Stress Strain Behavior of Compressed Stabilised Earth Blocks Using Geogrids

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Abstract*: The Existing Situation is employed to concern the soil that is more desirable for compressed stabilised earth block. The behavior of Compressed stabilised earth block (CSEB) on the contrary compressive load, sturdiness, water suction etc. are controlled by the kinds of fine material and stable substance as stickum. The fine material is blended with relevant part of stabilised like fine ashes, cement, coconut fibers and Chemicals are consolidated by labouringly or by using machines. From the review it should be identified that by enumerate Unlike stabilizer in fine aggregate up to a few agreed proportion that rising a practical things of a block. The Specimen is additional strength than typical burnt clay brick. The Soil is checked in a laboratory and considered as a favorable for CSEB on the argument of compactness for the preparation by Montmorillonite Soil. Now it can be decided that the fine aggregate has higher strength than the casual brick but it not please the quality of absorption of water.

***Index Terms*: Cement, Soil, Water, Geo-grid, Stress-Strain relationships.**

I. INTRODUCTION

Masonry is an assemblage of masonry units and mortars. Masonry properties and behavior are controlled by the characteristics of masonry units and mortar as well as the bond between them. Burnt clay bricks and cement mortars are the most commonly used materials for the construction. Significant studies have been made on properties and behavior of brick masonry in cement mortar. Apart from bricks several types of masonry units and mortars are used. Now a day's Compressed stabilised earth blocks is abundantly used as a replaceable to the normal clay bricks in the construction of masonry. A large number of Compressed stabilised earth blocks constructions are performing satisfactorily for the past several years. Popularity of this new material can be mainly attributed to the advantages such as low cost, low energy content, decentralized production, utilization of locally available soil, better shape and pleasing appearance. These blocks were prepared by applying a pressure and processed soil-cement propotions in a manually operated machine and can be produced in the construction site itself. Soil is one of the essential ingredients used in the production of Compressed stabilised earth blocks.

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Soil is composed mainly of gravel, sand, silt and clay. Percentages of these constituents, block density and quantity of cement are the factors which influence the strength and durability characteristics of Compressed stabilised earth blocks. Percentage of constituents in the soil may vary from place to place.In this studies for the production and properties of a Compressed stabilised earth blocks have been carried out by several investigations. These investigations reveal that the properties of stabilised blocks are support greatly influenced by soil-cement composition percentage and block density. Mitra (1951) after examining 9 types of local soils has concluded that block of soils of sandy in nature with five percent of cement provides a required strength and safe keeping resist to weathering. Sarangapani [1992] had investigated in detail, The suitability of soils in and around kengeri for the production of Compressed stabilised earth blocks. Reddy and Jagadeesh(1995) have also found the soils have sandy in nature are suitable for stabilization showing better strength and durability characteristics. There is hardly any information regarding the compositions of the soils available in and around Kengeri and their relation to the strength of stabilisation of earth blocks by compressing. Hence in present investigation is aimed at determining the stress strain behaviour of Compressed stabilised earth blocks produced by using locally available soils and geo-grid as a reinforcing material.

II. PRELIMINARY INVESTIGATION OF MATERIALS AND METHODOLOGY USED FOR PREPARING MASONRY SPECIMENS

Cement

43 grade of cement confirming to Indian standards code IS 8112:1989 is applied in this investigation.

Soil

The quality of soil for the preparation of stabilised blocks should be suited. Commonly, it consists of a minerals of clay and dormant substances like silt and sand.

Water

The water is used for the preparations of blocks is to be resist the properties like strength and sturdiness.

Geo-grid

It is used as a reinforcement.

III. METHODOLOGY

Soil is the old construction material used in early ages. The soil is used widely from compressed block to earthen dams. cement or lime. Therefore, we prefer today and to called them as a Compressed Stabilized Earth Blocks(CSEB). The input of the soil stabilization allowed to build higher with thinner walls, which have a much better compressive strength and water resistance.

With cement stabilization, the blocks must be cured for 28days after manufacturing. After this, they can be dry freely and be used like common bricks with a soil cement stabilized mortar. The first tries for compressed earth blocks were tried within the period of the nineteenth century in Europe. The CSEB can be stabilized or not. But most of the days, they are stabilized with cement or lime. Therefore, we prefer today and to called them as a Compressed Stabilized Earth Blocks(CSEB). The input of the soil stabilization allowed to build higher with thinner walls, which have a much better compressive strength and water resistance. With cement stabilization, the blocks must be cured for 28days after manufacturing. After this, they can be dry freely and be used like common bricks with a soil cement stabilized mortar.

- According to the IS standards basic test for cement mortar and soil is carried out.
- Using 8% of the cement stabilizer compressed stabilised earth blocks are prepared(CSEB).
- Stack bound prisms and Masonry valets prepared by using CSEB.
- Stress strain behavior of the prisms is observed for different reinforcement conditions.
- Stress strain behavior of the valets is observed for different reinforcement conditions.
- Compare those stress strain values of those prisms and valets.

The collected soil is tested for suitability of making bricks is dried in air and crushed, then the soil is passed through the 4.75mm IS sieve and stored for making of bricks Weight of the cement and soil is taken to the required proportion and water is added to the soil to get the optimum moisture content. Then the lumps in the mixture is breakdown thoroughly. The mould is oiled and base of the mould is covered with a glass sheet in order to obtain level surface. The soil is added in 2 coats and it is consolidated by a wooden hammer with enough tamping. For de-molding surface of the bricks are straightened. The mould is allowed to make 16 bricks at a time and around 800 bricks are done and cured for 28 days by using gunny bags.

Construction of Stack Bound Prisms and valets:

Stack bound prisms and valets is the combination of the and cement mortar and soil blocks. The ratio of height and width is decided as per Indian Standards. The ratio of cement and sand is 1:6. The size of cement coat is 10mm to be kept and the ratio of height and width of 3.45 is to be kept and it is more than two and less than five it is prescribed in the IS masonry code.

Here geo-grids is used as a reinforcement and for the horizontal plane condition it is nailed into a specific size of the soil block. it is nailed to the top of the soil block. In case of the perpendicular reinforcement and geo-grid were tied-up in greater side of the brick masonry. The 3 prisms and 3valets are constructed for the different combinations of the reinforcement totally 12 prisms and 12 valets are allowed for 28 days of curing.

Experimental Investigation

Table 1.0 Test on cement

Sl no	Test on mortar	Results
1	Workability	101.9%
2	Compressive Strength	17.92mpa
3	Direct Tensile Strength	27.17kg\cm²
4	Flexural Strength	1.427Mpa

Table 2.0 Test on Soil

Sl.no	Test	Reference	Results
1	Specific gravity	IS 2720 Part III	2.495
2	Shrinkage limit of soil	IS 2720-1985	14.98
3	Liquid limit of soil	IS 2720-1985	32.25
4	Plastic limit of soil	IS 2720-1985	12.95

Table 3.0 Test on Geo-grid

Sl no	TEST	Reference	Results
1	Tensile test of geo-grids	IS 516-1959	0.42 Mpa

Different combination of reinforcement

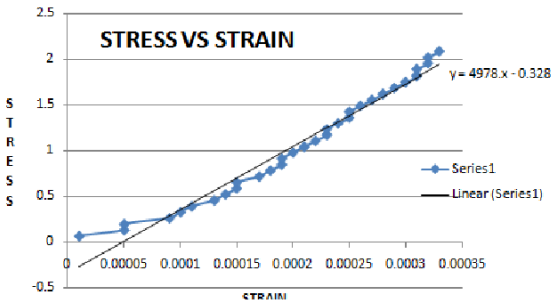
Table 4.0 Different combination of reinforcement

Sl.No	Type of reinforcement	Number of specimens	
		prisms	Wallets
1	Without Reinforcement(A)	3	3
2	Reinforcement in each layer(B)	3	3
3	Reinforcement in alternate layer(C)	3	3
4	Vertical Reinforcement(D)	3	3

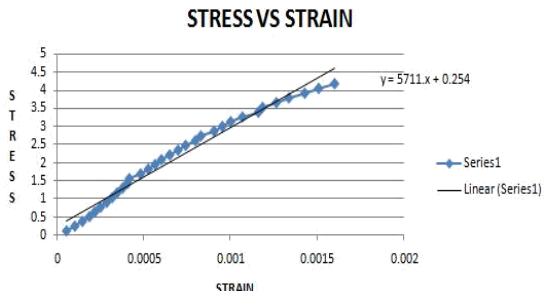
Results and discussions

Test for Modulus of Elasticity of prisms

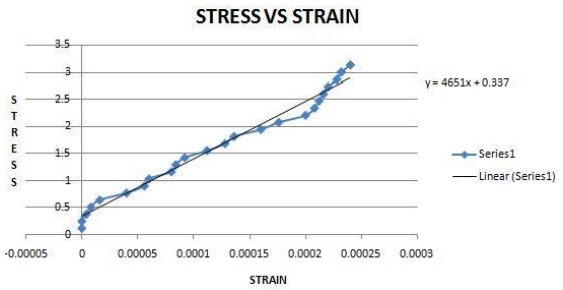
1) without reinforcing prisms



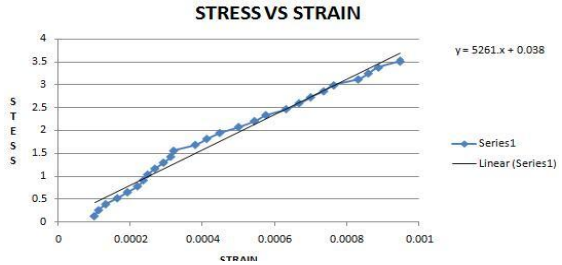
2)prisms having reinforcement in each layer



3) prisms having reinforcement in alternate layer

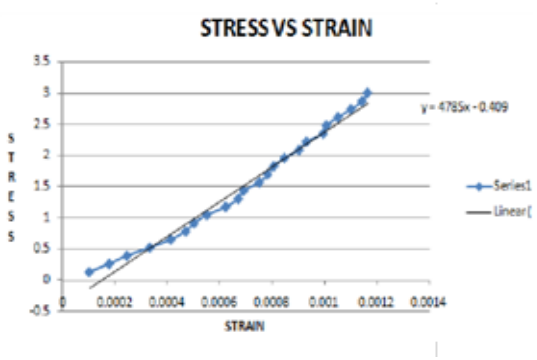


4) prisms having reinforcement in vertical layer

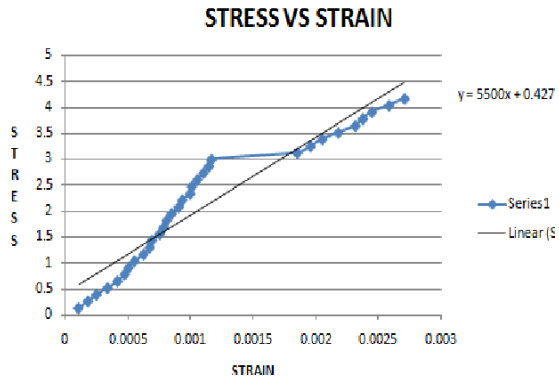


Test for Modulus of Elasticity of Valets

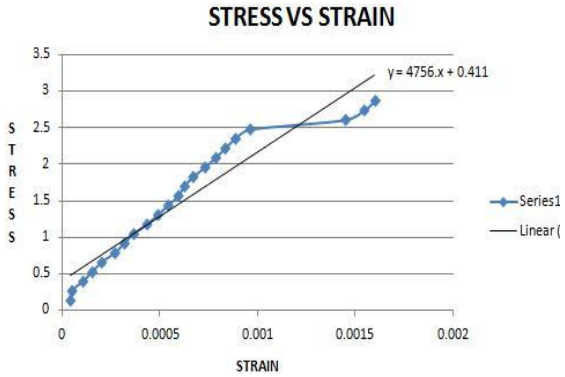
5) without reinforcing valets



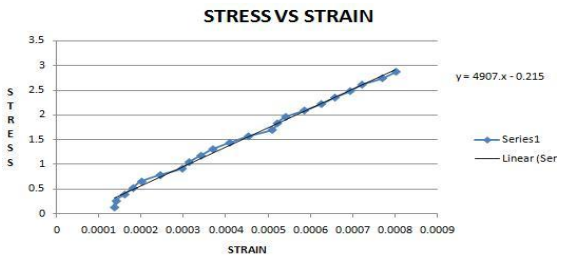
6) valets having reinforcement in each layer



7) valets having reinforcement in alternate layer



8) valets having reinforcement in vertical layer



CONCLUSION

PRISMS

- The prisms of without reinforcement manifest a less elastic modulus.
- By looking graphs finally we can conclude that prisms have geo-grids in specimen(B) have possessed elastic modulus is more than 3 specimens.
- It is 12.9% higher than combination A.
- It is 18.6% higher than combination A.
- It is 7.9% higher than combination A.
- The vertical reinforced specimens shows 5.4% and 11.6% elastic modulus is more than the combination A and combination C.
- The alternate layer reinforcement shows the 6.6% elastic modulus is more than combination A.

VALETS

- By looking graphs finally we can conclude that Valets have geo-grids in specimen(B) have possessed elastic modulus is more than 3 specimens.
- It is 13% higher than combination A.
- It is 13.6% higher than combination A.
- It is 10.8% higher than combination A.
- The vertical reinforced specimens shows 2.5% and 3.1% elastic modulus is more than the combination A and combination C.
- The alternate layer reinforcement shows the 0.6% elastic modulus is more than combination A.

SCOPE FOR FUTURE STUDY

- The modulus of elasticity obtained can be used in the finite element analysis can be done for further studies.
- The bond between the brick and the geo-grid is observed to be weak so it can be improved by making of frogs to the bricks.
- This type of reinforcement should be applied to life-sized models and its effectiveness can be evaluated.
- Further construction of masonry prisms and wallets using normal bricks(standard bricks) can be done with the same reinforcement conditions for future studies.

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