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SOIL STABILIZATION USING FLYASH

Mr. Ankush Chaudhary[*1], Mr. Ayush Yadav[*2], Harshit Verma[*3], Ashish Gupta[*4], Jigyasa[*5]

[*1]Assistant Professor, Dept. Of Civil Engineering, KIET Group Of Institutions, Gzb.

[*2,3,4,5]Research Students, Dept. Of Civil Engineering, KIET Group Of Institutions, Gzb.

ABSTRACT

The purpose of paper is to know about the compactness, consistency, acidic properties, shearing and bearing strength of a soil due to the additive substance called flyash. The physical characteristic and strength characteristic of a soil is also being subjected by the organic content present in the soil. To identify the effect of FLYASH on a soil, we used two types of soil having different compositions. The liquid limit and plasticity of a soil decreases and plastic limit increase when we used FLYASH. Also, the dry density increases with increasing FLYASH whereas Optimum moisture content decreases. Where as the increasing in dry density signifies the higher strength. Due to the puzzolonic action of a flyash, it also increases qu value with increase in flyash. But their is the reduction in water content due to additive called flyash. Generally, class C 1 FLYASH gives higher value of qu in comparison to Class Type 2. These characteristics are attributing the property of flyash including CaO and CaO/SiO2.

Keywords: Stabilization, Type C Flyash, Maximum Dry Density.

I. INTRODUCTION

Soil is the most crucial and primary material used for the construction work. Moreover, the engineering properties of the soil directly governs the strength and durability of any structure. Also it has been found by our researchers from investigations that due to undesirable engineering properties , the shearing and bearing strength of the soil is found to be very low whereas it's soundness , ie volume change in compression and expansion is very high. In recent years, soil subgrades in the construction of pavement are generally constructed by replacement of soil having organic content to granular soil to improve the engineering properties of the soil Which requires the huge Investment in this field. Moreover, we also able to reduce the cost of this granular soil by adding the additives known as chemical Stabilizers, and the mixing of this chemical Stabilizers to improve the engineering properties of the soil is known as chemical Stabilization. This process mainly includes the mixing and blending of the soil to improve its gradation and engineering properties. This chemical Stabilizers includes Flyash, Lime, Cement, rice husk ash, etc. This Stabilizers are pozzolonic material which have high efficiency and low cost.

Benefits of soil stabilization

- Stabilization of soil improves strength of soil.
- Stabilization Helps inn reducing volume changes due to temperature and moisture variation.
- Stabilization of soil improves the workability .
- It reduces risk of swelling and shrinkage
- Soil stabilization also increases durability of soil

Methods of Doing Soil Stabilization

1.Mechanical methods

(Compaction, Soil reinforcement, Addition of graded aggregates, Mechanical remediation).

2.Chemical methods

(Fly ash, quicklime, Portland cement, bitumen etc.)

Material:

Soil: The soil samples from different places of Baghpat get collected. soil samples get collected from a depth of approx. 1.5 m from natural ground surface. collected sample of soil was stored in a large plastic bag and left to dry for 7 days' so that soil sample dried properly. Soil sample get finely divided and sieved Through sieving arrangement.

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Fly ash: Fly ash is a substance in the form of finely divided powder. Produced from coke combustion, fly ash large amount of of silica. Fly ash mainly available in two types Type 1 and Type 2. Mainly fly ash is classified as Class (C) and second type is classified as Class (F) flyash. Type C fly ash is finer as compared to Type F fly ash as well as Si02/Ca0 content in class Type C fly ash is more as in comparison of class (F) Fly ash.

Table 1: Properties of flyash

Properties	Type1 (C)	Type2 (F)
Silica	50.2	65.6
Alumina	22.5	25
Magnesia	0.51	0.7
Lime		
Sieving by .45 mm residue %	16.89	7.04
Moisture%	0.18	2

Experimental works:

Following lab experiments to be performed by taking reference of IS Code 2720.lab test are going to be performed on both soil firstly on natural soil then on soil with fly ash mixture

- Atterbergs limits.
- Liquid Limit
- Plastic Limit
- Proctor Test (MDD,OMC)
- Core cutter test

Table 2: Details of laboratory test

Test no.	**Experiments(lab TesT)**	**Amount of flyash**
A-C	(Liquid) limit	10%,15%,20%
D-F	(Plastic) limit	10%,15%,30%
G-J	Proctor test	10%,15%,30

The properly dried finely divided soil was properly added with fly ash with different proportions of volume. The mixture gets correctly and properly mixed after that test gets performed properly by following the IS code 2720.Proctior compaction test was performed to determine the value of Optimum moisture content also determination of of maximum dry density. Initially experiment is performed on natural soil after that Test were carried out on soil fly ash mixture with varying proportions.

Atterbergs limits i.e., liquid limit and plastic limit are going to be the important values for determining the character soil within a wide range. Variation in Atterbergs limits on soil as well as soil fly ash mixture were observed on changing fly ash content. similarily variation of maximum dry density as well as moisture content was observed in proctor compaction test on varying the fly ash composition .

Table 3: Test result on natural soil

TEST (CORE CUTTER)	**DENSITY (BULK)**	**DENSITY(DRY)**	
	1.916 gm/cc	1.64	
Atterbergs limit	**Liquid limit**	**Plastic limit**	**Plasticity index**
	41.71	29.9	11.81
Proctor compaction test	**OMC**	**MDD**	
	11.7	1.89gm/cc	

these above test values are for natural soil collected there is no addition of fly ash or any impurity Now test result are going to carried out with fly ash mixture

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Table 4: Test results of soil flyash mixtures

Experiments	10%(flyash)	15%(flyash)	20%(flyash)
Liquid limit	40.1	39.08	38.1
Plastic limit	27.81	26.87	27.24
Plasticity index	13.09	12.93	11.66
Maximum dry density	1.94	1.954	1.978
Optimum moisture Content	11.56	12.31	8.31

II. RESULT AND DISCUSSION

Atterbergs limit for normal soil was found i.e., liquid limit 41.71% and plastic limit 29.9 percent but on soil fly ash mixture this value alters on changing the fly ash content the value of, plastic and , liquid limit and , plasticity index changed differently. By adding 10 % Fly ash there was slight reduction in value of (liquid limit) as well as in plastic limit, plasticity index also gets reduced on further increasing the flash content 15% the value of Atterbergs limit again reduced but in adding 20% fly ash the value of liquid limit get reduced but the the value of plastic limit gets increased.

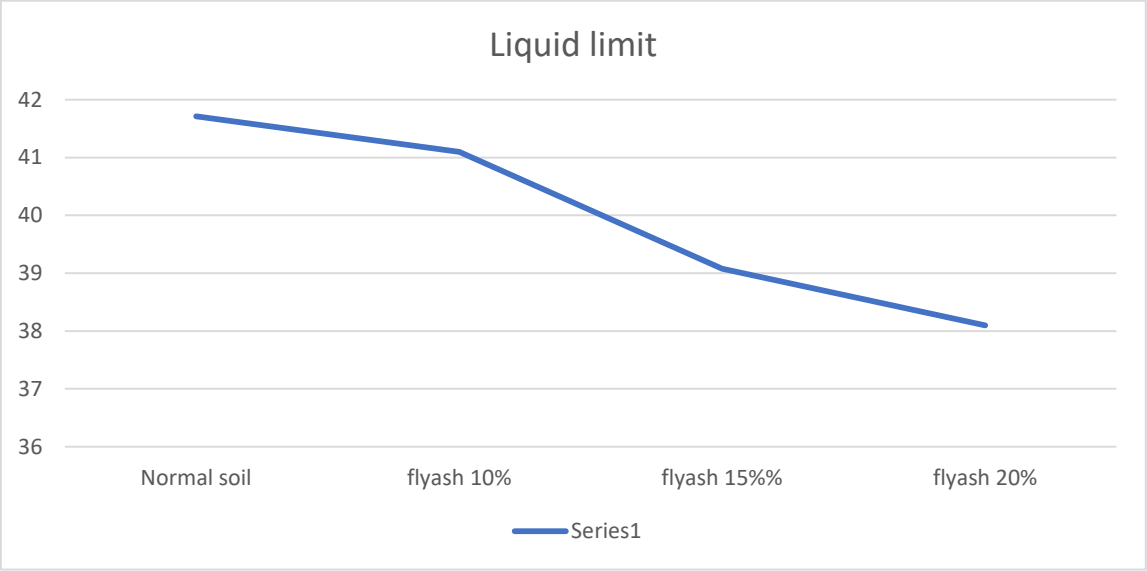

Fig 1: Comparison of Liquid limit with different compositions.

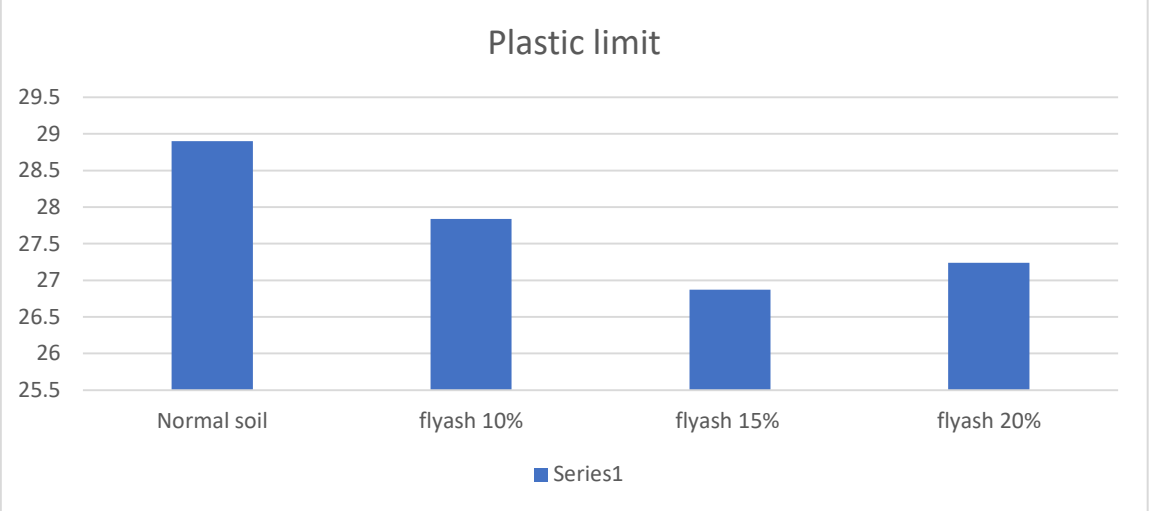

Fig 2: Comparison of Plastic limit with different compositions

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After analyzing the Atterbergs limits now proctor compaction test get performed and dry density different values observed and different value of optimum moisture content were obtained. initially compaction test get performed on natural soil after that test was performed on soil flyash mixture .

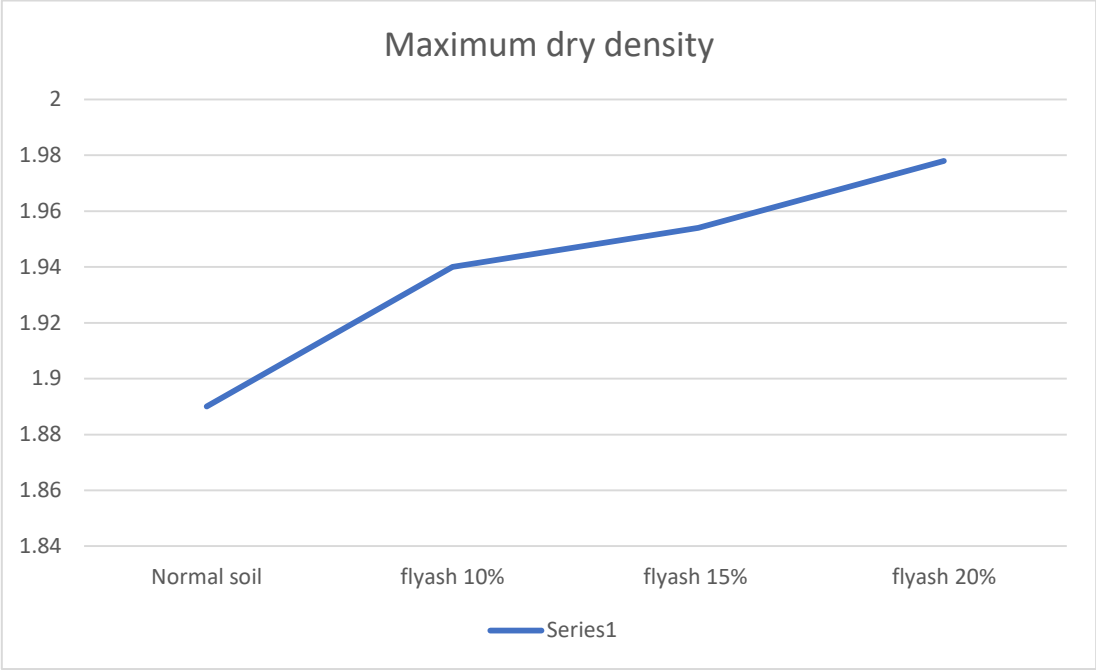

Fig 3: Comparison of maximum dry density

Dry density gets increased on increasing the amount of fly ash in soil mixture but the values of optimum moisture get altered dramatically firstly increased then decreased.

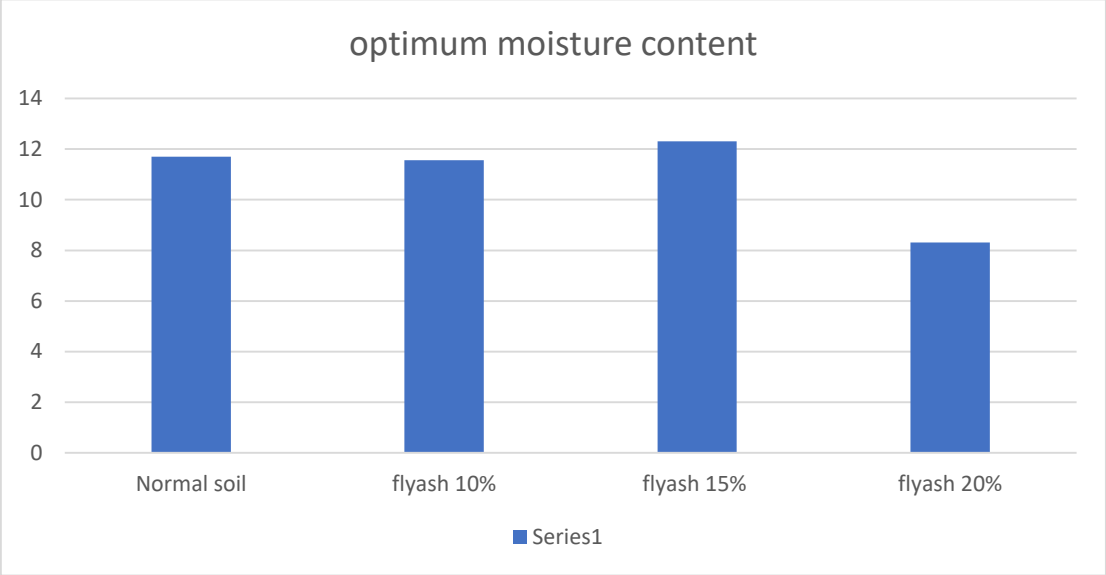

Fig 4: Comparision of optimum moisture content with different compositions

III. CONCLUSION

Based on above test performed these inferences are obtained.

A. The naturally available normal sample of soil have more value of index of plasticity as well as the value of Atterbergs limits like liquid and plastic limit was also more.

B. On adding amount of some ash the value of liquidlimit gets decreased. On adding 20% of impurity(flyash) value gets decreased of liquid limit from 40.1% to 38.01

C. Similarly on adding 20% of fly ash the value of plastic limit decreased from 27.81 to 27.24.

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D.In proctor test the value of maximum dry gets increased on increasing the amount of fly ash the maximum dry density gets increased from 1.94 to 1.978 on adding 20% of fly ash

E. inclusion of addition having varying percentages of flyash added to natural soil improved the value of compressive strength of naturally available soil.

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