A Laboratory of Soil Subgrade Stabilization by Using Fly Ash and Rice Husk Ash

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1. Introduction

A well compacted granular structure consisting of robust ranked mixture will transfer the compressive stresses through a wider space and so forms an honest versatile pavement layer In India, ninety fifth of unrestricted roads incorporates versatile pavements. Versatile pavement or ordinarily designed mistreatment empirical act charts or equations taking under consideration a number of the planning factors. There also are semi- empirical and theoretical style ways. The rules on style for versatile pavement were 1st brought get in 1970 that were supported Calif. Bearing magnitude relation (CBR) and traffic in terms of economic vehicles. Indian Roads Congress adopted the Calif. Bearing magnitude relation (CBR) technique of versatile pavement as per IRC: thirty seven since 1970 that has since been revised in 1984, 2001 and 2012. The recent revision of IRC: 37-2012 could be a semi-mechanistic approach of style which provides thickness of the pavement primarily based upon cosmic microwave background radiation of the subgrade and style traffic in million normal axles.

2. Objectives of the Study

The general objective of this study is appraise to gauge to judge the suitableness of ash and rice husk ash as a helpful agent for various kinds of soils typically on the market in geographic area evaluate their cosmic microwave background radiation worth. This can be achieved through the subsequent specific objectives.

The specific objective of this study may be summarized as follows:

I. To gauge the result of ash and rice husk ash on the properties of hand-picked soils equivalent to gradation, atterberg limits, optimum wet content (OMC), most dry density (MDD) and cosmic microwave background radiation worth of the soils that are typically on the market in geographic area.

II. To combine these soils with variable proportion like five, ten and V-J Day of ash and rice husk ash and measure on top of mentioned properties of the mixes.

III. To check the amendment in numerous properties of the chosen soils with relevancy the proportion of ash and rice husk ash and discuss the results of the study.

IV. To see suitableness of the admixtures for the soils hand-picked for the study.

3. Literature Review

LaxmikantYadu (2011) the paper presents the laboratory study of black cotton (BC) soil stabilized with fly ash (FA) and rice husk ash (RHA). The soil was stabilized with different percentages of FA (5, 8, 10, 12, and 15%) and

RHA (3, 6, 9 11, 13, and 15%). The atterberg's limits, specific gravity, California Bearing Ratio (CBR) tests were performed on raw and stabilized soils. Results indicate that addition of FA and RHA reduces the plasticity index (PI) and specific gravity of the soil. The moisture and density curves indicate that addition of RHA results in an increase in optimum moisture content (OMC) and decrease in maximum dry density (MDD), while these values decrease with addition of FA. Based on the CBR and UCS tests, the optimum amount of FA and RHA was found to be as 12% and 9%, respectively. They Concluded that BC soil collected from shallow depth of rural road located at Raipur have been stabilized with FA and RHA. Addition of RHA results in an increase in OMC and decrease in MDD, while these values decrease with addition of FA. The study shows that fly ash is better additive as compared to rice husk ash. Key words: Black cotton soil, Fly ash, Rice husk ash, UCS, CBR.

Sarkar, Islam et al. (2012) demonstrates the effects of rice husk ash on the geotechnical properties of soil in stabilized forms specifically strength, workability, and compaction and compressibility characteristics. Therefore, laboratory tests such as compaction, Atterberg limits, free swell index, unconfined compressive strength, direct shear and consolidation tests for different percentages of rice husk ash content and original soil samples were performed. The test results of study shows that the soil can be made lighter which leads to decrease in dry density and increase in moisture content and reduced free swelling and compressibility due to the addition of rice husk ash with the soil. Besides that the unconfined compressive strength and shear strength of soil can be optimized with the addition of 10% rice husk ash content.

Fattah, Rahil et al. (2013) experimental study carried out on three different soils improved with different percent of rice husk ash. Samples were brought from different sites of Iraq. The testing program conducted on the clayey soil samples mixed with different percentages of rice husk materials, included Atterberg limits, specific gravity, compressibility, unconfined compression test and consolidation test. It was found that the liquid limit of the three soils has been decreased by about (11-18) % with the addition of 9% RHA, while the plasticity index decreased by about (32-80) %. Treatment with rice husk showed a general reduction in the maximum dry unit weight with increase in the rice husk content to minimum values at 9% rice husk content. The optimum moisture content generally increased with increase in the RHA content. There is enormous increase in the unconfined compressive strength with increase in rice husk content for the soil to its maximum at RHA between (6-8)percent.

4. Methodology of the Study

The study aims at improving the CBR value and other properties of the soil for road construction purpose with the addition of fly ash and rice husk ash. The main properties of soil which govern its use in road construction include Maximum dry density (MDD), Optimum moisture content (OMC), Liquid limit (L.L), Plasticity Index (P.I), Gradation, Specific Gravity and CBR value, etc. In this study, two different types of soils have been used for improving their various properties by adding fly ash and rice husk ash in varying proportion from 5, 10 and 15 %.

5. Criteria for the Selection of Soils and Stabilizers for the Study

Keeping the objectives of the study in view, various soil samples were selected from nearby area of SOUTH KASHMIR and lime from local market of pampore, Fly Ash from toll plaza, khonmah rice husk ash from pampore the soil samples and stabilizer were selected keeping the following criteria into consideration.

1) Two types of soils, that is, SM (silty sands) and ML (Inorganic silts of low plasticity) have been used in the study. These soils were collected from nearby regions of south Kashmir. The soils were selected in such a manner that they represent usual kind of soil available in the Kashmir.

2) The lime from local market of pampore, fly ash used in the study has been collected from toll plza, khonmah because of its proximity to the place of study.

6. Lab Investigations

Various lab investigations to be carried out on samples of soils and fly ash selected for the study include:

- Sieve Analysis
- Liquid limit test
- Plastic limit test
- Specific gravity test
- Proctor test
- CBR test

7. Conclusion:

On the idea of results of the study, fundamental conclusions drawn on the cease of the paintings are as follows:

1. The selected soils belong to ML (silts of low plasticity) and SM (salty sand) varieties of soils.

2.The sand content within the ML and SM soils is found to be 27.4% and sixty two four% respectively. The PI of ML soil is 3.38 and SM soil is non-plastic.

3.With the addition of fly ash in ML kind soil the liquid restriction and plasticity index decreases but on addition of rice husk ash liquid restrict will increase and plasticity index decreases.

4.With addition of fly ash and rice husk ash liquid limit of SM type soil will increase but plasticity index cannot be determined because soil is a non-plastic soil.

5.The MDD of decided on soils decreases and OMC of the soils increases with the addition of fly ash as well as rice husk ash.

6.The addition of fly ash and rice husk ash causes more reduction in MDD of ML type soil than SM type soil.

7.The addition of fly ash and rice husk causes growth in OMC of the chosen soil. OMC of ML type soil will increase greater when fly ash is delivered however when rice husk ash is introduced OMC of SM type soil increases greater

8.CBR value of each soils multiplied with growing share of fly ash and rice husk ash within the soil. The boom in CBR with equal share of admixtures is extra in case of fly ash than rice husk ash

9.The CBR value of SM kind soil increase when rice husk delivered up to eight% on in addition CBR fee of soil is decreased.

10.The consequences of the observe shows that waste substances each fly ash and rice husk ash are suitable for reinforcing properties of the soils which might be commonly available in Haryana which also decrease the environmental pollution reasons by those:

a. The selected soils belong to ML (silts of low plasticity) and SM (silty sand) types of soils.
b. The sand content in the ML and SM soils is found to be 27.4% and 62.4% respectively. The PI of ML soil is 3.38 and SM soil is non-plastic.
c. With the addition of fly ash in ML type soil the liquid limit and plasticity index decreases but on addition of rice husk ash liquid limit increases and plasticity index decreases.
d. With addition of fly ash and rice husk ash liquid limit of SM type soil increases but plasticity index cannot be determined because soil is a non-plastic soil.
e. The MDD of selected soils decreases and OMC of the soils increases with the addition of fly ash as well as rice husk ash.
f. The addition of fly ash and rice husk ash causes more reduction in MDD of ML type soil than SM type soil.
g. The addition of fly ash and rice husk causes increase in OMC of the selected soil. OMC of ML type soil increases more when fly ash is added but when rice husk ash is added OMC of SM type soil increases more.
h. CBR value of both soils increased with increasing proportion of fly ash and rice husk ash in the soil. The increase in CBR with same proportion of admixtures is more in case of fly ash than rice husk ash.
i. The CBR value of SM type soil increase when rice husk added up to 8% on further addition CBR value of soil is decreased.
j. The results of the study shows that waste materials both fly ash and rice husk ash are suitable for enhancing properties of the soils that are generally available in Kashmir which also decrease the environmental pollution causes by these two.

8. Recommendations for Further Research

The study can be carried out using other additives such as cement, fibers, and bagasse ash commendations for similarly research

- Ø The take a look at can be completed using other components together with cement, fibers, bagasse ash and so forth.
- Ø The take a look at can be executed using components one at a time. It can be performed on lime- rice husk ash blend, lime- fly ash mix, cement-rice husk ash mix and so on.
- Ø the present study has been carried on soils from undeniable terrain. The same look at can be conducted on soils from hilly terrain.
- Ø The look at is executed via proctor compaction and CBR assessments. It can be prolonged with tests

together with unconfined compressive tests and tri-axial assessments.

- Ø The study is performed OMC. it may be prolonged with checks by using growing extra water than OMC like 2% water + OMC, 4% water + OMC and so forth.

This paper can be conducted by adding different varying dose rate of fly ash and rice husk ash i.e. 20%, 25, 30% etc.

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