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A Literature Review On Soil Stablization by Using RBI Grade – 81

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Abstract : It is the era of reformation, low bearing capacity and high settlement behaviour of black cotton soil is the challenge for the engineers to work on it. To overcome this problem various techniques are used to increase the strength and durability of black cotton soil. Stabilization is the best technique which reduces the consistency limits of the soil. In this present study, experimental investigation are conducted to find out the improvement in the various engineering properties of soil after the addition of Lime and RBI grade 81 into the Black cotton soil. From the LL, PL, and PI tests on optimum mixes arrived, it has been found that the Liquid limit as well as plastic index decreases and Plastic limit increases by increasing the proportions of RBI grade 81. The CBR and Standard Compaction tests were conducted on the optimum mix for comparatively with normal black cotton soil, optimum mix.

Keywords – Soil stabilization, RBI Grade 81, Compaction Test and CBR Test

1. INTRODUCTION

Subgrade layer is the lowest layer in the pavement structure underlying the base course or surface course, depending upon the type of pavement. Generally, subgrade consists of various locally available soil materials that sometimes might be soft and/or wet that cannot have enough strength/stiffness to support pavement loading. A sound knowledge of performance of the subgrade soil under prevailing in-situ condition is necessary prior to the construction of the pavement. The better the strength/stiffness quality of the materials the better would be the long- term performance of the pavement. Hence, the design of pavement should be focused on the efficient, most economical and effective use of existing subgrade materials to optimize their performance. This review paper deals with the soil stabilization using a chemical additive RBI Grade-81. It is a very effective stabilizer and can be used in sub grade, sub base and base layer. The industrial waste like Pond ash, Fly Ash, Stone dust, Foundry Sand, Steel Slag etc can also be used with RBI Grade-81 as stabilizer to reduce the cost.

2. LITERATURE REVIEW

Vipin Kumar Pal (2022) studied shows that Liquid Limit of the Black cotton Soil decrease with increase in percent of RBI Grade 81 and Lime. Plastic Limit of Black Cotton Soil increases with increase in percent of RBI Grade 81 and Lime. Plasticity Index of the Black Cotton Soil decreases with increase in percent of RBI Grade 81 and Lime The result implies that when sub-grade is reinforced with RBI Grade 81 and Lime it's CBR increases as for virgin soil CBR is 2.3 and it increases to 9.5 with RBI Grade 81 and Lime under un-soaked condition. For soaked condition CBR of RBI Grade 81 and Lime as 12.2 which is higher than virgin soil CBR of 2.8 under soaked condition.

Gurunath K, Nithin Somashekar D P ,Manu A, Narasimha Murthy K N , Prajwal K C(2021) Black cotton soil with up to 25% of fly ash content the MDD value is increased from 1.46 g/cc to 1.48 g/cc and OMC is decreased from 31% to 25.6%. The maximum dry density of black cotton soil decreases when fly ash content is increased above 25% from 1.48 g/cc to 1.42 g/cc and also OMC increases from 25.6% to 28%. Therefore, for effective stabilization of black cotton soil 25% of flyash is considered as optimum content. MDD value is decreased when RBI Grade 81 is added beyond 6% from 1.5g/cc to 1.41 g/cc and OMC is increased from 29.9% to 32.4%. Hence 6% of RBI Grade 81 is considered to as the optimum content to be added to the Black cotton soil for stabilization. Addition of optimum content of both RBI Grade 81 (6%) and Fly ash (25%) resulting to increase MDD from 1.46 g/cc to 1.53 g/cc and decreased in OMC from 30.05% to 28.5%. UCS is increased from 122kN/m2 to 268kN/m2 up to optimum content of Fly ash (25%) treated with Black cotton soil and beyond 25% of Fly ash it decreased from 268kN/m2 to 210kN/m2 . Therefore 25% Fly ash considered to be optimum. Up to 6% RBI Grade 81 UCS is increased from 122 kN/m2 to 295 kN/m2 mixed with Black cotton soil and UCS is decreased from 295 kN/m2 to 264 kN/ m2 with addition of RBI Grade 81 beyond 6%. UCS increased from 122kN/m2 to 397 kN/m2 when 6% of RBI Grade 81 and 25% of fly ash is mixed with Black cotton soil.

Anitha et al. 2020, studied the effect of using a new stabilization material, named RB1-81 on, red soil, kaolinite & Lateritic soil. After experimental studies, they revealed that soaked and UN soaked CBR values improved with the addition of cementitious stabilizer RB1-

81 for Red soil, kaolinite & lateritic soil. They were prepared the CBR specimen with varying percentage of RB1 Grade-81 i.e., (0%, 2%, 4%, 6%, & 8%) during the experiment. Water content of 1% plus OMC was added for specimen preparation. CBR test were conducted at 0, 7 & 11 days of curing. CBR test at 11 days was conducted after soaking it for 4 days and cured for 7 days. After all experiments they came to the conclusion that un-soaked CBR did not vary much for lateritic and red soil and but it was increased 16 times for kaolinite. They also been found that soaked CBR increased 16, 14 & 4 times with the addition of optimum percentage of RB1-81 suggested for red soil, lateritic and kaolinite respectively.

Madurwar et al. 2019, took an effort to improve geotechnical properties of black cotton soil by using sodium silicate and RBI Grade-81. They were conducted out Atterberg's limit, UCS and CBR tests were on the specimen of soil with RBI-81 in a mix proportion of 2% & 6% and period of curing 7 and 14 days. After getting test results, they concluded that that the raw soil which was having 2.69% UCS value and 2.33% CBR values has been increased to 3.62% and 10.03% at 14 days curing by adding 2% of RBI Grade-81. For 7 days of curing, they got 2.97% UCS value and 8.03% of CBR value with 7 days. After that they boosted the percentage of RBI Grade-81 from 2% to 4% which delivered them result of 4.44% of UCS and 18.87% of CBR values with 14 days curing and 3.96% of UCS and 16.24% of CBR values with 7 days of curing. Finally they came to the conclusion that the UCS & CBR value improving with increase in RBI Grade-81. In addition they suggested that RBI Grade-81 is a good soil stabilizer to improve engineering properties of soft soil. They also concluded that free swell index decreases with increase in RBI Grade- 81 and it increases with increase in sodium silicate.

Patil & Patil 2013, investigated stabilization of sub grade soil by using natural soil stabilizer RBI Grade-81 and fly ash. They performed laboratory tests like Differential Free Swell Index (DFS), standard Proctor compaction test, UCS and CBR test on different mixes of RBI Grade- 81, fly ash and raw soil. They find out the soaked CBR value of untreated soil and it is found to be 2.76%. For soil treated with fly ash and RBI Grade 81 in the ratio soil: fly ash: RBI Grade 81 in the proportion of 76:20:04 the CBR value is enhanced to 13.14% from 2.76%. For the same mix proportion, the soaked CBR value enhanced by 376 percent as compared to virgin soil. The stabilization of soil by using fly ash and RBI Grade 81 by adding both in optimum dosage significantly enhances the structural properties of soil.

John & Ryan 2013, conducted a study on improvement of index and engineering properties of sub grade soil by using and locally available cheap materials and soil stabilizer. They carried out the light compaction test on untreated and treated soil sample and value of Max dry density and Optimum moisture content were find out. For soil treatment, moorum and RBI Grade-81 were added in different mix proportions and tested for soaked CBR value, MDD and OMC. The mix proportions of soil and stabilizer were selected as soil: RBI Grade 81 in mix proportions of 100:0, 98:2 and 96:4 respectively, After testing, the soaked CBR values were found to be 2.56%, 4.89%, and 8.79%. After that these tests were repeated by introducing moorum also in proportion for mix of soil: moorum: RBI Grade-81 in the proportions of 100:0:0, 90:10:0, 80:20:0. The soaked CBR values were found to be 2.56%, 2.41% and 2.84%. For mix of soil: moorum: RBI Grade 81, in the mix proportions of 78:20:2 and 76:20:4, the soaked CBR values were found to be 4.56% and 14.76% respectively. They concluded that the CBR value of sub grade soil can be improved effectively by addition of moorum along with RBI Grade-81. They also concluded that this method is very economical because construction cost can be reduced by avoiding replacement of sub grade.

Singh & Riar 2013, conducted a study on the effect of soil stabilizer RB1 Grade-81 in the stabilization of soil. They were conducted Atterberg's limit, Light compaction test & CBR test to find out the improvement of soil. They estimated the construction cost of pavement by stabilizing the soil by adding +2% RB1 Grade-81. And they checked it with conventional method of pavement cost. And they found that the stabilization method is economical. They performed wet sieve analysis for determining practical size distribution of soil. Atterberg's limit tests were also conducted to know the change has been done by RBI Grade-81 on index properties of soil. CBR samples were also prepared for various percentage of RBI Grade-81 i.e. 0%, 2%, 4%, 6% & 8% of RBI Grade-81 with moisture content of 1% + OMC. After all testing, they concluded that highly plastic soil can be strengthened with RB1 Grade-81 and can be constructed as stabilized sub base. During this experiment, they determined that CBR value increased with the addition of RB1 Grade-81. The CBR value of the existing soil was only 2%, which has been boosted to 28.9% by addition of 2% RBI Grade 81 after 4 days of soaking and 7 days of curing. At 8% of RBI Grade-81 content, CBR value is 135.5.

3. CONCLUSION

The review of earlier studies related to soil stabilization by using RBI Grade - 81 reveals With the addition of RBI Grade-81 the plastic limit of soil increases and liquid limit of soil decreases and thus plasticity index of soil also decreases. MDD decreases and OMC increases with the addition of RBI Grade-81 but the strength does not decrease with decrease of MDD. The optimum percentage of RBI admixture are observed in between 0 to 8% respectively for improving the properties of expansive soil. Addition of RBI at different proportional to clay soil decreases the dry density and increases optimum moisture content.

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