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Review Paper on Study of Black Cotton Soil to Enhancing the Properties of Sub Grade & Base Layer of Pavement

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INTRODUCTION

Soil is basic and important element in Civil Engineering field. Stability of every structure depends on the type and characteristics of foundation which in turn depends on the type of soil. Many problems irrupt if expansive soil, Natural soil is to be used in foundation, because of its shrinkage and swelling properties. There are many methods to make natural soil stable for various constructions. Natural soil is comfortable for road work, compared to other types of soil.

LITERATURE REVIEW

"Stabilization of expansive soils using RBI Grade-81", by Dr. R. G. Robinson, IIT Madras, May 2007. The major tests conducted in the study were mainly CBR and UCS. A highly expansive type soil was used to study its behavior using RBI Grade-81within the range 4% to 8%. The soil tested had a PI of 40 and FSI of 80%. The CBR value increased from 1.9% to 108% at 8% RBI Grade-81, at the same dosage the swell potential came down to 0. The unconfined compressive strength improved from 580kPa to 1520kPa at 28 days with 6% RBI Grade-81.

A. K. Choudhary et.al (2010) placed numerous layers of reinforcement horizontally at specified vertical spacing within the sub-grade and hence determining their relative positions for 2 unlike types of reinforcement namely geogrid and jute geotextile. The figure of reinforcing layers was altered from 1 to 4. He found that expansion ratio lowers down when soil is reinforced with single layer and goes on decreasing with a raise in number of reinforcing layer but this decrease is considerable in case of jute geotextile and marginal in case of geogrid which means insertion of reinforcement controls swelling of soil. CBR tests were executed with both unreinforced and reinforced specimens with varying number of reinforcing layers and reinforcement types and derived that CBR value of soil also increases with raise in number of reinforcing layers. Further it was established that geo-grid offers superior reinforcing efficiency than jute geotextile but it could be advantageously exploited in low cost road project.

Lekha B. M. and A. U. Ravi Shankar, (2015) conducted a study on the performance of RBI Grade-81 in the laboratory to stabilize the soil for pavements. The soil and stabilizer RBI-81 mixed in different proportion and tested for atterberg's limit, OMC, MDD, UCS, and CBR. The UCS of untreated soil was 380 kN/ and unsoaked UCS of soil mixed with RBI-81 in the proportion 98:02, 96:04, 94:06 were found to be 265kN/, 380 kN/ , 475 kN/ after 1 days curing period and 830 kN/ , 1350 kN/ , 1800 kN/ after 28 days curing. The CBR values for soil and stabilizer proportion 100:00, 98:02, 96:04, 94:06 were found to be 0.3%, 4.5%, 9.3% and 12.5% after 7 days curing and 4 days soaking period. On the basis of results, they concluded that the strength of BC soil improved appreciably with the stabilizer under unsoaked condition. The CBR value of soil showed good improvement when treated with 6% stabilizer. They also determined the fatigue life (number of cycles) of treated soil at repeated loads corresponding to one third and half of UCS strength of 98:02 soil: RBI mix cured for 7 days and 28 days.

Manisha Gunturi et. al., (2016) carried out a study on CBR and swelling behavior of expansive soil when treated with RBI Grade-81. The soaked CBR value and free swell index of untreated soil and soil treated with 2%, 4% & 6% RBI Grade-81 at 3 days, 7 days and 14 days curing period were determined. The author has taken two soil sample A B of expansive soils for testing. The results show that the CBR value of untreated samples A & B were 2% & 2.19% which increased to 9.56% & 10%, 16% & 15% and 20% & 18% after 3days, 7days and 14days curing period at 2% RBI Grade-81. At 4% RBI Grade-81, the CBR values were 9.93% & 10.4%, 22% & 22% and 34.9% & 30% after 3days, 7days and 14days curing period. At 6% RBI Grade- 81 the CBR values were 10.8% & 11.5%, 27% & 26% and 53.6% & 40% after 3days, 7days and 14days curing period. Free Swell Index values decreased significantly with curing period as well as with the addition of RBI Grade-81. They also carried out a study on strength properties of problematic soils with stabilizer RBI Grade – 81 on the same soil samples A1 and A2 and with same Soil and RBI proportions. The authors have tested the soil samples for atterbergs limit, compaction and UCS and Field Emission Scanning Electron Microscopy of untreated and treated the soil with 6% RBI Grade-81 at 7 days curing period was conducted. The UCS value of version soil samples A1 and A2 were found to be 138 kPa and 122

kPa which were increased to 209 kPa and 130 kPa after 3 days curing and 217 kPa and 148 kPa after 7 days curing with 2% RBI Grade-81. The UCS value was increased to 742 kPa and 514 kPa after 3 days of curing and 794 kPa and 541 kPa after 7 days of curing with 6% RBI Grade-81. After the test investigation, they were concluded that the UCS value was improved appreciably with the addition of RBI Grade-81 under the curing period of 3 days and 7 days with the increase in the percentage of RBI the rate of increase of UCS also increased. The UCS value of sample A1 and A2 increased by 425% and 430% respectively after 7 days of curing period with 6% RBI stabilizer.

V. Ramesh Babu IJCIET -2016 The exams performed for this paintings have been. atterberg limits, unique gravity , well known proctor take a look at , unconfined compression take a look at , California bearing ratio. All construction must rest on the soil. So, the soil bearing capacity plays a critical role in constructions. All soils will not have good electricity and bearing capacity. So there is a need to increase the soil electricity and bearing potential. The black cotton soils pose many issues in production.

Amrutha Mathew et al (2016) Effect on Strength Characteristics of Expansive Soil Using Sisal Fibre and Waste Materials, Volume 5 Issue nine, September 2016, Pp-455-463.

The addition of sisal fibre, bagasse ash and glass powder waste in various proportions with black cotton soil and combination on the above share of substances is studied. To attain this aim experimental research had been carried in two phase. In the first section, the bodily houses of soil inclusive of particle size distribution, specific gravity, Atterberg's limits, swelling strain have been determined. In second section, diverse checks have been done on black cotton soil using extraordinary percentage of sisal fibre, bagasse ash, glass powder waste and from the most values of strength check a combination of zero. Nine% sisal fibre,7% bagasse ash and 14% glass powder waste was additionally carried out. The results indicated that with addition of sisal fibre, bagasse ash and glass powder waste the dry density expanded and ultimate moisture content material was discovered to be lowering. The unconfined compressive energy and California

Rohit et al (2016) In many situations, soils in herbal kingdom do no longer gift good enough soil homes for use as pavement (avenue) service layers. In order to development their geotechnical parameters to fulfill the necessities of technical specifications of creation industry; soil stabilized strategies are generally emphasized. The objective of this paintings is to make use of the effectiveness of Bagasse Ash (BA) cloth to decorate the houses of herbal soil (NS) used for materials in pavement sub grade. The experimental paintings worried index homes to categorise the soil pattern. The preliminary investigation of the herbal soil shows that it's miles belongs to A-6 elegance in the AASHTO soil classification machine. Whereas as in keeping with IS classification this elegance are commonly low compressibility clay soil (CL). Liquid restriction, plastic restriction, plasticity index, OMC, MDD, swelling pressure and CBR assessments had been used to assess residences of stabilized soil. The natural soil was stabilized with BA in stepped concentration of five%, 10%, 15%, 20%, 25% and 30% by dry weight of the soil individually. All stabilized artificial soil samples have been additionally cured for ninety six hours for CBR take a look at in absolutely saturated situation. The test consequences suggest that the addition of BA complements the percentage of partial length distribution, but with addition of BA until 20% the L.L, PL, PI and swelling pressure decreases, even as those parameters further increases in this restriction past i.E. 20% to 30% of BA, Specific Gravity and MDD decrease with addition of BA, for all percent values, whereas most effective moisture content will increase in every fabric. The CBR value increases with addition of BA until 20%, the CBR price increases and it is decreases with similarly addition of BA beyond 20% to 30% for both condition (soaked and Unsoaked) gasse Ash (SCBA) from Sugar Industry can be used as Stabilizing Material for Natural Soils, International Journal for Scientific Research & Development

ades and Grim (2017), described that practically all 4 fine-grained soils undergo this rapid cation exchange and flocculation/agglomeration reactions when treated with lime in the presence of water. The second phase of the chemical reaction involves pozzolanic reactions within the lime-soil mixture, resulting in strength gain over time. When the cement is combined with a sandy soil, the pH of the pore water increases. When the pH reaches 12.4, the silica and alumina from the clay become soluble and are released from the clay mineral. In turn, the released silica and alumina react with the calcium from the lime to form cement, which strengthens in a gradual process that continues for several years. As long as there is sufficient calcium from the lime to combine with the soluble silica and alumina, the pozzolanic reaction will continue as long as the pH remains high enough to maintain the solubility of the silica and alumina. Strength gain also largely depends on the amount of silica and alumina available from the clay itself; thus, it has been found that cement stabilization is more effective for montmorillonitic soils than for kaolinitic soils (Lees et. al, 1982). In addition to pozzolanic reactions, carbonation can also lead to long-term strength increases for soils stabilized with lime. Carbonation occurs when lime reacts with carbon dioxide from the atmosphere to produce a relatively insoluble calcium carbonate. This can be advantageous since after mixing, the slow process of carbonation and formation of cementitious products can lead to long-term strength increases (Arman and Munfakh, 1970). However, prior to mixing, exposure of cement to air should be avoided through proper handling methods and expedited construction procedures in order to avoid premature carbonation of the lime (Chou, 1987).

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(July - 2017) Investigation at the properties of black cotton soil, it is determined that, its power houses are very low. In order to assemble any basis one such soil, we need to stabilize the black cotton soil. Red dust is cloth produced with the aid of aluminum industries, which, now a days growing so many issues when we dump it on open area. To beat both the standards purple mud is used as a stabilizer. Number of mixes is proposed right here and experiments are performed on the same. Black cotton soil become stabilized with pink dust through varying the % of blend from 15% to 30% with 1% interval Gypsum is also used within the mixes so that it will give better binding between the particles. It is observed that results obtained at the combination

proportions zero% to 25% is increasing. Optimum of 25% of pink dust substitute gives higher outcomes. After acquiring the take a look at consequences as said above, another attempt has been made to understand the interrelation (linear) between the parameters; regression analysis is made. This regression analysis is made using Microsoft Excel 2010; regression summary output is also discussed on this take a look at.

Anup Gajanan Bombatkar et al. (2018) Black cotton soils have high degree of expansion and possess high swelling potential and require stabilization for their better performance. The present work shows 1 to 5% of RBI grade 81 can have a significant effect on the stabilization of a fine material. The index parameters of study soils improve with the addition of RBI grade 81. The liquid limit decreases from 73.79% to 60.33%, plastic limit from 34.42% to 28.10% and the plasticity index from 39.37% to 32.23% for corresponding increase of RBI grade 81 from 0, 1 up to 5%. The CBR value increases from 2.59% for 0% RBI grade 81 to 8.37% for 3% RBI grade 81. Any further increases in addition of % of RBI grade 81 do not increase CBR value. By using RBI Grade-81 cost reduction in road pavement is 15.63%.

Objective

- To study the change in Geotechnical properties of black cotton soil by stabilizing it with Red mud & RBI Grade-81.

CONCLUSION

Significant changes in the soaked & Un soaked CBR value of the Black Cotton soil.

Future Scope of work

The suitability of using waste material like demolition waste, all types of slag, marble, granite, stone dust, fly ash, etc. to be stabilized with this RBI Grade-81 technology along with soil and used in road construction.

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