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AN INVESTIGATION ON BLACK COTTON SOIL STABLIZED WITH RED-MUD & POLYTHENE STRIP's.

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Abstract – *The investigation on the properties of black cotton soil, we observed that, the strength properties of black cotton soil is very low. Before any foundation work one such soil, we need to stabilize them. Red-mud is an industrial waste material, which is produced by the aluminum industries, which create so many problems when dumped in open space. To beat this criteria we are going to use red-mud as a stabilizer. Another material is polythene(LDEP) which is also a problem for our environment. By the help of these two material we are going to stabilize black cotton soil, and enhance the baring and sharing strength of the weak soil like black cotton soil. Varying % of red-mud mix is 10% , 15% and 20% with 0.2%, 0.3%, and 0.5% of polythene strip. The mix proportion of polythene is applied for each proportion of red-mud mix. Polythene is used mainly to give better binding between and has tendency to elaborate . It is observed that the mix proportions 10% & 15% is increasing. But the Optimum one for UCS is at 20% of red-mud and 0.3% of polythene strip. And 20% of red-mud and 0.2% of polythene in optimum for CBR value.*

KEY WORD'S:- Black cotton soil, red-mud, polythene, soil stabilization UCS test, and CBR test & environment safety.

1. INTRODUCTION:

Now-a days construction work activities increasing day by day. Civil Engineer's are responsible for every steps of the construction should run safely. The construction activities on black cotton soil is a challenging tasks. Before the construction/ structures / foundation are needed to be constructed over the black cotton soils site, the soil unable to provide the desired properties to the construction work. To have construction work in such soil, stabilization is only the method to get the desired engineering and index properties of soil.

1.1) Stabilization:- Stabilization is a process of changing the properties of weak soil by changing there gradation and mixing with any other soil, by compaction the density of soil is also changed, or by replacing the soil with other stabilizing materials. This process change's both engineering and index properties of soil. Stabilization process is carried out by using different types of soil stabilizing materials and techniques. Work depends upon the cost, type of structure and also the climatic conditions. Materials like red-mud, plastic rice husk ash, disposal of solid wastes, lime, cement, fly ash, copper slag, etc.

2. MATERIALS AND PROPERTIES:

2.1) Black cotton soil: Black cotton soils is the major form of soil found in India, and it cover 20% of the total area. It is mainly found in middle most part of the like MP, Maharashtra and some part of southern area. In this investigation the Black cotton soil sample was collected from Beside land near by our college campus on rai-sene road Bhopal, MP, and further tested in laboratory for their all index and engineering properties, results are resulted down in table-1

Table:-1: characteristics of black cotton soil sample obtained in laboratory test are:-

S.NO	PROPERTY	VALUE
1	Specific Gravity	2.64
2	Liquid Limit (%)	48.94
3	Plastic Limit (%)	30.34
4	Plasticity Index (%)	18.60
5	Optimum moisture Content (%)	13.70
6	Maximum Dry Density (g/cc)	1.882
7	California Bearing Ratio	2.52

Table-1

2.2) Red Mud:- Industrial waste Red-mud .Red mud is a waste produced in the formation of alumina in aluminum industries. It is mainly composed of iron oxide. Red-mud another name is Buxite tailings but is commonly known as red-mud. The Red-mud sample is collected from the working site of NHAI near koktak bypass raisan road. Bhopal, MP. Various Laboratory test's like index and engineering properties are obtain from past study results are tabulated down in table-2.

Table:-2: properties of red mud are :-

S.NO	PROPERTY	VALUE
1	Specific Gravity	3.0
2	Atterberg's Limit	NP
3	Optimum moisture Content (%)	26.90
4	Maximum Dry Density (g/cc)	1.69
5	California Bearing Ratio	3.3
6	Permeability (cm/sec)	$1.12x10^{-5}$

Table-2

2.3) Polythene:- polythene is made up of synthetic organic, Very Slowly-degradable substance. Polythene is harmful for our environment. Polythene is the commonly used plastic all over the world, it is mainly used for bag's and packing. In this study we are going to use (LDPE) low density polythene. Which is collected from our surrounding. Properties of LDEP are shown in Table-3

Table:-3: Properties of polythene

PROPERTY	
Chemical Formula	$(C_2H_4)_n$
Density	0.88-0.96 g/cm^3
Melting point	105-115^{o}C
log^P	1.02620
Magnetic susceptibility	$-9.67x10^{-6}$

Table-3

3. REVIEW OF LITRETURE:

Many studies ware carried out for black cotton soil stabilization with different additives and materials & results for CBR and UCS value. Previous study of stabilization by red-mud, flyash, cement and granite dust are respectively. We also reviewed the IS code for soil stabilization. Rajashekhar Malagihal(2014), Mishra et al(2014), modak et al(2012), are studied the stabilization of black cotton soil with stabilizing materials such like red mud, granite dust and fly ash . Hind et al (1999), Deelwal et al, studied about the physical and characteristic properties of red mud. N.vijaya study about the stabilization with plastic and bottle strip.

4 METHODOLOGIES:

4.1 Stabilization:- Stabilization of Black Cotton soil was done by Red mud and polythene Percentages. The addition of red-mud and polythene with soil are presented in the table 4.

Table 4 show's the mix proportion of sample.

S.NO	SYMBOL	MIX PROPORTION
1	S1	(BC)+(0%RM)+(0%Polythene)
2	S2	(BC)+(10%RM)+(0.2%Polythene)
3	S3	(BC)+(10%RM)+(0.3%Polythene)
4	S4	(BC)+(10%RM)+(0.5%Polythene)
5	S5	(BC)+(15%RM)+(0.2%Polythene)
6	S6	(BC)+(15%RM)+(0.3%Polythene)
7	S7	(BC)+(15%RM)+(0.5%Polythene)
8	S8	(BC)+(20%RM)+(0.2%Polythene)
9	S9	(BC)+(20%RM)+(0.3%Polythene)
10	S10	(BC)+(20%RM)+(0.5%Polythene)

Table-4

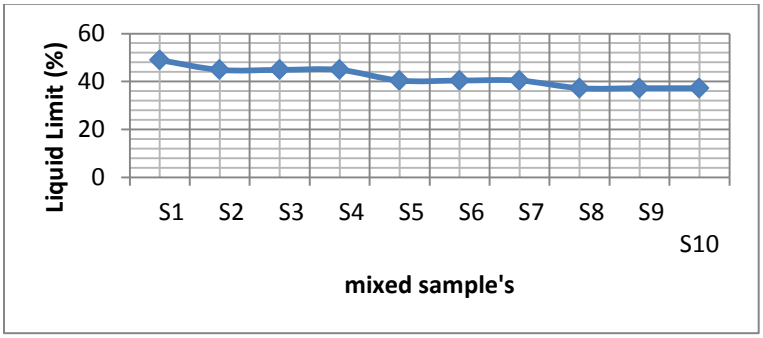
5 TEST RESULTS AND DISCUSSIONS:

5.1. The result's are shown in Table (5)

S.NO	SAMPLE	LL for red-mud mix only (%)	PL for red-mud mix only (%)	MDD (g/cc)	OMC (%)	UCS (kg/cm^2)	CBR (%)
1	S1	48.94	30.34	1.882	13.70	0.41	2.52
2	S2	44.86	27.24	1.865	12.02	0.49	3.24
3	S3	44.86	27.24	1.724	13.66	0.48	2.74
4	S4	44.86	27.24	1.880	12.15	0.38	1.71
5	S5	40.41	24.12	1.820	13.73	0.53	4.98
6	S6	40.41	24.12	1.799	12.84	0.55	3.44
7	S7	40.41	24.12	1.779	16.35	0.49	2.70
8	S8	37.23	21.82	1.800	17.72	0.94	6.22
9	S9	37.23	21.82	1.792	17.13	0.97	5.41
10	S10	37.23	21.82	1.809	16.59	0.83	3.52

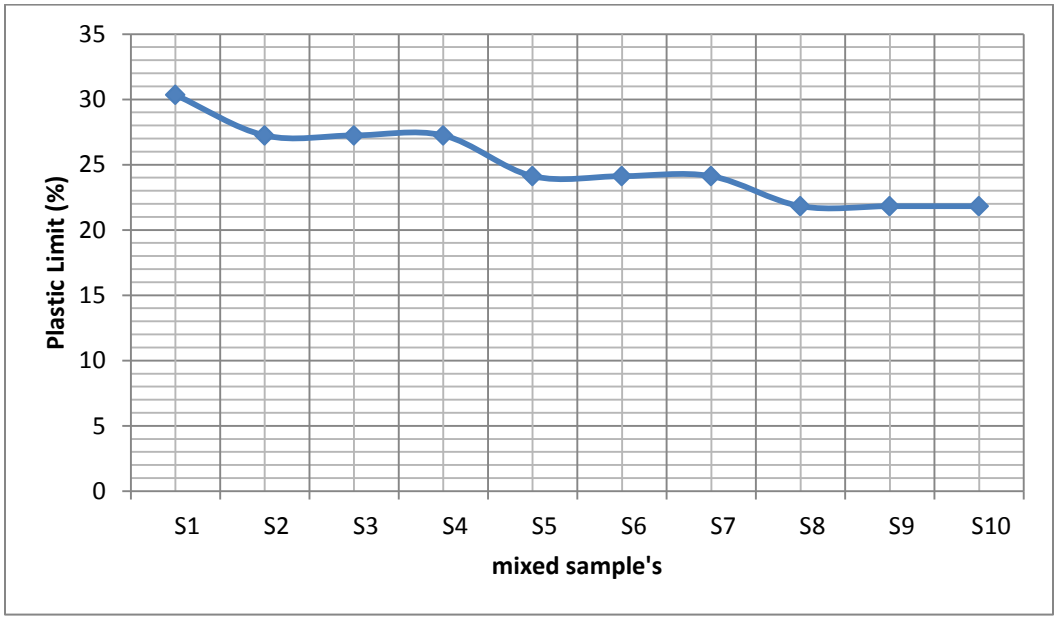
* Fig.1 shows the relation between combinations and liquid limit for all the sample's.

Fig-1:



* Fig.2 shows the relation between combinations and plastic limit for all the sample's.

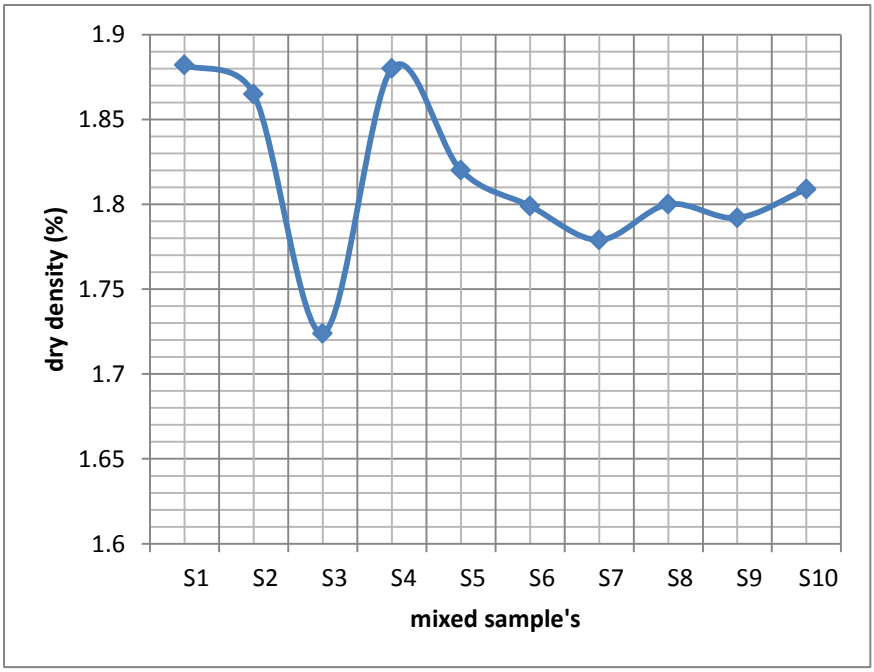
Fig-2



* Fig.3 MDD for all the sample's from S1 to S10

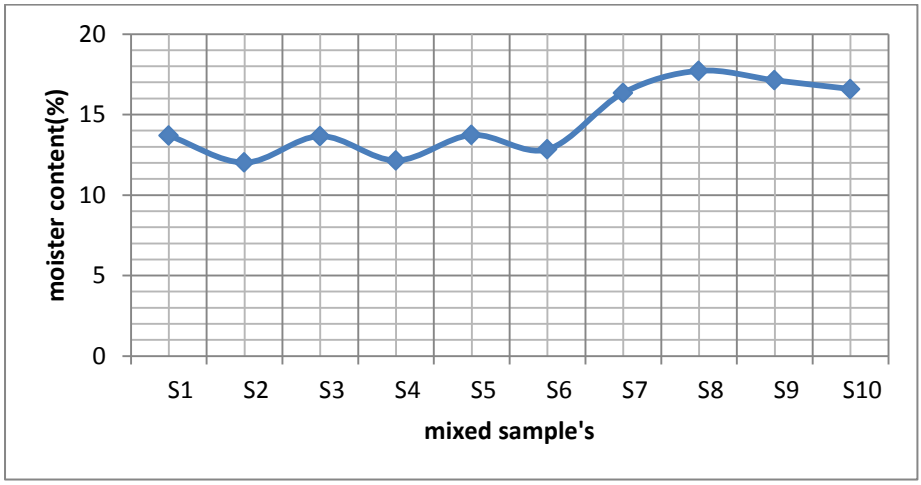
Maximum dry density is 1.882 (S1) and minimum is 1.724 (S2)

Fig-3



* Fig.4 OMC for all the sample's from S1 to S10.Maximum OMC obtained is 17.72 and minimum is 12.02

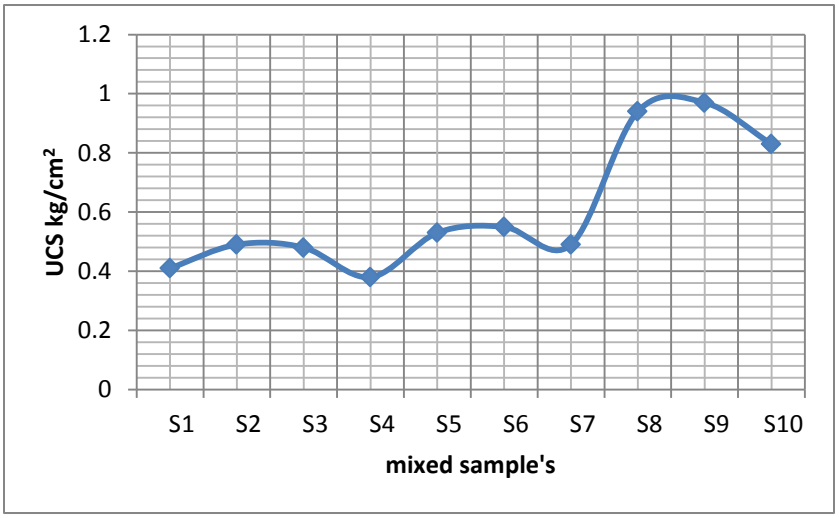
Fig-4



* Fig.5 shows relationship between combinations and UCS values of all the sample's

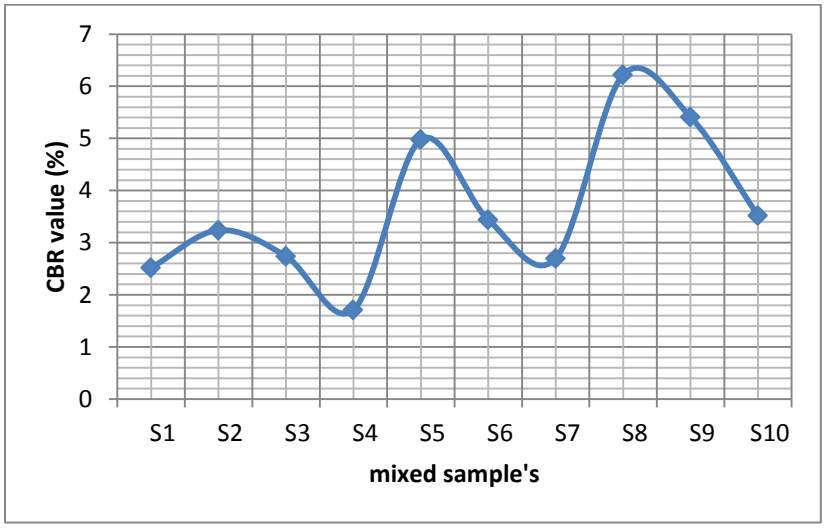
Max UCS value was recorded at 20% red-mud and 0.3% polythene mix with soil sample & it is 0,97kg/cm^2. At sample S9

Fig-5



* Fig.6 shows the relationship between combinations and CBR values of all the sample's. Maximum CBR value is recorded at 20% of red-mud + 0.2% plastic when mix with soil sample & its value is 6.22. at sample S8.

Fig-6



6 CONCLUSIONS:

* Black cotton soil was stabilized with red mud and polythene. Varying the % of mix 10%, 15%, and 20%. 0.2%, 0.3% and 0.5% of polythene strip is mixed with every sample of the red-mud they are mixed well in order to give better binding between the particles.

* Optimum value of unconfined compressive strength was obtained at 20% of red-mud+ 0.3 % of polythene when mixed with the soil. The value was recorded 0.97kg/cm^2

* The CBR values obtain optimum was 6.22 % at 20 % of red mud and 0.2% of polythene when mixed with soil sample.

* To understand the result's of flow characteristics of the mix, LL and PL test's are conducted, these values constantly decreased as the red-mud mix is increased. But we note that while we mix 0.5 % of polythene it increases again. Maximum value of LL for black cotton soil is 48.94% and the minimum being 38.21%. The maximum and minimum PL is 30.34 % and 23.12% respectively.

* Later in order to obtain the co-relation between all the samples from S1 to S10 analysis is carried.

7 REFRENCE:

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BIOGRAPHY

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