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STUDY OF COMPRESSED STABILIZED EARTH BLOCKS

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ABSTRACT

Study is carried out mainly to find out a proper mix proportion to locally available materials such as soil, silt, clay, grits, coir, etc. with lime for making stabilized earth block for construction of inexpensive residential houses. The local soil and clay in and around local area of Pune district was mixed with the local silt, to make a composite of lime 15 %, soil 50 %, river silt 5%, fly ash 30 %,& chemicals(Na_2SiO_3&NaOH)for compacted stabilized earth blocks (CSEB).1 Blocks of 254 mm x 127 mm x 76 mm size,were prepared with varying percent of materials. We will test properties of natural soil such as a plasticity index, liquid limit, gradation and shrinkage limit.The blocks were cured and tested for compressive strength, waterabsorption and density. Based on the results, it has been concluded that the compactedlime stabilized earth blocks both with coir fibermay beacost effective andeco-friendly substitute to the burnt clay bricks in lightly loaded houses (ruralareas) where stability is not a governing factor.

***Keywords**: Lime stabilizer, black cotton soil,fly ash , river silt, coir,chemicals-Na2SiO3&NaOH*

I. INTRODUCTION

In everyday conversation, the word brick and block sometimes refer to the same object and has ambiguity. The definition of brick and block depend upon the country of origin but British Standard BS 3921: 1985 defines a clay brick as "a masonry unit not exceeding 337.5 mm in length, 225 mm in thickness (referred to as width in one of the standard) or 112.5 mm in height. As for block, BS 6073: Part 1: 1981 Pre-cast concrete masonry units defines a block as "a masonry unit which, when used, in its normal aspect exceeds the length or width or height specified for brick". CDI (Compressed Earth Blocks, 1998) defined compressed earth block as "masonry elements principally made of raw earth, which are small in size and which have regular and verified at characteristic obtained by the static or dynamic compression of earth in a humid state followed by immediate remolding". Morton (2008) even give lighter definition for brick and block as a small masonry unit, which can be lift with one hand and a large masonry unit, which can be lift with two hands. The soil, raw or stabilized, for a compressed earth block is slightly moistened, poured into a steel press (with or without stabilizer) and then compressed either with a manual or motorized press. The new development of earth construction really started in the nineteen fifties, with the technology of the Compressed Stabilized Earth Blocks (CSEB): a research programmed for affordable houses in Colombia proposed the first manual press – the Cinvaram. Since the considerable scientific researches has been carried out by laboratories. The knowledge of soil laboratories concerning road building was adapted to earth construction. Since 1960 – 1970, Africa has seen the widest world development for CSEB. India developed CSEB technology only in the nineteen eighty's, but sees today a wider dissemination and development of CSEB.

Fig.no.01 Compressed Stabilized Earth Blocks

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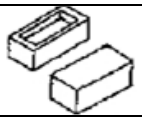
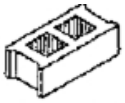
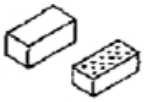
Table No.01 Comparison Between Cseb And Other Masonary Materials

SR NO	CHARACTERISTIC	UNIT	CSEB	FIRED BRICK	CONCRETE BLOCK
1	Shape				
2	Size L X W X H	Mm	190x90x90	190x90x90	190x90x90
3	Surface		Smooth	Rough To Smooth	Rough
4	Visual Aspect		Medium To Good	Good To Excellent	Average
5	Wet Compressive Strength	Mpa	1 To 4	0.5 To 6	0.7 To 5
6	Thermal Insulation	W/M'c	0.81 To1.04	0.7 To 1.3	1.0 To 1.2

II. METHODOLOGY

A. Soil Identification

Soil identification can be performed with sensitive analyses. The main points were examined as:

1. Grain size distribution for knowingquality of each grain size.
2. Plasticity characteristic to know the quality anproperties of each of the binders
3. Sample Details : Red Earth
4. Plastic Limit=56%
5. .Liquid Limit=66%
6. Plasticity Index = 10 =Slightly plastic
   LI=1, hence the remold soil is at theliquid limit and it has un-drained shear strength of about 2KPa.

B. Procedure for Making CSEB (Compressed Stabilized Earth Blocks)

1. Collected the soil sample.
2. Test for soil classification.
3. Various mixing of ingredients/stabilizers with clay soil and sand vary in percentage of mixing.
4. The various mixes are placed in the proposed brick mold.
5. The mold is compressed in a process (manually compress).
6. Then it is dried for 28 days.7.Strength determination on UTM/CTM.

Fig. No.02 UTM machine

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III. SCOPE OF PROJECT WORK

The current investigation proposes to study the engineering properties of Compressed Stabilized earth block bricks when stabilized with different materials mixed with different percentages with locally available soil. Considering the adaptability of the CSEB bricks for rural housing needs, the present study is conducted to achieve following characteristics :To experimentally establish the suitability of local available earthen soil for production of CSEB bricks .To obtain the engineering properties of CSEB bricks when mixed with different stabilizers . To compare the performance of CSEB bricks with standard coal fired brick and with different stabilizers. The present report will also give the cost analysis of the CSEB and its comparison with conventional coal fired standard bricks.

Mixing Proportion Of Soils And Chemicals

Table No.02 Black Cotton Soil + Fly Ash + Chemicals

SR NO.	PERCENTAGE (%)			WEIGHT IN KG.			WATER CONTENT PER NOS.	
	B.C	FLY ASH	Na2SiO3 +NaOH	B.C	FLY ASH	Na2SiO3+ NaOH	WATER CONTENT	NOS.
1	75	20	2.50	1.875	500	62.5	3.701	6
2	62.50	30	3.75	1.5662	750	93.75	2	6
3	50	40	5	1.25	1000	125	2	6

Table No.03 Black Cotton Soil + Lime + Coir

SR NO.	PERCENTAGE (%)			WEIGHT IN KG.			WATER CONTENT PER NOS.	
	BLACK COTTON	LIME	COIR	BLACK COTTON	LIME	COIR	WATER CONTENT	NOS.
1	87	12	1	2.175	0.3	25	4	6
2	86	12	2	2.15	0.3	50	4.5	6
3	83	15	2	2.075	0.375	50	4	6

IV. RESULT

Resulting values of Compressed Stabilized Earth Block are given in following tables.

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Table no. 04 results

SR NO.	TYPE OF BLOCK	LOAD (KN)	COMPRSSIVE STRENGTH(N/MM^2)	REMARK
1	B.C + F.A.	46	2.69	Success
		48	2.80	
		49	2.86	
2	B.C + F.A. + Chemical	25	1.46	Failure
		27	1.58	
		30	1.75	
3	B.C + Lime+Coir	62	3.62	Success
		49	2.86	
		64	3.74	
4	R.S.+ F.A.	52	3.04	Success
		59	3.45	
		55	3.21	
5	R.S. +F.A.+ Chemical	30	1.75	Failure
		26	1.52	
		34	1.98	
6	R.S.+ Lime+ Coir	63	3.68	Success
		56	3.27	
		70	4.09	

Table No .05 Test On Cseb Block

SR NO.	TEST	IDEAL RESULT	RESUL
1	Dimension Variation	5-10mm	9mm
2	Compressive Strength	3-35 N/Mm2	3.17 N/Mm2
3	Water Absorption	10-12%	11%
4	Erosion	3-8 Mm	8 Mm
5	Surface Characteristics	Smooth	Smooth

V. CONCLUSION

From liquid limit, we know the quantity of water to be added in to the soil.Plastic limit show the water content in soil so that there is bonding between the practical of soil.Shrinkage limit shows the minimum water content require for soil, after it will shrink.Sieve analysis test conclude the type of soil use for making block.This all test are help in deciding the type of soil required for making stabilized compressive earthblock.It is useful for the construction of the urban housing.It helps in reduction of shrinkage cracks and enhancement of binding force.The development and promotion of good quality of earth blocks can improves the standard of living.Use of stabilizers can improve the cohesive and tensile strength of earthen block.The experiment of black cotton soil with fly ash and lime with coir is successive product.The earth block of river silt with fly ash and lime with coir is also successive model.

Then river silt and black cotton soil with chemical will be failure model because of the swelling and shrinkage of the earth block.Addition of soil stabilizer resulting increasing the compressive strength of earth block. Skilled labour is required for addition of chemicals because of percentage variation cause the effect on the earth block.The main advantageous things are this control the deforestation, energy efficient, and eco-friendly.Beneficial for rural housing.

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