

Experimental study on improve the shear strength of soil by using of plastic waste

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Abstract - Generally, all types of construction are built with or upon soil. If the sub grade is not enough good the whole structure will face failure such as cracks. Therefore, sub grade is normally replaced with stronger soil material so as to improve the soil strength but it is not economical. In this project the strength of soil is increased by adding plastic waste. This initial strength of the soil is determined by conducting soil test such as California bearing ratio test, direct shear test, standard Procter test. The plastic waste is divided into 0.5%, 1% and 1.5% weight of the total dry soil sample on which the test is to be performed. Then results obtained by adding plastic waste are than compared with the soil treated with of plastic waste.

Key Words: Standard proctor test, Direct shear test, CBR test, Soil bearing capacity.

1. INTRODUCTION

Stabilization of soil done in various way such that mechanical stabilization, chemical stabilization and by using other improvement techniques. Because of use and throw policy of plastic by the user it become serious issue as it develops man made hazards, the other issue is that plastic will last in environment for number of years and hence pollution is remaining as a problem.

When we use the plastic drinking straw which is used once for a minute and then thrown which remain in existence for 100s of years, that's why the new techniques are required for disposal of plastics. Some new techniques used for stabilization of soil by using steel and other admixtures will be more costly and hence for both economical and pollution reduction of plastic waste the best way is that use such wastes is for improving engineering properties.

Therefore, in present study stabilization of soil is reviewed by using locally available plastic waste products of plastic bottles are used in stabilization of soil in the form of strips of suitable dimensions. The objective of this study was improving properties of soil in economical way and reducing environmental pollution, and minimize the problems of plastic waste disposal.

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2. SCOPE & OBJECTIVE

To improve the bearing capacity of weak soil.

To improve the engineering properties of the soil such as shear strength.

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

Decreasing cost of soil stabilization by using cheap material.

Making the waste materials and environmental hazardous material into the useful material.

3. MATERIALS

Normal soil

Plastic waste & water

4. METHODOLOGY

Study on plastic waste

Material collection (soil, plastic waste)

Determining the normal test of soil

Adding plastic waste to soil

Tests on sample treated with plastic waste

Comparison of results

Conclusion

5. EXPERIMENT INVESTIGATION

Standard proctor test (IS:2270 PART-7, 1983)

The Standard Proctor test has been conducted as per IS 2720, PART 7, 1883 on cohesive soil and plastic mix composites to determine optimum moisture content and maximum dry density. The soil is mixed with randomly distributed plastic strips of varying percentages of 0.5%, 1%, 1.5% of the dry weight of soil and varying length of 15MM X

15MM. Standard proctor test has been conducted on soil and plastic strips mixture.

Direct shear test (IS:2270 PART-13, 1986)

Direct shear test has been conducted as per IS:2270, PART 13, 1986 on cohesive soil and plastic mix composites to determine the shear parameter or strength. The soil mixes of soil and varying length 15MM X 15MM.

CBR test (IS:2270 PART-16, 1979)

CBR test has been carried out on soil and plastic mix composites as per IS2720, PART 16, 1979. The soil is mixed with plastic of varying percentages 0.5%, 1%, 1.5% and length 15MM X 15MM. The CBR values obtained from Laboratory.

6. RESULTS AND DISCUSSION

Standard proctor test (IS:2270 PART-7, 1983)

There are shown in table-1 is an increase of plastic content the value of maximum dry density decreases where the value optimum moisture content increase.

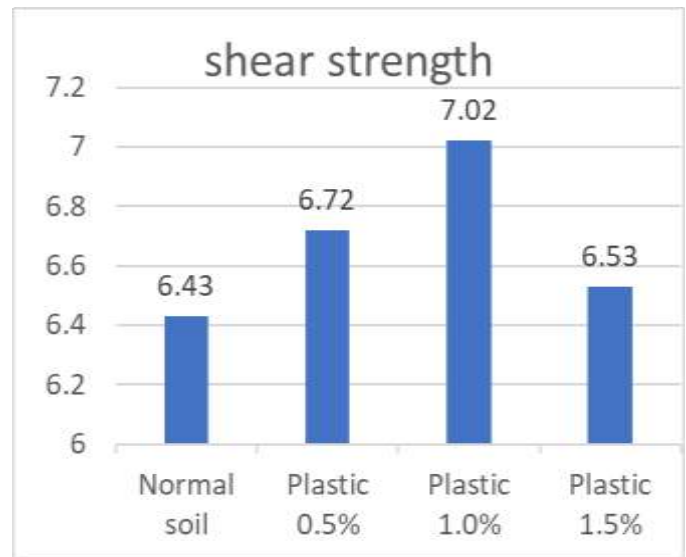
Table - 1: Experimental Test Results of standard proctor test

Percentage of plastic	MDD (gm/cc)	OMC (%)
0%	1.58	10.91
0.5%	1.63	11.2
1%	1.60	11.3
1.5%	1.55	11

Direct shear test (IS:2270 PART-13, 1986)

There are shown on graph-1 Direct shear test results show that the increase up to 0.5%, 1%, & 1.5% of plastic content by mass of natural soil. For higher percentage of plastic content, the shear parameters are found to decrease. For strip sizes (i.e. 15 mm x 15 mm), shear strength parameters exhibited highest improvement at 0.5% & 1% of plastic content and decreasing 1.5% of plastic content by mass of natural soil.

Graph - 1 Experimental Test Results of Direct shear test



CBR test (IS:2270 PART-16, 1979)

There are shown in graph-2 The improved CBR values of the soil are due to the addition of plastic strips. The CBR value increasing when adding plastic strips 0.5% & 1% of mass of natural soil and CBR value decrease when adding of plastic strips 1.5% of mass of natural soil mass.

Percentage of plastic	CBR VALUE AT 2.5MM PT	CBR VALUE AT 5MM PT
0%	3.06	2.43
0.5%	4.23	3.96
1%	4.59	4.08
1.5%	3.32	2.87

7. CONCLUSIONS

The plastic can improve the strength thus increasing the soil bearing capacity of the soil. Every year a lot of plastic waste is generated and occupied a lot of space. It is necessary to find a solution for this problem.

There is an increase of plastic content the value of maximum dry density decreases where the value optimum moisture content increase.

Direct shear test results show that the increase up to 0.5%, 1%, & 1.5% of plastic content by mass of natural soil. For higher percentage of plastic content, the shear parameters are found to decrease. For strip sizes (i.e. 15 mm x 15 mm), shear strength parameters exhibited highest improvement at 0.5% & 1% of plastic content and decreasing 1.5% of plastic content by mass of natural soil.

The improved CBR values of the soil are due to the addition of plastic strips. The CBR value increasing when adding plastic

strips 0.5% & 1% of mass of natural soil and CBR value decrease when adding of plastic strips 1.5% of mass of natural soil mass.

The main advantage of the using plastic is proven to be economical as it is a non-useful waste and free of cost.

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