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SOIL STABILIZATION BY USINGWASTE PLASTIC

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ABSTRACT

Soil is a major key element of the environment and all human needs in the life like food, houses, cloths and etc., block cotton soil (clay) get high potential in swelling as well as shrinkage while change in the moisture content. The block cotton soil is one of the major soil deposit in India nearly 74%. Soil stabilization is a process of changing physical properties of soil to increase shear strength, bearing capacity and etc., it's achieved by use of controlled compaction or adding admixtures.

This new technology effectively used to meet the challenging environment. If we are using plastic as stabilizer then, it's remove the disposal problem in the environment as well as increase the density and bearing capacity of the soil. In the present study was conducted at the place of melakaraikatu, near Amman kovil, Thottiam. Randomly distributed plastic strips (0%, 2%, 4%, and 6%) are added to the soil and strength calculated by California bearing ratio test.

Keywords:Admixtures,California bearing ratio test,plastic strips, shrinkage, stabilizer

I. INTRODUCTION

In India, the soil stabilization process was carried out 1970's onwards, with help of various replacement and compaction technique, it became an important process otherwise the soil replaced poor soil at foundation level. In recent times, with the increase in the demand for infrastructure, raw materials and fuel, soil stabilization has started to take a new shape. With the availability of better research replacement of material is emerging as a popular and cost-effective method for soil improvement. Here, in this project, soil stabilization has been done with the help of randomly distributed waste plastic fibers obtained from waste materials. The increasing of shear strength can be find out by using California bearing ratio test results.

II. METHODS

(i) Mechanical method of Stabilization:

In this procedure, soils of different gradations are mixed together to obtain the desired property in the soil. This may be done at the site or at some other place from where it can be transported easily. The final mixture is then compacted by the usual methods to get the required density.

(ii) Additive method of stabilization:

It refers to the addition of manufactured products into the soil, which in proper quantities enhances the quality of the soil. Materials such as cement, lime, bitumen, fly ash etc. are used as chemical additives. Sometimes different fibers are also used as reinforcements in the soil. The addition of these fibers takes place by two methods;

a) Oriented fiber reinforcement:

The fibers are arranged in some order and all the fibers are placed in the same orientation. The fibers are laid layer by layer in this type of orientation.

b) Random fiber reinforcement:

This arrangement has discrete fibers distributed randomly in the soil mass. The mixing is done until the soil and the reinforcement form a more or less homogeneous mixture. Materials used in this type of reinforcements are generally derived from paper, nylon, metals or other materials having varied physical properties.

III. INDENTATIONS AND EQUATIONS

1. PRINCIPLES OF SOIL STABILIZATION

➢ Evaluating the properties of given soil

➢ Deciding the lacking property of soil and choose effective and economical method of soil stabilization

➢ Designing the Stabilized soil mix for intended stability and durability values

2. OBJECTIVES

➢ To increase the density and California Bearing Ratio (CBR) of soil using plastic as an admixture.

➢ To provide an alternative solution for the disposal of plastic waste.

➢ To provide an economical solution for soil stabilization using plastic waste.

➢ To determine the optimum plastic content to be used.

3. SCOPE

Through this project, a small attempt has been made at deducing a new method of waste disposal in effective manner. This project aims at proposing a new method of disposal of waste plastic (PET)by using them in stabilization admixture.

4. ADVANTAGES OF SOIL STABILIZATION

- It improves the strength of the soil, thus, increasing the soil bearing capacity.
- It is more economical both in terms of cost and energy to increase the bearing capacity of the soil rather than going for deep foundation or raft foundation.
- It is also used to provide more stability to the soil in slopes or other such places.

- It helps in reducing the soil volume change due to change in temperature or moisture content.
- Stabilization improves the workability and the durability of the soil.

5. MATERIALS USED

- **SOIL SAMPLE:**

  Location -melakaraikatu, near Amman kovil, Thottiam.

  Reinforcement -waste plastic fiber

- **WASTE PLASTIC FIBER**

  Plastic used in the project was polyethylene terephthalate (PET).

6. TEST CARRIED OUT

The following are the some of the test which is carried out in soil .

1. Specific gravity of soil
2. Grain size distribution
3. Moisture content
4. Liquid limit test
5. Core cutter test
6. Plastic limit test
7. Plasticity index
8. Proctor compaction test
9. Cbr test

IV. TEST RESULTS AND OBSERVATIONS

1.SPECIFIC GRAVITY OF SOIL

Particulars	**Trial – 1**	**Trial – 2**	**Trial – 3**
Wt. of Pycnometer (W1)	630	630	630
Wt. of Pyconometer+Soil (W2)	830	830	830
Wt. of Pyconometer+Soil+ Water (W3)	1700	1691	1701
Wt. of Pyconometer+Water (W4)	1570	1572	1572
SPECIFIC GRAVITY	2.85	2.469	2.816

Specific Gravity of Soil = 2.72

2.GRAIN SIZE DISTRIBUTION

IS Sieve(mm)	Retained soil (gm)	Retained soil (%)	Cumulative% Retained	%FINER
4.75	132	13.3	13.3	86.7

2.36	138	13.9	27.2	72.8
1.18	284	28.6	55.8	44.2
0.6	134	13.5	69.3	30.7
0.3	170	17.1	86.4	13.6
0.15	88	8.9	95.4	4.6
0.075	36	3.6	98.9	1.1
<0.075	10	1	99.9	0.1

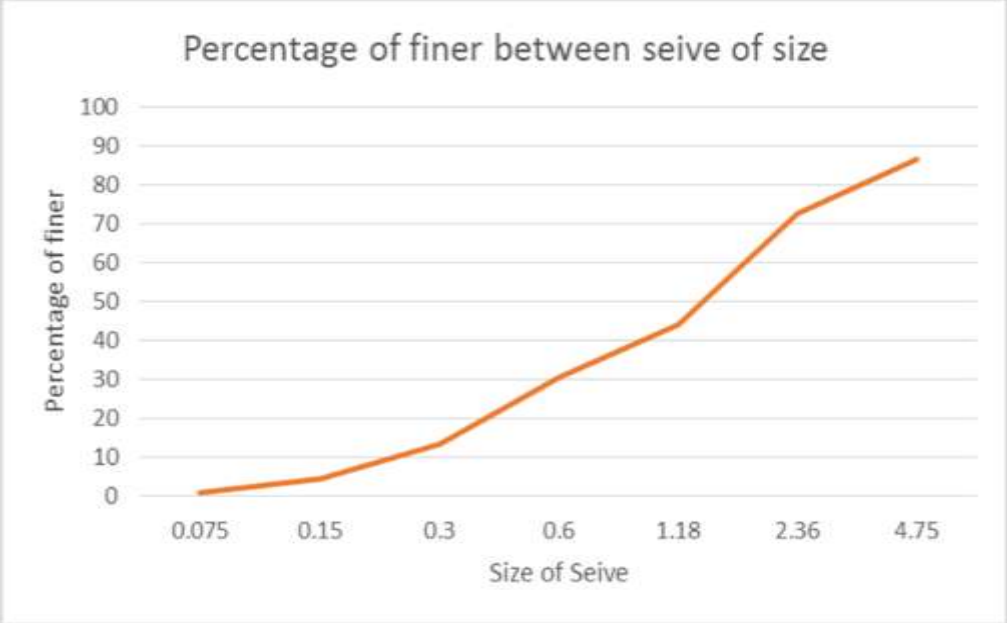
Uniformity co-efficient (Cu) = D 60/ $D10$ =1.94/0.25=7.76

Co-efficient of curvature (Cc) = ($D302$) / $D60$X $D10$

=0.582/(1.94x0.25)

= 0.693

Co-efficient of curvature (Cc) = 0.693



3.MOISTURE CONTENT

Wt. Of Container (gm)	**Wt. of container + Wet soil(gm)**	**Wt. of container + dry soil(gm)**	**Moisture Content (%)**

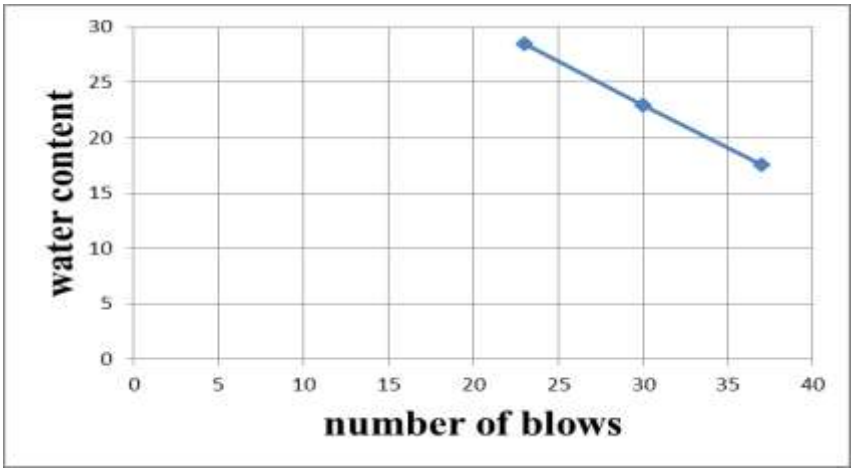
19	57	52	13.15
18	69	63	11.76
18	54	49	16.12

Moisture Content=13.67%

4.LIQUID LIMIT TEST

Sample number	1	2	3
Number of blows	37	30	23
Weight of containers W_0 g	10.6	10.6	10.6
Weight of container + wet soil W_1 g	24	25.6	26.8
Weight of container + oven-dry soil W_2 g	22	22.8	23.2
Weight of water W_1 -W_2 g	2	2.8	3.6
Weight of oven dry soil W_2 –W_0 g	11.4	12.2	12.6
Water content= $\frac{W_1 - W_2}{W_2 - W_0}$x100	17.54	22.95	28.5

Liquid limit =26.8%



5.CORE CUTTER TEST

Volume of core cutter (VC) = 1021 cm3

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Mass of core cutter (WC) = 915gms

Mass of core cutter + wet soil (WS) = 2780gms

Mass of wet soil (WS-WC) = 2780-915 = 1865gms

Bulk density = γ = M/V

=1865/1021=1.81g/cm3

Dry density = γ/ (1+W)

= 1.81/(1+0.1367)

= 1.592 g/cm3

6. PLASTIC LIMIT TEST

Sample number	1	2	3
Weight of containers W_0 g	10.6	10.6	10.6
Weight of container + wet soil W_1 g	14.8	15.4	14.6
Weight of container + oven-dry soil W_2 g	14.3	14.9	14.1
Weight of water W_1 -W_2 g	0.5	0.5	0.5
Weight of oven dry soil W_2 –W_0 g	3.7	4.3	3.5
Water content= $\frac{W_1 - W_2}{W_2 - W_0}$x100	13.514	11.628	14.286

Plastic limit=13.142%

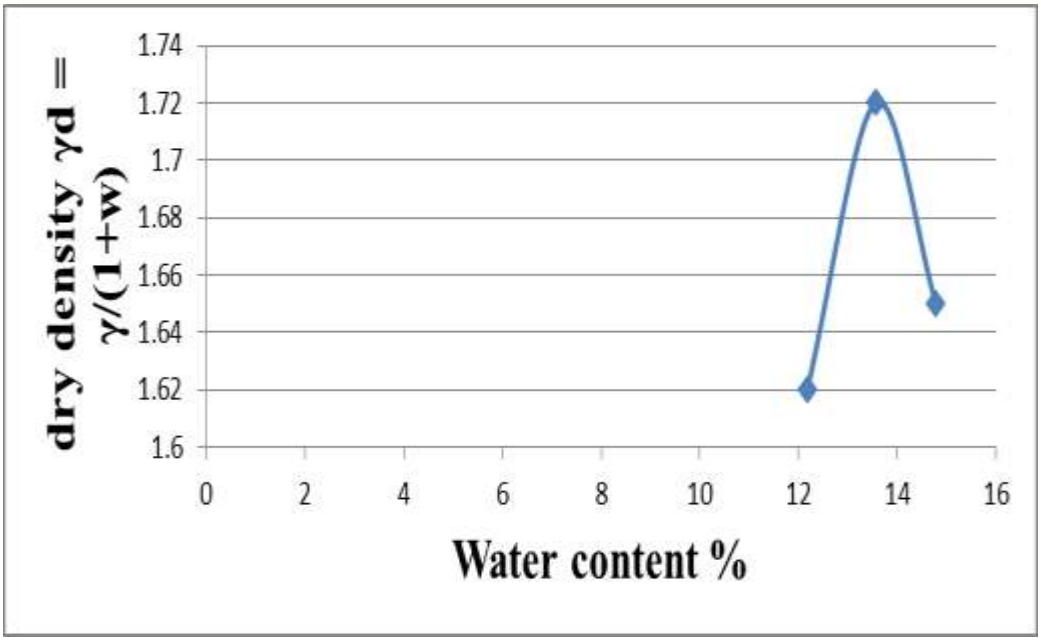
7. PLASTICITY INDEX

Ip = wL – Wp

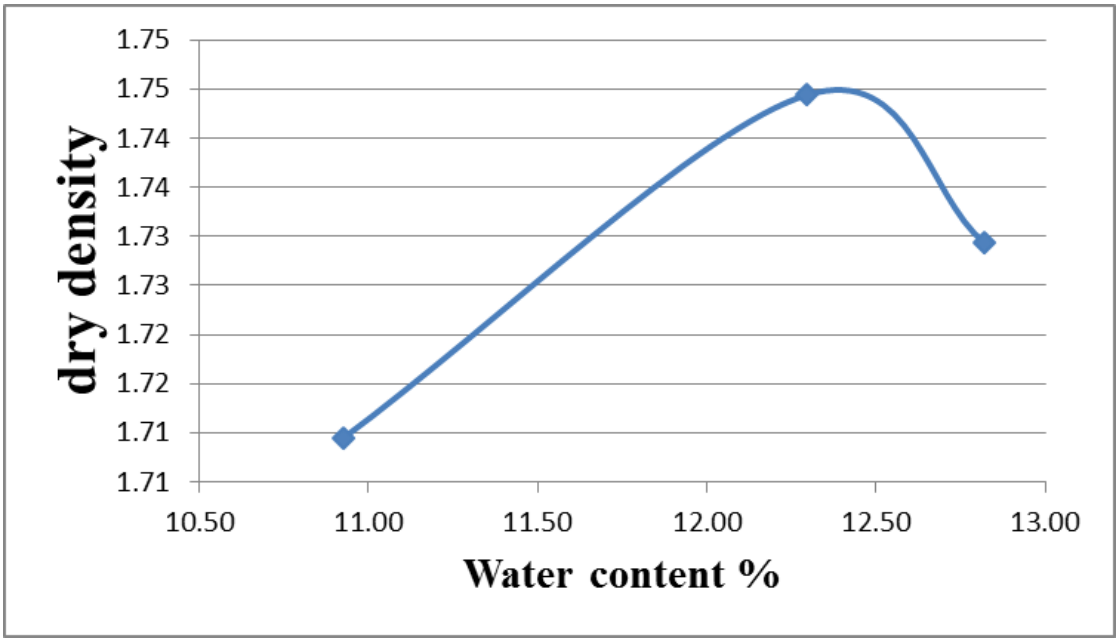
=26.8-13.142

= 13.658

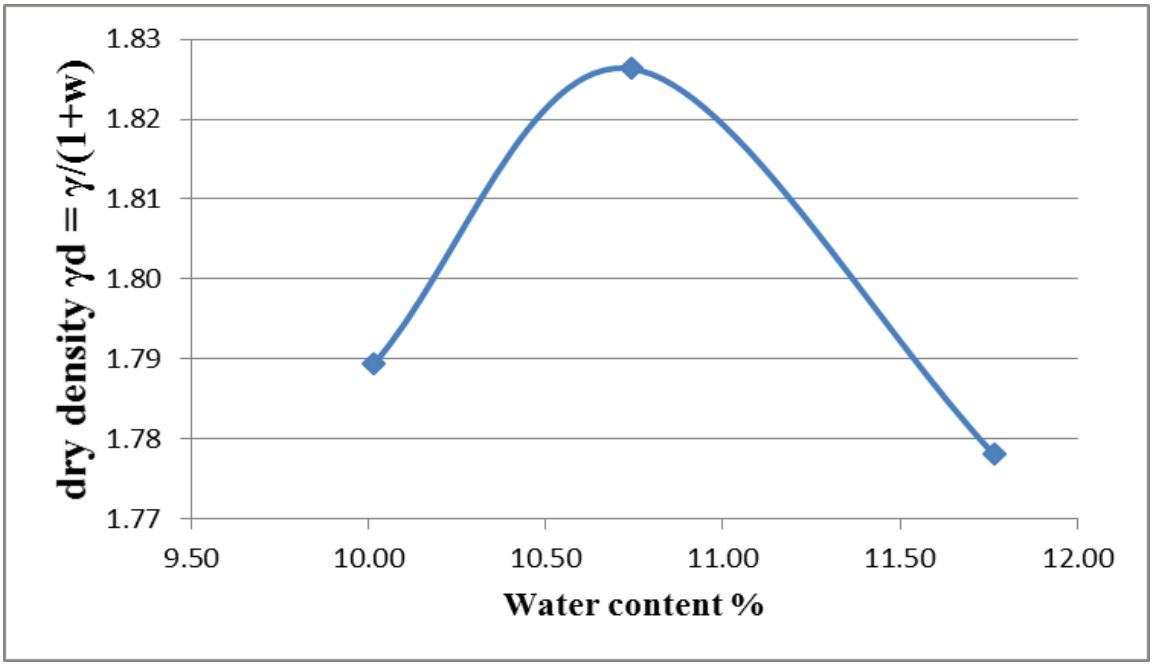
8. PROCTOR COMPACTION TEST



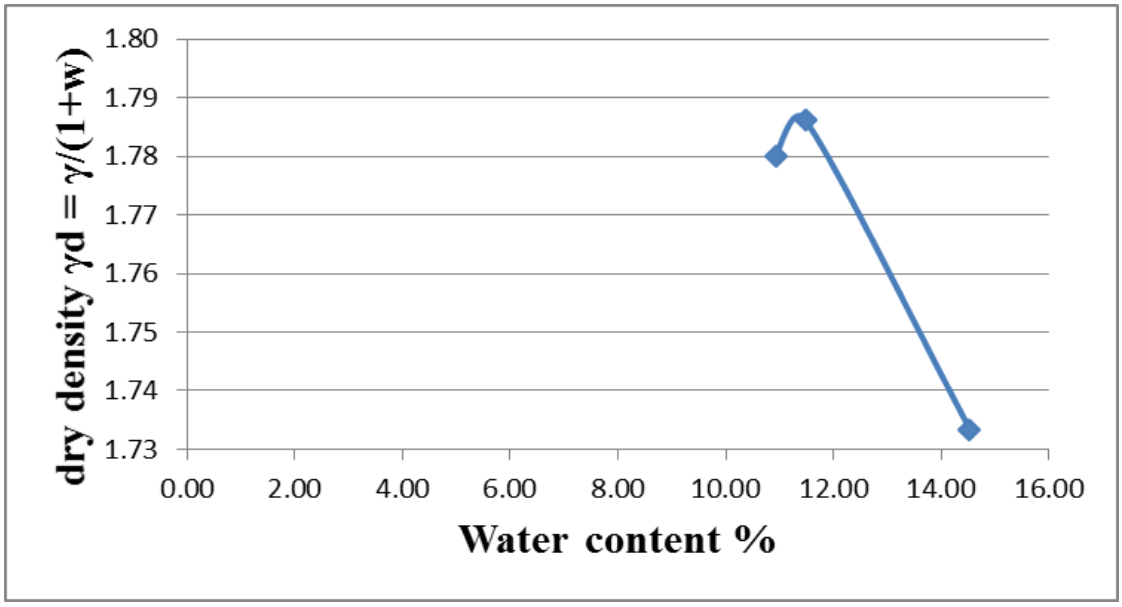
Proctor compaction test for unreinforced soil



Proctor compaction test for 2% of reinforced soil



Proctor compaction test for 4% of reinforced soil

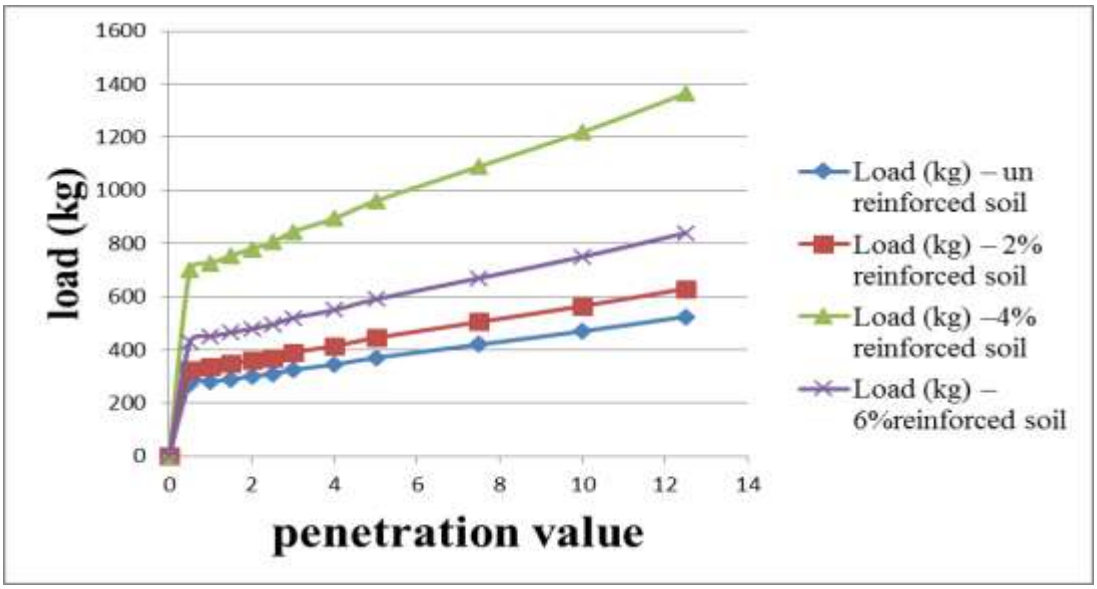


Proctor compaction test for6% of reinforced soil

9 CBR TEST

SAMPLE DESCRIPTION	MDD gm/cc	OMC %	CBR %
SOIL	1.62	20.5	1
SOIL WITH 2%	1.75	19.0	1.2

SOIL WITH 4%	**1.81**	**18.5**	**2.59**
SOIL WITH 6%	**1.71**	**18.0**	**1.59**



V. CONCLUSION

In the present examination, the enhanced CBR estimation of the dirt is because of the expansion of plastic strips. Plastic can be used as one of the material that can be utilized as a dirt settling operator yet the best possible extent of plastic must be there, which helps in expanding the CBR of the dirt.

It can be inferred that CBR rate continues expanding up to 4% plastic substance in the dirt and subsequently it diminishes with increment in plastic substance. Thus, we can state that 4% plastic substance is the ideal substance of plastic waste in the dirt.

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