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ECO FRIENDLY ALTERNATIVE IN CONSTRUCTION: ASSESSING COMPRESSIVE STRENGTH AND WATER RESISTANCE IN STABILIZED MUD BLOCK

GURURAJ M H[1], RAVIKIRAN L[2], SAHANA K Y[3], SANJANA R[4], BHOOMIKA S GOWDA[5], AASHISH Y N[6]

[1,2]Assistant Professor Department of Civil Engineering, Maharaja Institute of Technology Mysore, Karnataka, India
[3456]U.G Students, Department of Civil Engineering, Maharaja Institute of Technology Mysore, Karnataka, India

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Abstract – *Production of cement cause carbon footprint and releases carbon dioxide and harmful gases which affects the atmosphere. To overcome the higher consumption of cement we have to use eco friendly materials or the green building materials. One of the green building material is stabilized mud block. Here we are conducting the experiment to check on the compressive strength using stabilizers like cement and lime with varied proportion, and to study the effect of water repellent admixture in reduction of water absorption of stabilized mud block.*

Key Words: **(Stabilized Mud Block), SMB, Eco Friendly materials, Green Building Materials.**

1.INTRODUCTION

Earth is the most abundant building material available for various construction work. Local availability of earth makes its use advantageous and hence making mud block as one of the most energy efficient, cost effective and very reliable building material in general. It's very much important to enhance the properties of traditional unbaked mud blocks. Looking towards this, the alteration was made to them by stabilizing the earth with stabilizers. It's known that constructions with mud brick technology has been widely used in regions soil containing high silt and clay contents. Therefore this study aims to investigate the enhancing the properties of mud bricks after its stabilization with cement and lime which are the stabilizing agents. In this experiment the compressive strength and water absorption of stabilized mud block is investigated.

2 OBJECTIVES

The objectives of this experimental study are,

1. To understand the strength property and water absorption of stabilized mud block with varied percent of cement and lime.
2. To study the effect of water repellent admixture in reduction of water absorption of stabilized mud block.

3 METHODOLOGY

Initially the procurement of materials is done. Then suitable basic tests were carried out for the materials such as soil, m-sand, cement and lime. The SEB is prepared for different proportions of cement and lime. The prepared blocks are then cured upto 28 days and then tested for compressive strength (7 days, 14 days and 28 days). Water absorption test is carried out by applying a coat of siloxane which is water repellent admixture. Results are then evaluated.

4. MATERIALS USED

4.1 Red soil

Fig-1 Red soil

Table -1: Tests on red soil

SI.NO	TESTS	VALUES
1	Specific Gravity	2.65
2	Grain size analysis	
	% finer	94
	% gravel	6
	% sand	76
	% clay and silt	18
4	Mini compaction Optimum Moisture Content (OMC) %	15.02
	Maximum Dry Density (MDD) gm/cc	2.2
5	Moisture content (%)	22.5

4.2 M- Sand

Fig-2 M-Sand

Table-2: Tests on m-sand

SI.NO	TESTS	Values
1	Specific Gravity	2.6
2	Grain size analysis	
	% finer	100
	% gravel	0
	% sand	99.09
	% clay and silt	0.91

4.3 Cement

Fig-3: Cement

Table-3: Tests on cement

SI.NO	TESTS	Values
1	Specific Gravity	3.10
2	Standard consistency (%)	34
3	compressive strength (N/mm^2)	33.8
4	Initial setting time (min)	90
5	Final setting time (min)	180

4.4 Lime

Fig-4: Lime

Specific gravity: 2.46

4.5 Siloxane

Fig-5: Siloxane

Siloxane is a water repellent admixture. When coated on SMB it acts as barrier layer which do not let the water absorbed into the SMB.

5. MIX DESIGN

Table-4: Proportion of materials

TRIAL MIX	Soil %	M-Sand %	Cement %	Lime %
Trial 1	55	30	13	2
Trial 2	55	30	11	4
Trial 3	55	30	9	6
Trial 4	55	30	7	8

6. TESTING

- **Compressive Strength Test**

The test specimen of size 12”×8.5”×4”are cured for 7, 14 and 28 days. The cured specimens are tested for compression strength using CTM (Compression Testing Machine).

- **Water Absorption Test**

After curing the test specimens for 28 days, they are coated with a layer of siloxane. The specimens are then placed in an oven for 24 hours, after which theirdry weight is recorded. Following this, the specimensare immersed in water for 24 hours. After the immersion period, the specimens are removed from the water, the excess water is wiped off with a cloth, and their wet weight is recorded.

Compressive Strength Test

Table-5: Compressive Strength Result

TRIAL MIX	COMPRESSIVE STRENGTH, N/mm²		
	7 DAYS	14 DAYS	28 DAYS
TRIAL 1	2.64	5.66	6.73
TRIAL 2	2.58	5.09	5.86
TRIAL 3	2.42	4.50	6.07
TRIAL 4	2.09	5.14	5.24

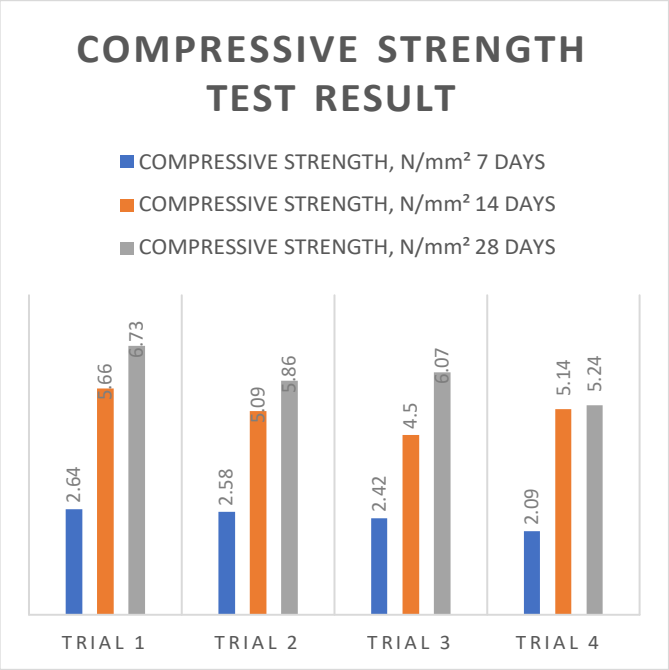

Fig-6: Compressive strength test results @ 7, 14 &28 days

Water Absorption Test

Table-6: Water Absorption Result with and Without Siloxane

TRIAL MIX	WATER ABSORPTION, %	
	Without Siloxane	With Siloxane
TRIAL 1	13.22	10.30
TRIAL 2	18.01	8.31
TRIAL 3	13.53	12.66
TRIAL 4	10.81	5.04

CONCLUSION

- From Table 5, it is evident that SMB with a higher percentage of cement and a lower percentage of lime exhibits greater compressive strength compared to SMB with a higher percentage of lime and a lower percentage of cement.
- The strength decreased as the percentage of lime increased, and conversely, the strength increased as the percentage of cement increased.
- The highest compressive strength achieved was 6.73 N/mm² which is trail-1 mix having 13% cement and 2% lime.
- The most significant reduction was observed in Trial 4, where water absorption dropped from 10.81% to 5.04%.

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