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A REVIEW STUDY ON THE SOIL STABLIZATION WITH RECRON-3S FIBER

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Abstract: Geotechnical engineers face various problems while designing the foundations on highly compressible clayey soil due to poor bearing capacity and excessive settlement. Most of the soil available are such that they have good compressive strength adequate shear strength but weak in tension / poor tensile strength. The quality and life of asphalt is enormously influenced by the sort of subgrades. In any case in India the greater parts of the adaptable asphalts have to be built over feeble and dangerous sub-grade. The California bearing proportion (CBR) of these subgrade have low, it needs to more thickness of pavement. Lessening in the accessibility of suitable sub base and base materials for asphalt development have prompts a look for financial technique for changing over generally accessible tricky soil to suitable development material. Soil stabilization is very necessary by the addition of additives in suitable dosages for road pavement foundation because it improves the engineering properties of soil to sustain load carrying capacity in terms of quality and quantity of performance. To overcome the same, many researchers have concentrated their studies on soil improvement techniques by developing new such materials, through the elaboration of composites. The main objective of this study is to study the effect of fibers in geotechnical applications. In this study a brief review is prepared on the research work of various authors.

Keywords: Clayey soil, Recron-3S, Soil Stabilization

1.0 INTRODUCTION

Soils are complex mixtures of minerals, water, air, organic matter, and countless organisms. Various types of soil available in India like alluvial soils, black cotton soils, laterites soils, mountain soils, desert soils, red soils. Soil is the upper most part of earth and it is cheapest and readily available construction material. Soil is generally categorizes into four basic types (such as): Gravel, Sand, Clay and Silt. Out of them, few possess montmorillonite in high amount resulting in sudden swelling and shrinkage upon contact with water. Such soils are not useful in construction directly but can be made useful after their stabilisation. Soil is defined as an unconsolidated material, composed of soil particles, produced by the disintegration of rocks and chemical decomposition. On the basis of shear strength, soil can be divided into three types: cohesion less soils, purely cohesive soils and cohesive soils. Soil stabilisation is used for foundation, embankment and highway construction, airport and village roads to highways or expressway. Soil stabilisation improves the bearing capacity, compressibility, strength, and other properties of soil. Soil stabilisation is the popular method of soil improvement. Various methods of soil stabilisation are used like mechanical method, chemical method, thermal method, additive method (fiber reinforcement). In case of road construction the aim of stabilization of soil is to increase the stability by increasing its bearing capacity and hence increasing its strength and reduction in pavement thickness. Soil stabilisation improves the strength of the soil, thus, increasing the soil bearing capacity, used to decrease the permeability and compressibility of the soil mass in the earth structures, more economical both in terms of cost and energy to increase the bearing capacity of the soil rather than going for deep foundation or raft foundation, improves the workability and the durability of the soil and maximize the lifecycle costs of projects.

1.1 METHODS OF STABILIZATION

The two general stabilization methods are mechanical and additive. The effectiveness of stabilization depends on the ability to obtain uniformity in blending the various materials. Mixing in a stationary or traveling plant is preferred. However, other means of mixing (such as scarifies, plows, disks, graders, and rotary mixers) have been satisfactory. The soil-stabilization method is determined by the amount of stabilizing required and the conditions encountered on the project. An accurate soil description and classification are essential for selecting the correct materials and procedure. FM 5-410, Chapter 9, lists the most suitable treatments for various soil types to stabilize these soils for different objectives.

- **Mechanical Stabilization**
  Mechanical stabilization is accomplished by mixing or blending two or more gradations of material to obtain a mixture meeting the required specifications. The blending of these materials may take place at the construction site, at a central plant, or at a borrow area. The blended material is then spread and compacted to the required densities by conventional means. If, after blending these materials, the mixture does not meet the specifications, then stabilization with an additive may be necessary.
- **Additive Stabilization**
  Additive refers to a manufactured commercial product that, when added to the soil in the proper quantities, will improve the quality of the soil layer. The two types of additive stabilization discussed mainly in this

chapter are chemical and bituminous. Chemical stabilization is achieved by the addition of proper percentages of portland cement, lime, lime-cement-fly ash (LCF), or combinations of these materials to the soil. Bituminous stabilization is achieved by the addition of proper percentages of bituminous material to the soil. Selecting and determining the percentage of additives depend on the soil classification and the degree of improvement in the soil quality desired. Smaller amounts of additives are usually required to alter soil properties (such as gradation, workability, and plasticity) than to improve the strength and durability sufficiently to permit a thickness-reduction design. After the additive has been mixed with the soil, spreading and compacting are achieved by conventional means.

2.0 LITERATURE REVIEW

Gati Sri Utami studied the clay soil stabilization with lime effect the value CBR and swelling. The swelling would reduce the volume of soil that is stable when it rains the soil is not swollen, otherwise when the dry season does not shrink too high. Ground improvement methods used in this study was stabilization of lime-soil, using a mixture of percentage 5%, 10% and 15% of the lime. Tests performed on the Atterberg's limits, Compaction (Standard Proctor Test), C.B.R laboratory, and Swelling. The results of the study about a large percentage of the value of lime plasticity (liquid limit, plasticity index) decreased with the increasing compaction. The average CBR value is increased for the natural soil to percentage 5% and 10% of lime, while the percentage of 15% decreased. For the swelling, the percentage of 15% lime with 24 hours immersion showed 45.28% increase in swelling of the normal soil (i.e. 31.67% to 17.33%) So in general the best for clay soil stabilization is Pakuwon area where the addition of 10% lime CBR values obtained optimum and could reduce swelling value.

Siyyagalla Subbarayudu et al studied the Soil stabilization by using recron -3s, flyash & lime. In this study, the stabilization of the soil by using RECRON-3S, FLYASH, LIME is done .In this study recron-3S as (1%,2%,) lime(2%,3%,4%) and fly ash at (10%,12%,15%,20%) are used. With different proportion of soil with additive materials California bearing ratio value will be more compare to conventional materials. And from that thickness of pavement can be minimized to the certain extent.

Kolla Ashwani Chandh et al studied on the Effect of Fibre on Non Swelling Sub Grade Layer. In this study, Recron 3s fibre is mixed with soil to investigate the relative strength gain in terms of bearing capacity and compaction. The effect of fibre on the geotechnical characteristics of soil-fibre mixture was investigated by conducting standard Proctor compaction tests, CBR tests and permeability test. The tests were performed as per Indian Standard specifications. The materials were used for preparing the samples are Soil & Fibre.The soil used for these experiments was brought from a site, in our college. The physical properties of the soil were determined as per IS specifications. In this test programme, without additives clay was tested to find the optimum moisture content, CBR value and plasticity index. Fibre is added in varying percentages and that fraction for which maximum strength is obtained was found out. These experiments resulted in decreasing the sub-grade thickness to 50% 0f the actual thickness required, thereby reducing the cost of construction.

R.V.Giridhar et al studied the structured teaching program on geotechnical application and soil treated. The vast majority of the dirt accessible are with the end goal that they have great compressive quality satisfactory shear quality yet feeble in strain/poor rigidity. To beat the same numerous specialists have focused their reviews on soil change strategies by growing new such materials, through the elaboration of composites. The primary target of this review is to explore the impact of filaments in geotechnical applications and to assess the quality of unsaturated soil via completing compaction test and CBR tests on soil test. The filaments are cut long of 6mm and 12 mm and blend haphaz rates (0.50%, 1.0%, 2.0%, 4.0%) by dry weight of soil and compacted to most extreme dry thickness at ideal dampness content. The test outcomes demonstrate a lessening in the greatest dry thickness and ideal dampness substance of soil because of the expansion of Recron fiber. It likewise shows a change in the CBR esteem.

P.Sowmya Ratna et al studied the Performance of Recron-3s Fiber with Lime in Expansive Soil Stabilization. The properties of the black cotton soils can be altered in many ways viz. mechanical, thermal and chemical means. Therefore soil stabilization techniques are necessary to ensure the good stability of soil so that it can successfully sustain the load of the superstructure especially in case of soil which is highly active; also it saves a lot of time. In the present work, an attempt has been made to study the compaction and CBR characteristics tests of black cotton soil mixing with different percentages of lime and Recron-3s Fibre with a view to determine the optimum percentage. Test results shows that stabilizing clayey soils with lime and imparting Recron 3s fibers enhance the strength. The study yielded the following conclusions based on the laboratory experimentation carried out in this investigation. Addition of lime has shown decrement in liquid limit from 84% to 67% and improvement in plastic limit from 55% to 60.5% and plasticity index decrease from 29% to 26.4% when the lime content varies from 0% to 6% mixed in expansive soil as a result of cation ions from the lime which reduces the volumetric changes.

Muhammad Nawazish Husain et al studied the Application of Recron 3S Fibre in Improving Silty Subgrade Behaviour. The objective of the present paper is to check the usefulness of Recron 3S fibre in improving soil subgrade strength of local silty soil of Kurukshetra. For this purpose a series of experiments were conducted which include Modified Proctor Compaction, California Bearing Ratio (CBR) and Unconfined Compressive Strength (UCS) tests. A total of four samples of soil - fibre mixture were made with fibre content as 0.15%, 0.30%, 0.45% and 0.60% of dry

weight of soil. Other tests for index and physical properties like Atterberg's limits, Specific gravity and sieve analysis of parent soil were also carried out. Experimental results revealed that addition of Recron 3S fibre increases the CBR and UCS value of the silty soil. From the results it is also observed that benefit is more appreciable at lower percentage of Recron 3S fibre i.e. 0.15% as compared to higher percentage.

P.V.KOTESWARA RAO et al studied the performance of recron-3s fiber with cement kiln dust in expansive soils. In the present work, an attempt is made to study the influence of polymer fibers on the properties of locally available Black cotton soil with and without admixture modification. This study revealed that the fiber reinforcement improves the soil properties in terms of improved stress-strain patterns and progressive failure in place of quick post peak failure of plain samples. The unconfined compressive strength of Clay soil is increased by 7 times with admixture stabilization and 9 times for admixture with fiber modification with respect to plain samples. The shear strength parameters of clay soil are also significantly increased upon admixture stabilization and admixture with fiber treatment. The CBR value also increased significantly even for soaked CBR tests. By addition of CKD the Liquid limit of the mixture is decreased 23 %, where as plastic limit is increased by 41%. Plasticity Index of the mix is decreased by 57%.

CONCLUSION

On the basis of various studies done by authors, Following conclusions are drawn:

1. Strength of soil can be increased to the certain extent by using additive materials in soil. Especially Recron 3s, when mixed with soil gives a wonderful result.
2. Fiber absorbs everything and keeps the road surface intact and many problems can be solved like potholes, cracking & failure of pavement.
3. From the arrangement of standard delegate tests directed, we found that the OMC of the strengthen soil increments with the pickup of the fiber content.
4. There is considerable decrease in cohesion of soil with Recron Fibre thread. Though F value increase with addition of both the reinforcing materials.
5. Unconfined compressive strength of the soil increases with the addition of Recron Fibre.
6. From the series of standard proctor tests conducted, we found that the OMC of the reinforce soil increases with the gain of the fiber content.

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