IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Experimental Study on Stabilization of Red Clay Soil using Rice Husk Ash

[1]Anusuri. Uma Maheswari, [2]T.Balakrishna,[3]K.Bhanu, [4]M.Avinash

[1]Assistant Professor,[2,3,4]U.G. Students

[1]Department of Civil Engineering,

[1]Chaitanya Engineering College, Kommadi, Madhurwada, Andhra Pradesh.

Abstract: Soil is defined as sediments or other accumulation of mineral particles produced by the physical or chemical disintegration of rocks. The main aim is to study the feasibility of stabilizing the soil by using rice husk ash ., thus re-using the waste materials and providing an economical and eco-friendly method of soil stabilization. Soil stabilisation is a system to treat the soil to improve the performance of the soil.

***Index Terms* –California Bearing Ratio(CBR), Stabilisation, Red Clay soil, Rice Husk Ash.**

I. INTRODUCTION

For any land-based structure, the foundation is very important and has to be strong to support the entire structure. In order for the foundation to be strong, the soil around it plays a very critical role. So, to work with soils, we need to have proper knowledge about their properties and factors which affect their behavior. The process of soil stabilization helps to achieve the required properties in a soil needed for the construction work. Stabilization of soil is a method to improve the index and Engineering properties of soil. There are certain method of soil stabilization such as mechanical stabilization, chemical stabilization and bio- enzymatic soil stabilization. RHA may be used as chemical stabilizer as it contains high silica content.

II. LITERATURE REVIEW

[A] **T.Subramani, D.Udayakuma (2016) "Experimental study of stabilisation of clay soil using coir fibre"**:From this research we concluded that the strength of soil-coir mix is seen to increase as increasing percentage of coir Fibre, CBR and UCS values of soil-coir Fibre mix increases with its increasing percentage. When we reinforce the soil with coir Fibers/coir geo-textiles it is seen to be a cost effective method regarding the ground improvement techniques.

[B] **Aparna Roy (2014), "Soil Stabilization using Rice Husk Ash and Cement":** has presented a study which gives details about soil which is stabilized with different percentages of Rice Husk Ash and a small amount of cement. The results obtained show that the increase in RHA content increases the Optimum Moisture Content but decreases the Maximum Dry Density. Also, the CBR value and Unconfined Compressive Strength of soil are considerably improved with the Rice Husk Ash content.

[C] **Prakash Chava. Dr. M.S. Nagakumar (2014) "Studies on soil stabilisation by using bagasse ash**": It was observed that there was decrease in plasticity index of soil reinforced with bagasse fibre. Bagasse is an eco friendly fibre which is biodegradable also. Values of UCS and CBR increased with its addition .Optimum moisture content also increased. Sugarcane bagasse improved some properties of the clayey soil and also helpful in rural road construction purpose.

III.MATERIALS CHARACTERIZATION

3.1 Clayey Soil

Clay is one of the main construction material in the manufacture of brick. Clay is the finely grained natural rock or soil material that combines one or more clay minerals with possible traces of quartz, metal oxides and organic matter.

Silica is the main constituent &is responsible for strength, resistance to shrinkage and shape of the brick, hardness, and also to a great extent, for its durability or long life. But if we add too much free sand in the brick earth and thereby increase the proportion of total silica in the earth, resulting bricks would be very brittle and porous and may not burn easily. In the red soil lime, kankar and free carbonates are absent and these soils are rich in lime, magnesia, phosphates, nitrogen, humus, and potash. The water holding or water-absorbing capacity of these soils is less

Table 3.1 Properties of Clay

Properties	Brick clay
Silica (SiO_2)	55%
Alumina (Al_2O_3)	30%
Iron Oxide (Fe_2O_3)	8%
Magnesia (MgO)	5%
Lime (CaO)	1%
Potash (K_2O)	-
Loss on ignition	-
Other matter	1%
pH	-

3.2 Rice Husk Ash

Rice Husk Ash is obtained from the burning of rice husk. The husk is a by-product of the rice milling industry. Rice husk is also known as rice hull. Rice husks are the hard protecting outer cover of grains of rice. In growing season rice husk act as protecting cover, after that it can be use as building materials, insulation materials, fertilisers, fuel or gasoline. It includes sililca and lignin. The hull is mostly indigestible to humans. About 20 million tons of RHA is produced annually. This material causes environment threat, when this material is dumped it causes damage to the land and surrounding area.

Table -3.3: Basic constituent of RHA

Constituents (%mass)	Percent Content
Fe_2O_3	0.21
SiO_2	90.23
CaO	1.58
Al_2O_3	2.54
MgO	0.53
Carbon	2.23
KaO	0.39

IV. TESTS ON SOILS

4.1 Specific Gravity Test (IS-2720-PART-3-1980)

The "specific gravity" of soils and soil solids refers to the mass of solids in the soil compared to the mass of water at the same volume.

4.2 Grain Size Distribution (IS: 2720 (Part 4) – 1985)

Grain size analysis or sieve analysis is a practice or procedure used (commonly used in civil engineering) to assess the particle size distribution (also called gradation) of a granular material by allowing the material to pass through a series of sieves of progressively smaller mesh size and weighing the amount of material that is stopped by each sieve as a fraction of the whole mass.

4.3 Liquid Limit Test (IS 2720 (PART 5)-1985)

Liquid Limit (LL or W_L) - the water content in percent of a soil at the arbitrarily defined boundary between the semi-liquid and plastic states. The liquid limit (LL) is conceptually defined as the water content at which the behaviour of a clayey soil changes from plastic to liquid.

4.4 Plastic Limit Test (IS 2720 (PART 5)-1985)

The moisture content at which any increase in the moisture content will cause a semi-solid soil to become plastic. This limit is defined as the moisture content at which a thread of soil just crumbles when it is carefully rolled out to a diameter of 1/8 inch.

4.5 Proctor Compaction Test (IS: 2720 (Part 8) – 1983)

The proctor compaction test is a laboratory method of experimentally determining the optimal moisture content at which a given soil type will become most dense and achieve its maximum dry density. This method gives the determination of the relationship between the moisture content and density of soils compacted in a mould of given size with as 2.5 kg dropped from the height of 30cm.

4.6 California Bearing Ratio Test (IS: 2720(Part 16)-1973)

CBR value of a soil is an index which is related to its strength, modulus of sub grade reaction, modulus of resilience and plasticity index. The index is highly dependent on the condition of material at the time of testing. CBR test performed on remoulded specimens who may be compacted either statically or dynamically.

V. RESULTS & DISCUSSIONS:

5.1 Specific Gravity Test

Sample taken	Specific gravity
100% RC Soil	2.37
95% RC Soil+5% RHA	2.35
90%RCSoil+10% RHA	2.34
85%RCSoil+15% RHA	2.34
80%RCSoil+20% RHA	2.33

5.2 Grain Size Analysis

Table 5.2 Grain Size Analysis for Red Clay Soil

RED CLAY SOIL					
S.no	**Sieve size(mm)**	**Soil retained(gm)**	**% Retained**	**Cumulated % Retained**	**% Finer**
1	4.75mm	166	16.6	16.6	83.4
2	2.36mm	74	7.40	24.0	76
3	600 µ	144	14.4	38.4	61.6
4	425µ	90	9.00	47.4	52.6
5	300 µ	44	4.40	51.8	48.2
6	180 µ	36	3.60	55.4	44.6
7	75 µ	68	6.80	62.2	37.8
8	PAN	46	4.60	66.8	31.2

5.3 Liquid Limit Test

Table 5.3 Liquid Limit Test Results for Red Clay Soil with Rice Husk Ash

Sample taken	Liquid Limit (%)
100% RC Soil	54.0%
95% RC Soil+5% RHA	53.8.0%
90%RCSoil+10% RHA	52.5%
85%RC Soil+15% RHA	51.5%
80%RCSoil+20% RHA	50.0%

5.4 Plastic Limit Test

Table 5.4 Plastic Limit Test Results for Black Cotton Soil, Red Clay Soil with Rice Husk Ash

Sample taken	Plastic Limit (%)
100% RC Soil	28.0
95% RC Soil+5% RHA	27.0
90%RCSoil+10% RHA	26.4
85%RC Soil+15% RHA	26.2
80%RCSoil+20% RHA	26.0

5.5 Proctors Compaction Test

Table 5.3 Optimum Moisture Content and Maximum Dry Density Results for Red Clay Soil with Rice Husk Ash

Sample taken	OMC	MDD (g/cc)
100% RC Soil	17.4%	1.92
95% RC Soil+5% RHA	16.4%	1.85
90%RCSoil+10% RHA	16.20%	1.71
85%RC Soil+15% RHA	16.16%	1.65
80%RCSoil+20% RHA	15.95%	1.61

RC Soil- Red Clay Soil, RHA- Rice Husk Ash

5.6 California Bearing Ratio (CBR) Test

Table 5.3 California Bearing Ratio Test Results for Red Clay Soil with Rice Husk Ash

Sample taken	CBR Value @2.5mm Penetration	CBR Value@5mm Penetration
100% RC Soil	2.88	2.81
95% RC Soil+5% RHA	2.58	2.52
90%RCSoil+10% RHA	2.70	2.67
85%RC Soil+15% RHA	3.28	3.24
80%RCSoil+20% RHA	3.58	3.50

VI CONCLUSIONS

The properties of red clay soil was increasing as the percentage of rice husk ash the percentage of rice husk ash increases. So we can finally conclude that RHA can be used as stabilizing agent for improving the properties of soil.

REFERENCES

[1]Aparna Roy, "Soil Stabilization using Rice Husk Ash and Cement" International Journal of Civil Engineering Research, ISSN 2278-3652 Volume 5, Number 1 (2014), pp. 49-54

[2]Harshita Barraged, R.K. Yadav, R Jain (2014) Effect of jute fibres on engineering characterstics of black cotton soil, International Journal of Engineering Research & Technology (IJERT), vol3 issue2 .

[3]Sabat, A.K. (2013) "Engineering Properties of an Expansive Soil Stabilized with Rice Husk Ash and Lime sludge," International Journal of Engineering and Technology, 5(6), 4826-4833.

[4]Sabat, A.K. (2012) "Effect of Polypropylene Fiber on Engineering Properties of Rice Husk Ash Lime Stabilized Expansive Soil," Electronic Journal of Geotechnical Engineering, 17(E), 651- 660.

[5] IS 2720-5: Methods of test for soils, Part 5: Determination of liquid and plastic limit.

[6] IS: 2720(Part 7)-1980- Methods of test for soils: Determination of water content-dry density relation using light compaction. [7] IS: 2720(Part 16)-1973- Methods of test for soils: Laboratory determination of CBR.