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STUDY ON SUBGRADE SOIL WITH ADDITION OF EGG-SHELL POWDER AND RECRON-3S FIBRES

- Review

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Abstract - *Embankment of pavements is made up with earthen material mainly used soil. Sometimes soil have not fulfill the desired parameters of strength or other design conditions then we have an option to add something to soil which helps us to upgrade soil up to designed limits. At present study the utilization of waste material i.e. egg shell and recorn in which the disposal of egg shells is not possible which is only done with its addition in something. This study aims to enhance the properties of soil with addition of mentioned materials which compared to virgin soil observations. Upper layers of embankments transmit the load to the lower layers. It is required to all materials that they fulfill the desired design strengths. Use of waste materials as stabilizer it is good for soil strength as well as for good environment.*

Key Words: egg shell, recorn, soil, embankment, waste, environment.

1.INTRODUCTION

The overall strength and performance of a pavement is dependent not only upon its design but also on the load-bearing capacity of the sub grade soil. The quality of a flexible pavement depends on the strength of its sub-grade soil. The main function of the sub grade is to give adequate support to the pavement and for this the sub grade should possess sufficient stability under adverse climatic and loading conditions. The strength of sub-grade is the major parameters for determining the thickness of pavement. Material selected for use in construction of sub grade must have to be of adequate strength and at the same time it must be economical for use. In view of the present investigation has beencarried out with easily available material like eggshell powder in combination with recron 3s fibers. Index properties of soil are observed to classify the soil. Soil means earth's upper layer, which may be furrowed or dug, chiefly the separate material of the earth where plants and organic matter develops according to the Webster's dictionary. The word soil is derived from solium a Latin word. Soil is a material naturally available in universe. The cheapest available construction material is also soil, on the same hand it is very complex material too. Study of soil mechanics is complex thing too in itself. The high variability in characteristics and composition makes soil a complex material. The behaviour of soil varies from place to place and also with the change in the naturally occurring conditions changes the behaviour of the soil. The very first duty of geotechnical engineer is to check whether the engineering property of soil matches to the design requirements of an engineering structure or not. This is very common problem for a construction engineer that the soil available at a particular site is unsuitable for the construction work. Strength, durability, stability and permeability are the main engineering properties of soil with which the soil engineer is concerned.

LITERATURE REVIEW:

Santoni, et al., (2001) in this study investigation was done on non plastic cohesion less soil which was reinforced with monofilament fibre with dia. = 4, 15, 20 fibre length= 13 to 51mm and fibre content = 0 to 1%. UCS test was performed at 2.6% base moisture content and 14% saturation. From UCS the obtained results that 0.8% fibre is optimum. Whereas at fiber content less than 0.6% causes softening and more than 0.85% leads to cause hardening. Also compressive stress improves gets improved by increasing aspect ratio.

Chandra, et al., (2008) in this study effect of polypropylene fibre was observed. Three different types of soils; clay, slit and silty sand were reinforced with polypropylene fibre of 0.3mm dia. Fibre was in cut pieces of length 15, 25, 30 mm and aspect ratio of 50, 80 and 100 respectively. The amount of fibre was 0.75, 1.5, 2.25, and 3% by dry weight of soil. Static triaxial test of unreinforced and reinforced soil were conducted and the results showed

uniaxial compressive strength of 3.82, 4.83 and 9.73 Mpa respectively.

Viswanandhan, B. V. S., (2009) in this study the objective was to show the demonstrate the effect of randomly distributed fibres : (a) restraining cracking affinity of clay barrier subjected to differential settlement b) reducing swelling affinity of moist-compacted soil . here in this study polyester fibers were used named as recron 3s. it is concluded that using recron 3s is a very effective method . it helps to hold back cracking of clay barrier of differential settlements. It is here advised to use homogeneous mix of geofiber- reinforced soil (GRS) as substitute fill material where expansive soil deposits are at the construction sites. Separate fibres are normally added and mixed with soil like as cement, lime etc and compacted well.

Sharan Alok., (2011) in this study the focus is on geo-engineering properties of compacted with fibre recron 3s inclusions in the strength properties of pond ash through direct shear test. UCS and CBR test. In the mix proportions the fibre was varied as 0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1% of dry weight of pond ash. 6mm and 12mm fibres were used in this study. The undrained cohesion of reinforced specimens was increased with the fibre content. Also 12mm showed higher strength than of 6mm sized fibers.

Sharma R. K. (2012) in this study author stated that the expansive soil causes no. of civil engineering structural damages , especially to the low rise building. Laboratory work done here is on recron 3s of length 6mm and 12mm, fly ash and soil. Properties like grain size distribution, moisture- density relation and CBR are studied for soil mixed with fly ash in range of 20-80%. Ratio 70% soil and 30% fly ash was used further for addition of recron 3s fibre in range of 0.5-1.5%. From CBR test the best proportion was 70: 30: 0.5%.

Khunt Krishna (2013) in this study the stabilization black cotton soil used as sub grade material for road is done. As the bituminous roads are affected by temperature, traffic load, rainfall etc. these problems are solved here by using fly ash, lime and recron 3s. These materials were mixed in various proportions and were investigated by CBR test. 84% soil, 12% fly ash, 3% lime and 1% recron 3s by weight was the best proportion was achieved by CBR test. it was concluded that when the recron 3s was mixed with soil and fly ash the results were excellent as it may results in solving problems like cracking , potholes and failure of pavements.

Gary et al., (2004) Eggshell known as a smooth surface that is desirable compared rough eggshells fracture more easily. Most good quality eggshells from commercial layers contain approximately 2.2 grams of calcium in the form of calcium carbonate. About 95% of the dry eggshell is calcium carbonate weighing 5.5 grams. The average eggshell contains about 0.3% of magnesium, phosphorous, and traces of sodium, zinc,, potassium, iron, copper and manganese. There are many factor influences in quality of eggshell which is nutrient adequacy, flock health problem, environmental condition and breeding. Apart from that, the controlling rate of egg weight also contributes to a good quality of eggshell and it is not depends on the thick eggshell mean strong. Sometimes, thinner eggshell is stronger than thicker eggshell. This fact is due to shape and organization of organic and inorganic component of the shell.

J. Olarewaju et al., (2011) studied suitability of eggshell stabilized soil as subgrade material for road construction. Eggshell powder as a stabilizing material for improving soil properties. Eggshell waste generation in India, the United States and the United Kingdom is 190000, 150000 and 11000 tones per annum respectively. Eggshell waste can be used as fertilizer, animal feed ingredients and other such uses. However, majority of the eggshell waste is deposited as landfills. Eggshell waste in landfills attracts vermin due to attached membrane and causes problems associated with human health and environment. Few investigations were conducted to use eggshell waste in civil engineering applications.

Sharan Alok (2011) in this study the focus is on geo-engineering properties of compacted pond ash with fibre recron 3s inclusions in the strength properties of pond ash through direct shear test. UCS and CBR test. In the mix proportions the fibre was varied as 0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1% of dry weight of pond ash. 6mm and 12mm fibres were used in this study. The undrained cohesion of reinforced specimens was increased with the fibre content. Also 12mm showed higher strength than of 6mm sized fibers.

IMPROVEMENT

This is very common problem now days the engineering properties of soil do not come up to the design requirements of the standards. The further step taken must be made whether to;

i) Use the site material as it is present and makes changes in the design to meet the existing quality standards of the soil.

ii) Replacement of site material with some superior material.

iii) Modify the properties of the existing soil so as to create a new improved material meeting the requirement of the designed standards.

Now times, in this fast developing world it is quite impossible to impose restrictions on the design requirements. The purpose of the structure to be built on such soil is not served. Secondly it will be uneconomical to replace the soil when vast quantities are involved.

So the last left alternative of improving the engineering behavior of the available soil. This method of improving soil properties is known as stabilization of soil.

METHODS OF SOIL STABILIZATION

Soil improvement mainly comes under three types viz Elimination of undesirable materials, control of ground water, strengthening the geological materials and reclaimed materials. These methods are mainly focuses to change the un favourable conditions into those more suitable for the support of structures in shallow foundations or to reduce pavement thickness requirements etc.

The properties of soil may be improved by following ways, which are;

1 Cement stabilization
2 Lime stabilization
3 Chemical stabilization
4 Bituminous stabilization
5 Grouting concrete stabilization
6 Geotextile stabilization

RECORN 3S FIBRE

The basic mechanism of earth reinforcement is the generation of the frictional forces between the reinforcement and soil. Previous research has been done to find out the suitability of compacted fly ash in geotechnical construction like retaining walls, embankments etc. on the other hand these structures are needed to be protecting from getting wet in case to prevent the inherent strength of compacted pond ash, which is difficult to do in fields. Having this issue in mind fly ash soil has been modify the stress – strain behavior of destabilized material, reinforcement has been used in the form of recron 3s fiber. Effect of fiber reinforcement on the stress – strain behavior, strength parameters of the compacted mixes has been evaluated through a series of unconfined compressive stress tests, direct shear tests. From the results shown that the addition of fiber reinforcement is very proficient in increasing the failure load.

Fig. 1.1 Recorn 3s fibre

PRINCIPLES OF REINFORCED EARTH

Soil mass in general is a discrete system consisting of soil grains. And it is unable to withstand tensile stresses and this is particularly in the case of cohesion less soil like sand. Soil cannot stay stable on steep slopes, a relatively large strains will be caused when the external loads are imposed on them. Reinforced earth is a combined material, a combination of reinforcement and soil placed suitably to withstand the development of tensile stress. Presence of reinforcement `modifies the stress field giving a hold back mostly in the form of adhesion or friction so that minimum strains are induced and tension is avoided.

EGG SHEL

Eggshell is a unique, cost-effective, environment friendly technological breakthrough in soil stabilization, waste binding and pavement layer design for the road and highway building world. Eggshell powder is a unique and highly effective natural inorganic soil stabilizer for infrastructure development and repair. Meets the requirement for a well-proven, reliable and very cost-effective method by creating a strong and irreversible impermeable layer resistant to adverse climatic conditions, from very high temperatures to permafrost conditions, and accommodating all types of roads and load requirements. It is environment friendly and emphasizes the use of recycled material, recognizing the lack of readily available resources. It reduces the Carbon Footprint of any project by reducing transportation requirements and carbon emissions. This makes it eligible for Carbon Credits in the environment friendly sensitive global marketplace.

Fig. 1.2 Egg shell powder

OBJECTIVES:

The objectives of this study are;

- To study the effect of egg shell powder and recron 3s fibre on compaction characteristics of soil for different mix proportions (soil: egg shell: recron 3s).
- To study the effect of egg shell and recron 3s fibre on unconfined compressive strength of soil for different mix proportions (soil: fly ash: recron 3s).
- To determine the above properties of the soil admixed with Eggshell by varying proportions

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