

“Experimental Investigation on Effect of RBI Grade81 on Properties of Black Cotton Soil”

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Abstract- Roadways in India is developing at rapid state. A comfortable and economical movement of traffic is quite essential nowadays. Pavement thickness mainly relies on soil properties and intensity of traffic. Engineering properties of soil subgrade depends on liquid limit (LL), Maximum dry density (MDD) and higher Optimum moisture content (OMC). Black cotton soils don't suit for subgrades because of swelling property and causing tremendous damage to structure as well as for pavements. Globally these soils are considered to be a challenge for engineers. The present work is based on addition of new stabilization product, RBI Grade-81 to black cotton soil for enhancing its Engineering properties.

Key Words – Subgrade, RBI Grade-81, Black Cotton Soil.

I. Introduction

Black cotton soil mainly composed of clay mineral called Montmorillonite which has an unusual behaviour of swelling in the existence of moisture and develops shrinkage cracks in dry season. Due to the volumetric change in behaviour, the structures constructed on such soils will experience differential settlements, cracks in buildings or total destruction of the entire model. Structures built on such type of soil can be protected by treating the expansive soil with a non-expansive material. Enhancement of soil properties can be achieved by ground improvement technique like mechanical stabilization, chemical stabilization and reinforcing earth technique etc.

Black cotton soil also called as expansive soil which is predominantly a clay soil greatly affected by moisture content. Due to the rise and fall in moisture content, the soil gets expanded, the pressure increases and subgrade of the structure losses its strength in turn reducing the load carrying capacity thereby the pavement failing process starts. Principle of soil stabilized road construction involves the effective utilization of local soils and other stabilizing agents.

RBI Grade-81 an inorganic soil stabilizer, acts on soil to reduce the voids between soil particles and minimize the thickness of adsorbed water layer in the soil particles to achieve maximum compaction. RBI Grade-81 works on the principle of hydration reaction. Black cotton soil stabilized with RBI Grade-81 for various proportions i.e., 2% 4% 6% and 8% stabilizer and Laboratory tests are executed to estimate the efficacy of the stabilizer in stabilizing the soil.

[1] Anitha.K. R et al investigates the effect of RB1-81 on different kinds of soils such as kaolinite, red soil, & Lateritic soil. Results of both soaked and un-soaked CBR value was increased significantly with the addition of RB1-81 for kaolinite, red soil & lateritic soil. Specimen were prepared for different percentage RB1- 81 i.e. (0%, 2%, 4%, 6%, & 8%) water content of 1% + OMC was added for preparation of specimen. Results showed that, soaked CBR increased 16, 14 & 4 folds with the addition of optimum percentage of RB1-81 recommended for red soil, lateritic and kaolinite respectively.

The objectives of the present work are:

- To ascertain the Engineering properties of Black cotton soil.
- To determine the compaction characteristics of untreated soil and soil stabilized with RBI Grade-81 with varying dosages.
- To study the strength characteristics of soil specimens with and without stabilizer from CBR test
- To decide the optimum dosage of RBI grade-81.

II. Methodology

In 3 stages works are carried out to draw the conclusions.

Stage 1: Tests on soil to study the Engineering properties.

Stage 2: To check the values of OMC & MDD for expansive soil by heavy compaction

Stage 3: California Baring ratio test is conducted on soil with varying percentages of RBI Grade-81 stabilizer.

III. Properties of Black cotton soil

Grain size Distribution	72.66% finer
Specific Gravity(G)	2.6
Water content(w)	11%
Liquid limit (WL)	58.50%
Plastic limit (Wp)	27.10%
Plasticity Index (Ip)	27.40%
Free swell Index	28
Optimum moisture content (OMC)	20.02%
Maximum Dry Density (MDD)	1.63g/cc
California Bearing Ratio (CBR)	2.21%
Unconfined Compressive strength (UCS)	2.5kg/cm ²

IV. Results and discussions

SI No	Particulars	Soil	Soil+ 2% RBI 81			Soil+ 4% RBI 81			Soil+ 6% RBI 81		
1	Liquid limit - WL (%)	58.5	55.8			53.6			51.5		
2	Plastic limit - WP (%)	27.1	28.8			30.1			32.2		
3	Plasticity Index - Ip (%)	27.4	27.0			23.5			21.3		
4	Free swell index	28	19			9			6		
5	Optimum Moisture content - OMC (%)	20.02	24.25			25.09			26.4		
6	Maximum Dry density – MDD (g/cc)	1.63	1.575			1.565			1.563		
7	California Bearing Capacity - CBR (%)	2.21	7D	14D	28D	7D	14D	28D	7D	14D	28D
			6.6	9.5	10.6	14.65	16.8	18.9	19.2	24.5	30.6
8	Unconfined Compressive Strength - UCS (kg/cm ²)	2.5	2.8	3.2	3.9	4.1	4.2	4.4	4.6	5.15	5.9

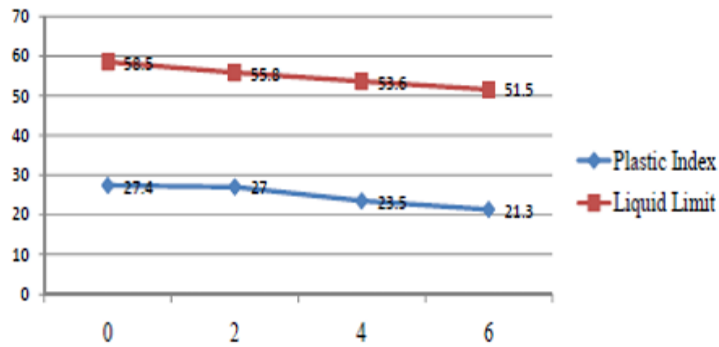


Fig: Variation of Atterberg’s limit with zero and 2, 4, and 6% of RBI grade-81

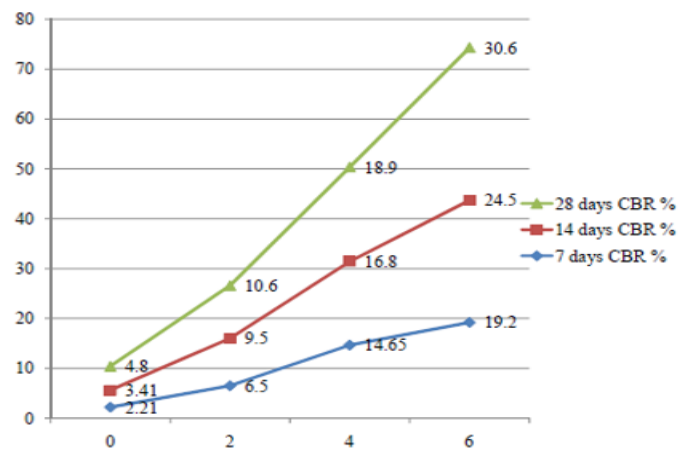


Fig: Variation of CBR values with zero and 2, 4 & 6% of RBI grade-81

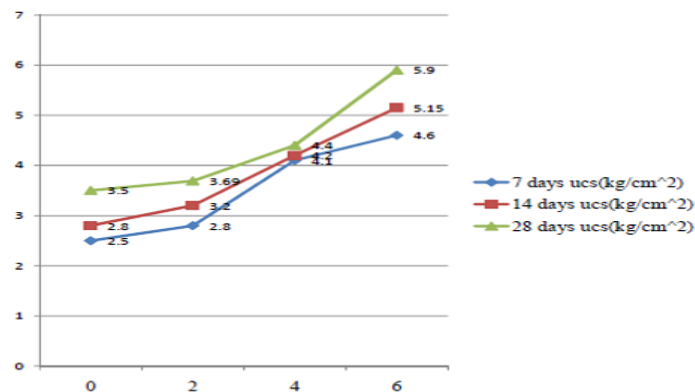


Fig: Variation of UCS values with zero and 2, 4 & 6% of RBI grade-81

Conclusion

- The liquid limit and Plasticity Index decreases with the addition of RBI grade 81 stabilizer.
- The soaked CBR value increases as the percentage of increase in RBI grade 81 addition suggests its suitability to improve performance of soft soil.

- Up to 6% of RBI grade stabilizer can be utilized for strengthening the subgrade of flexible pavement with a suitable save in cost of construction.
- By adding the stabilizer, Engineering properties of clayey soil can be enhanced to a greater extent.

V. REFERENCE

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