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## The forgotten gem

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### ABSTRACT

*In the growing concern of awareness regarding Sustainable building materials and environmental issues related to them, Compressed Stabilized Earth Bricks (CSEB) is the environmental friendly building and sustainable material we can rely on. Earth as a building material is already known for centuries. It turns out that Compressed Stabilized Earth Bricks properties can be easily compared with the properties of concrete blocks and normal fired bricks. Selection of materials during the design plan leads towards more sustainable construction. This paper reviews some advantages of ecofriendly materials such as Compressed Stabilized Earth Brick over other economic and technological benefits.*

**Keywords**— *Compressed, Stabilized, Earth Material, Sustainable, Concrete Blocks, Fired Bricks*

### 1. INTRODUCTION

Materials are the essential components of buildings construction. Chemical, physical and mechanical Properties of materials as well as an appropriate design are accountable for the building's mechanical strength. The design of green buildings should thus begin with the selection and use of eco-friendly materials. Building materials are usually selected through functional, technical and financial requirements. Nevertheless, the price of a building element signifies just the manufacturing and transportation costs, not social or environmental costs. In the growing environmental crisis, Embracing green building materials is a good alternative to meet to this objective. Therefore, Selection of construction materials that have minimum environmental burdens is useful in the sustainable development. The purpose of this paper is to highlight how sustainable building material can contribute to lessen the impact of environmental degradation, considering Compressed Stabilized Earth Bricks as a helpful ecofriendly material.

### 2. AIM

To study about Compressed Stabilized Earth Bricks as ecofriendly and sustainable materials.

### 3. OBJECTIVE

- To study the need of minimal impact on environment by local infrastructure.
- To analyse compressed stabilized earth bricks and other working techniques which can lead to sustainable construction.
- Comparative study between compressed stabilized earth bricks, concrete and normal fired bricks, in terms of COST and STRENGTH.

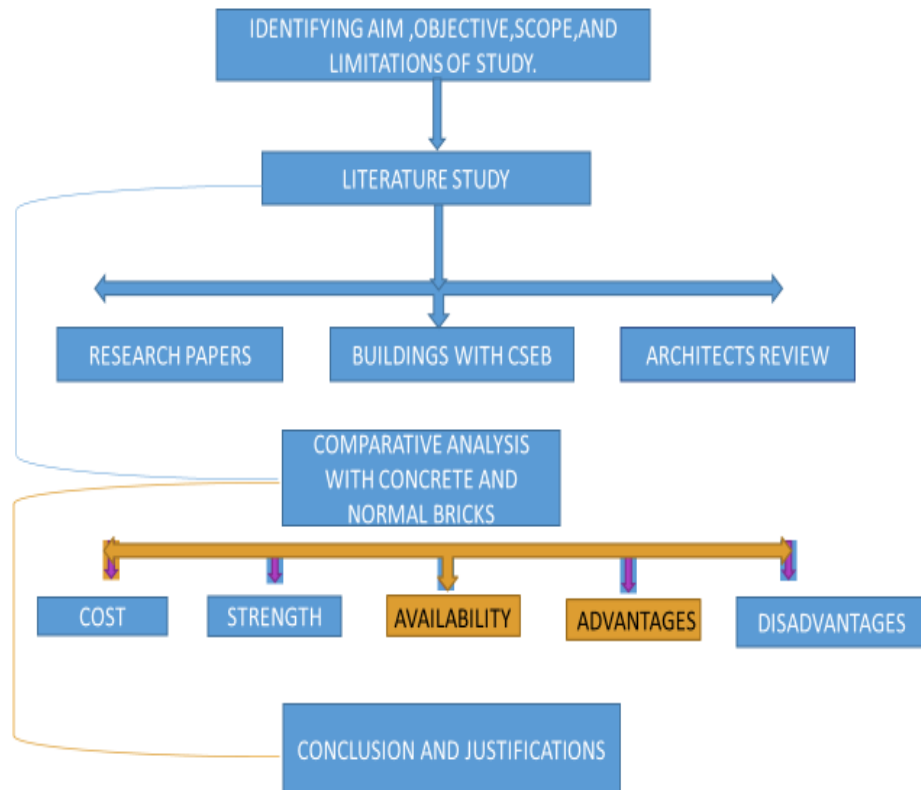
#### 4. NEED OF THE STUDY

- It is very important to study the short term and long term durability of the Compressed Stabilized Earth Bricks to build up the confidence in using this technology.
- Compressed Stabilized Earth Bricks has not been studied in the same extent as a more commonly used building materials such as concrete, steel and timber.

#### 5. SCOPE

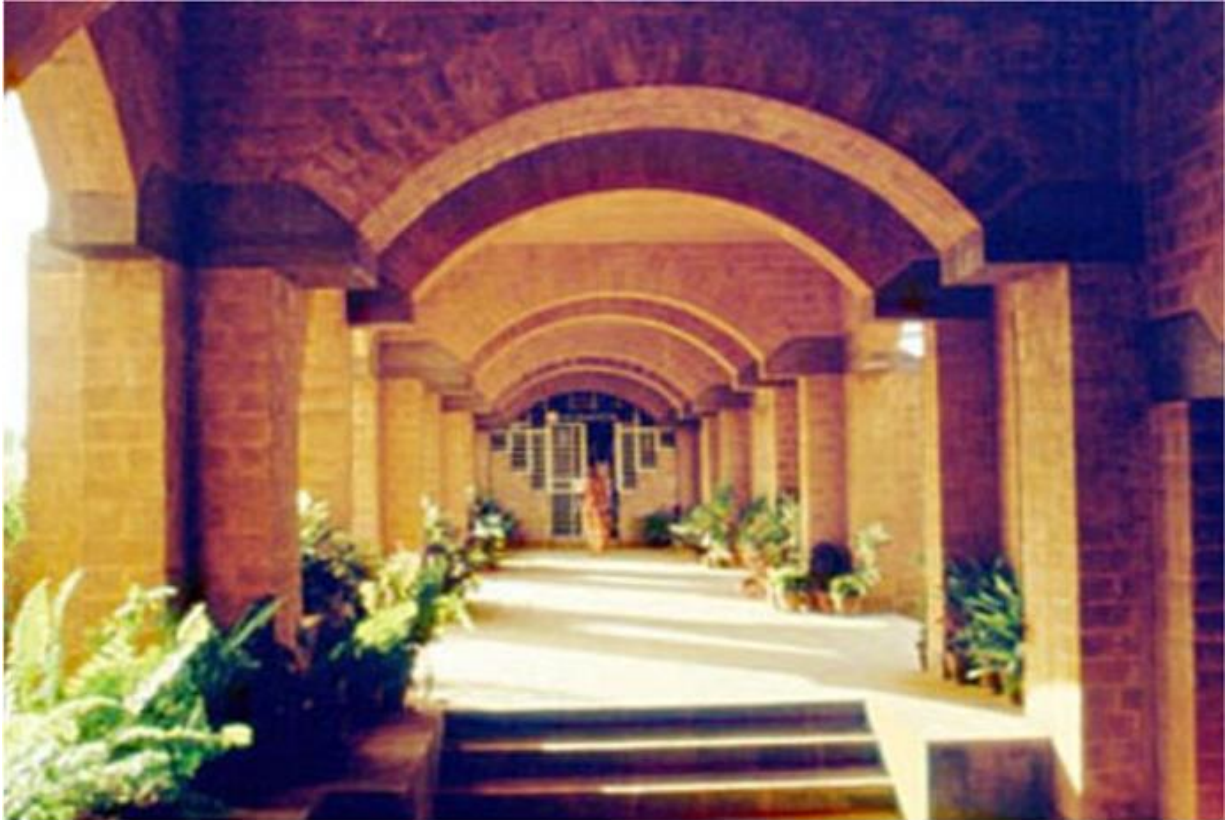
- To create awareness about importance of Compressed Stabilized Earth Brick material through explaining the manufacturing process, its characteristics and advantages.

#### 6. METHODOLOGY



#### 7. LITERATURE REVIEW

By use of OPC as a stabilizer in place of PPC gives more strength to the compressed stabilized earth bricks with same proportion of sand, clay, and stabilizer. It has been found that use of M-sand gives more strength. After experimenting with different types and propotion of stabilizers, based on the test results finalized as the wood ash and lime were good stabilizers for the production of compressed stabilized earth bricks. This material is preferable than other wall making materials due to low cost of materials, local skills, and simple to manufacture and construct. Despite the possibilities and advantages offered by stabilized earth materials, buildings with compressed stabilized earth brick is still not the common practice. Either people don't want to acknowledge the advantage of this material or they don't want to get the burden to organize the block production on their site and manage everything themselves. This paper is made to stabilize CSEBs which is casted using locally available soil & clay with lime, ash along with cement. The variation in properties like compressive strength and water absorption of the blocks are studied and compared. The aim of soil stabilization is to increase the soil's resistance to destructive weather conditions in one or more of the following ways: 1) By cementing the panicles of the soil together, leading to increased strength and cohesion 2) By making the soil waterproof or at least less permeable to moisture. For the production of CSEB, mainly subsoil is needed and the abundant supply of riverbed sand in this region can also be used. Moreover, hollow-interlocking CSEBs allow for horizontal and vertical reinforcement for earthquake resistant construction. For constructing affordable, safe and eco-friendly housing, CSEB is a strong alternative in Bangladesh. They were more effective when they were combined with cement. Cement stabilized blocks had the higher compressive strength and density and lower water absorption rate in comparison with that of other blocks. Lime stabilized blocks showed good compressive strength and density but high water absorption rate. Wood ash stabilized blocks exhibited the poor strength and density and high water absorption.



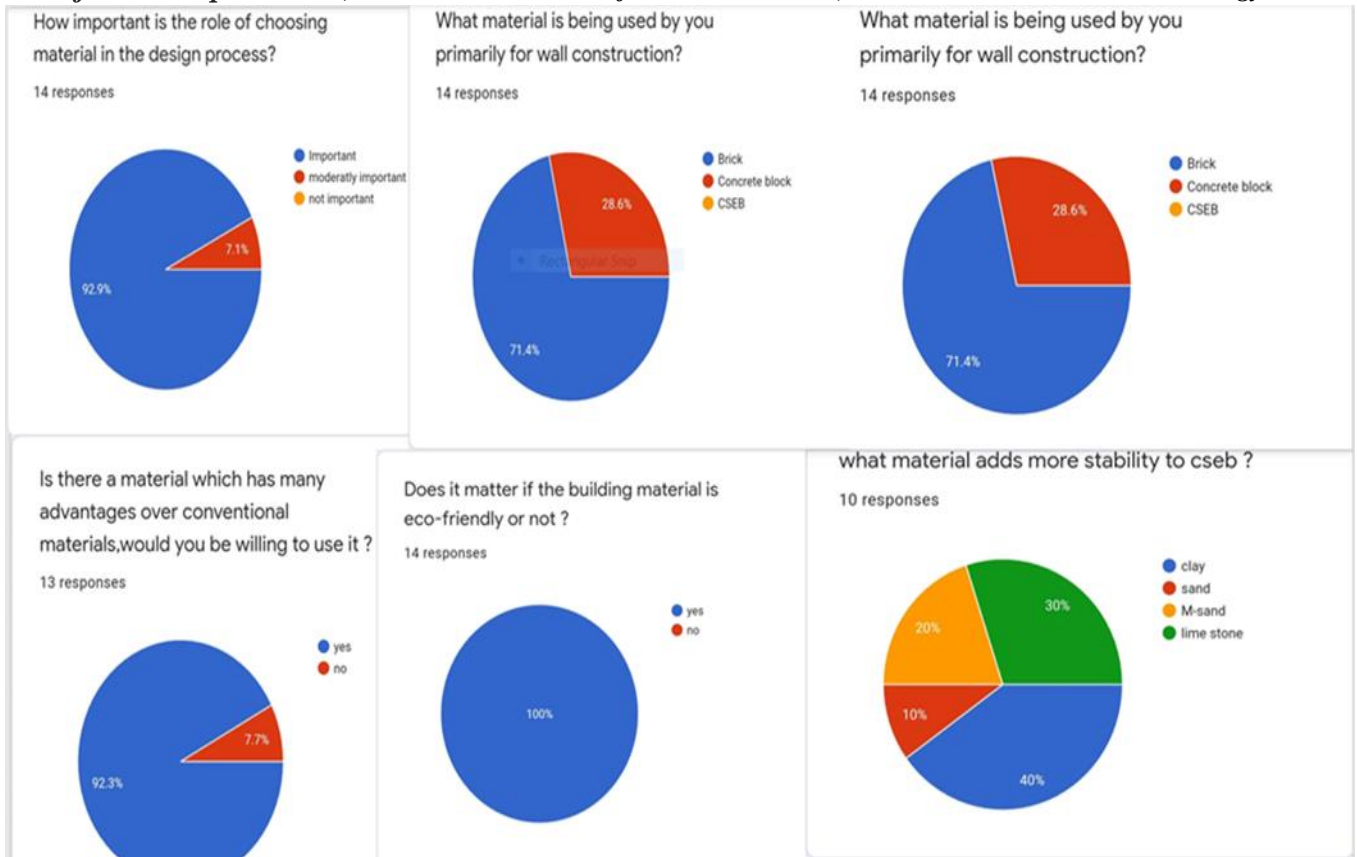
**Fig (1) Visitors centre at Auroville, TamilNadu.**



**Fig(2) Training centre at Auroville , TamilNadu**

## **8. PRIMARY CASE STUDY**

We conducted a survey for over 10 – 15 people which included students of architecture, Architects and also the ones aware about different building materials.



### 9. REVIEW ON PRIMARY CASE STUDY

Choosing of material in a design process plays a very important role. Material is chosen based on availability, cost and also on the location of the building. Compressed Stabilized Earth brick is a material which is made from site hence, availability is always on positive side. The total cost of this material from collection of soil till the final product is almost equal to other primary materials need such as bricks and concrete blocks. Almost all kind of soils are suitable for manufacturing of CSEB. There are a very few building which use CSEB as a primary material, most of them used brick and concrete blocks. Comparitively the strength and other advantages of bricks and concrete blocks are as same as CSEB.

Over many advantages of CSEB why it is not being used?

Based on survey, everyone would be using a material which has equal strength and other physical properties but eco-friendly in nature.

CSEB is physically good in appearance, strength and stability. People lack in the knowledge of this material.

Paying and directly getting the materials on site seems easy rather than using the soil and manufacturing the material on site people didn't want to take all the responsibility on this.

### 10. COMPARATIVE STUDY ON MATERIAL

	CSEB	BRICKS	CONCRETE BLOCKS
COST	30 % less than normal bricks as it excludes transportation.	The price of typical brick in India is around 12/- per piece excluding transportation, it may vary according to type and region of production.	One unit of concrete block cost approx 80/- depending on locality and availability excluding transportation.

STRENGTH	65 kg/m <sup>2</sup> This depends on the soil bearing capacity of the soil used hence indirectly the location.	Compressive strength depends upon the types of brick . 1 <sup>st</sup> class bricks =105kg/cm <sup>2</sup> 2 <sup>nd</sup> class = 70kg/cm <sup>2</sup> 3 <sup>rd</sup> class = 35kg/cm <sup>2</sup>	It depends on many factors such as ratio , number of days given to cure and maintenance [approx. 50kg/cm <sup>2</sup>
AVAILABILITY	As CSEB is manufactured on site it is not much suitable to enemy soil. Any soil with this proportions can be used. GRAVEL 15% + sand 50% + clay 20%	In India , bricks are mainly used as a material in construction sector, hence it can be easily available almost every where, depending on site.	In India , concrete blocks are mainly used as a material in construction sector, hence it can be easily available almost every where, depending on site
ENERGY	1 times less pollution emission than concrete blocks. 2 times less pollution emission than fired or red bricks. 5 times less energy consumption than bricks. 0.5 times less energy consumption than concrete blocks.		

As the size of CSEB , red bricks and concrete blocks are not same it is essential to calculate the rate for a specific work. Work taken here is 1 cubic meter.

## 11. CONCLUSION

In this paper, we have done a brief review on Compressed Stabilized Earth Bricks, previous research history showed that CSEB demonstrate many advantages compared to conventional fixed bricks. CSEB are ultimately greener, eco-friendly, comparable in strength, cost and availability. The use of CSEB also promote healthiest living for building dwellers

Still it has many possibilities to explore more in enhancing its properties

Data from previous works shows that the strength is equivalent to common bricks. Also it has shown that the cost is less compared to common bricks and concrete blocks.

The research conducted emphasize on the advantage of using CSEB for better living. As it promote healthier building material and cost reduction not only in production but also in service cost. As “Economic potential may attract more than ecological reasons,” this kind of building material have a great potential in the future for low to medium cost construction and also contribute on sustainable development.

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