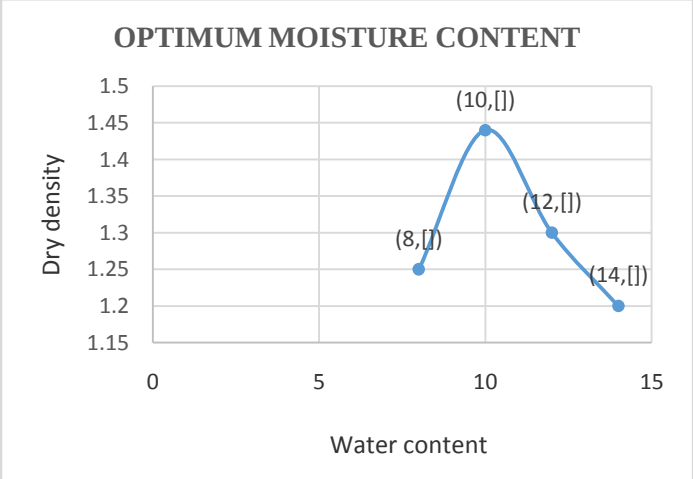


Figure. Compaction test

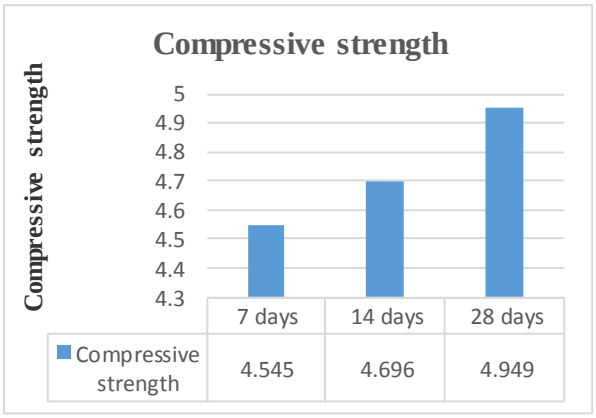
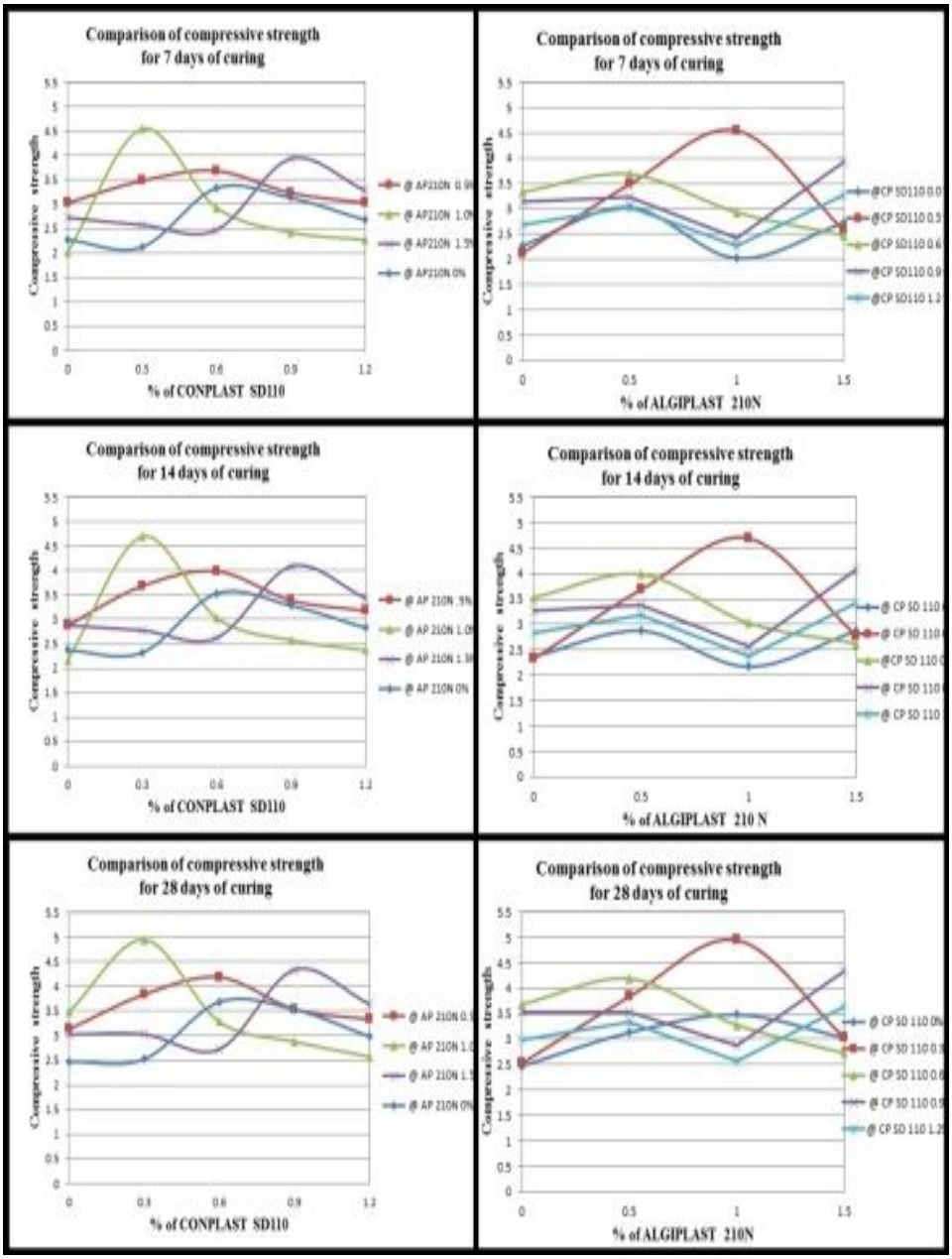


Figure. Compression Test



4.3 Comparison of compressive strength

V. Conclusion

Compressed Stabilized Earth Blocks (CSEB) offer a number of advantages which includes increased utilization of local material and reducing the cost of transportation as the production is in situ, makes quality housing available to more people, and generates local economy rather than spending for import materials. The previous sections have demonstrated that in general, the utilization of compressed stabilized earth buildings blocks in building construction can provide a great number of advantages, especially to the India's building industry and developing countries in general. If the chemicals like Algiplast 210N & Conplast SD110 are added then the above experiments have shown that the strength and the durability of compressed stabilized earth blocks is increased. The development and promotion of good quality building blocks can also improve the standard of living for low-income groups in developing countries. Soil blocks are the only building material that can be produced in-situ if the proper equipment and optimum amount of stabilizer is available. For example, housing authorities may organize for the transport of a block making machine and supporting equipment to the building site and assist in training of the work-force. Alternatively, the equipment can be owned by a contractor within the urban areas, and/or by co-operatives in rural areas operating on a self-help basis.

- Stabilized compressed earth blocks include; uniform, sized building components which can result in less waste, faster construction and the possibility of using other pre-made components or modular manufactured building elements.
- Major usage in the world for construction is clay bricks; many researchers are presently looking for newer options because they need low cost materials, which are also environmentally friendly.
- When the soil is stabilized with 10% of cement and Algiplast 210N, Conplast SD110 is of 1.0% & 0.3% respectively, the highest compressive strength of 4.949N/mm^2 and water absorption of 21.54% was achieved.
- The investigation of this thesis has revealed that many different factors are responsible for ensuring a good bond between the cement, chemicals and particles mix together. These requirements not only affect the components of the mixture used, how it prepared, delivered into its final state, but also environmental conditions of the finished product.

References

[1]. Properties of Compressed Stabilized Earth Blocks (CSEB) For Low-Cost Housing Construction: A Preliminary Investigation by Baba Shehu Waziri, Zanna Alhaji Lawan, Mustapha, Maaji Mala , International Journal of Sustainable Construction Engineering & Technology (ISSN: 2180-3242) Vol 4, No 2, 2013, page no.39-44
[2]. Compressed Stabilized Earth Blocks by using Lime by Abhijeet D. Patil, Dr. A. C. Attar, International Journal of Engineering Research & Technology (IJERT)ISSN: 2278-0181 (Vol. 4 Issue 09, September-2015
[3]. Study on bricks and stabilized compressed earth blocks by Sadek Deboucha and Roslan Hashim, Scientific Research and Essays Vol. 6(3), page no. 499-506,February, 2011
[4]. Study of compressed cement stabilized soil block as an alternative wall making material by Asmamaw Tadege (October 2007).
[5]. Durability of compressed stabilized earth blocks by Iyambo Lisias Ipinge, July 2012.
[6]. Study of stabilized mud block as an alternative building material and development of models by Habtemariam molla.
[7]. A Critical Analysis of Waterproofing Compressed Earth Blocks, Jonathan Chew BSc (Hons) Construction Management Southampton Solent University (2012).
[8]. Compressed stabilized earth blocks and stabilized earth techniques research and development by the auroville earth institute (AVEI), Satprem Main (November 2010).
[9]. Research article studies on stabilized compressed earth blocks by Dr.S.Maragatham (December 2011). International Journal of Current Research Vol. 3, Issue, 12, page no.160-161
[10]. Study of Compressed Stabilised Earth Block by B. N. Patowary, N. Nath, I. Hussain, H. J. Kakoti, International Journal of Scientific and Research Publications, Volume 5, Issue 6, June 2015 ,2250-3153

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