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SOIL STABILIZATION BY USING FLY ASH, LIME AND WASTE PLASTIC IN EARTHEN ROAD

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Abstract-Unconfined compression tests, Brazilian tensile tests, and saturated drained triaxial compression tests with local strain measurement were carried out to evaluate the stress-strain behavior of a sandy soil improved through the addition of carbide lime and fly ash. The effects of initial and pozzolanic reactions were investigated. The addition of carbide lime to the soil-fly ash mixture caused short-term changes due to initial reactions, inducing increases in the friction angle, in the cohesive intercept, and in the average modulus. Such improvement might be of fundamental importance to allow site workability and speeding construction purposes. In addition, under the effect of initial reactions, the maximum triaxial stiffness occurred for specimens molded on the dry side of the optimum moisture content, while the maximum strength occurred at the optimum moisture content. After 28 days, pozzolanic reactions magnified brittleness and further increased triaxial peak strength and stiffness; the maximum triaxial strength and stiffness occurred on the dry side of the optimum moisture content. The waste material such as fly ash, lime and plastic increase the soil stability and reduce the cost of construction.

Keywords-soil stabilization, fly ash, lime, plastic, increases strength of earthen road

1. INTRODUCTION

A.Definition of soil stabilization

"Stabilization is the permanent physical and chemical alteration of soils to enhance their engineering properties thus improving the load bearing capacity of a sub-grade or sub-base to supports pavement and foundations." or to resist the load coming on pavement.

B.Properties of soil

The properties of soil change not only from one place to other but also at the place with depth and with a change in the environmental, loading and drainage conditions. The properties of a soil depend not only on its type but also on the conditions under which it exists. In comparison to other construction materials such as concrete or steel, it is not economically feasible to transport the soils from one place to other, because a huge quantity of soil is involved and it is not opened to inspect at greater depth for foundations of different structures.

Since the outset of the industrial revolution the greatest challenge before the processing and manufacturing industries is the disposal of the residual waste products. Waste products which are generally toxic, ignitable, corrosive or reactive pose serious health and environmental consequences. Thus disposal of industrial wastes is a measure issue of the present generation. This measure issue requires an effective, economic and environment friend method to combat the disposal of the residual industrial waste products. These industrial wastes which are used as a substitute for natural soil in the construction not only solve the problems of disposal and environmental pollution but also help to preserve the natural soil. The industrial wastes used in this project are waste plastic, fly ash and lime. The electricity require for domestic purpose and industry are depends on the coal and the huge waste is coming out in the form of ash and it is difficult to disposal on the land. The poor-quality soils usually have the potential to demonstrate undesirable engineering behavior, such as low bearing capacity, high shrink and swell potential and high moisture susceptibility. Pavement structures on poor soil sub grades show early distresses causing the premature failure of the pavement. Stabilization of these types of soils becomes uneconomical to replace the foundation material with good quality soil.

2. OBJECTIVE

The main target of this study is to increase the soil stability using the waste material such as fly ash, lime and plastic. The waste material use in middle layer of pavement because its stability and strength is less as compared to soil.

3. LITERATURE SURVEY

Pandian et.al. (2002) [1]Studied the effect of two types of fly ashes Raichur fly ash (Class F) and Neyveli fly ash (Class C) on the CBR characteristics of the black cotton soil. The fly ash content was increased from 0 to 100%. Generally the CBR/strength is contributed by its cohesion and friction. The CBR of BC soil, which consists of predominantly of finer particles, is contributed by cohesion. The CBR of fly ash, which consists predominantly of coarser particles, is contributed by its frictional component. The low CBR of BC soil is attributed to the inherent low strength, which is due to the dominance of clay fraction. The addition of fly ash to BC soil increases the CBR of the mix up to the first optimum level due to the frictional resistance from fly ash in addition to the cohesion from BC soil. Further addition of fly ash beyond the optimum level causes a decrease up to 60% and then up to the second optimum level there is an increase. Thus the variation of CBR of fly ash-BC soil mixes can be attributed to the relative contribution of frictional or cohesive resistance from fly ash or BC soil, respectively. In Neyveli fly ash also there is an increase of strength with the increase in the fly ash content, here there will be additional puzzolonic reaction forming cementitious compounds resulting in good binding between BC soil and fly ash particles.

Singh et. al (2008) [2]Detailed laboratory investigations were carried out on cement stabilized fly ash –(GBFS) mixes in order to find out its stability for road embankments , and for base and sub-base courses of highway pavements.Overall it can be concluded that fly ash mixed soil can be good sub-grade in pavement technique specially on weak soil where it can act as additive to increase strength and reducing the overall cost as well as energy.

Dr.A.IDhatrak: **In 2015[3]** After reviewing performance of plastic waste mixed soil as a geotechnical material, it was observed that for construction of soil stabilization to improve the sub-grade soil of pavement of using plastic chips in an alternative method. In proportion of 0.5%,1%,1.5%,2% and 2.5% of the weight of dry soil, plastic waste was added to calculate CBR value. He concluded that using plastic waste chips will improve the soil stability.

Anas Ashraf etal (2011)[4] Studied on possible use of plastic bottels for soil stabilization. The analysis was done by conducting plate load test on soil reinforced with layers of plastic bottles filled with sand. The test results shows that waste plastic bottles most efficient in increasing in soil stabilization.

AKSHAT MALHOTRA AND HADI GHASEMAIN: In 2014[5] Studied the effect of HDPE plastic waste on the UCS of soil. In a proportion of
1.5%, 3%, 4.5% and 6% of the weight of dry soil. HDPE plastic waste was added. They concluded that the UCS of black cotton soil increased on addition of plastic waste.

4. CONCLUSION

Based on laboratory and field tests, following conclusions have been made:If soil has more moisture it is difficult to mix with FA. Such soil shall be spread on surface and allowed to dry before construction. The waste material is use in middle layer of pavement because its strength and stability is less as compared to soil properties

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