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Soil Stabilization Using Plastic Waste

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***Abstract*: In the 21st century the waste of plastics all over the world which is bad for Environment and it is affected to Economic processes, dynamic Consumption, and Production Patterns. The world's annual consumption of plastic materials has inflated from around 5-million tonnes in the 1950 to nearly 100 million tons. Thus, presently twenty times a lot plastic is produced as compared to 50 years ago. Soil stabilization alters the physical properties of soil to improve its strength, durability, stability or other qualities which is engineering necessities. For soil stabilization we will add admixtures of plastic (2%, 4%, 6%) which is improve the characteristics of soil strength, durability, only we add plastics strips for stabilization of soil we can protect the Environmental solutions.**

***Keywords*: California bearing ratio test, Black cotton soil, Plastic strips, Compaction of soil and plastic.**

1. Introduction

Soil stabilization using plastic waste is an innovative and environmentally friendly approach to enhance the properties of soil for various applications. Plastic waste, which is a significant global concern due to its non-biodegradable nature, can be effectively utilized in soil stabilization techniques, thereby addressing both waste management and soil engineering challenges.

The process of soil stabilization involves improving the engineering properties of soil to increase its strength, durability, and load-bearing capacity. Traditionally, soil stabilization has been achieved through the use of conventional materials such as cement, lime, or asphalt. However, incorporating plastic waste into this process offers a sustainable alternative that can help mitigate the environmental impact of plastic pollution while improving soil performance.

2. Materials

A. Soil Sample

Location: Kesnand gao Wagholi Pune Maharashtra 412207
Reinforcement: Waste plastic material.

We collect soil sample (Black cotton soil) from kesnand gao and cut [PET] bottles into strips.

B. Waste Plastic Material

polyethylene terephthalate (PET) are used in black cotton soil into strips for the purpose of increase the bearing capacity of soil.

1) Test Carried out

The following tests which are carried out in soil Shown in below.

a. Moisture content
b. Liquid limit test
c. Plastic limit test
d. Proctor compaction test
e. CBR test

Table 2
Liquid limit test

Sample number	1	2	3
Number of blows	37	30	23
Weight of containers W0 g	10.6	10.6	10.6
Weight of container + wet soil W1 g	24	25.6	26.8
Weight of container + oven-dry soil W2 g	22	22.8	23.2
Weight of water W1 -W2 g	2	2.8	3.6
Weight of oven dry soil W2 –W0 g	11.4	12.2	12.6
Water content= x100	17.54	22.95	28.95

Liquid limit test =26.8%

Table 3
Plastic limit test

Sample number	1	2	3
Weight of containers W0 g	10.6	10.6	10.6
Weight of container + wet soil W1 g	14.8	15.4	14.6
Weight of container + oven-dry soil W2 g	14.3	14.9	14.1
Weight of water W1 -W2 g	0.5	0.5	0.5
Weight of oven dry soil W2 –W0 g	3.7	4.3	3.5
Water content= W1-W2/W2-W0x100	13.514	11.628	14.268

Plastic limit =13.142%

Table 4
Proctor compaction test

Sample Description	OMD gm/cc	OMC %
SOIL	1.62	20.5
SOIL WITH 2%	1.75	19.0
SOIL WITH 4%	1.81	18.5
SOIL WITH 6%	1.71	18

Table 1
Moisture content test

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%

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Table 5
CBR test

Sample Description	OMD 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	1.59

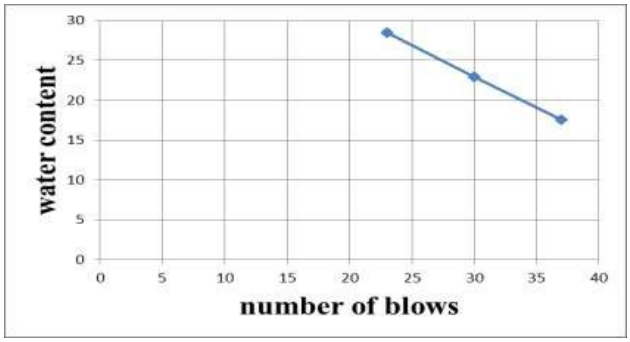

Fig. 1. Liquid limit test

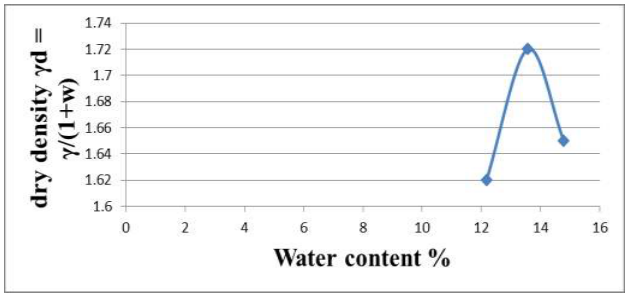

Fig. 2. Proctor compaction test for soil

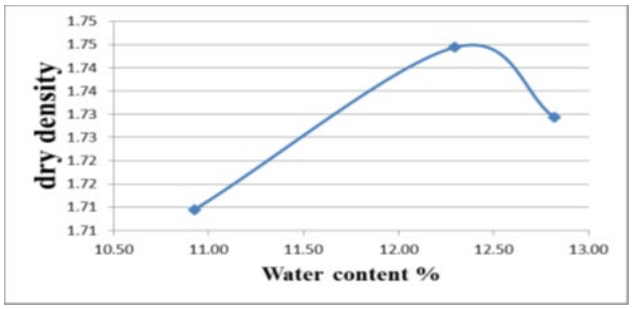

Fig. 3. Proctor compaction test for soil with 2% plastic

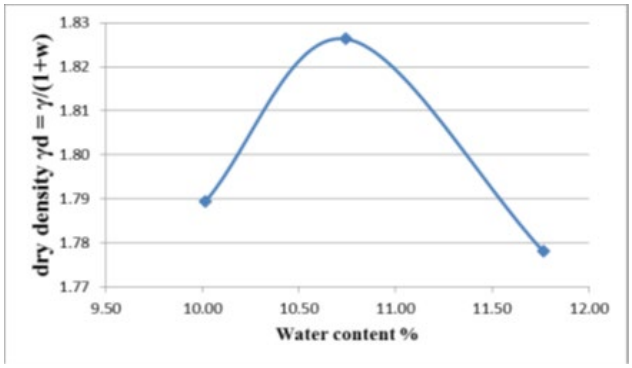

Fig. 4. Proctor compaction test for soil with 4% plastic

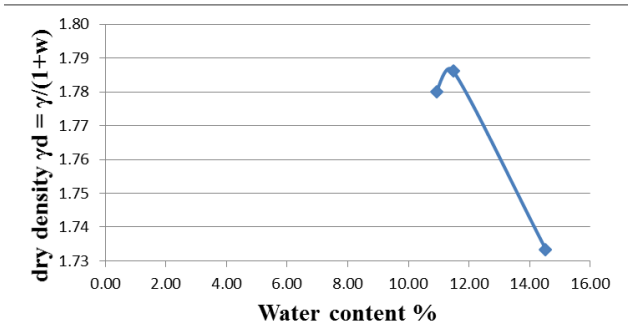

Fig. 5. Proctor compaction test for soil with 6% plastic

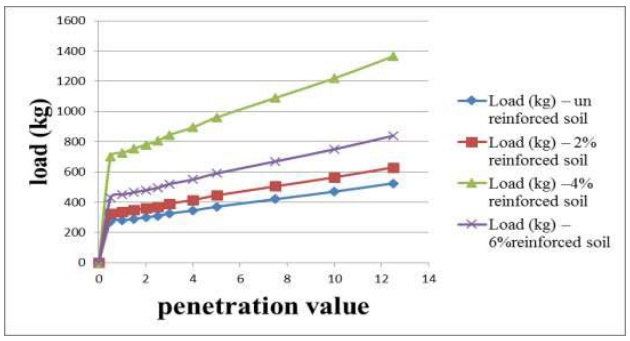

Fig. 6. CBR test graph

3. Conclusion

There are uses of plastic product such as polythene Plastic bottles, and packing strips etc. these products are increasing pollutions day by day in whole life which is very dangerous for human life and aquatic life. The disposal of the plastic wastes for society is very challenging to present society. Thus, using plastic bottles as a soil stabilizer is an economical and gainful utilization since there is scarcity of good quality soil for embankments and fills. Thus, this project is to meets the challenges of society to reduce the quantities of plastic waste, producing useful material from non-useful waste materials that lead to the foundation of sustainable society.

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