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EXPERIMENTAL STUDY ON THE EFFECT OF POWDERED RECRON-3S (PR3) ON SHEAR STRENGTH PARAMETERS OF RED CLAY

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Abstract - *Designing a structure on clay or Red clay is the most difficult task for civil engineers as well as geotechnical engineers due to its swelling effects, enormous change in shear strength, and settlement while in contact with water. To make those clays capable of more bearing soil, a special method of stabilization must be adopted to improve the bearing capacity of the soil. In that regards this paper grants a laboratory study of the effect of powdered Recron-3S(PR3) on the shear strength parameters of Red clay. Soil samples were collected around the Coimbatore region. In the first stage of the laboratory study the effect of powdered Recron-3S(PR3)on Red Clay at optimum moisture content with various proportions of PR3 incorporation. The compaction tests have been carried out on the sample of red clay collected on the Coimbatore region with 1%, 2%, 3%, and 4% inclusion of Recron-3S powder(PR3) by weight of the red clay and the RRP3 (Red clay and Recron-3S Powder) samples have been prepared at the standard optimum moisture content. The Second Stage of a laboratory study on the main focal point of observing shear strength parameters like unconfined compression strength and maximum dry density of natural red clay and combination with PR3 samples. At the end of the laboratory study, it concluded that the inclusion of PR3 on Red clay soil be an effective method for improving the shear strength parameter of the Red clay.*

Key Words: **Red clay, Recron-3S powder,PR3, RRP3, Compaction tests, Optimum Moisture Content, and shear strength parameter of the Red clay.**

I. INTRODUCTION

1.1. General

Coimbatore is one of the cities in Tamilnadu, India. The city has a huge population. As a need in of population. Engineers were forced to construct different types of structures throughout the city. But, the geological feature of the city does not have a soil profile to bear those structures, Because Loamy soil, Red Clayey soil, and Calcareous black cotton soil profile were generally found all around the city, and 50% of the city cover up with Red Clayey soil and black cotton soil. Constructing any civil structure on this type of soil is a difficult task for engineers. In fact of view these clays show an enormous change in bearing capacity while in contact with water. Climatic conditions of the city also facilitate the same, During the summer(April & May) city records the maximum temperature 108^{0}F and an average temperature of 103^{0}F at the same time the rainfall in those months will be 20% (April - 43.6mm & May - 55.2mm) of annual rainfall (499.5mm) of the city. Due to this change in the climatic condition clay also shrinks and swells with short duration. The main aim of this laboratory investigation is to study the effect of the inclusion of Recron-3S powder (PR3) supplement on the enhancement of shear strength parameters of Red clay soil samples collected from the south part of coimbatore city. The laboratory investigation was performed on the compacted soil specimens with 1%, 2%, 3%, and 4% Recron-3S powder (PR3) and results of compaction, unconfined compression, and California Bearing Ratio (CBR) tests are discussed.

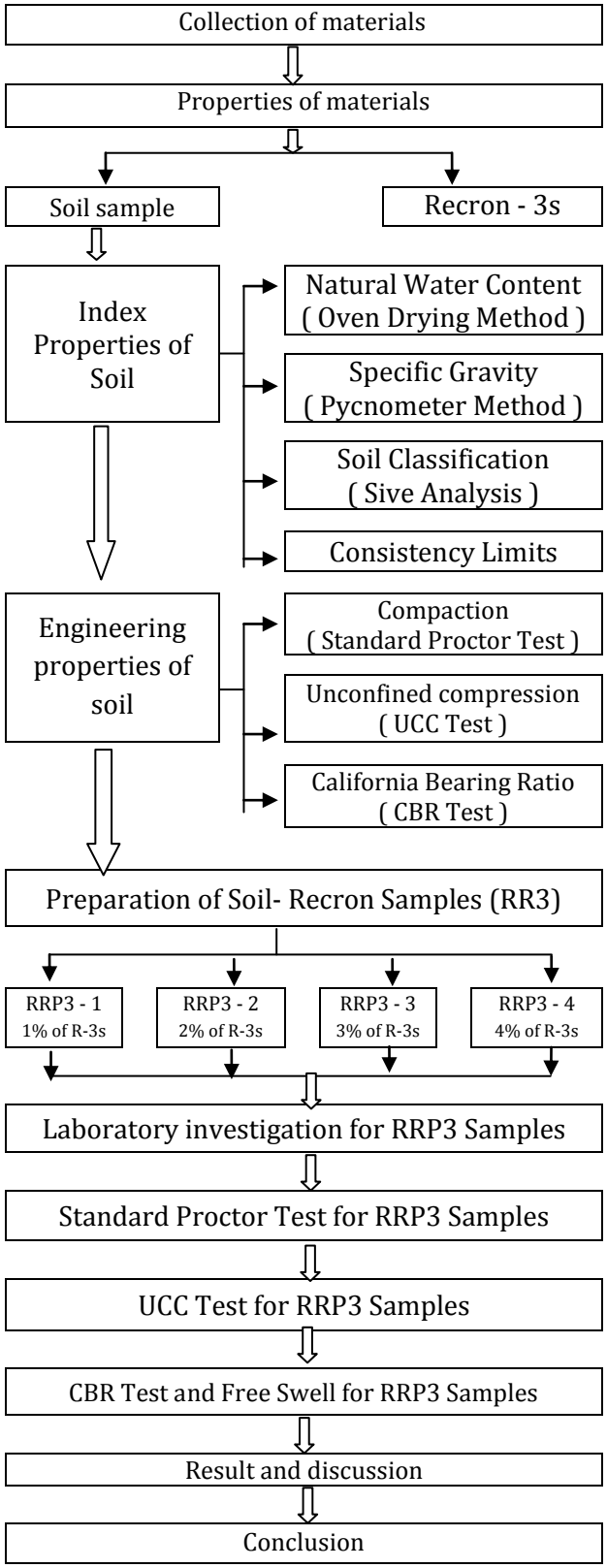
II. OBJETIVES

This experimental study is mainly focused to get a clear idea about the improvement in shear strength of red clay available near coimbatore and also observe the behavior of red clay while added with the powdered Recron-3S.
The broad Ares includes:

- Study the effect of powdered Recron-3S on Red clay.
- To produce the proper foundation material to hold a maximum load.

III.METHODOLOGY

Following process was done for preparing Recron-3S on Red clay samples and observe the behavior of samples in different loading conditions



3.1 Mix Propositio

While mixing the Recron -3s with red clay soil samples does not make the proper bonding with each other. To create the proper bonding between these two materials. Recron - 3s is made as powdered form by Grinding and mixed with the Red clay samples with the proportion shown below.

Table-1: Mix Proportion

Mix	Natural soil	RRP3-1	RR3P-2	RRP3-3	RRP3-4
Weight of soil (g)	5000	4950	4900	4850	4800
Weight of Recron (g)	0	50	100	150	200

IV. RESULT AND DISCUSSION

Properties of materials

4.1 RECRON – 3s:

Table 2: Properties of powdered form of Recron -3s

S.No	Property	Specification
1.	Diameter	0.04 – 0.05 millimeter
2.	Colour	White
3.	Specific Gravity	1.36
4.	Melting point	240 ^{o} C - 260^{o} C
5.	Flash point	> 329^{o} Celsius
6.	Relative Density	0.89 - 0.94 g/cm^{3}
7.	Moisture	< 1%

4.2 RED CLAY:

Properties of Red clay soil were determined as per IS code and tabulated below

Table 3: Properties of Soil

S.No	Property	Specification
1.	Natural Water Content	7%
2.	Specific Gravity	2.562
3.	Soil Classification	CH
4.	Consistency Limits	
	Liquid Limit (W_L)	89 %
	Plastic Limit (W_p)	40 %
	Plasticity Index (I_p)	49 %
5.	Optimum Moisture Content	16 %
6.	Maximum Dry Density	2768 kg/m^3
7.	Unconfined Compressive Strength	35.22 kN/m^2
8.	California Bearing Ratio	9.81%

4.3 RRP3 Samples

Laboratory investigation is carried out on Red clay blended with different percentages of Recron - 3s powder i.e., 1%, 2%, 3%, and 4% by weight. This investigation mainly focused on getting detailed information about the effect of Powered Recron - 3s on Red clay's shear strength parameters by conducting a Atterberg's limits, compaction test, unconfined compression test, California bearing ratio, were done. The data collected from various laboratory investigations on RRP3 samples are as follows.

4.4 Consistency Limits

Liquid limit, plastic limit, and plasticity index values are get decreased by the introduction of Powered Recron - 3s.

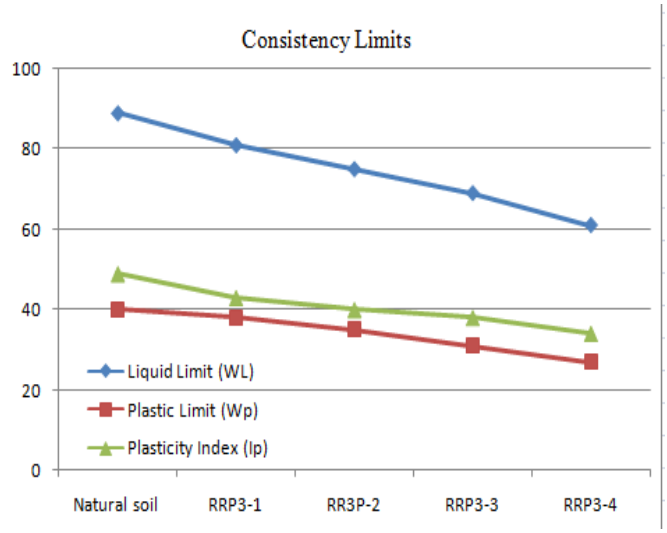


Fig. 1 Atterberg's limits Test on natural soil & RRP3 samples

4.5 Compaction Properties

Proctor compaction tests were carried out on natural soil as well as prepared RRP3 samples. Variations in Optimum moisture content and maximum dry density of RRP3 samples and Natural Soil shown in the figure 2

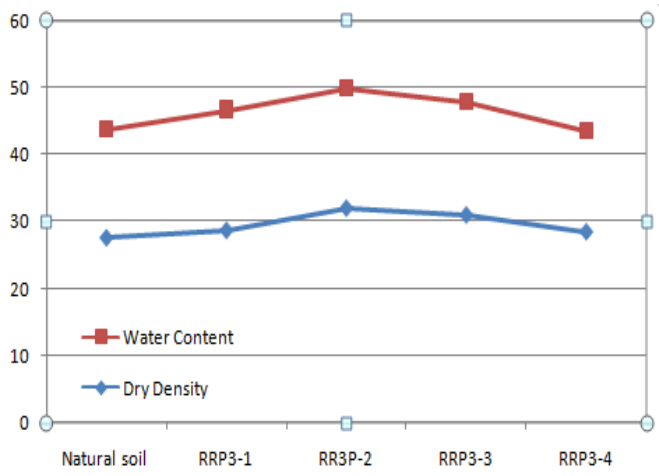


Fig. 2 Proctor compaction Test on natural soil & RRP3 samples

4.6 Unconfined Compression Strength

To find the unconfined compression strength and cohesive force developed on the soil with different proportions of powered Recorn - 3s. the UCC tests were

conducted on natural soil and RRP3 samples, results of UCC tests were shown in the figure 3

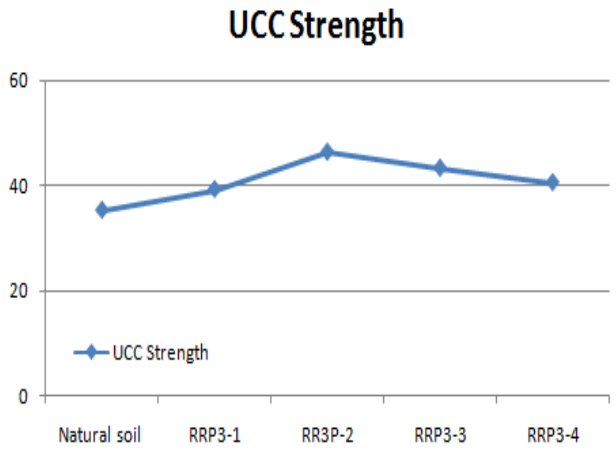


Fig. 3 Unconfined Compression Test on natural soil & RRP3 samples

4.7 California Bearing Ratio

In order to calculate the California Bearing Ratio for natural natural soil and RRP3 samples, CBR tests were conducted and results were shown in the figure 4

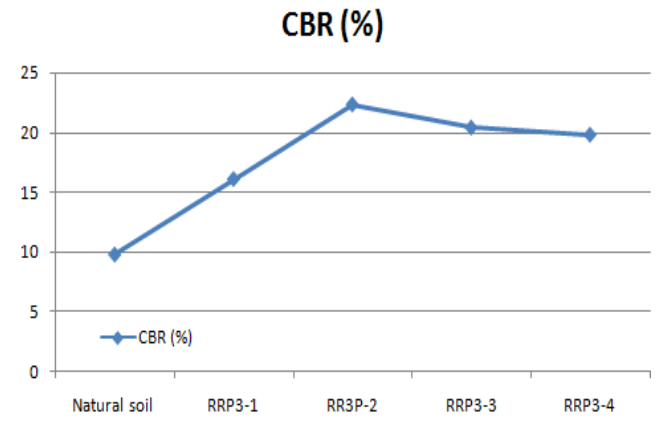


Fig. 4 California Bearing Ratio Test on natural soil & RRP3 samples

From all of the test results, it is observed that the Liquid Limit, Plastic Limit, and Plasticity Index values get decrease with the addition of PR3. It also shows the increase in Dry Density, Optimum Moisture Content, Unconfined compression strength, cohesion, and California Bearing Ratio while adding the PR3.

(I) Soil with PR3 shows a gradual reduction in the Liquid Limit, Plastic Limit, and Plasticity Index.

(2) The soil having 2% PR3 may increase the Dry Density by 15.36% and the Optimum Moisture Content by 12.5%

(3) The soil having 2% PR3 may increase the unconfined compression strength by 31.23% and Cohesion by 15.56%

(4) Soil with 2% PR3 may increase the California Bearing Ratio by 127%

V. CONCLUSION

In this experimental work, we did several tests on natural and RRP3 samples to get a clear idea of the effect of PR3 in red clay around the Coimbatore region. From the result, we conclude that the maximum percentage of RP3 mixed with red clay is in the range of 1% to 2%.

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