

REVIEW OF SOIL STABILIZATION USING DIFFERENT TYPES OF STABILIZERS

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ABSTRACT

In the present situation soil adjustment has turned into an imperative term in the field of geotechnical designing because of the development of overwhelming structures, for example, elevated structures, huge dams, underground structures and so on. These structures force huge weight on the soil. More often than not designs are not sufficiently fortunate to get the dirt strata having the adequate quality to maintain this weight, particularly if there should arise an occurrence of exceptionally strong soil which experiences colossal variety in quality in dry and wet conditions. Subsequently, it ends up plainly basic to pick an elective answer for upgrading the geotechnical properties of poor soil. In this present paper different research work's result is been reviewed to analyze the effects of such stabilizers on soil's engineering property.

Keywords: *Soil Stabilization, Stabilizers*

I. INTRODUCTION

Soil Stabilization is a procedure to modify any property of the given soil. It is required when the bearing limit or the quality of soil accessible at the development site isn't according to prerequisite or particular. All things considered these properties are improved by utilizing distinctive mechanical or concoction implies soil adjustment. The significance of soil adjustment is expanding step by step as a result of the development of gigantic structures, for example, multistory building, extensive traverse spans, colossal dams and so forth. Solid waste materials such as masonry waste (Brick powder) are used for this intended purpose. Disposal of these waste materials is essential as these are causing hazardous effects on the environment. This may found to be an economical treatment method for soils as these materials are available locally and such solution will definitely found beneficial for the developing countries like India where the economy is the prime concern for adopting any new method or technique. Lime has been widely used either as a modifier for clayey soil or as a binder. When clayey soils with high plasticity are treated with lime, the plasticity index is decreased and the soil becomes friable and easy to be pulverized, having less affinity with water. Lime also imports some binding action.

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 fly ash, rice husk ash, polymers, brick dust, sugarcane ash, fibers, adding lime, by different geo materials like geosynthetic, geogrid and geo form.

With the help off stabilization, waterproofs the soil, improve 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. METHOD OF STABILIZATION

3.1 Polymer Stabilization:

Vijay Rajoria & Dr. Suneet Kaur from the department of civil engineering of Maulana Azad National Institute Technology, Bhopal, has conducted an experimental study on stabilization of black cotton soil with Renolith polymer. In this investigation, the expansion of polymer caused a critical alteration in building properties. The polymer expansion indicated a significant change in quality, CBR, and in addition swelling attributes. The expansion in these building properties was because of polymer holding on the surface of the dirt particles. The polymer treated soil sample the liquid limit of soil sample decreased. The plasticity index of untreated black cotton soil sample also decreased. Maximum percentage increase in CBR value for treated soil sample was 772%. The UCS value has increase in the contents of cement and polymer.

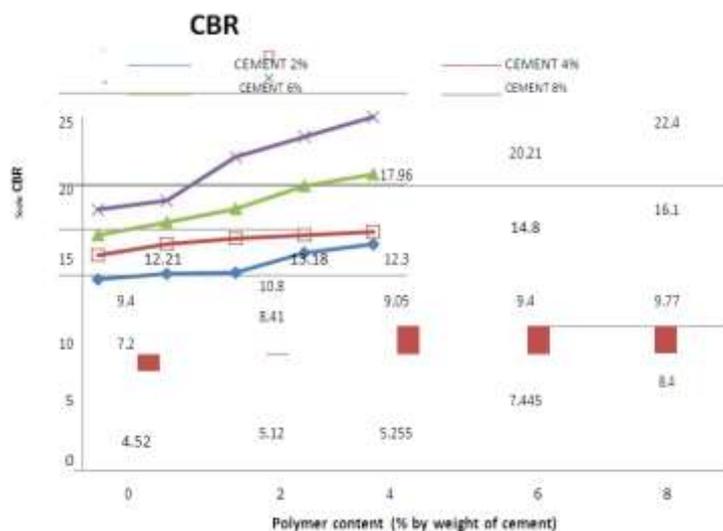


Figure: Variation in the CBR value for different contents of cement and polymer stabilizer for 1 day curing (graph from Vijay Rajoria & Dr. Suneet Kaur “Effect of Polymer Stabilizer on the Geotechnical Properties of Black Cotton Soil” International geotechnical conference IGC-2015.

3.2 Lime Stabilization:

Ankit Singh Negi, Mohammed Faizan, Devashish Pandey Siddharth & Rehanjot Singh from the department of civil engineering of University of Petroleum and Energy Studies, Dehradun, has conducted an experimental study on stabilization of black cotton soil with lime. Lime is used as an excellent soil stabilizing materials for highly active soils which undergo through frequent expansion and shrinkage. Lime acts immediately and improves various property of soil such as carrying capacity of soil, resistance to shrinkage during moist conditions, reduction in plasticity index, and increase in CBR value and subsequent increase in the compression resistance with the increase in time. The reaction is very quick and stabilization of soil starts within few hours. The graphs presented above give a clear idea about the improvement in the properties of soil after adding lime.

3.3 Brick Dust Stabilization:

Ms. Akshatha R & Mr. Bharath H M from the department of civil engineering of Jain Institute of Technology, Davanagere, Karnataka, has conducted an experimental study on stabilization of black cotton soil with Brick Dust. In his investigation, the MDD of the selected BC soil increases and the OMC of the soils decreases with the addition of lime as well as Brick Powder. The Increase in MDD and reduction in OMC is more with an increase in the proportion of admixtures in the soils. The results of the study show that both lime and Brick Powder are suitable for enhancing properties of the soils. Black cotton soil after stabilization the required CBR value of 8% according to IRC: 37-2012 is achieved by stabilizing with the replacement of BC soil by 50% BP, 4% lime and 30% BP + 1.5% lime. From the above discussion, it can be concluded that the BP can effectively utilize with BC soil in improving the soil CBR values. The use of Brick Powder resulted in utilization of demolition wastes and found to be economical for the local area. This will result in the utilization of rejected black cotton soil in construction. From the results, it is concluded that impact of Brick Powder and Lime is positive.

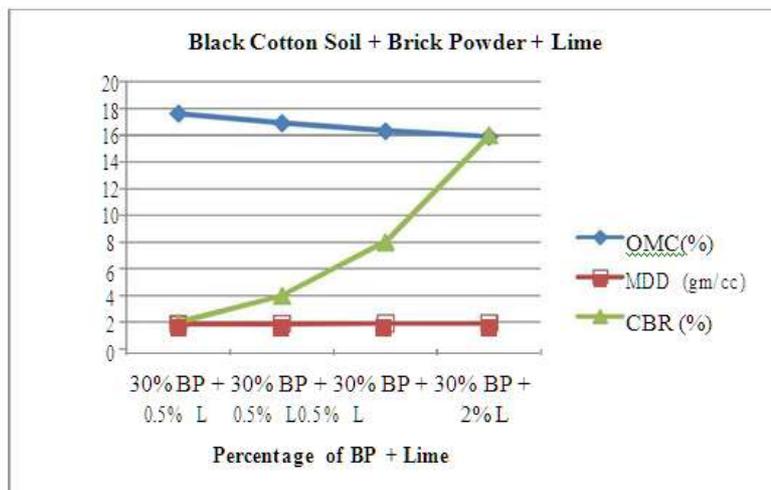


Fig. Graph Shows the Effect of Brick powder and Lime on OMC, MDD and CBR of Black Cotton Soil

3.4 Marble Dust Stabilization:

Sreekumar. V. Babu & Mary Rebekah Sharmila. S from department of civil engineering of, SRM University, Kattankulathur, Chennai, Tamilnadu, has conducted an experimental study on stabilization of black cotton soil with marble dust. Based on the tests and investigation conducted on soil sample the following conclusions were given, Marble dust addition showed improved performance in problematic soils with the help of cation exchange reaction. The presence of excess Ca^{2+} ions are responsible for the improved performance. The liquid Limit of soil sample is 61%. Soil sample is classified as Highly Compressible clay (CH). The unconfined compressive strength (UCS) of on addition of marble dust increases up to 188% for 14 day curing period. The California Bearing ratio (CBR) of soil increased from 5.19% for the virgin soil sample to 8.83% for 9% marble dust addition for 0 day curing period. Further addition of marble dust reduces the CBR value. The maximum CBR value was obtained as 14.5% at 14 days curing period for 9% addition of marble dust. The strength characteristics UCC and CBR are increasing up to 9% addition of marble dust and then decreases with further addition. Hence 9% marble dust addition can be regarded as the optimum percentage for stabilizing the soil sample.

Table.1: Effect of marble dust on UCC values (from Sreekumar. V. Babu Mary & Rebekah Sharmila S “Soil Stabilization Using Marble Dust” International Journal of Civil Engineering and Technology IJCIET).

Varying percentages of marble dust	Unconfined compressive strength q_u (kN/m^2)			
	0 day	3 days	7 days	14 days
3%	123.8	145.3	177.5	205.2
6%	125.7	169.3	236.9	260.7
9%	135	197.1	262.6	286.5
12%	118.1	148.1	165.3	177.5
15%	106.1	117.4	134.1	159.2

Table.2: Effect of marble dust on CBR values (from Sreekumar. V. Babu Mary & Rebekah Sharmila S “Soil Stabilization Using Marble Dust” International Journal of Civil Engineering and Technology IJCIET).

Varying percentages of marble dust	California bearing ratio (CBR)%			
	0 day	3 days	7 days	14 days
3%	7.79	8.83	11.43	12.4
6%	8.31	9.87	12.99	14.03
9%	8.83	10.91	13.51	14.55
12%	7.27	10.39	12.47	13.51
15%	6.75	9.35	11.95	12.99

IV. CONCLUSIONS

From the above literary works, it is watched that the expansion of stabilizers enhance the designing properties and furthermore the required gauges are discovered from it. It is additionally express that they 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, brick dust, polymer, and lime.

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