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Soil Stabilization of Marine Soil using Lime

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***Abstract*—Nowadays, inefficient properties of soil are a critical issue in engineering projects. In some cases, improve the characteristic of unsuitable soil is a fundamental step for making construction. Marine soil is a soft soil that could be found widely at coastal and offshore areas. This soil is usually associated with high settlement and instability, poor soil properties that are not suitable for engineering requirements and low unconfined compressive strength. Stabilization of these soil is a usual practice for improving in the strength. Soil stabilization performed the use of technique to adding a binder to the soil in order to improve the engineering properties of soil. In this project we focus on the improvement in the strength and engineering of a locally available marine soil by addition of lime and to check if lime is good for stabilization.**

Keywords—Marine soil; Stabilization; Hydrated lime

I. INTRODUCTION

Soil stabilization is defined as chemical or physical treatments which increase or maintain the stability of a soil or improve its engineering properties. Stabilization can increase the soil shear strength of a soil and control the shrink-swell properties of a, thus improving the load bearing capacity of a sub-grade to support pavements and foundations. Soil stabilization aims at improving soil strength and increase resistance to softening by water through eliminating of voids in the soil grains, reducing the volume of the soil mass, increasing the capacity to bear load and improving impermeability. Soil stabilization is the alteration of soils to enhance their physical as well as engineering properties. Lime stabilization is a method of chemically transforming unstable soils into structurally sound construction foundations. Lime stabilization is particularly important in the construction of highways for modifying subgrade soil and base materials. Lime stabilization creates a number of important engineering properties in the soils which includes improved strength, improved resistance to fracture, fatigue, and permanent deformation; reduced swelling, and resistance to the damaging effects of moisture.

II. SOIL STABILIZATION

A. Components Of Stabilization

Soil stabilization is defined as chemical or physical treatments which increase or maintain the stability of a soil or improve its engineering properties. Stabilization is to improve on site materials to create a solid and strong sub base and base courses. Stabilization is commonly used for better soil gradation, reduction of plastic index or swelling potential and increased durability and shear strength. Broadly, all types of soil stabilization can be classified into two groups, that is mechanical stabilization and chemical stabilization.

In soil stabilization, it is very important to identify the properties and composition of materials used in the process. For stabilization hydrated lime is taken. Hydrated lime is also known as calcium hydroxide and traditionally called slaked lime which is an inorganic compound. Its molecular formula is Ca (OH)2 .the specific gravity of hydrated lime ranges from 2.2 to 2.3 and bulk density ranges from 400 to 600(kg/m3). The chemical composition of lime are given below;

TABLE 1 COMPOSTION OF HYDRATED LIME

Items	**CaO**	**Al_2O_3**	**MgO**	**Fe_2O_3**	**pH**
% by weight	72.0	0.5	1.0	0.6	12.4

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B. Scope

Helps to study the engineering properties of Azheekal soil stabilized with lime, thus help to increase the stability of the soil and thereby lead to a development in that area.

C. Objective

To improve the shear strength of the Azheekal marine soil. To improve the properties of soil by adding lime as a stabilizer. Utilization of cost effective and ecofriendly soil stabilizer. Comparing the stability of soil sample and soil lime mixture. To enhances shear strength and bearing capacity of Azheekal soil by using various engineering tests like compaction test, CBR method.

Fig. 1 Azheekal marine soil

III. METHODOLOGY

Soil sample is taken from Azheekal, Kollam. The preliminary test on soil sample was done. The various test performed on the soil samples are particle size distribution, specific gravity, determination of moisture content, Atterberg's consistency test, compaction test and CBR test.

Different percentage of lime was mixed with marine soil as 5%, 10%, 15%, 20% by standard proctor test. The optimum moisture content was obtained as 10%. CBR test, unconfined compression test and liquid limit are carried out and the engineering properties of the soil are improved.

IV. TESTS ON SOIL

The soil sample is collected from Azheekal, Kollam for the test.The data obtained from the preliminary tests on soil sample are shown in Table 2.

TABLE 2

Sl No	Preliminary Test	
	Engineering Properties	***Values***
1	Water content%	7.6
2	Specific gravity	2.66
3	Liquid limit %	61
4	Plastic limit %	0
5	Shrinkage limit %	14.05

A. Compaction

Compaction test is performed to obtain the optimal moisture content at which the soil will become most dense and become compact. The percentage of hydrated lime to be added to the soil sample can be identified using standard proctor test. A graph is plotted between dry density and water content, the optimum moisture content was obtained as 10% and dry density as 1.94.

B. CBR

CBR test is conducted to evaluate the strength of the soil. This test is carried out by adding certain percentage of lime to the soil sample the amount of soil to be added is identified by compaction test. In this experiment 10% of hydrated lime is added to the soil. The CBR value of untreated soil obtained is 12% and CBR value of treated soil with lime mixture is 21.68%.

CONCLUSION

This study concludes that in Azheekal the soil stability is found to be low and thus will seriously affect the construction of building there.hence the soil must be stabilized there, so we used hydrated lime to improve the strength of the soil. The standard proctor test is carried out with 5%, 10%, 15%, 20% and the optimum value is obtained as 10%. Twith these percentage of lime remaining tests are carried out. CBR value of lime treated soil increases as compared to untreated soil. The CBR value of treated and untreated soil are 12% and 21.68% respectively. Thus it shows that the strength and stability of the marine soil increased when treated with lime and thereby lead to a development in that area.

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