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AN EXPERIMENT ON STABILIZATION OF SOIL BY USING WASTE PRODUCT LIKE FLYASH, GGBS AND CCR

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ABSTRACT: Utilization of industrial waste materials in the improvement of problematic soils is a cost efficient and environmental friendly method. It helps in reducing disposal problems caused by the various industrial wastes. However, it is essential to understand the performance of these waste products prior to use. The present paper evaluated the potential of granulated blast furnace slag (GGBS) with fly ash and (CCR) to stabilize a soft soil. Soft soil samples were collected from Rajouri Village, Dhonora. This soil was classified as per Indian Standard Classification system (ISCS). The performance of GGBS with fly ash and CCR modified soils was evaluated using California Bearing Ratio (CBR) test. Based on these performance tests, optimum amount of GGBS with fly ash and CCR was determined as 20% fly ash + 20% GGBS+ 9% CCR. Reasonable improvement has been observed for unsoaked CBR value of soils with this optimum amount. Soil Sample was prepared with 5% (GGBS), 5% (FLYASH) & 3% (CCR). Second Sample was prepared with 10% (GGBS),10% (FLYASH) & 5% (CCR). Third Sample was prepared with 15% (GGBS), 15% (FLYASH) & 7% (CCR). & finally Sample was prepared with 20% (GGBS), 20% (FIYASH) & 9% (CCR).

I. INTRODUCTION

There are various types of soils which show volume changes due to change in the moisture content. This causes major damage to property constructed on it. These soils contain minerals such as montmorillonite that are capable of absorbing water. When they absorb water their volume increases. One of the biggest necessities in the developing countries is to provide proper roadway network by conventional method. Hence it is necessary to go for suitable method of low cost road construction followed by a process of stage development of the roads, to meet the growing needs of road traffic. Good quality of subgrade soil is preferable for durable road but not always available for highway construction. The highway engineers designing a road pavement face weak or unsuitable subgrade. In this situation improvement in the properties of the existing soil by addition of some other materials can be adopted which is otherwise known as "soil stabilization".

Soil Stabilization: Soil stabilization means the improvement of the stability or bearing capacity of a poor soil by the use of compaction; proportioning and the addition of suitable stabilizers or admixtures. Soil stabilization includes chemical, mechanical, physio-chemical methods to make the soil stabilized. This process basically involve excavation of soil, this is an ideal technique for improving of soil in shallow depth, as in pavements. Stabilization method may be categorized as two main types: (a) improvement of soil properties of existing soil without using any type of admixture; and (b) improve the properties with the admixtures. The greatest challenge before the processing and manufacturing industries is the disposal of the harmful residual waste products. Waste products which are generally toxic, ignitable, corrosive or reactive pose serious health and environmental consequences. Thus disposal of industrial waste is a major issue of the present generation. This major issue requires an effective, economic and environment friendly method to combat the disposal of the residual industrial waste products. Hence it is a common and feasible way to utilize these wastes in construction of roads, highways and embankments, so that the pollution problems caused by the industrial wastes can be greatly reduced. Huge amount of soil is used in the construction of roads and highways but sufficient amount of soil of required quality is not available easily. These industrial wastes which are used with natural soil in the construction not only solve the problems of disposal and environmental pollution but also help to preserve the natural soil.

II. LECTURE REVIEW

BinodSinghi, Aminul Islam Laskar, M. Ali Ahmed(2015): An experimental investigation on soil geopolymer incorporating fly ash, GGBS and their mixture as source materials was carried out. Below mentioned observations derived in this study.

Unconfined compressive strength of modified soil increases in slag content (more than 8%).

UCS strength of modified soil observed very less in fly ash as compare to slag.

Optimum value in flexion strength were observed in 25% koaline clay content for 200 kg cement dosage.

Sara Rios, Antonio Viana Fonseca, Srikanth SagarBangaru (2016): In this experimental study, results of UCS, seismic wave measurements obtained and compared. Silty sand stabilized with different materials such as geo polymer, lime, lime-fly ash, in various proportions. Effect of curing was also observed. Key observations are mentioned below.

It was observed that geo polymer gave higher strength and stiffness as compare to other materials.

It was also observed that strength of modified soil with geo polymer increased with time.

Murat Aziz Ozdemir (2016): Soft soil's bearing capacity was improved by adding fly ash. Proctor compaction test, unconfined compressive strength test, and

Soaked California bearing ratio tests were conducted after performing tests of index properties. Flyashcontent of 0%, 3%,5%, 7% and 10% were used. Effect of curing also observed for CBR and UCS after 0, and 28 days. Electron Microscope-Energy Dispersive X-ray analysis also performed to observe microstructures of sample.

Elastic modulus value for combined treatment enhanced from 7.92 MPa to 9.66

Mpa. Siavash Mahvash, Susana Lopez-Querol, Ali BahaduriJahromi(2014):

To observe the effect of fly ash on fine sand three proportions of FA (5%,10% and 15%) and constant cementcontentof3%wasusedinthisstudy.Forcomparisons, behavior of virgin soil and soil- cement (3%) also observed. Main observations of the study are as follows. Fine fly ash gave better strength results as compare to coarse fly ash. Strength increased with curing time.

Mechanical strength obtained by cement-based binders was more and have better consistency.

Laxmikant (2013): This study has been conducted to assess effects of GBS to stabilization of soft soil. 3,6,9 and 12 percent of GBS added to soil in experimental study.

It had found that GBS increased maximum dry density and strength properties of soil. Optimum moisture content of soil decreased. It also reduced free swelling index and swelling pressure. On the other hand value of soaked California bearing ratio (CBR) also improved.

Hossain, L. Mol (2011): To observe mechanical properties of clayey soil by incorporating cement kiln dust and volcanic ash Standard proctor test, California bearing ratio test, Modulus of elasticity, Un confined compressive strength, splitting tensile strength were carried out. Dosage of volcanic ash and cement kiln dust varying from 0% to20%. Following are key observations.

All modified soil mixes produced very high CBR value. Stabilized soil exhibit increments in compressive and tensile strength, modulus of elasticity. It shows more durability in terms of water resistance and shrinkage.

III. PREPARATION OF TEST SAMPLE

For experimental study different nomenclatures have been prepared with different proportions of ingredients, which have been shown below

SL NO	NOMENCLATURE	SOIL (%)	GGBS (%)	FLY ASH(%)	CCR (%)
1	S	100	0	0	0
2	S1	87	5	5	3
3	S2	75	10	10	5
4	S3	63	15	15	7
5	S4	51	20	20	9

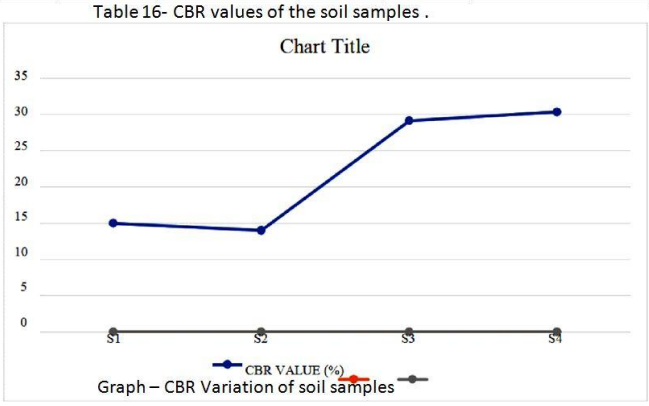
Table– Nomenclature of sample .

CBR TEST OF SOIL SAMPLES

2.5 MM Penetration value is taken

SL NO.	SAMPLE	LOAD MEASURING DEVICE READING	LOAD IN KG	CBR VALUE (%)	VARIATION OF CBR W.R.T NATURAL SOIL
1	S1	38	213.75	15	96.54%(Increase)
2	S2	35	196.875	14	83.48%(Increase)
3	S3	71	399.375	29.15	282.044%(Increase)
4	S4	74	416.25	30.38	298.165%(Increase)

Table 16- CBR values of the soil samples .



Graph – CBR Variation of soil samples

IV. CONCLUSION

20% fly ash, 20% GGBS, 9% CCR mixture is determined as optimum percentage as an additive for the soft soil.

Based on the results of this research, it appears that soft soil can be effectively stabilized with the addition of fly ash-GGBS-CCR mixtures . Fly ash-GGBS-CCR mixtures are suitable for use in rural roads, embankments and it be used as provide fill materials of comparable strength.

REFERENCES

[1] Kumrawat Neeraj, Ahirwar. S.K.,(2014), "Performance Analysis of Black Cotton Soil Treated with Calcium Carbide Residue and Stone Dust", International Journal of Engineering and Science & Technology, ISSN 2319-5991. Vol. 3, No. 4 Nov 2014

[2] Pathak, A.K. 2014, "Soil Stabilization using Ground Granulated Blast Furnace Slag". IJERA ISSN:2248-9622,Vol.4, Issue 5 2014,pp.164-171

[3] Laxmikant Yadu, Tripathi, R.K, (2013), "Stabilization of soft soil with granulated blast furnace slag and flyash", International Journal of Research in Engineering and Technology, vol.2, Issue 2, pp115-119.

[4] Horpibulsuk. S., Phetchuay, C., and Chinkulkijniwat,.A. (2013) "Strength development in silty clay stabilized with calcium carbide residue and flyash", Soils and Foundation, 53, issue4, pp477-486.

[5] Gyanen. Takhelmayum, Savitha. A.L, Krishna Gudi (2013), "Laboratory Study on Soil Using Flyash Mixture", International Journal of Engineering Science and Innovative Technology (IJESIT), ISSN:2319-5967.

[6] Dr. D. Koteswara Rao. And G.V.V. Rameswara Rao, P.R.T. Pranav, (2012), "A Laboratory Study on the affect of Rice Husk Ash & Lime on the Properties of Marine Clay" International Journal of Engineering and Innovative Technology (IJEIT) vol 2, ISSN:2277-3754.

[7] Horpibulsuk. S., Phetchuay, C., and Chinkulkijniwat,.A. (2012). "Soil stabilization by calcium carbide residue and flyash", Journal of Materials in Civil Engineering, ASCE, 24, Issue 2, pp184-193.

[8] Anil Kumar Sharma, Sivapullaiah, P.V., (2011) "Soil stabilization with waste materials based binder." Proceedings of Indian Geotechnical Conference.

[9] Erdal cokca,(2009). "Stabilization of Expansive clays using Granulated Blast Furnace Slag and GBFS cement", Geotech Geol Eng 27:489-499.

[10] Andres M. Arvelo Guerrero. (2004), "Effects of the soil properties on the Maximum Dry Density Obtained from the Standard Proctor Test" 2004 Andres Arvelo.

