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A SYNOPTIC REVIEW ON STABILIZATION OF EXPANSIVE SOIL USING DIFFERENT ADMIXTURES

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Abstract: Soil is play key role in construction industry as the structure are supported on soil. If the bearing capacity of the soil is not adequate then it may lead to fail of structure. Generally the failure is observed in expansive soil like black cotton soil which shows high swelling and shrinkage properties in contact with water. Mainly this property of swelling and shrinkage is due to presence of mineral known as Montmorillonite. In order to remove this defect, it is vital to improve the properties of soil using different additives. This method of bringing improvement in expansive soil is known as stabilization of soil. The main objective of stabilization is to improve bearings capacity of expansive soil. It is technique which improvises one or more soil indices by mechanical, cementing and chemical use. Many research has been conducted for stabilization of soil by using cementing, chemical materials. The study done by various researchers have -shown lime and fly ash as key ingredient for stabilization of soil. This materials easy accessible and eco-friendly in nature. This paper attempt to give a synoptic review on various researches made on stabilization of soil using lime and fly ash.

KEYWORDS: *Soil, Stabilization, lime, fly-ash, black cotton soil.*

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I INTRODUCTION

The foundation of a structure or pavement is an essential part that help in effective transmission of load to the subsoil present beneath it. If this sub soil, supporting the structure is of poor quality or structurally unstable, the it may lead failure of structure. The expansive soils are examples of weak soils, which if encountered under foundation engineering structures like highwayssubgrade, buildings founadtions, embankments etc may leads to huge disaster. Expansive soil undergoes volume changes when they come in contact with moisture. They show alternate swelling and shrinkage properties. It expands during rainy season and shrinks during summer season. This alternative swelling and shrinking property of expansive soil lead to rupture of structures resting on it. Therefore, it is necessary to mitigate the problems associated with expansive soil. . Black cotton soils are extensively distributed all over India, and is root cause for various structural damage. In India near two-sixth portion of land of country is covered with black cotton soil. Expansive soil covers nearly 38% of the land mass in Maharashtra.This soil is generally found in deccan traps. These soils possess weak properties due to presence of clay minerals known as „Montmorillonite". Typical behavior of soil results into failure of structure in form of settlements cracks etc. Therefore it is important to remove the existing weak soil and replaced it with a non-expansive soil or alter its properties by soil stabilization. Soil stabilization is a procedure in which existing parameters of soil are enhanced by means of addition of binding or cementing materials or chemicals. The main objective of stabilization is to enhance bearings capacity of expansive soil. It is a technique which enhancing one or more soil indices by mechanical, cementing and chemical use. Many research has been conducted for stabilization of soil by using cementing, chemical materials. One of the more common methods of stabilization includes the mixing of natural coarse grained soil and fine grained soil to obtain a mixture that develops

adequate internal friction and cohesion and thereby provides a material that is workable during placement.

II LITERATURE REVIEW:

2.1 Phanikumar et. al. critically analysed effect of fly ash on various engineering indices of expansive soil through an experimental analysis . The indices influencing Black cotton soil like free swell index (FSI), swell potential, swelling pressure, plasticity, compaction, strength and hydraulic conductivity were examined .The fly ash was blended with black cotton soil in various proportion of 0, 5, 10, 15 and 20% of bulk weight of black cotton soil and they implies that increase in fly ash content decrease in plasticity characteristics. The hydraulic conductivity of blended mixture of soil and fly ash reduces with increase in fly ash content, due to the increase in maximum dry unit weight with an increase in fly ash content. When the fly ash content increases

there is a decrease in the optimum moisture content and the maximum dry unit weight increases. The effect of fly ash increases compactive effort. Hence the expansive soil is rendered more stable. The undrained shear strength of the soil blended with ash show direct proportionality with increase in fly ash content.

2.2 Manoj Shukla et al. examined five different type of soil. The clay content in soil differs from low to high percentage. The recent study helped to determine behavior of soil under addition of different materials . Tests were conducted on soil samples with and without addition of lime to determine different engineering indices, like Atterbergs limit, CBR and UCS .The addition of different proportion have shown Little to high improvement in the physical indices of soil with lime.The improvement in soil is observed due to the chemical composition of soil which is less reactive with the lime. The results showed tremendous improvement in CBR and Sandy UCS of silty type soil. In places where the availability of granular material is less, lime used to treat soil can satisfactorily improve quality of soil was concluded in this study.

2.3 H.N. Ramesh et al examined the performance of coir ash on the compressive strength behaviour of expansive soil. Research work did comparison between coated coir with kerosene and burnt coir ash.The fibers were fully submerged before usef. Both coated and uncoated fibers were used to reinforce the black cotton soil. 0.5% of uncoated coir found optimum for compaction and compressive strength. Further addition of 0.5% of kerosene coated coir fiber increases ucs by 50% compared to uncoated to coir fiber in expansive soil. The results shown that fibers coated with bitumen can be better substitute for reducing water absorption of soil fibers.

2.4 Priyanka M Shaka et al invesigated behavior of Black cotton soils and Red soil stabilized using lime and fly ash. The most vital aspect in any project is its durability and economic criteria. Recently use of lime is adopted in many constructions works. The village of Bagalkot from karnataka is covered with Black cotton soil and few areas with Red soil which have low bearing capacity. The present paper describes a study carried out for improving of geotechnical properties of soils. The collected soil samples were treated with the commercially available lime and were cured for 7, 14 and 21days. The results of Consistency limits, Compaction test, Free swell index (FSI), Unconfined Compressive Strength (UCS and California Bearing Ratio (CBR) of untreated soil are presented in this paper. The engineering properties obtained for different mix proportions of soil and curing period were studied. The Free swell index (FSI) and the soaked CBR tests were conducted for the stabilized soil at different curing period.

2.5 Adil Ali et.al focuses on this research is on the improvement of engineering indices of three natural residual soils and mixed with different proportions of liquid chemical. The engineering indices like as unconfined compressive strength (UCS), consistency limits, optimum moisture content was taken to critically examine the performances of this chemical as soil stabilizing agent. The results show that addition of the liquid stabilizer can reduce plasticity and shrinkage by eliminating re-absorption of water molecules; It reduces optimum moisture content by ionizing and exchanging the water molecules on the surface of the clay platelets; It increases maximum dry density by neutralizing and orderly re arranging the clay platelets and increases the compressive strength by increasing the inter particles bonding.

III METHODOLOGY:

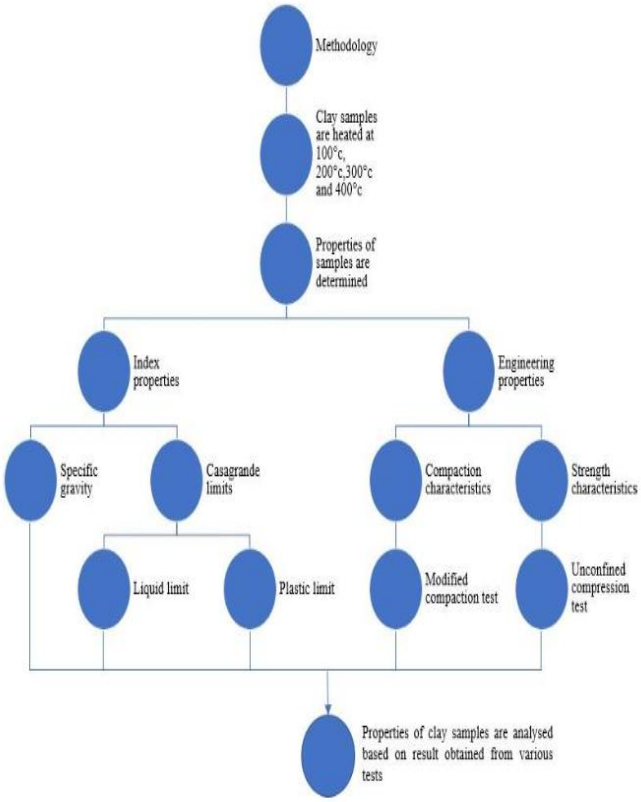

Figure 3.1: sequence of work

IV MATERIALS :

Black cotton soil:

Black cotton soils are extensively distributed all over India , and is root cause for various structural damage. In monsoon with contact of water this soil swell and in summer, they shrink on evaporation of water. Black cotton soils contain minerals like clays that are becomes dimensionally unstable after they absorb water and increase its volume. Mainly this property of swelling and shrinkage is due to presence of mineral known as Montmorillonite. The Black cotton soil becomes very hard when looses moisture content, but loses its strength completely when it is in wet condition. It is also noticed that on loosing of moisture content, the black cotton soil develops cracks of varying depth. Due to such peculiar characteristics, it is it is necessary to mitigate the problems associated with this soil by stabilizing it using different admixtures.

Figure 4.2 : Black cotton soil

Lime:-

Lime is widely used as modifier and binder in expansive soil in order to improve engineering and index properties of soil. Lime when in contact with soil, provides pozzolanic action, which helps in stabilization of soil. The addition of lime with soil helps to reduced plasticity index of highly plastic soils. The addition of lime leads to increase in strength and durability with rise in the optimum water content and a decrease in the maximum compacted density. Lime has been widely used either as a modifier for clayey soil or as a binder. The calcium hydroxide [Ca (oH)2] is major constituent of lime. Mainly hydrated lime is generally used for stabilization of soil.

Fly Ash:-

Fly ash is known as byproduct of coal power generation industry, exibits little cementitious properties comparedto lime and cement. Fly ashes are easily accessible , economical and ecofriendly solution . Usually it is categorized into two main classes i.e, class C and class F .Class C fly ashes are produced from flaming of sub bituminous coal. This kind of fly-ash have high percentage of CaO, which yield high cemetious properties . Class C from lignite has the highest CaO. Class F fly ashes are produced byburning anthracite and bituminous coal; it has low self-cementing properties due to limited amount of free CaO available for flocculation of clay minerals and thus require addition of activators such as lime or cement. The reductionof swell potential achieved in fly ashes treated soil relates to mechanical bonding rather than ionic exchange with clay minerals.

Figure 4.2 : lime

Figure 4.3 : fly-ash

V CONCLUSION:

By critical examination of research paper of various authors, the conclusions drawn-out are:

- The study reveals that lime and fly ash blended with soil improves shear and unconfined compressive capacity of clayey soil.
- It is found that replacement of soil with Fly ash is more effective than the lime.
- It is observed that strength of expansive soil can be signifficantly improved by addition of different additives.
- It can be concluded that the by the decrease in plasticity index and increase in dry density improves the bearing capacity of clayey soil.
- As the amount of lime and fly ash increase in , the value of plastic limits tends to increase.

REFERENCE:

- Baban ram and Sunil kumar chaudhary, " Cost effective and eco friendly construction of rural roads- need of hour", Indian highways, Nov 2010
- S. Bhuvaneshwari , S. G. Robinson , S. R. Gandhi . "Stabilization of expansive
- Soils using fly ash", fly ash utilization program, TIFAC, DST, new Delhi
- Erdal Cocka (2001) " Use of class c fly ashes for the stabilization of an expansive soil", Journal of geotechnical and geoenvironmental engineering, vol. 127, July,N pp. 568-573
- Pandian, n.s.,krishna, k.c. leelavathamma b., (2002), effect of fly ash on the cbr behavior of Soils , Indian geotechnical conference , Allahabad , vol.1,pp.183-186.

- Phanikumar b.r., & radhey s.sharma(2004) "effect of fly ash on engg properties of expansive Soil" journal of geotechnical and geoenvironmental engineering vol. 130, no 7,july, pp. 764-767.
- Niroj MIshra, Sudhira Rath, Siddharth Sankar biswat, Girija Sankar Pujhari," Use of fly ash and other stabilizing agents for construction of cost effective roads in sambhalpur district in Orissa, Indian Highways, July 2010.
- Shrirama rao and G. Shridevi , " Improving the performance of expansive soilsubgrades with lime – stabilized fly ash cushion, Indian highways , oct 2010
- Ramakrishna and A.V. Pradeepkumar, "Effect of moisture content on strength behavior of BC soil- Rice husk ash- lime mixes, Indian Highways, jan 2008.