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REVIEW ON EFFECT OF MARBLE DUST ON GEOTECHNICAL PROPERTIES OF EXPANSIVE SOIL

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ABSTRACT

The black cotton soil is expansive type of soil which expand and start swelling when it comes in contact with moisture. Due to this property the strength and other properties of soil are very poor. Expansive type of soil shows unpredictable behavior with different kind of stabilizers. Soil stabilization is a process to treat a soil to maintain, alter or improve the performance of soil.The marble is a most prefer stone of India and available mostly in Rajasthan and MadhyaPradesh. The Rapid growth of industries of marble produces hazardous waste materials at a large extent which creates a big problem to the humans surrounding them as well as acts as a pollutant so affect the ecological system of the environment. It shows that there is urgent need for exploring the alternative of disposal of these materials. The black cotton soil having lack of construction problem due to insufficient stability naturally. In this present paper different research work's result is been reviewed to analyze the effects of marble dust stabilizers on soil's engineering property.

***Keywords*: Bearing capacity, Density,Hazardous, Marble dust, Stabilization, Swelling, Shrinkage**

I. INTRODUCTION

"Expansive soil is commonly known as black cotton soil because of their color and their suitability for growing cotton." It starts swell and shrink excessively due to change in moisture content. When an engineering structure is associated with black cotton soil, it experiences either settlement or heave depending on the stress level and the soil swelling pressure. Design and construction of civil engineering structures on and with expansive soils is a challenging task for geotechnical engineers. The marble dust is generated from cutting and polishing of marble stone. The amount of marble slurry generated is very substantial, being in the range of 5-6 million tons per annum.

The purpose of present study is to see the effect of industrial wastes (marble dust), in improving the UC strength of silt soil. A better understanding of these characteristics will enhance the usage of these materials in geotechnical engineering works in places where they are abundant and thereby making clays suitable for foundation purpose. The

study also focuses at reduction of huge stockpile of the various industrial wastes and their potential impact on the environment.

II. STABILIZATION

"Soil stabilization is a technique aimed at increasing or maintaining the stability of soil mass and chemical alteration of soil to enhance their engineering properties."

Stabilization allows for the establishment of design criteria as well as the determination of the proper chemical additive and admixture rate to be used in order to achieve the desired engineering properties. Benefits of the stabilization process can include higher resistance values, reduction in plasticity, lower permeability, reduction of pavement thickness, elimination of excavation material hauling or handling.

Soil stabilization is done by various methods by adding marble dust, fly ash, rise husk ash, polymers, brick dust, sugarcane ash, fibers, adding lime, by different geo materials like geo synthetic, geo grid and geo form.

With the help off stabilization, waterproofs the soil, improves soil strength, reduce soil volume change due to temperature or moisture, improves soil workability, reduces dust in work environment, upgrades marginal materials, improves durability, dries wet soils, conserves aggregate materials and reduces cost.

III.REVIEW

3.1 EFFECT OF MARBLE DUST ON GEOTECHNICAL PROPERTIES OF BLACK COTTON SOIL:

Parte Shyam Singh & Yadav R K from Civil Engineering Department, JEC Jabalpur carried out stabilization on black cotton soil using marble dust as a stabilizing agent. In this studythe following conclusions can be drawn:

The liquid limit values of the samples are decreasing with the inclusion of marble dust into the BC soils. It has been found that the liquid limit decreased from 57.67% to 33.90% on adding of 0% to 40% marble dust into it.

There is significant reduction in plasticity index values from 28.35% to 16.67%.

The shrinkage limit of the black-cotton has been increased by adding of 40% marble dust. The shrinkage limits increase from 8.06% to 18.39%.The Differential Free Swell (DFS) has reduced from 66.6% to 20.0%. The results of plasticity index, shrinkage limit and DFS indicates that the degree of expansiveness reduced from "very high'' to "low".

From the above laboratory investigation it can be concluded that the industrial waste like marble dust has a potential to modify the characteristics of expansive clay like black-cotton soil and to make it suitable in many geotechnical applications.

3.2 Impact of Marble Powder on Engineering Properties of Black Cotton Soil:

Sachin N. Bhavsar, Hiral B. Joshi, Priyanka K. Shrof, Patel Ankit J from Civil Engineering Department, SVBIT Gandhinagar carried out stabilization on black cotton soil using marble powder as a stabilizing agent. In this study the liquid limit values for 30% replacement are nearly equal to 37 which 13% less than the black cotton

soil value. As same for 40% replacement liquid limits value decrease by 22% and for 50% marble powder it reduced by 36%.

As same reduction is identified plastic limit and plasticity index. Reduction in plastic limit value for 30, 40, 50 % marble powder are respectively 9.03, 19.60, & 44.96 %. As same reduction in plasticity index for 30, 40, 50 % marble powder are respectively 15.63, 23.63, & 30.48 %. With increasing marble powder content the linear shrinkage is reducing. For 30% marble powder it reduces 74.68 % and as same for 40% & 50 % it reduces 78.9% & 83.12% respectively than the black cotton soil.

3.3 Expansive Soil Stabilization Using Marble Dust and Bagasse Ash:

R. Ali, H. Khan & A. A. Shah fromCivil Engineering Department, SUIT Peshawar, Pakistan,carried out stabilization on expansive soil using marble dust & bagasse ash as a stabilizing agent. . In this study Addition of 12% marble dust reduce soil uplift pressure from 9.02psi to 5.56psi where as 12% bagasse ash reduce soil uplift pressure from 9.02 psi to 4.72psi which shows that bagasse ash is more effective in decreasing the soil uplift pressure.

Dry density of expansive soil also increase with the addition of marble dust and bagasse ash and remain maximum approximately at 8% addition but again decline with the addition of 12% marble dust and bagasse ash.

3.4 Influence of Marble Dust, Fly Ash and Beas Sand on Sub Grade Characteristics of Expansive Soil:

Chayan Gupta, Dr. Ravi Kumar Sharmafrom Civil Engineering Department,, National Institute of Technology, H.P., India, carried out stabilization on expansive soil using marble dust, fly ash & sand as a stabilizing agent. In this study the optimum value of maximum dry density is achieved for black cotton soil-sand mix of 70:30 followed by other proportions. On further increasing the percentage of sand in the composite, amount of sand required increases and composite becomes uneconomical.

The maximum dry density of black cotton soil-sand (60:30) mix decreased with addition of fly ash which is a light weight material as compared to black cotton soil and sand (since the fly ash particles are much finer and rounded in shape) as compared to that of black cotton soil and sand.The highest value of maximum dry density is achieved for black cotton soil-sand-fly ash-marble mix of 52.36%-22.44%-13.20%-12%, followed by other proportions.The soaked California bearing ratio value of black cotton soil improved significantly i.e. from 2.69% to 8.07% approximately 200% with addition of sand, fly ash and marble dust in appropriate proportion.Thus, black cotton soil stabilized with sand, fly ash and marble dust can be used as a sub-grade material for construction of flexible pavements in rural roads with low traffic volume.

3.5 Stabilization ofNon Plastic Silt Using Marble Dust:

Krichphon Singh, V.K.Arorafrom Civil Engineering Department, NIT Kurukshetra, carried out stabilization on non-plastic silt using marble powder as a stabilizing agent. . In this study the following conclusions can be drawn, Optimum value of marble dust comes out to be 15% by weight of dry soil.Maximum unconfined compressive strength of sample is 1.032 for 15% marble dust addition.

With increase in percentage of marble dust dry density decreases and optimum moisture contain increases.Samples turned brittle on higher percentage of marble dust.

IV. CONCLUSIONS

From the above results it is concluded that the impact of marble powder on black cotton soil is positive. By replacing soil its dry weight by marble powder it gives maximum improvement in the swelling and linear shrinkage properties of black cotton soil. So use of marble powder is preferable for stabilization because it gives positive results as stabilizer and also it is a waste utilization. Benefits of the stabilization process can include higher resistance values, reduction in plasticity, lower permeability, reduction of pavement thickness, elimination of excavation material hauling or handling improves soil workability, reduces dust in work environment, upgrades marginal materials, improves durability,. It is additionally express that the want properties can be picked up by the settling it with various materials and the reasonable development taxicab be completed with more economy by utilizing waste materials like marble powder, bagasse ash, Beas sand and fly ashdries wet soils, conserves aggregate materials and reduces cost.

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