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Effectiveness of Using Polymers and Cement for Soil Stabilization

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ABSTRACT

Soil stabilization has been widely used as an alternative to substitute the lack of suitable material onsite. Since the anicent time for transportation of goods or travelling purpose, we used roads. Heavy loaded vehicles running on the roads needs special care and attention during the phase of construction so that they can bear the maximum loads. Research says, higher the quantity of cement added to the soil, dry density of soil decreased and optimum moisture content increased. In this study a laboratory experimental was conducted to evaluate the effect of waterborne polymer on unconfined compression strength on sandy soil, and CBR Test on clay soil. Result indicated that the unconifined compression strength of sandy soils which have susceptibility of liquefication.

INTRODUCTION

Soil stabilization include both physical stabilization and chemical stabilization which increase or maintain the stability of a soil or improve its engineering properties. Stabilization can increase the shear strength of a soil or control the shrink swell properties of a soil, thus improving the load bearing capacity of a sub-grade to support pavement and foundation.

LITERATURE SURVEY

Soil stabilization is the permanent physical and chemical alteration of soil to enhance their physical properties. Stabilization can increase the shear strength of a soil and control the shrink swell properties of a soil , thus improving the load bearing capacity of a subgrade to support pavement and foundation.

OBJECTIVE OF THIS STUDY

To study the effect of additives (lime and cement)on soil properties in terms of the following parameters:

- Atterberg limits
- Maximum dry density
- Optimum moisture content

METHOD OF SOIL STABILIZATION

1) Lime stabilization
2) Cement stabilization

LIME STABILIZATION:

Lime stabilization is a well established technique to improve the subgrade properties of different soil for pavement construction.Physical and chemical event occure in lime stabilization. Hydrated lime is calicium hydroxide,designated in chemical form as Ca(OH)2. Hydrated lime is produced by reacting quicklime with sufficient water to form a white powder. Hydrated lime is the form of lime used in the majority of lime stabilization procedure. This process is known as slaking.

$CaO + H_2O$ ____ $Ca(OH)_2$ +Heat

In the present study mechanism of long strength behaviour of lime treated soil has been brought clearly through alteration in ionic exchange (Ca2+, Mg2+, Na+ and K+), mineralogy and microstructure by performing series of physical chemical and micro-analysis. The conclusion is that addition of lime to soil influences greatly the concentration. of sodium and calcium ions with marginal alteration in potassium (K+) and magnesium (Mg2+) with curing period. Further, a significant increase in the strength upto 28 days and marginal upto 1 year substantiates that variation in Ca2+ and there by formation of cementitious **compounds** control the strength behaviour of lime treated soil.

CEMENT STABIZATION

Strength gain in soil using cement stabilization occurs through the same type of pozzolanic found using lime stabilization. Both lime and cement contain the calcium required for the pozzolanic reactions to occur. Cement stabilization involves the mixing of soils with injected cement insitu. The process can also take place ex situ by excavating and mixing soil with a stabilization agent either in plants. Addition of cement to a soil, which acts as a binding agent and produces a weak form of concrete called soil cement. The quantity of cement to be added depends upon the type of soil.

OTHER METHODS

BITUMEN : Two examples of bituminous materials are tar and asphatt. These helps the soil conere. Which improves stability and reduces water absorption. In turn , these things keep soil from eroding away.

The four stabilization method used with bitumen are:

- soil bitumen stabilization
- sand bitumen stabilization
- oiled earth
- Water proofed mechanical stabilization which method is used depends on the type of soil being amended.

Chemical compound

Where there are many chemicals that can be added to the soil for improved stability , the three most popular are :

- Sodium chloride
- Calcium chloride
- Sodium silicate

All of these work in similar ways and help the soil to compact making it more stable. They do this by increasing the water retention of the soil to help individual particles stick together better.

TWO DRAWBACKS

1) They have to be applied several times because of chemical loss through leaching.
2) They must reach certain levels of humidity during application to be effective. Make sure you keep these things in mind when choosing to chemically stabilize your soil.

CLOSING REMARKS

The use of these methods has good effect on stabilization of soil which can be observed from the experiments. More the quantities of additives are used, lesser will be the variation in values. The use of additives has good impact on soil stabilization but at the optimum value, its effects are more pronounced.

CONCLUSION

- Calcium is the most important ingredient in the stabilization of clay. Lime provides calcium through the dissolution of calcium hydroxide in the presence of water.
- Stabilization methods are employed for modification the properties of a soil to improve its engineering performance
- Soil stabilization is used in construction of road and airfield pavement, where the main objective is to increase the strength of soil and to reduce the construction cost by making best use of locally available material.

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