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Improvement of Black Cotton Soil with Stabilizer Cement, Lime and Fly Ash Use for Pavement

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Abstract: ***The qualities of black cotton soil is which stays poor specialty with steep slapping and shrinkage soil stabilization is the process in which improving the properties of black cotton soil and it is making for stable soil thus we should perform stabilizer of soil past utility for cement FA and lime addition of BC soil suitable proportion this paper expresses a learning of the cement lime and fly ash as the stabilizers in improving of BC soil .this experimental test are Atterberg limit ,standard proctor test and unconfined compression strength (UCS) test the percentages of cement and lime used in B.C soil varied from 3 % to 12 % and fly ash used in BC soil varies from 12 % and 36 % .***
Keywords: Black cotton soil, Cement, Lime, Fly ash.

I. INTRODUCTION

In black cotton soil which origins expensiveness and cracks becomes in soil with out warning which dangerous for construction soil stabilization are only of the techniques to improvement in black cotton soil use for pavement such as strength plasticity index , density ,moisture content of such B.C soil so that construction of road pavement can be done on these soil stabilization has to be done the admixture use for this study cement ,lime and fly ash. When exposed to Materials modifications in moisture content and therefore have been recovered to be highest degree disturbance from engineering thoughtfulness B.C soil are conceived by volcanic basaltic rocks.

1) *Cement:* cement is fine mineral powder manufactured with very precise processes mixed with water this powder modifies into a composition that Deterrents and hardness when plunged into water. Because the composition and smoothness of the pulverisation may very cement has various possessions trusting upon its constitution. Cement is the primary element of concrete. Its an economical, high level structure embodied Used in construction undertaking worldwide.

a) The main types of cement produced by the groups are :-
b) Portland cement
c) Portland compound cement
d) Blast furnace slag cement
e) Pozzolana cement

2) *Lime:* Lime is a calcium containing in organic mineral composed primarily of oxides and hydroxide usually calcium oxides *and calcium hydroxide. this material are still used in large quantity as building and engineering materials.*
3) *Black Cotton Soil:* Black cotton soil one the major soil is one of major soil deposited of India. The exhibit height range of grooving and drop-off when exhibited to actions in wet aggregation and thus have been set-up to be to the highest degree exertion from engineering considerations .black cotton soil are casted by volcanic basaltic rocks .
4) *Fly Ash:* Fly ash is the precisely separated substance that results from the burning of powdered coal and is diffused from the combustion assembly by wipe out gases Fly ash is made by fragment fired. Electric and vapour producing plants typically coal is powdered and gasping with air in to the boilers burning assembly where it promptly erupts, producing, Heat and producing a liquified mineral substance Fly ash are used in a multifariousness practical utilization include, Portland cement concrete (PCC), soil and road base stabilization.

II. METHODOLOGY

In this paper, the black cotton soil is stabilized with cement, lime and fly ash with different proportions.
Black cotton soil is selected from Career Points University Kota (Raj) campus in agriculture field and different engineering properties were premeditated to imply the sufficient % of cement ,lime and fly ash to stabilized the black cotton soil.
Cement and lime are mixed to 2 to 8% and fly ash is mixed 12% to 36 % the BC soil at equal intervals.

The followings are the different properties premeditated Liquid limit, Plastic limit, plasticity index, optimum moisture contents, maximum dry density and compressive strength, evaluated the effect of cement, lime and fly ash by its self has binding properties but in the existence of moisture that responds, chemically and attributes binds matters and from to the improvement of black cotton soil. The cement and lime were increased from 0 to 10 % and fly ash was increased from 0 to 40 % generally the C.B.R value is modified by its friction and cohesion. The U.C.S of black cotton soil that belong of prevailing of small particles it imparted by adhesive .the U.C.S of cement lime and fly ash are belongs prevailing of coarser particles that imparted by its frictional element . the degraded U.C.S value of B.C soil is ascribed to the inbuilt down the compressive strength is due to the status of soil fraction.

The acquisition of cement, lime ,and fly ash in B.C soil ,increased the U.C.S and C.B.R of the combine to the primary optimum level due to the frictional opposition from cement ,lime and fly ash in acquisitions to the adhesiveness from the B.C soil .further acquisition of lime and fly ash beyond the optimum stages to the decrease to 10 % to 40% respectively and the seconds optimum stages to increased so for the changes U.C.S and C.B.R of cement ,lime fly ash are assorts can be ascribed to the relative effortless of frictional or adhesive opposition from cement ,lime , fly ash and B.C soil. In primitively cement, lime in fly ash also there an increase of strength with the increased in the cement ,lime and fly ash substance, here there are improvement chemical reactions shaping bindeous matters outcoming in best binding between B.C soil and three stabilizer of cement, lime, fly ash.

III. RESULTS AND DISCUSSION

Table 1. STANDARD PROCTOR TEST (0%)

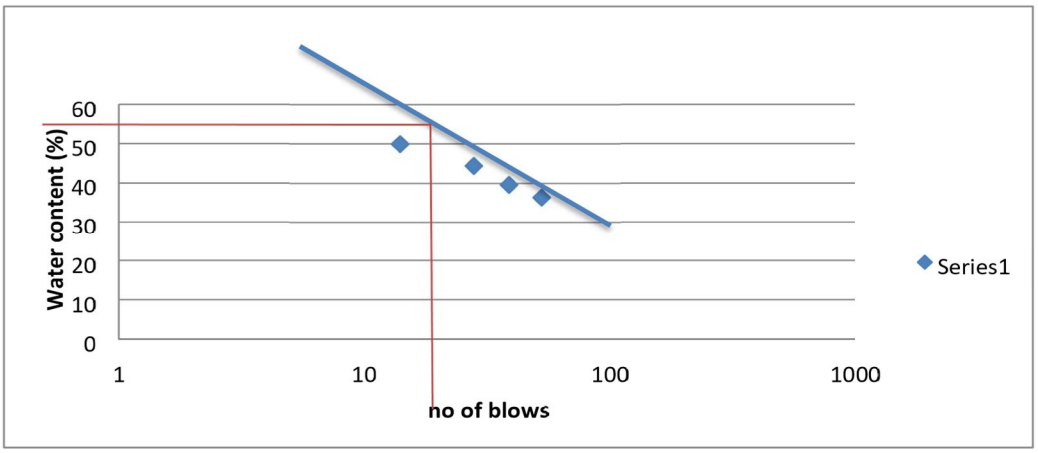
S.NO	DESCRIPTION	Sample 1	Sample 2	Sample 3	Sample 4
1.	Weight of mould (gm)	2268	2268	2268	2268
2	Weight of mould +wet soil (gm)	4146	4346	4446	4366
3	Weight of wet soil (gm)	1874	2074	2171	2071
4	Container no (gm)	131	34	98	462
5	Weight of container (gm)	26	32	25	32
6	Weight o container + wet soil (gm)	115.2	122.6	140.7	171.6
7	Weight of container + dry soil (gm)	111.1	113.4	123.7	156.7
8	Weight of water (ml)	8.6	8.83	12.12	16.69
9	Weight of dry soil (gm)	77	77	98	119
10	Water content (%)	10.37	10.60	11.64	13.24
11	Wet density (gm/cm3)	1.84	2.04	2.24	2.6
12	Dry density (gm/cm3)	1.64	1.64	1.74	1.65

Result	Penetration dial reading	Penetration in mm	Proving ring dial readings in divisions	Load in kg
1	0	0	0	0
3	100	1.0	205	245.15
4	150	1.5	302	350.66
5	200	2.0	370	455.55
6	250	2.5	440	520.22
7	300	3.0	505	592.25
8	350	3.5	645	640.70
9	400	4.0	595	702.50
10	450	4.5	645	785.82
11	500	5.0	702	815.15
12	550	5.5	738	860.65
13	600	6.0	775	910.12
14	650	6.5	805	944.48
15	700	7.0	850	944.45
16	750	7.5	865	1002.50

CBR of the given sample = 38.92mm

Table 2 LIQUID LIMIT 30%

S.NO		DESCRIPTION				Sample 1	sample 2	Sample 3	Sample 4
1		Container no				53	58	514	517
2	Weight of container	30.5	32.5	33.0	31.5				
3	No .of blows	14	28	39	53				
4	Weight of container + wet soil (gm)	36.5	39	41	39				
5	Weight of container + dry soil	34.5	37	38.5	37				
6	Weight of water (ll)	2	2	2.5	2				
7	Weight of dry soil (gm)	4	4.5	5.5	5.5				
8	Water content (%)	50	44.44	39.6	36.36				



Oil (LL) = 43% COMPARISON GRAPHS
Figure 3 LIQUID LIMIT

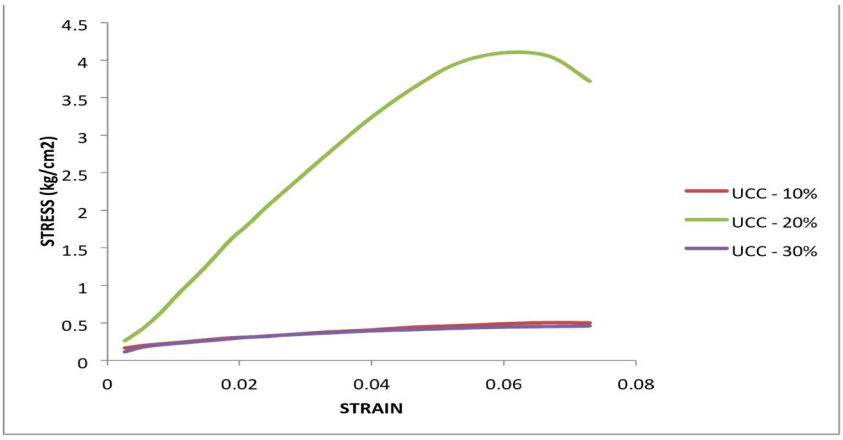
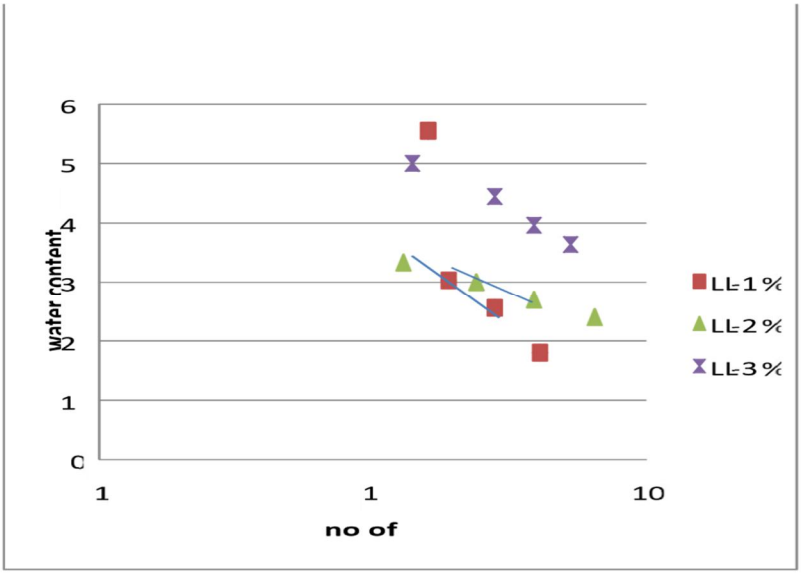


Figure 5 UNCONFINED COMPRESSION TEST



RESULT

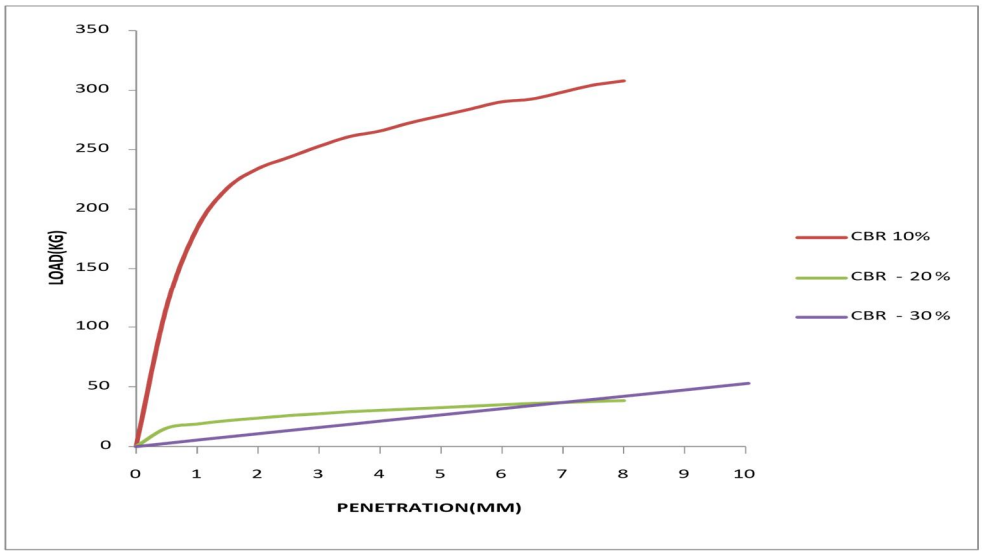


Figure 6 CALIFORNIA BEARING RATIO TEST

IV. CONCLUSIONS

The followings conclusion is prolonged from the research test.

A. Liquid limit and plastic limit of BC soil decrease with maximizing % fly ash but liquid limit and plastic limit of BC soil increment with increasing % cement and lime both Plasticity index of BC soil decreased with increasing % cement ,lime and fly ash. MDD of BC soil decrease with increasing % fly ash and OMC increasing with increase of fly ash and BC soil also affected by varying % of cement and lime.

B. MDD of BC soil decrease with increasing % cement and lime and OMC increase with increase of cement and lime. UCS value of BC soil also increase with increasing varying % fly ash. In 28 days, the UCS test for best results use for pavement. UCS value of BC soil also increases with increasing varying % of cement and lime. In 28 days, the UCS test for best results use for pavement It can be terminated that the cement, lime and fly ash can be used effectively in BCC soil improvement use for pavement but cement is the unconfined compressive stress of natural soil without fly ash which was 114kN/m2 increased to 123 kN/m2 at 20% fly ash in natural soil showing 7.89 % improvement

C. Liquid limit was decreases with increases in percentage of fly ash up 30% in natural soil which was 74.4%, decreased to 72.5%, showing 2.56 % decreased. e. Plastic limit was decreases with increases in percentage of fly ash up 30% in natural soil which was 38.4%, decreased to 32.93 %, showing 14.24 % decreased. f. Maximum dry density was increase with increases in percentage of fly ash up 30% in natural soil which was 1.68gm/cc, increase to 1.71gm/cc at 14% OMC showing 1.78 % .

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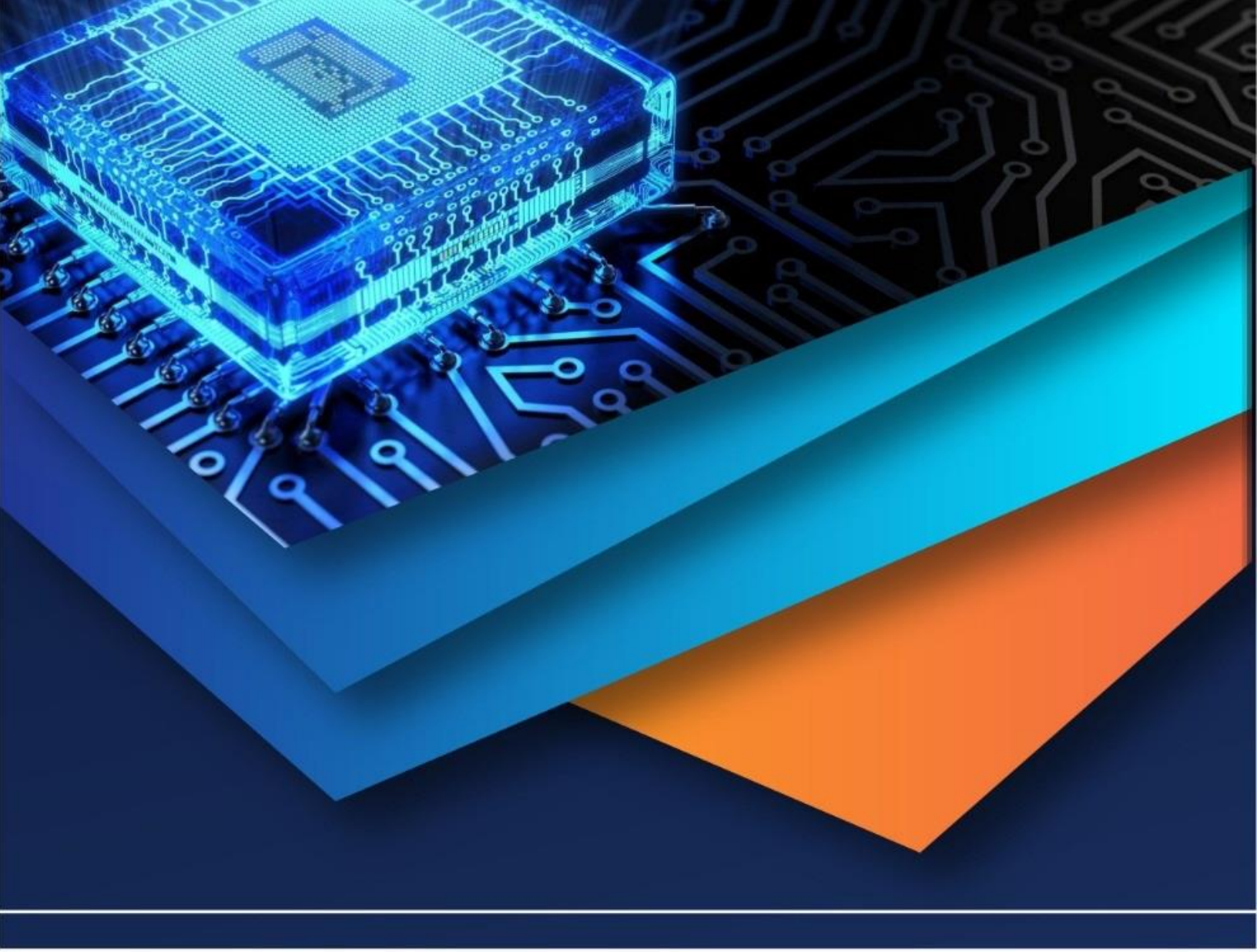

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