Soil Stabilization of Black Cotton Soil by UsingGranite Powder

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Abstract—The Black Cotton soil is known as extensive soil due to its property of swelling and expansiveness with influence of friction humidity in soil. It also shows loss geste when dried. Due to these parcels the strength characteristics are also affected negatively. The black cotton soil is also extensively available in all around the world which leads us to wastage of land for construction uses to resolve this problem we can replace the extensive soil bynon-expansive soil which is also a expensive option so in this present paper we've stabilize a soil using waste material named marble greasepaint which is a derivate of marble diligence. For the determination of parcels, we've performed atterberg's limit test, flyspeck size distribution by wet sieve analysis, water content test, specific graveness test, OMC and MDD test on the sample of determinedness greasepaint. We've marked a great enhancement in engineering parcels of black cotton soil by stabilizing it with 5, 10 and 15, of relief by determinedness greasepaint. It also gives large diminishment in swelling and loss geste of soil.

Keywords: Soil Stabilization, Granite powder , Ground improvement technique, Marble dust, Cost effective, Black Cotton Soil.

I. INTRODUCTION

SOIL STABILIZATION:

A. WHAT IS SOIL STABILIZATION?

Soil Stabilization is the natural, chemical or mechanical revision of soil engineering parcels. In civil engineering, soil stabilization is a fashion to upgrade and ameliorate the engineering parcels of soils. These parcels include mechanical strength, permeability, compressibility, continuity and malleability. Physical or mechanical enhancement is common but some seminaries of study prefer to use the term ' stabilization ' in reference to chemical advancements in the soil parcels by adding chemical cocktails.

For any construction design, whether it's a structure, a road or an airport, the base soil acts as the foundation. also, soil is one of the pivotal construction raw accoutrements . As similar, the soil should retain parcels that produce a strong foundation.

The practice of stabilizing or modifying soils dates back to the age of the Romans. Other nations similar as the United States and China among numerous others espoused it in the ultimate half of the 20thcentury.

What are the soil stabilization methods?

Mechanical stabilization – its ideal is to achieve thick, well canted material by mixing and compacting two or further soils and/ or summations.

Chemical stabilization – refers to the revision of soil parcels by changing its chemical make- up with different complements like lime, cement, fly ash or by the addition of chemicals similar as polymers, resins and enzymes.

Biological stabilization – refers to the planting of vegetative cover to help wind, water and soil corrosion. The roots hold and aggregate soil patches together although in the morning, other styles of stabilization should be used to support the growth of seeds and seedlings.

• What is the purpose of soil stabilization?

Substituting poor grade soils with summations enjoying more favorable engineering parcels.

improvement of the strength and thus bearing capacity of the soil.

Dust control for a good working terrain.

Waterproofing for conservation of natural or manmade structures.

To promote the use of waste geomaterials in constructions.

Eventually, enhancing the parcels of soil on point.

B. BLACK COTTON SOIL

• extensive soils, popularly known as black cotton soils in India are, amongst the most problematic soils from Civil Engineering construction point of view. Of the colorful factors that affect the swelling geste of these soils, the introductory mineralogical composition is veritably important. utmost extensive soils are rich in mineral montmorillonite and a many in nobility.

• The degree of expansion being more in the case of the former. Soil suction is another quality that can be used to characterize a soil's affinity for water on its volume change geste .

• Black cotton soil is heavy complexion soil, varying from complexion to gault ; it's generally light to dark slate in color. Cotton grows in this kind of soil. The soil prevails generally in central and southern corridor of India.

• The most important specific of the soil is, when dry, it shrinks and is hard like gravestone and has veritably high bearing capacity. Large cracks are formed in the bulk of the soil. The whole area splits up and cracks up to 150 mm wide are formed up to a depth of3.0 to3.5 cadence. But when the soil is wettish it expands, becomes veritably soft and loses bearing capacity.

• Due to its extensive character, it increases in volume to the extent of 20 to 30 of original volume and exerts pressure. The upward pressure wielded becomes so high that it tends to lift the foundation overhead. This rear pressure in the foundation causes cracks in the wall over. The cracks are narrow at the bottom and are wider as they go up.

• The unusual characteristics of the soil make it delicate to construct foundation in similar soil. Special system of construction of foundation is demanded in similar soil.

C. GRANITE POWDER

• Determinedness greasepaint waste is a waste material that results from the processing of determinedness jewels. There are two main types of determinedness waste crushing determinedness jewels and cutting determinedness jewels. The significantly developed gravestone assiduity leads to the product of huge quantities of this waste, which isn't presently of significant use and is stored in stacks. This fact leads to the declination of the natural terrain, which can be observed in water pollution, changes in soil pH, lung cancer, and pneumoconiosis in humans. As a result, scientists from each over the world are now looking for styles to use this waste. One of them is the application of determinedness greasepaint in cementations mixes. The entire process related to the mining, processing of determinedness jewels and the product of determinedness greasepaint waste.

• The determinedness waste is a by- product produced in determinedness manufactories while cutting huge determinedness jewels to the asked shapes. About 3000 metric ton of determinedness waste is produced per day as a by- product during manufacturing of determinedness penstocks and crossbeams from the raw blocks. profitable way of stabilization because determinedness which is available in huge volume from determinednessindustries.The parcels of waste depend upon the determinedness from which it's taken.

II. OBJECTIVES

• To estimate effectiveness of determinedness greasepaint in enhance the soil parcels.

• To identify the optimum mixing rates and ways for illuminative this waste material in to the soil.

• To pierce mechanical and engineering property of stabilized soil.

• To give recommendations for practical operation of determinedness greasepaint in soil stabilization for construction and civil engineering systems.

III. LITERATURE REVIEW

Nadgouda and Hegde (2010) delved the Effect of Lime Stabilization on parcels of Black Cotton Soil. The results of their work indicated that liquid limit of soil dropped from59.8 to53.2 with increase in lime content up to4.5 after that it goes on adding with increase in lime content. Malleability indicator of soil dropped from25.9 to15.1. DFS decreases gradationally with increase in lime content. MDD remains constant with variation in lime content whereas the OMC decreases with adding chance of lime.

Singh and Vasikar (2013) delved stabilization of Black cotton soil using lime. They concluded that an addition of 4 lime decreases the liquid limit by12.1, while addition of 6 lime shows a drop of only17.1. It's observed that swelling pressure of Black cotton soil mixed with 4 and 6 lime dropped by 40 and 80 independently. MDD is set up to drop by2.4 and5.6 at 4 and 6 lime content independently.

Singh and Pani (2014) studied evaluation of lime stabilized cover ash as a trace material. They concluded that dry unit weight of compacted instance dropped from1.142 to1.255 kJ/ m3 with change in contraction energy from118.6 kJ/ m3 to 2483 kJ/ m3, whereas the OMC is set up to drop from30.2 to24.2. The loftiest unsoaked and soaked CBR values were set up to be25.39 and1.546 at contraction energy of 2483 kJ.

Kumari Pratima et al. (2015) delved swelling geste of extensive soil mixed with lime and fly ash as amalgamation. They set up that liquid limit of stabilize samples originally drop with the addition of lime up to 6 and also increases. Free swell indicator of samples decreases with adding lime content and the value of Free swell indicator becomes 0 at 8 of lime addition. The OMC of BC soil increases with adding chance of cover ash, still it decreases at 35 of cover ash and again increases at 40 cover ash. MDD decreases with adding chance of cover ash, still it decreases at 35 of cover ash. OMC of BC soil increases with adding chance of lime and MDD decreases with adding chance of lime.

Choudhary etal. (2015) studied the effect of lime on contraction characteristics of soil- cover ash fusions. The results of their work indicated that OMC of the soil fly ash lime blend increases with increases with increase in chance of lime and 20 cover ash and the MDD of the soil fly ash lime blend decreases with increase in chance of lime.

IV. METHODOLOGY

The soil sample used for this study was collected by system of perturbed slice at average depths of1.0. The primary tests for identification of the natural soil and the geotechnical parcels of the soil treated with chase dust. Black cotton soil is mixed with determinedness and chase dust greasepaint in different proportions. For the present study, the colorful tests are performed along with a brief description of the procedure have been included. The tests include the indicator test for Soil, determinedness waste & Chase dust, the engineering tests to understand the geste of the soil. These tests were performed on locally available Black cotton soil.

All tests performed on soil sample are as per IS codes listedbelow.

IS codes for test procedures

Water content	IS 2720 part 2
Specific gravity	IS-2720-PART-3-1980
Grain size distribution by sieveanalysis	IS 2720 (part IV) 1985
Atterberg's limits: A. Liquid limit	IS 2720 (Part V) 1985

B. Plastic limit	
Proctor compaction test: A. OMC B. MDD	IS: 2720 Part VII – 1974

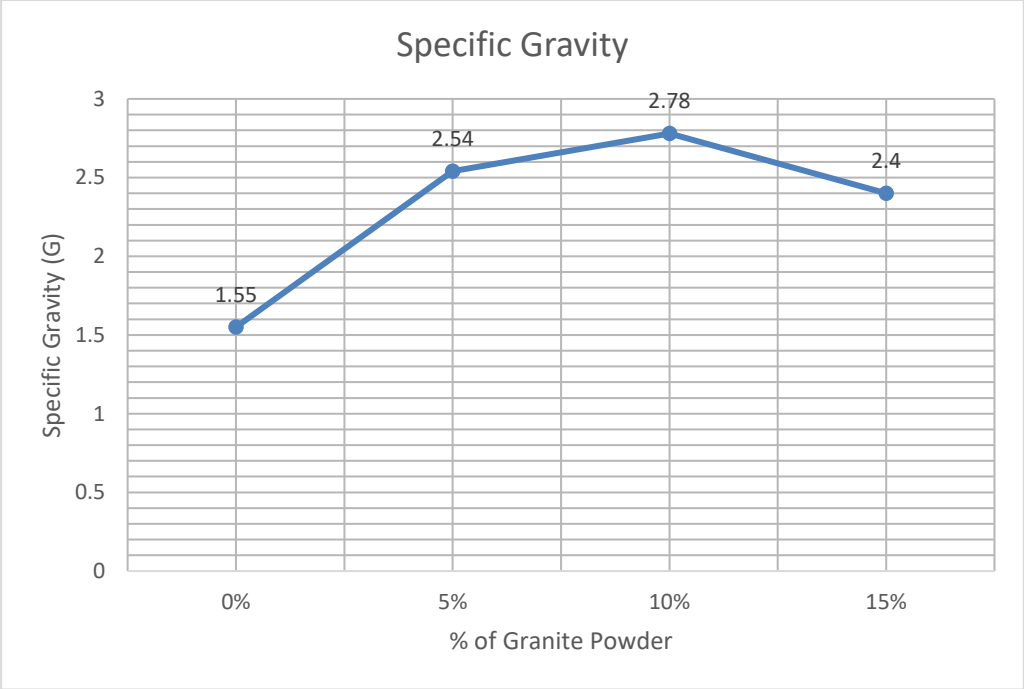
Table no. 1: Comparative analysis

V. RESULTS AND DISCUSSIONS

• Following table shows overall result of specific gravity, liquid limit, plastic limit, optimum moisture content, maximum dry density.

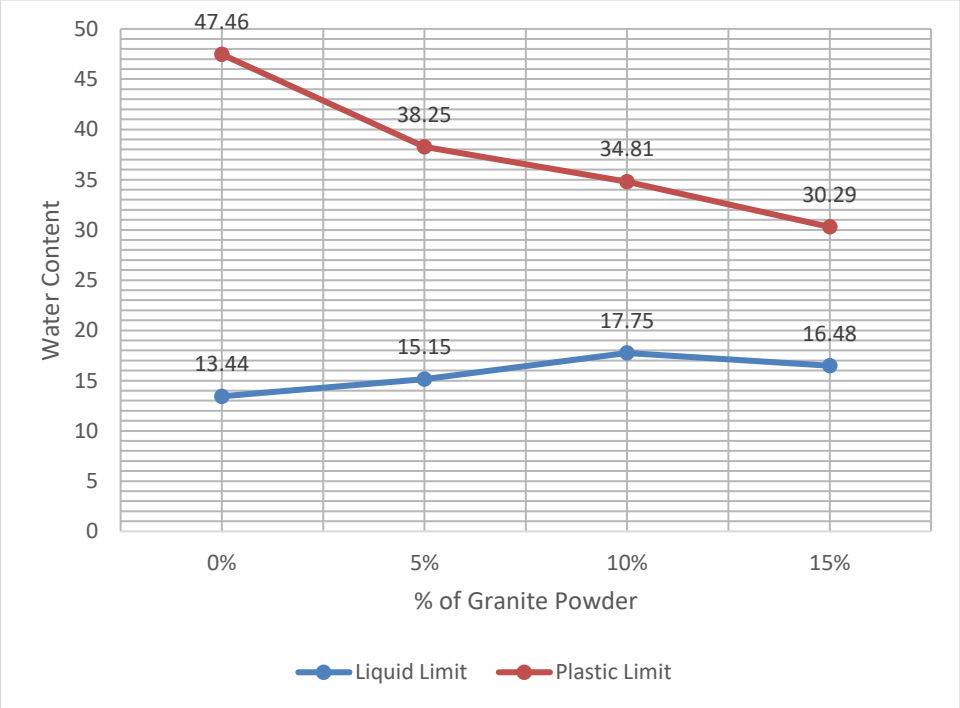
Sr. No.	Description	NaturalSoil (NS)	Soil+5% GP (S1)	Soil+10%GP (S2)	Soil+15% GP (S3)
1.	Specific Gravity	1.55	2.54	2.78	2.40
2.	Liquid Limit	13.44	15.15	17.75	16.48
3.	Plastic Limit	47.46	38.25	34.81	30.29
4.	Optimum Moisture Content (OMC)	19.35	20.99	20.75	17.17
5.	Maximum Dry Density (MDD)	1.59	1.73	1.81	1.96

GRAPH 1. Specific gravity for soil goes on increasing with addition of granite powder.



Conclusion: Optimum mixing ratio for improving Specific Gravity is 10%

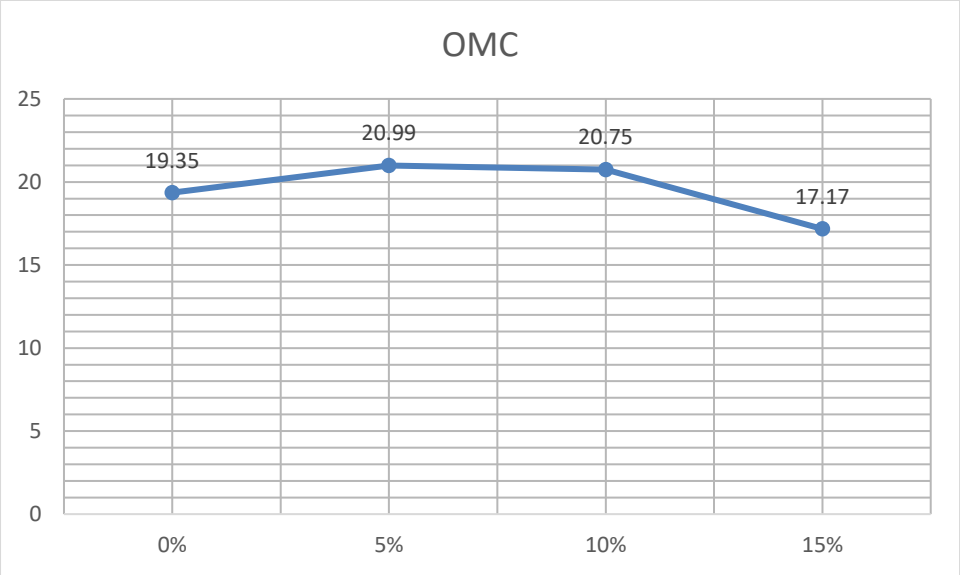
GRAPH 2. Variation in Liquid Limit and Plastic Limit for varying percentage of granite powder.



Conclusion: 1) Optimum mixing ratio for improving Liquid limit of soil is 10%.

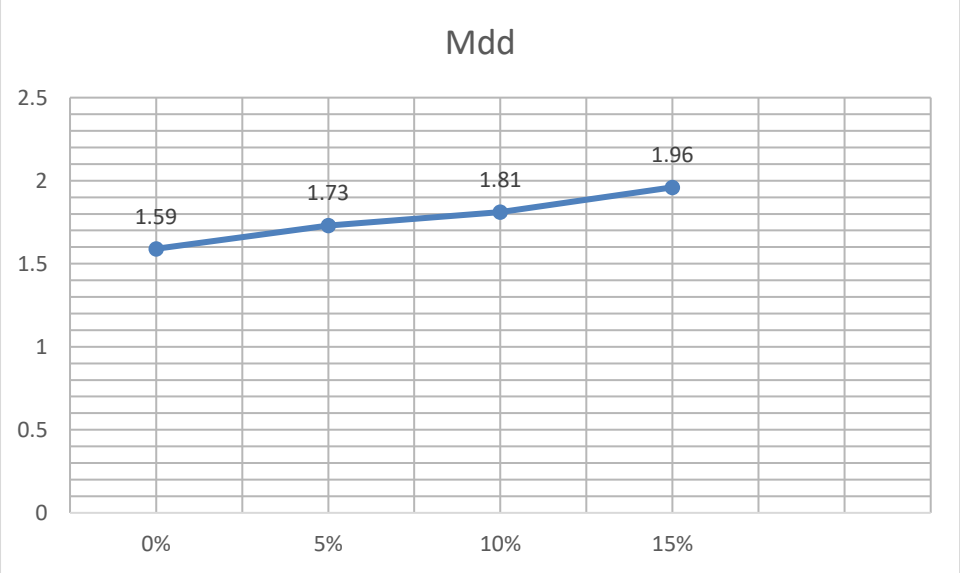
2) Optimum mixing ratio for improving is Plastic Limit 10%.

GRAPH 4. Variation in optimum moisture content (OMC) for varying percentage of granite powder.



Conclusion: Optimum mixing ratio for improving OMC of soil is 5%.

GRAPH 5. Variation in maximum dry density (MDD) for varying percentage of granite powder



Conclusion: Optimum mixing ratio for improving MDD of soil is 10%.

VI. CONCLUSION

The addition of the determinedness greasepaint to the soil reduces the complexion contents and therefore increases in the chance of coarser patches. Overall it can be concluded that soil stabilized with can be considered to be good ground enhancement fashion, especially in engineering systems on weak soils where it can act as a cover to deep/ raft foundations, reducing the cost as well as energy.

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