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Soil Stabilization Using Powdered Glass

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Abstract - *The project aims at determining the noticeable change in the behavior of the soil after blending it with some admixture. For this purpose broken glass was taken as admixture in different balance up to 20% of the total weight by mass. Before mixing the soil with this admixture some basic properties of the soil like grade of the soil, moisture content ,specific gravity and atterberg"s limit were to be determined. After determining the basic properties 2 main tests of this project namely proctor compaction test and California bearing ratio test were performed on both unreinforced and reinforced soil with different proportion of glass powder. After obtaining the results of the project we concluded that the dry density of the soil was increased up to 10%(max) and decreases further on 15% and afterwards. The same result was obtained for CBR value of soil which was found to be highest on 10% and then the value declined on 15%.*

Key Words: **Atterberg limits, Subgrade material, Stabilisation, Compaction, Proctor Test, California Bearing Ratio Test (CBR)**

1. INTRODUCTION

The properties of soil are the major aspect which has to be keep in mind before executing a construction plan. Properties like the bearing capacity, moisture content, nature and type of soil etc determines the possibility and stability of the upcoming project .The soil having high moisture content will not be able to provide the stability as desired by engineers and neither does a soil with low bearing capacity be able to sustain load on itself. Not only the moisture content and bearing capacity but the grade of the soil is also one among the major factors which determines the stability of the soil. The soil could be well graded which has lesser no. of voids and hence desirable and uniformly graded which has greater no. of voids and hence should be avoided or mixed with different grade of soils to improve its properties.

1.1 Need for Study

Some soils are always not suitable for construction like clayey soils. They show different physical properties at different times but their properties can also be enhanced by stabilizing them up to some extent with suitable admixture but even then it can

not be assured that even after improvement in their properties they are suitable for construction. Therefore soil stabilization which is "the mixing of soil with some admixture/admixtures in order to increase soil properties" is needed at different construction sites where ever possible to obtain required results with least expenditure

1.2 Materials Used

The materials used are powdered glass, soil and water. The apparatus used are Proctor Test apparatus and California Bearing Ratio Test apparatus.

2. EXPERIMENTAL STUDIES

The experiment starts by determining the basic properties of the soil namely (1)grade of soil (2)specific gravity (3)water content (4) Atterbergs limit , in order to know the nature and capability of the soil at the initial point. On determining the nature of the soil proctor compaction test was performed on unreinforced and reinforced soil by reinforcing the soil with glass powder which is inert, amorphous ,,non crystalline and non biodegradable .Glass has been seen to increase the strength of some road building elements and its disintegration process is similar to that of natural rocks.

After proctor test California bearing ratio test is performed to investigate the change in the bearing capacity of this soil at different proportions of glass powder i.e 5% ,10% and 15% .

The final goal is thus to determine the best proportion of glass powder at which the soil shows maximum positive results.

Tests are carried out on natural or compacted soils in water soaked or un-soaked conditions and the results so obtained are compared with the curves of standard test to have an idea of the soil strength of the sub grade soil.

3. RESULTS AND DISCUSSION:

Table -1: Experiments and their results

SR NO.	EXPERIMENT	RESULT
1.	Sieve Analysis	Cu=0.5
2.	Specific Gravity	2.65
3.	Water Content	21.6%
4.	Liquid Limit	25.39%
5.	Plastic Limit	11.80%
6.	Plasticity Index	13.59%

Table -2: Summary of Maximum Dry Density and Optimum Moisture Content Values at Different Additives Proportions:

	Unreinforced Soil	soil with 5% glass	soil with 10% glass	soil with 15% glass
OPTIMUM MOISTURE CONTENT	19.64	18.46	17.91	16.66
DRY DENSITY	1.761	1.827	1.864	1.819

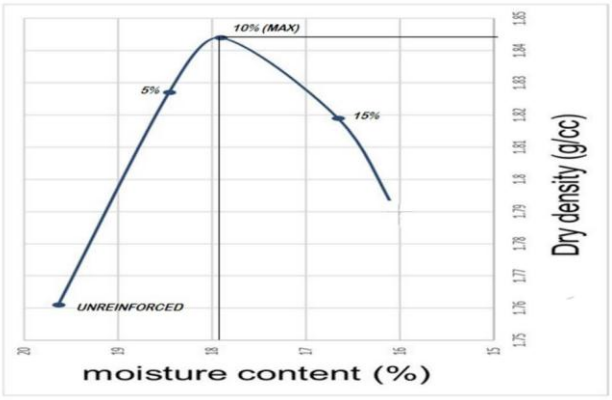

Chart 1: Proctor Test Graph

i). The best optimum moisture content by proctor test was found out to be 17.91% on addition 10% powdered glass.

ii).The maximum dry density corresponding to above moisture content is 1.864 g/cc.

Table -3: Summary of CBR Test values for different proportions of powdered glass

Glass content(%)	CBR Value(%)
0	23.8
5	24.133
10	24.32
15	24.26

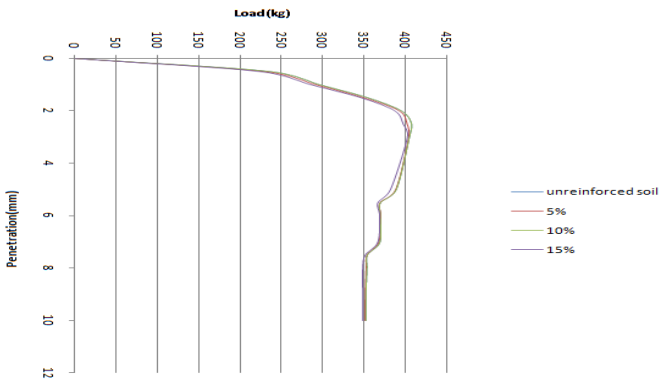

Chart 2: Graph showing Load and penetration values for different glass proportions

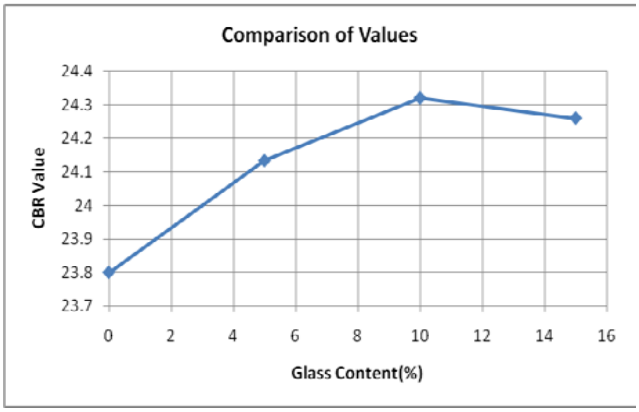

Chart 3: CBR values at different glass proportions

The maximum CBR value came out corresponding to 10% powdered glass by weight of the soil i.e. 24.32.

4. CONCLUSIONS

The results obtained by sieve analysis suggests that the soil is uniformly graded.

According to the results obtained after performing proctor compaction test we may conclude that the soil achieves maximum dry density i.e most dense nature at 10% glass which is 1.845 g/cc .

The results of California bearing ratio test shows that the CBR value of this soil is maximum at 10% glass i.e it has max bearing capacity at this glass content.

So on the basis of above results we finally concluded that the most effective proportion of glass powder is 10%.

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