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FEASIBILITY STUDY ON A MUD BLOCK WITH STRAW

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Abstract - When, trying to establish "sustainability" within local built environment, it is to understand prevailing methods that are using in wall construction. As a result, concentrating on "mud wall construction", will be developed by a "mud block", it is more structural durability, less weight, low cost, and it has high performance with respect to indoor air quality. As an initial attempt of the ultimate invent of "mud block", this research was carried out to analyze the correct proportions of the Mud block. During the research compacted mud block casted with straw. During the casting process soil, cement and straw were mixed with water in different proportions for the proposed blocks and determined the compressive strengths of each sample. From the research, find out the high possibility of inventing an effective mud block which has required strength for a load bearing dwellings.

Keywords: Sustainability, Red soil, Rice Straw, Mud block

I.INTRODUCTION

Mud is one of humankind oldest and most universally used construction materials. Even at the dawn of humanity, people are built the building with mud. Mud construction occurs throughout the majority of the world. Adobe is a construction material that presents several attractive characteristics. The raw earth construction materials are produced by using very low of energy and low emission of co_2. In this area dealt with the determination of the compressive strength and assessment of the influence of the type of fibers and their orientation, the volume fraction of fibers, the aspect of the specimens and the procedure of compression test.

Fig .1 - Red soil

II.MATERIALS USED

A. Red soil

The red soil is group of soil particle that develop in a warm, temperature, moist climate under deciduous mixed forests and that have thin organic-minerals overlaying a yellowish – brown leached layer resting on an alluvial red layer. Red soil generally derived from the crystalline. It is found in areas of low rainfall and their color is red due to their very high iron content.

B. Rice straw

Straw is an agricultural by product , after the grain removed from the crops. Straw makes up about half of the yield of cereal crops of rice. It is usually gathered and stored in a straw bale which is bundle of straw. Straw or other fibers that are strong in tension. It have low heating value and high moisture content.

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Fig.2 – Rice straw

C. *Cement*

A Cement is a binder substance that sets and hardness and can bind other materials together. It is usually a grey powder before being mixed with other materials and water. Portland cement is used for blocks and it is hydraulic cement. Ordinary Portland cement of 43 Grade cement is used for this study to compact the mud block.

III. PROPERTIES OF MATERIALS

A.PROPERTIES OF CEMENT

TABLE -I CEMENT PROPERTIES

PROPERTIES	VALUE
Consistency	25%
Initial setting time	32 minutes
Final setting time	143 minutes
fineness modulus	0.5%
Specific gravity	3.15

B.PROPERTIES OF RED SOIL

The red soil properties are tabulated below:

TABLE II- PROPERTIES OF RED SOIL

PROPERTIES	VALUE
Specific gravity	3.04
Plastic limit	21.05%
Liquid limit	29.95%
Plasticity index	8.4%

IV. MIX PROPORTIONS OF MUD BLOCK

Mud block Specimens were casted using water cement ratio 0.5, the red soil, cement, and straw was added in various proportions. To this, cement is added to straw and mixed water is added in required quantity to enhance the suitable w/c ratio. The mud block prepared by the above materials placed in three layers in each mould. For each layer, compaction was done to fill the voids. At last, finishing is done and excess of soil is removed. After 24 hours, the specimens was removed, from the mould and soaked in water for seven days to gain strength.

TABLE –III MIX PROPORTIONS

MIX TYPE	CEMENT	STRAW
1	10%	0.75%
2	10%	1.25%
3	15%	0.75%
4	15%	1.25%
5	20%	0.75%
6	20%	1.25%

V. BLOCK PREPARATION

The process of preparation of Mud Blocks involved the following five steps:

(1) Analysis of the soil

Soil composition and analysis of soil in a laboratory is very important. This will be required

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to estimate amount of cement and then estimated the percentages of each components in the soil: (1) filled a straight-sided glass jar about one-full of soil.(2) Added an equal amount of water. (3) Covered the jar and shake vigorously to suspend all the dirt. (4) Finally, allowed to sit undisturbed for 30 minutes or until the soil has settled into three separate layers with the sand at the bottom.

(2) Sifting of soil

Soil dried and sieved (to remove large lumps, stones, leaves, and other impurities) before it can be used properly mixed with cement, straw and soil compressed into blocks.

(3) Preparation of the mix

Mix thoroughly all the ingredients: cement, soil, and straw are needed. After mixing of all the ingredients, water is added a little at a time reaches the right consistency. A garden hose with the nozzle used to adjust to produce a fine spray.

(4) Compaction of the blocks

Vibrating machine is proposed in the project for compacting straw, cement and soil into blocks of desired size. Hand-operated machines also be used in place of power operated machines. After compaction, the block formed is ejected from the mould. The blocks are plastic and fragile when newly formed.

(5) Curing of the blocks

Placed the blocks as soon as possible on a water. Set each block on edges and space the blocks without any touch each other. After 24 hours of moulding blocks were soaked into the water for 7 days and stacked for 28 days.

Fig.3 – Mud Block

VI.RESULTS AND DISCUSSION

A.COMPRESSION TEST OF BLOCKS

The compressive strength values of the blocks and the maximum load level of each block are determined and tabulated.

CEMENT	STRAW	COMPRESSIVE STRENGTH (N / mm^2)	
		CB	Mud Block
10%	0.75%	1.82	1.80
10%	1.25%	1.82	1.72
15%	0.75%	1.99	1.99
15%	1.25%	1.99	1.98
20%	0.75%	2.01	2.01
20%	1.25%	2.01	2.0

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Table IV- Compressive strength Result

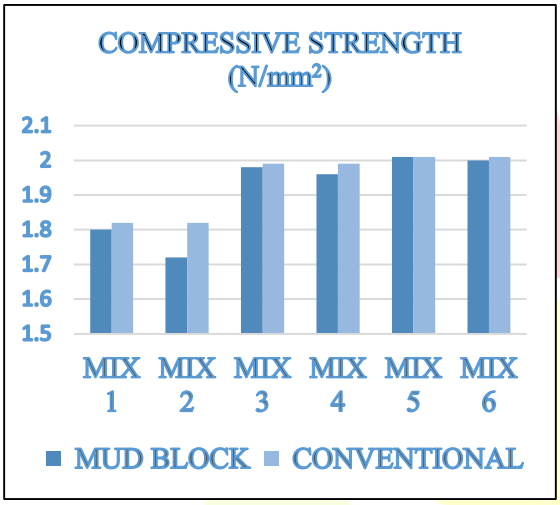

Fig .4 Compressive Strength Chart

Discussion

- In mix type 1 and 2: Blocks with 10% of cement and with 0.75%, 1.25% of straw was not reach the Compressive Strength of the Conventional Mud Block. The Compressive Strength of Mud Block with 0.75% Straw reduced 15% and with 1.25% Straw reduced 22% is observed for 28 days compared to the compressive strength of conventional block.

- In mix type 3 & 4 Blocks with inclusion of 0.75%, 1.25% straw and with 15% cement were almost reaching the Strength of Conventional Blocks. The Compressive Strength of Mud Block with 0.75% Straw reaching 32 % and with 1.25% straw reached 35% is observed for 28 days compared to the compressive strength of conventional block.

- In mix type 4 & 6: The Strength of Blocks with 0.75%, 1.25% straw are gained the Strength Conventional Block. The Compressive Strength of Mud Block with 0.75% Straw increased 38% and with 1.25% Straw increased 39% is observed for 28 days compared to the compressive strength of conventional block.

VII.CONCLUSION

Therefore, in this research 20% of cement can be used as the allowable cement requirement that need, to cast mud blocks for load bearing construction. In addition it was noted that the cement percentage also can increase, since adding of straw can reduce the unit cost of the block. But at the same time, adding more water reduces the strength of the mud block, due to internal cavities and less bond between soils with cement. Further, even by adding more cement strength cannot expect to be increased with the used mix, because of the high clay content and high water content.

In future work increases the percentage of cement and to investigate the sorpitivity level of blocks, failure mode level and straw orientation level of straw bales.

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