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Settlement Analysis of Clayey Soil Using Rice Husk Ash and Lime

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ABSTRACT: Rice husk ash (RHA) is a by-product of rice milling. Its use as a soil stabilizer is an alternative to the final disposition with environmental benefit. Because RHA is not self-cementitious, a hydraulic binder such as lime must be added to form cements to improve the soil strength. Researches on stabilization by applying RHA and lime combinations were conducted in clayey soils. The formation of cementitious compounds was observed in mixtures of soil with different RHA and lime contents. Unconfined compression strength tests were conducted on soils treated with RHA and lime. Results show strength improvements for all RHA and lime contents. The present experimental work briefly describes the suitability of the locally available Rice Husk Ash (RHA) to be used in the local construction industry in a way to minimize the amount of waste to be disposed to the environment causing environmental pollution. Soil sample taken for the study is clay with high plasticity (CH) which truly requires to be strengthened. The soil is stabilized with different percentages of rice husk ash (5-10%) and lime (2,4,6,8%).

Observations are made for the changes in the properties of the soil such as Maximum dry density (MDD), Optimum moisture content (OMC), California bearing ratio (CBR) and Unconfined compressive stress (UCS). The results obtained show that the increase in RHA content increases the OMC but decreases the MDD. Also, the CBR value induces of soil are considerably improved with the RHA content. Observing the tremendous improvement of CBR-value of soil, the present soil stabilization technique may mostly be recommended for construction of pavement.

I. INTRODUCTION

Soil stabilization is a general term for any physical, chemical, biological, or combined method of changing a natural soil to meet an engineering purpose. Improvements include increasing the weight bearing capabilities and performance of in-situ sub soils, sands, and other waste materials in order to strengthen foundation, soil stabilization can be accomplished by several methods.

Rice husk is a major agriculture byproduct obtained from paddy. For every 4 t of rice, 1 t of husk is produced. The husk is disposed off either by dumping it in an open heap near the mill site or on the roadside to be burnt later. Burning the rice husk generates about 15%-20% of its local optimum action of soil weight as ash. The ash being very light is easily carried by wind and water thus contributing to air and water pollution. The huge quantity of ash generated requires large areas for disposal. Its effective utilization by exploiting its inherent properties is the only way to solve the environmental and disposal problems of the ash. A number of researchers have studied the physical and chemical properties of rice husk ash. Rice husk ash (RHA) cannot be used alone for the stabilization of soil due to lack of cementitious properties. The high percentage of amorphous silica in soil time siliceous material present in rice husk ash indicates that it has pozzolanic properties. The normal method of conversion of husk to ash is by incineration. The properties of rice husk ash depend on whether the husks have undergone complete combustion or have been partially burnt. The rice husk ash has been classified into high carbon ash, low carbon ash and carbon free ash. This paper brings out the results of an experimental program to evaluate the effectiveness of using RHA as a pozzolana to enhance the lime treatment of soil.

II. METHODOLOGY

In this experimental study, the effect of RHA on geotechnical properties of the expansive soil are investigated and analysed. From the results obtained, it can be concluded there is little improvement in the usage of RHA stabilized soil. The conclusion to the study is summarized as follows: The specific gravity of the soil decreases with the addition of RHA to the soil. The liquid limit and plastic limit of the soil increases with the percentage increase of RHA. It was also observed that the maximum dry density (MDD) of the soil decreases with the addition of RHA due to lower specific gravity of RHA. The optimum moisture content (OMC) of the soil increases on stabilizing with RHA due to pozzolanic reaction between CaOH of the soil and RHA. The shrinkage limit of the soil decreases with the increase of RHA. The swelling nature of the soil decreases with the addition of RHA which reduces the formation of cracks on the pavement

surface. The CBR and UCS value gets increased to high limit at an optimum value of 5% of RHA content and 2% of lime. It is also be concluded that for the improvement in strength using stabilization in practical purposes, these optimum percentage values of RHA and lime can be recommended for construction. But addition of lime and RHA beyond this limit to the soil is not beneficial and workable.

III. RESULTS AND DISCUSSIONS

The following are results drawn from the experimentation of soil testing.

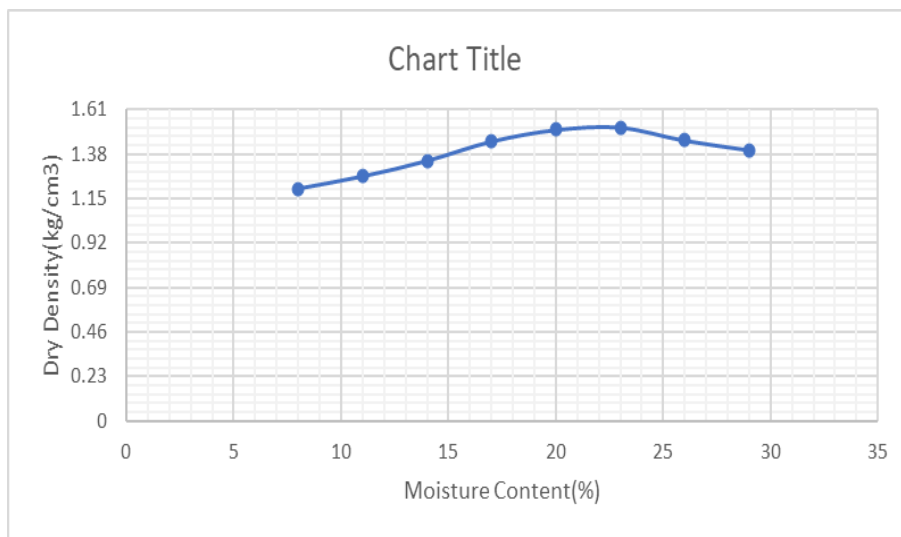


Fig.1 compaction test results



Fig.2 unconfined compression test

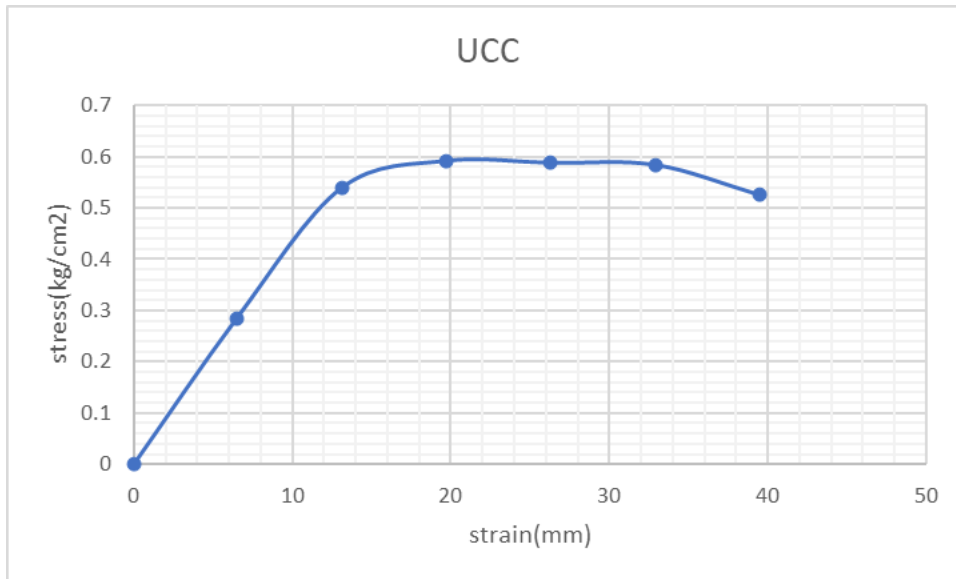


Fig. 3 Variation of stress vs strain

For penetration Test

Calibration factor of the proving ring, 1 Div. = 1.176 kg

Water content after penetration test %

Least count of penetration dial, 1 Div. = 0.01 mm

If the initial portion of the curve is concave upwards, apply correction by drawing a tangent to the curve at the point of greatest slope and shift the origin

Find and record the correct load reading corresponding to each penetration.

$$C.B.R. = \frac{P_T}{P_S} \times 100$$

where P_T = Corrected test load corresponding to the chosen penetration from the load penetration curve.

P_S = Standard load for the same penetration

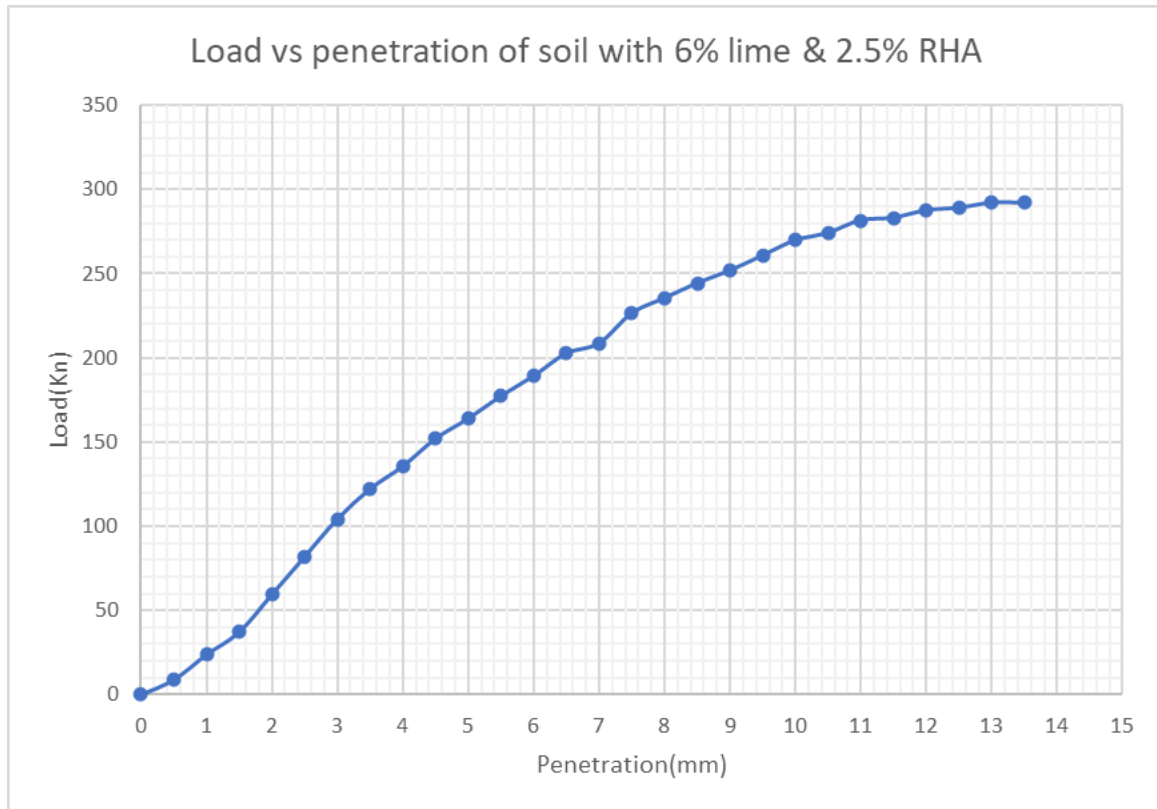


Fig.4 Results of CBR test

IV. CONCLUSIONS

- The soil which is collected from site has liquid limit=76.6% and PL=42.86%. & Plasticity index =33.74. As IP is greater than 17% it is concluded as high plastic clay
- Soil sample which is collected mixed with lime and was treated for compaction & unconfined strength (UCS) for determination of optimum percentage of lime.
- Compaction :For a given soil the compaction test ,addition of lime there is decrease in max dry density and increased in optimum moisture content. Earlier studies also observed by addition of lime ,immediate decrease in maximum dry density and increase in optimum moisture content
- Unconfined compressive strength: The effect of addition of lime on unconfined compressive strength results in increase of strength until optimum condition after the optimum value , there is marginal decrease in strength.
- The optimum lime content is observed to be 6%
- UCC increases with increasing curing period.

REFERENCES

1. IS: 2720 (Part III) – 1987, Methods of test for soil: Determination of specific gravity, Bureau of Indian Standards, New Delhi.
2. IS: 2720 (Part IV) – 1985, Methods of test for soil: Grain size analysis, Bureau of Indian Standards, New Delhi.
3. IS: 2720 (Part V) – 1985, Methods of test for soil: Determination of liquid limit and plastic limit, Bureau of Indian Standards, New Delhi.
4. IS: 2720 (Part VI) – 1972, Methods of test for soil: Determination of shrinkage factors, Bureau of Indian Standards, New Delhi.



5. IS: 1498-1970, Classification and identification of soils for general engineering purposes, Bureau of Indian Standards, New Delhi.
6. IS: 2720 (Part VII) – 1987, Methods of tests for soil : Determination of water content dry density relation using light compaction, Bureau of Indian Standards, New Delhi.
7. IS: 2720 (Part X) – 1973, Methods of tests for soil: Determination of unconfined compressive strength, Bureau of Indian Standards, New Delhi.
8. <http://home.iitk.ac.in/~madhav/geolab.html>
9. E B Oyetola and M Abdullah (2006), The use of rice husk ash in low-cost sandcrete block production, Leonardo Electronic Journal of Practices and Technologies, 8, pp. 58-70.
10. E A Basha, R Hashim, H B Mahmud and A S Muntohar (2005), Stabilization of residual soil with rice husk ash and cement, Construction and Building Material, 19, Issue 6, P 448-453



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