Investigations on Strengthening of Sub Grade Pavement by RBI Grade-81 for Flexible Pavement

Sujeet Kumar Tiwari[1], Nitesh Kushwaha[2]

[1]*M. Tech. Scholar,* [2]*Professor*

Department of Civil Engineering, Millennium Institute of Technology, Bhopal India

Abstract - An effective stabilizer i.e. RBI Grade-81(polymer) used as an chemical additive and can also be used in sub grade, sub base and base layer. The industrial waste like Fly Ash, Stone Dust, Steel Slag etc. can be used with RBI Grade-81 as stabilizer to reduce the cost. The strength has been compared on the basis of CBR for virgin and RBI grade-81 reinforced soil under un-soaked and soaked conditions. The result implies that when sub-grade is reinforced with RBI grade-81 its CBR increases as for virgin soil CBR is 2.54 and it increases to 4.03 with RBI grade-81 under un-soaked condition. For soaked condition CBR of RBI grade-81 as 15 which is higher than virgin soil CBR of 1.75 under soaked condition. RBI grade-81 has a good potential to reduce the cost of pavement layers if weak sub- grade is encountered on the alignment.

INTRODUCTION

- Black cotton soil is found in the central part of the country. It has shrinkage and swelling properties. This soil has been formed from basalt or traps .
- Black cotton soil has a low bearing capacity and low strength .
- About 61.05 % of Indian roads are paved and 38.95% are unpaved, so provide paved road at low cost by reducing optimum depth of pavement.
- RBI Grade-81 is one of them. It is a natural soil stabilizer.

OBJECTIVES

The objectives of the research are outlined below:

1. To study the effect of different dosage of RBI Grade-81 on Geotechnical properties of Black cotton soil.

METHODOLOGY

Following steps were taken to conduct the study.

1. Selection of Sample

2. Preparation of Sample

3. Various test such as LL,PL,PI,OMC&MDD and CBR where conducted varying the percentage of RBI GRADE - 81.

CALIFORNIA BEARING RATIO TEST

California Bearing Ratio (CBR) test was developed by the California Division of Highway as a method of classifying and evaluating soil-sub grade and base course materials for flexible pavements. Standard test equipment and procedure as per are: 2720 (part 16) 1979, (Laboratory determination of California Bearing Ratio) was used in the present work to perform the CBR test. The CBR test was conducted on soil and RBI mixture in which both these material were mixed in the proportion of 100:00, 98:02, 96:04, 94:06 and 92:08 respectively. For example, to prepare a sample of 6 kg for CBR testing with 2% RBI, 5880 gm dry soil and 120 gm RBI were mixed and OMC+1% water content was added into it. The mold was then cured for 0 days, 10 days and 24 days and soaked for 4 days. After soaking this specimen was tested in CBR testing machine. A graph is then plotted between load and penetration. The value corresponding to 2.5 mm and 5 mm penetration (which is higher) is divided by standard value and that is the CBR Value in percentage.

Figure: 1 CBR test conducted

RESULT

Un Soaked CBR Test Result:

The California bearing ratio values of the untreated soil and of RBI grade-81 used in the soil are compiled in the following table 6.1.

Table 1: UN Soaked CBR test result

s.no.	% of RBI grade-81	CBR value un-socked condition	
		2.5mm	5.0mm
1	0%	2.54	2.28
2	2.5%	3.15	2.8
3	5%	3.59	3.07
4	7.5%	4.03	3.85

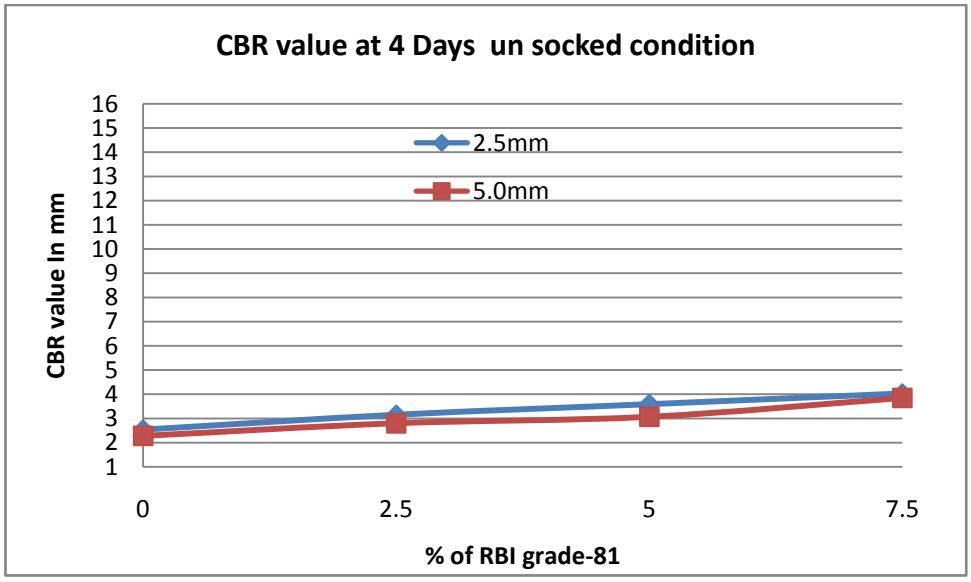

Figure: 2 line chart of UN Soaked CBR test result using RBI grade-81

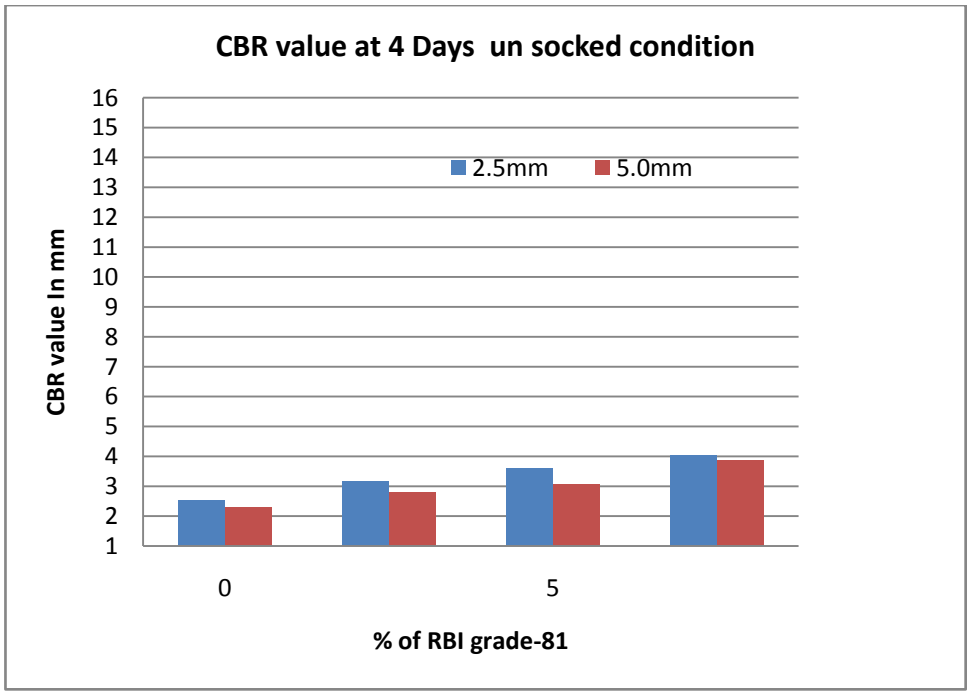

Figure: 3 Bar chart of UN Soaked CBR test result using RBI grade-81

5.7 4 DAY SOCKED CBR TEST RESULT

The California bearing ratio values of the untreated soil and of RBI grade-81 used in the soil are compiled in the following table 6.1.

Table 2: 4 days Soaked CBR test result

s. no.	% of RBI grade-81	CBR value at 4 Days socked condition	
		2.5mm	5.0mm
1	0%	1.75	1.64
2	2.5%	8.54	7.62
3	5%	13.01	10.95
4	7.5%	15	12.58

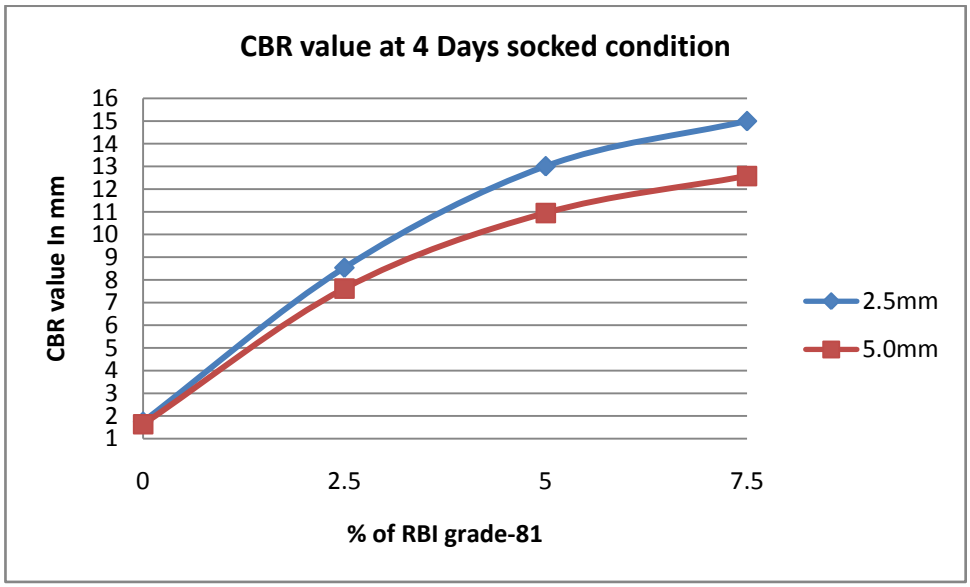

Figure: 4 Line Chart of 4Days Soaked CBR test result using RBI grade-81

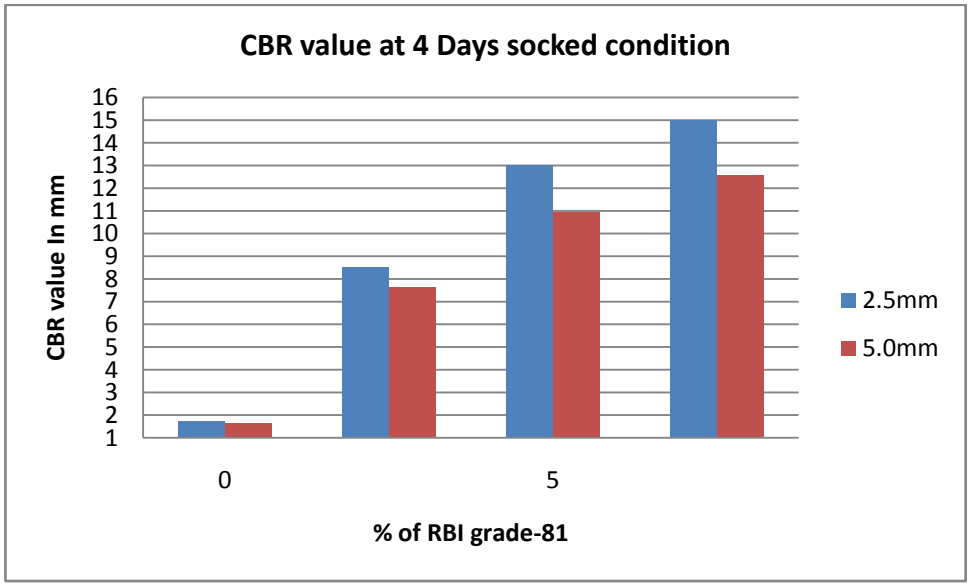

Figure: 5 Bar Chart of 4Days Soaked CBR test result using RBI grade-81

CONCLUSION

- The result implies that when sub-grade is reinforced with RBI grade-81 its CBR increases as for virgin soil CBR is 2.54 and it increases to 4.03 with RBI grade-81 under un-soaked condition.
- For soaked condition CBR of RBI grade-81 as 15 which is higher than virgin soil CBR of 1.75 under soaked condition.

REFERENCES

[1] . IS: 2720 (Part 8)-1983. "Method of Test for Soil (Determination of Optimum moisture content and Maximum dry density for modified proctor test)"

[2] Jain, P. and Goliya, H.S., 2014. Chemical stabilization of black cotton soil for the sub- grade layer. International Journal of Structural and Civil Engineering Research, ISSN, pp.2319-6009.

[3] Jones D. E. and Holtz W. G. (1973) "Expansive soils - the hidden disaster, Civil Engineering" ASCE 1973, Vol.43, No.8, 49-51.

[4] KR, A., Ashalatha, R. and Johnson, A.S., 2010. Effects of RBI Grade 81 on Different Types of Subgrade Soil.

[5] Lekha, B.M. and Shankar, A.R., 2014. Laboratory performance of RBI 81 stabilized soil for pavements. International Journal of Civil Engineering Research, ISSN, pp.2278- 3652.

[6] Madurwar, K.V., Dahale, P.P. and Burile, A.N., 2013. Comparative study of black cotton soil stabilization with RBI Grade 81 and sodium silicate. International Journal of Innovative Research in Science, Engineering and Technology, 2(2), pp.493-499.

[7] Mahto, B. and Duggal, A.K., 2015. Improvement of subgrade by RBI Grade 81 and pond ash. International Research Journal OF Engineering and Technology, 2(5), pp.1010- 1020.

[8] Mamta, Mallikarjun. Honna (2014) "A comparative studies

of black cotton soil and lateritic soil using rbi grade 81". IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN: 2321-7308, Volume: 03 Special Issue: 03, May-2014, NCRIET-2014.

[9] Naseem, A.K.A., Damir, R.M. and Hake, S.L., 2014. Effect of fly ash and RBI Grade 81 on the black cotton soil as a subgrade for flexible pavements. International Journal of Innovations in Engineering and Technology, 4(1), pp.124-130.

[10] Patil, B.M. and Patil, K.A., 2013. Effect of industrial waste and chemical additives on CBR value of clayey soil. International Journal of Structural and Civil Engineering Research, ISSN, pp.2319-6009.