

## Study on Compressed Stabilised Earth Blocks Using ALGIPLAST Admixtures

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### ABSTRACT

One of the governing factors on which safety of civil engineering structure depends on 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 are used in 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 stabilised 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 stabilised soil block is preferred because it is more economical walling material in itself and permits the use of economical building techniques.

**Keywords:** CSEB, Chemicals, Compressive strength.

### 1. INTRODUCTION :

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 [1]. 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 an extremely low level of waste and cause no direct environmental pollution during the whole life cycle [2, 3]. Earth bricks have the ability to absorb atmospheric moisture which creates a 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 soils in their natural condition lack the strength, dimensional stability, and durability required for building construction [4, 5]. These properties can be enhanced through stabilization. Many investigators have studied different types of chemicals as admixtures in the compressed stabilized earth blocks [6-9].

### 2. MATERIALS USED :

#### 2.1 ALGIPLAST 210 N

Algiplast 210 N is a plasticizer liquid admixture with air entraining properties. It is highly economical plasticizer recommended for M15 to M30 grade concrete. It makes concrete cohesive and reduces bleeding. Improves compressive strength, reduces w/c ratio by 10-15%. Algiplast 210 N assists in the manufacture of a more uniform and predictable concrete. The product shall have a relative density less than 1.3.

#### 2.2 CONPLAST SD110

Conplast SD110 is used to reduce material cost by reduction in cement without loss of strength or by

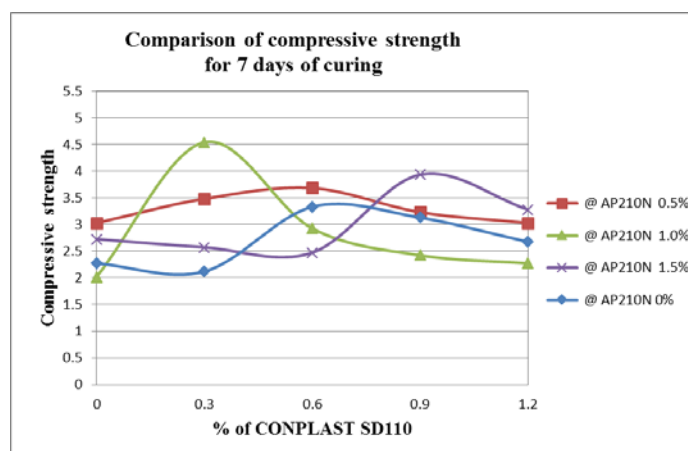
increasing strength without additional cement. To get high early strength to improve upon productivity Conplast SD110 is supplied as ready to use materials. Optimum dosage is best determined by site trials. 0.40 litres per 100 Kg of cement is normally used. Conplast SD110 is a brown liquid which has been formulated for optimum performance as a cement saver under manufacturing conditions encountered in earthen blocks. Conplast SD110 disperses the fine particles in the mix, improving cement dispersion and compaction to maximize the strength obtained from the cement used. Controlled air entrainment maintains yield and improves surface finish while providing improved resistance to frost attack.

### 2.3 RED AND LATERITE SOIL

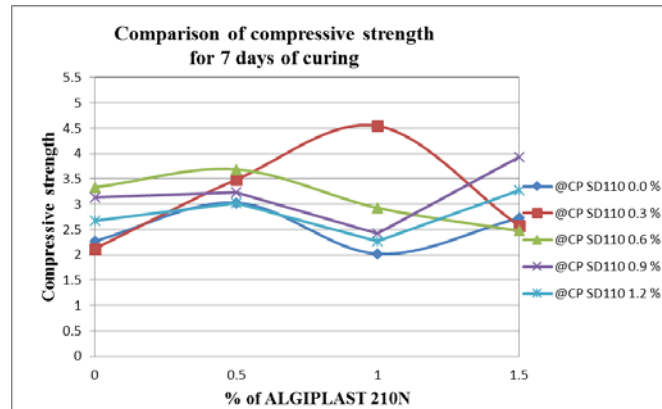
Spread over some 30% land area they occur extensively in eastern Madhya Pradesh, on Bihar plateau, in Orissa and parts of West Bengal, Andhra Pradesh, Karnataka, Kerala, and Tamilnadu. Most red soils are shallow that limits their capacity to hold water greatly reducing their agricultural potential.

### 3. RESULTS AND DISCUSSIONS :

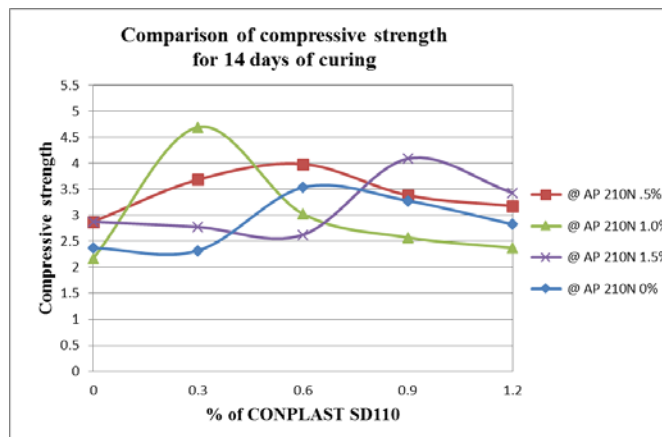
The compressive strength is the most universally accepted value for determining the quality of bricks. The crushing strengths of the blocks were tested using the universal testing machine. A total of 60 specimens were prepared and crushed at different curing ages of 7 [Chart 1 & 2], 14 days [Chart 3 & 4] and 28 days [Chart 5 & 6]. Compressive tests were conducted on the blocks at different ages to indicate the rate of strength gain and the strength at a point in time Average Compressive strength for 7 days, 14 days and 28 days curried compressed stabilized earth blocks in different chemical proportions as shown in the Chart 7. The result shows that the highest compressive strength of 4.949 N/mm<sup>2</sup> was obtained from the sample at the curing age of 28 days. According to the optimum cement content is in the range of 5%-10%. The strength obtained also compares favorably with the minimum British Standard requirements of 2.8 N/mm<sup>2</sup>.



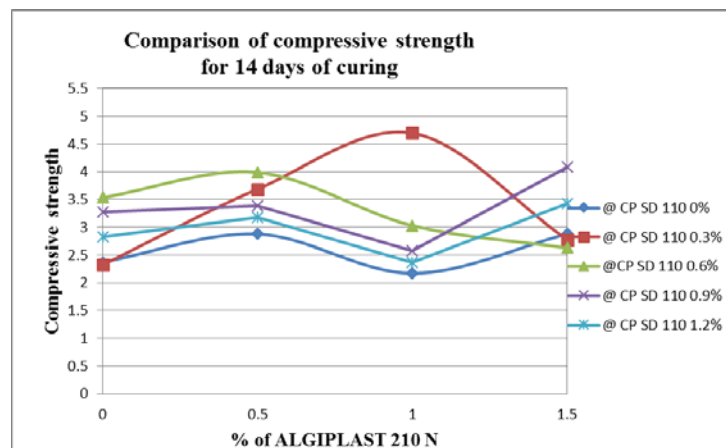
**Chart -1:** Compressive strength for 7 days curried compressed stabilized earth blocks in different chemical proportions



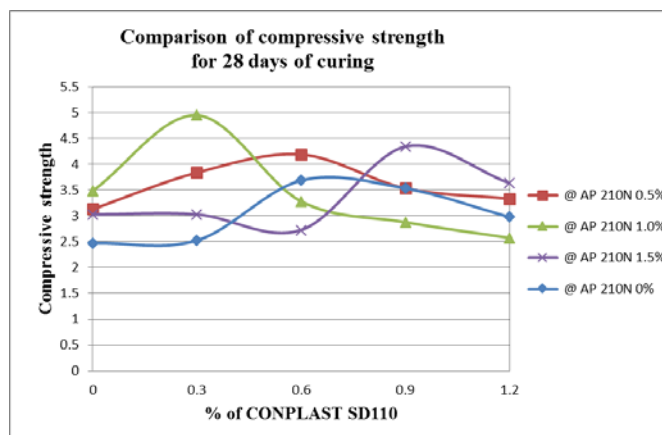
**Chart -2:** Compressive strength for 7 days cured compressed stabilized earth blocks in different chemical proportions



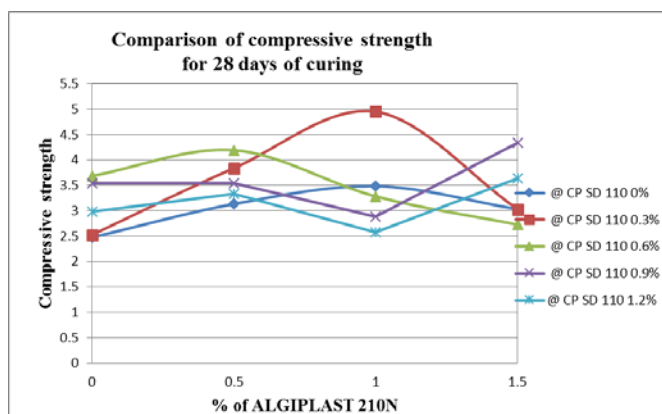
**Chart -3:** Compressive strength for 14 days cured compressed stabilized earth blocks in different chemical proportions



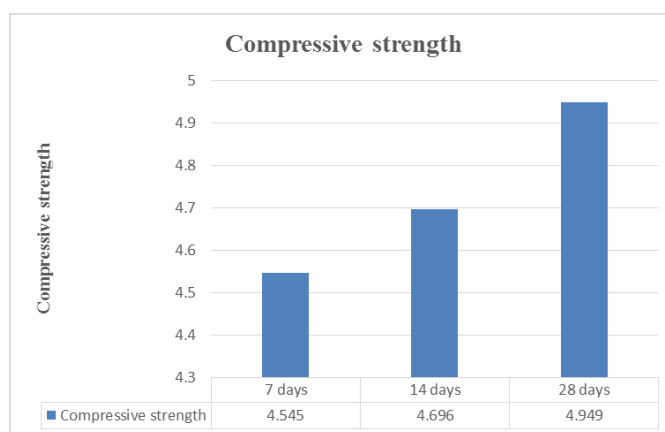
**Chart -4:** Compressive strength for 14 days cured compressed stabilized earth blocks in different chemical proportions



**Chart -5:** Compressive strength for 28 days cured compressed stabilized earth blocks in different chemical proportions



**Chart -6:** Compressive strength for 28 days cured compressed stabilized earth blocks in different chemical proportions



**Chart -7:** Average Compressive strength for 7, 14 and 28 days cured compressed stabilized earth blocks in different chemical proportions

**4. TOTAL WATER ABSORPTION TEST :**

The amount of water that is absorbed by a compressed stabilized earth block represents the volume of voids. The capillary action of material confers the existence of pores. The total absorption of a compressed stabilized block is to be known for the following causes.

- The compressed stabilized blocks can be checked for its quality

- Comparison with standard values for other materials
- Durability and structural classification of stabilized block
- The water content of stabilized block which is approximately same as to the voids

Therefore, the compressed stabilized earth block shows good performance which absorbs less water and retains good quality as well as durability. Total water absorption test was conducted on all the twenty samples types with different curing periods. The experimental results of the water absorption test show the effect of chemical content on the water absorption capacity of the blocks. According to the tabulated results, the mean water absorption values for the various samples tested range from 21.54% to 23.19%.

## **5. CONCLUSIONS :**

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 are 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 stabilizers are available. For example, housing authorities may organize for the transport of a block making the machine and supporting equipment to the building site and assist in the 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<sup>2</sup> 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.

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