STABILIZATION OF SOFT SOIL USING SHREDDED RUBBER AN INDUSTRIAL WASTE

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Abstract*— Shredded rubber tyre having sizes ranges from 15mm (Width) and30mm (Length) and the steel belting was removed are used extensively. Added amount of rubber tyre had been varied in proportions of 4%, 6%, 8% and 10%. Use of shredded rubber tyres in geotechnical engineering for enhancing the soil properties has received great attention in the recent times. This paper presents the investigation of behavior of pavement subgrade soil stabilized with shredded rubber tyre. It is found that the 8% (25 mm×50 mm) of tyre content is the specific value where the CBR has got the improvement of 66.28% than in comparison of the plain soil

Keywords— ***Soil Stabilization, Clayey Soil, Shredded Rubber Tyre, CBR etc….***

I. INTRODUCTION

The soil often is weak and has no enough stability in heavy loading. The aim of the study was to use the waste material for stabilization of soil in order to reduce the environmental impact. Several reinforcement methods are available for stabilizing soils. Scrap tyre generations is always on the increasing trend everywhere in the world. Majority of them end up in the already congested landfill or becoming mosquito breeding places. Worst when they are burned. This paper aims at studying the appropriateness of shredded rubber tyres for its use in pavement engineering, i.e. to stabilize the subgrade of the pavements. It discusses about CBR value of soil-tyre mixture and the results are presented

2. MATERIALS USED

The soil used in this study collected from CCET, Classification of soil as per BIS is CI which is clay with intermediate compressibility. Shredded rubber tyre was cut into different sizes ranges from 15mm (Width) and 30mm (Length). Added amount of rubber tyre had been varied in proportions of 4%, 6%, 8% and 10%. The view of shredded rubber tyre used in the study is shown in Fig.1 and Fig.2 Fig 3 .

Fig. 1: Red soil

Fig. 2: Block cotton soil

ig. 3: Clay soil

PROPERTIES OF SOIL :

CLAY SOIL:
Specific gravity =2.58

RED SOIL:
Specific gravity =2.27

BLOCK COTTON SOIL:
Specific gravity =2.058

IS sieve by means of pycnometer as per 2720(part3/sec1)-1980

Properties of rubber
Length of rubber = 30mm
Width of rubber = 15mm
Thickness of rubber =0.5mm

S.No	Properties of rubber tyre	Values
1	Specific gravity	1.4
2	Average ultimate tensile strength	8.02MPa
3	% of elongation at Failure	23%

PRIMARY TEST

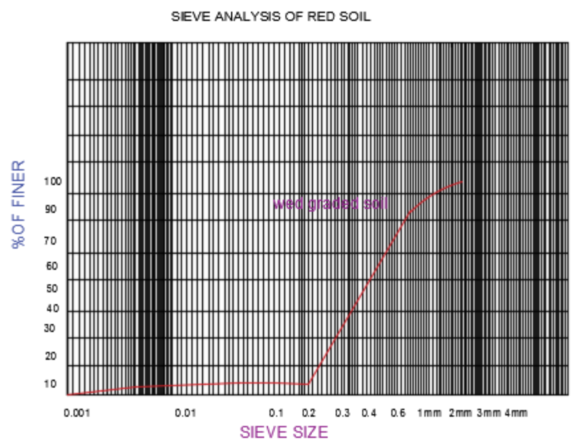
Sieve Analysis Test

Objective

The experiment is conducted for the determination of the percentage of various particle size in a soil sample and to classify the coarse grained soil
Reference: IS 2720 (part-IV) 1985

SIEVE ANALYSIS OF RED SOIL:

SIEVE SIZE	Sieve+soil (g)	Sieve wt(g)	Wt of soil	Cummulative retained	Cummulative % of rated	% of finer
4.75mm	488.5	378.5	110	110	11	89
2.36mm	575.5	356.5	218	326	32.5	67.2
1.18mm	559.5	349	210.5	538.5	53.85	46.15
0.6mm	500	387	113	651.5	65.15	34.85
0.3mm	557	350	207	858.5	85.85	14.15
0.15mm	425.5	312	113.5	972	97.2	2.8
0.07mm	342	326	16	988	98.8	1.2
Pan	332.5	309.5	12	1000	100	0



Sieve size	Sieve+soil wt(g)	Sieve wt(g)	Wt of soil	Cumulative Retained(g)	Cumulative % of rated	% of finer
4.75mm	471.5	378.5	93	93	9.3	90.7
2.36mm	577	356.5	220.5	313.5	31.35	68.65
1.18mm	588.5	349.5	239	552.5	55.25	44.75
0.6mm	531.5	387	144.5	697	69.7	30.3
0.3mm	545.5	341.5	204	901	90.1	9.0
0.15mm	441	341	100	1000	100	0
0.07mm	302.5	299.5	3	1000	100	0
Pan	310	309	1	1000	100	0

Standard Proctor Compaction Test

Objective

The experiment is conducted for the determination of optimum moisture content and maximum dry density for a soil by conducting standard proctor compaction test.

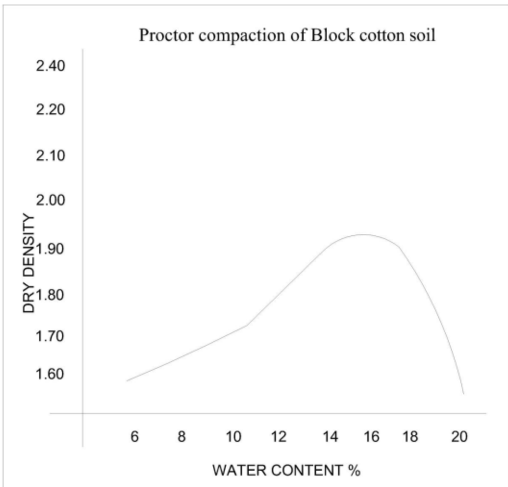
Reference: IS 2720 (part- XXVIII) 1974

a) Density of soil,
=W/V g/cm2

b) Water content,
*W= (W1-W2/W1)*100*

c) Dry density of soil,
d= / (1+W)

S.No.	Wt of soil (gm)	Water content	Water added(ml)	No. of blows
1	120	36%	43.2	80
2	120	38%	45.6	78
3	120	40%	48	55
4	120	42%	50.4	20
5	120	44%	52.8	18
6	120	46%	55.2	12
7	120	48%	57.6	10



3. UNCONFINED COMPRESSION

The unconfined compression test is by far the most popular method of soil shear testing because it is one of the fastest and cheapest methods of measuring shear strength. The method is used primarily for saturated, cohesive soils recovered from dry sands or crumbly clays because the material would fall apart without some land of lateral confinement.

To perform an unconfined compression test, the sample is extruded from the sampling tube. A cylindrical sampling of soil is trimmed such that the ends are reasonably smooth and the length-to-diameter ratio is on the order of two. The soil sample is placed in a loading frame on a metal plate; by turning a crank, the operator raises the level of the bottom plate. The top of the soil sample is restrained by the top plate, which is attached to a calibrated proving ring. As the bottom plate is raised, an axial load is applied to the sample. The operator turns the crank at specified rate so that there is constant strain rate. The load is gradually increased to shear the sample, and the resulting deformation. The loading is continued until the soil develops an obvious shearing

plane or the deformations becomes excessive. The measured data are used to determine the strength of the soil specimen and the stress-strain characteristics. Finaly, the sample is oven dried to determine its water content. The maximum load per unit area is defined as the unconfined compressive strength,qu.
In the unconfined compression test, we assume that no pore water is lost from the sample during set up or during the shearing process.

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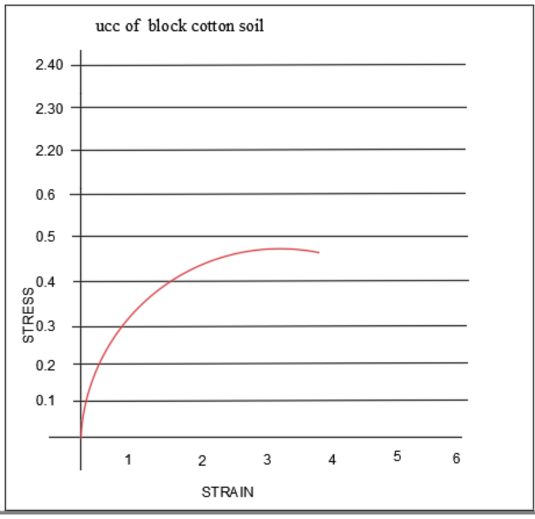

BLOCK COTTON SOIL:

Deflection reading	Deflection	Strain	Corrected area(A)	Proving reading	Axial load	Stress(P/A)
0.2	2	0.0267	11.65	0.2	7.24	0.621
0.4	4	0.053	11.94	0.4	14.45	1.210
0.6	6	0.08	12.326	0.6	21.68	1.75
0.8	8	0.1067	12.69	0.6	21.68	1.708
1	10	0.133	13.08	0.8	28.9	2.21
1.2	12	0.16	13.5	0.8	28.9	2.14
1.4	14	0.187	13.95	1	36.13	2.59
1.6	16	0.213	14.41	1	36.13	2.50
1.8	18	0.24	14.92	1.2	43.35	2.90
2	20	0.267	15.47	1.4	43.35	2.80
2.2	22	0.293	16.04	1.4	50.57	3.153
2.4	24	0.32	16.68	1.6	50.57	3.03
2.6	26	0.347	17.37	1.8	57.8	3.33
2.8	28	0.373	18.1	2	65.03	3.59
3	30	0.4	18.9	2.2	72.25	3.82
3.2	32	0.426	19.76	2.2	79.48	4.02

RED SOIL:

Deflection Reading	Deflection	Strain	Corrected area(A)	Proving reading	Axial load	Stress(P/A)
0.2	2	0.0267	11.65	0.2	7.24	0.621
0.4	4	0.053	11.94	0.4	14.45	1.210
0.6	6	0.08	12.326	0.6	21.68	1.75
0.8	8	0.1067	12.69	0.6	21.68	1.708
1	10	0.133	13.08	0.8	28.9	2.21
1.2	12	0.16	13.5	0.8	28.9	2.14
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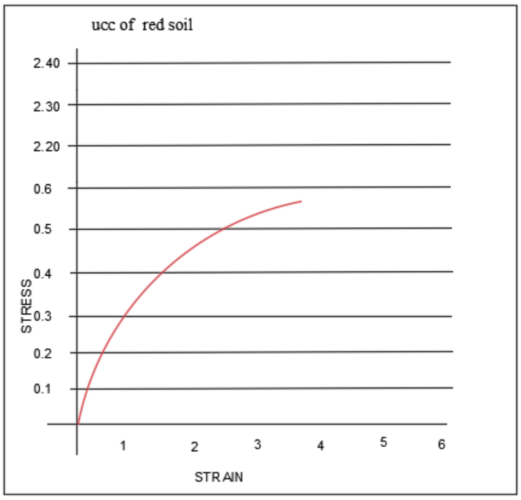
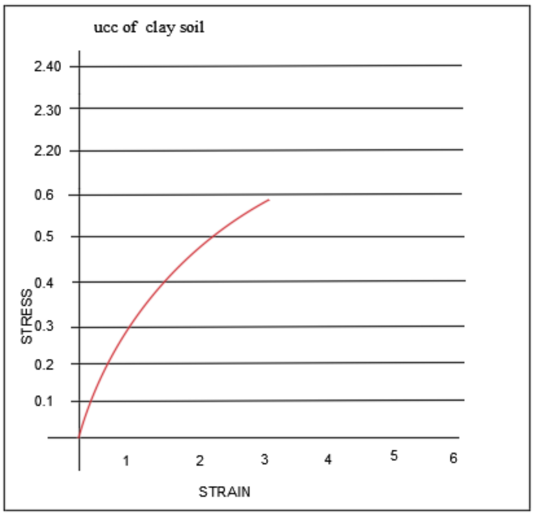
2.6	26	0.347	17.37	1.8	57.8	3.33
2.8	28	0.373	18.1	2	65.03	3.59
3	30	0.4	18.9	2.2	72.25	3.82
3.2	32	0.426	19.76	2.2	79.48	4.02
3.4	34	0.453	20.73	2.4	86.7	3.97
3.6	36	0.48	21.81	2.4	86.7	3.74





CLAY SOIL:

Deflection reading	Deflection	Strain	Corrected area(A)	Proving reading	Axial load	Stress(P/A)
0.2	2	0.0267	11.65	0.2	7.24	0.621
0.4	4	0.053	11.94	0.4	14.45	1.210
0.6	6	0.08	12.326	0.6	21.68	1.75
0.8	8	0.1067	12.69	0.6	21.68	1.708
1	10	0.133	13.08	0.8	28.9	2.21
1.2	12	0.16	13.5	0.8	28.9	2.14
1.4	14	0.187	13.95	1	36.13	2.59
1.6	16	0.213	14.41	1	36.13	2.50
1.8	18	0.24	14.92	1.2	43.35	2.90
2	20	0.267	15.47	1.4	43.35	2.80
2.2	22	0.293	16.04	1.4	50.57	3.153
2.4	24	0.32	16.68	1.6	50.57	3.03
2.6	26	0.347	17.37	1.8	57.8	3.33
2.8	28	0.373	18.1	2	65.03	3.59

RESULT

It is observed from the experiment is plotted in the figure enlisted above and from this conclusion can be drawn. It is very much clear that mixing of the plastic in the soil can increase the strength of the soil because the soil sample without shredded rubber is having less strength. There is major increase in the unconfined compression strength value which is clear in the above figure. But also shows that use of more shredded rubber decrease the compressive strength. This all shows that benefits of plastics reinforcement increases to certain level and after that it will decrease the strength. So careful observation must be done.

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Acknowledgment (HEADING 5)

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