

USE OF MARBLE DUST FOR SOIL STABILIZATION

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Abstract- *This research paper mainly deals about the experimental study on the stabilization of soil using waste materials. Marble dust is one of the most widely locally available stabilizer material used for the stabilization. Marble dust is formed from cutting and polishing of marble stone. It is one of the industry generated waste material. It contains a large amount of calcium, silica, alumina which aids in the stabilization of the soil. The dust is added in varying percentages (5%, 10%, 15%, 20%) and various properties of soil like Atterberg's limits, compaction characteristics and strength characteristics were determined.*

Keywords: *stabilization, stabilizer, Atterberg's limits, compaction & strength characteristics.*

1. INTRODUCTION

The stabilization of soil by industrial generated waste materials which cause huge disposal and environmental pollution problem can be effectively used. Marble dust is one of such waste product. The amount of marble slurry produced every year is in the range of 5-6 million ton. The marble dust powder contains very high amount of calcium, silica & alumina and were reported by many researchers as a very good Stabilizer. The improvement of red tropical soils by the addition of marble dust powder in varying proportions shows the plasticity was reduced by 20 to 33% and unconfined compressive strength and CBR increased by 30 to 46% and 27 to 55% respectively[1]. As compared to untreated soil, the percentage increase in OMC at 15% addition of Marble dust is 22.39% due to change in plasticity index and liquid limit.

Sreekumar. V. Babu et al[2] has studied about stabilization of soil using industrial waste and found the CBR values and UCS of the soil in increased with increasing proportion of waste material. The UCS of the soil is increased from 99.2 kN/m² to 286.5 kN/m² for 14 day curing period and CBR values are increased from 5.19% for the virgin soil sample to 8.83% for 9% marble dust addition. Altug Saygili[3] has studied about the use of waste marble dust for stabilization of clayey soil with various percentage and found that the geotechnical properties of the clay samples changed after the treatment with marble dust. The treated clay samples decreased their cohesive properties and behaved as a granular material after curing, swelling percentages reduced, while the shear strength parameters increased. Ramoo ram and Ravi Pareek[1] has studied about the effect of marble dust on MDD & OMC and CBR values and found that the these values are increased with increasing percentage of marble waste.

B. B patel et. All[4] has studied about use of waste marble dust to improve strength characteristics of black cotton soil and found that the unconfined compressive strength and the California bearing ratio of the clay soil increases about 18% as compare to virgin soil by stabilizing the soil with Marble powder.

Various Engineering Properties of soil are mainly depends on the many things like minerals present in that soil, water table of the particular region, soil water behavior etc. which vary with place to place. Due to variation in properties of soil with places to place we can't get desirable properties of soils as per our needs of construction. To resolve this problem we have to change the properties of soil with addition of some suitable materials. The process of adding such materials to change the soil properties is called stabilization which means to stable or to modify or to improve the soil properties in positive manner.

2. NEED OF SOIL STABILIZATION

Soil properties plays a great role and the construction of structures depends a the various properties of the soil such as the bearing capacity, Atterberg's limits, MDD & OMC of the soil, hence we need to stabilize the soil which makes it easier to predict the load bearing capacity of the soil and even improve the load bearing capacity. The grain size of the soil is also a very important property to keep in mind while working with soils. The soils may be well-graded which is desirable as it has less number of voids or uniformly graded which though sounds stable but has more voids. Thus, it is better to mix different types of soils together to improve the soil strength properties. It is very expensive to replace the inferior soil entirely soil and hence, soil stabilization is the thing to look for in these cases.

3. MATERIAL AND METHODS

The soil for this study were taken from the bank of a small pond in **Goner** village of **Jaipur** district and the waste marble dust is taken from the marble cutting and polishing industry in **Makrana** village of Nagaur district.

4. EXPERIMENTAL METRIX

To check the various properties of soil such as Liquid limit test, plastic limit test, Standard Proctor Test, California bearing ratio(CBR), various test were carried out for both natural soils and with the addition of marble dust with different percentages (10%, 15%, 20%) and results were analysis.

Various test results analysis:

Sample specification	Liquid Limit	Plasticity index (%)	OMC (%)	MDD (kg/m ³)	CBR (%)
Virgin soil	38.95	13.77	21.46	1.64	2.53
Soil + 10% marble waste	41.174	20.15	19.32	1.761	11.85
Soil + 15% marble waste	41.72 %	21.14	18.74	1.7861	15.40
Soil + 20% marble waste	42.1	19.79	18.54	1.734	13.75

5. CONCOLUSION

As per test shown above the following conclusions were made

- The CBR values of the soil with increases proportions of marble dust is increases till 15% of marble dust. The CBR values are increasing from 2.53 with virgin soil to 15.40% with addition of 15% marble dust
- The Liquid limit and plasticity index is also increases significantly
- The OMC & MDD are achieved max at the 15% of marble dust also increases with 15% of marble dust

Thus we can say that the mixing of marble dust up to 15% gives desirable results with respect to CBR values and MDD. Also we can concludes that for low volume roads we can use up to 20% replacement of marble dust as it gives CBR value about 13.75 % which is acceptable limit.

6. REFERENCES:

- [1] R. ramoo and pareek R K, "Effect of Marble Dust on Soil Properties", International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181, RTCEC - 2018 Conference Proceedings
- [2] V.B Sreekumar. and R S Mary, "Soil Stabilization Using Marble Dust", International Journal of Civil Engineering and Technology (IJCIET), Volume 8, Issue 4, April 2017, pp. 1706-1713.
- [3] Saygili Altug, "Use of Waste Marble Dust for Stabilization of Clayey Soil", ISSN 1392-1320 materials science (Medziagotyra), 21(4), 2015
- [4] B B patel and H B Thakur, "Use of Waste Marble Powder to Improve the Characteristics of Black Cotton Soil", International Journal of Engineering Research & Technology (IJERT), ISSN: 2278-0181, Vol. 6 Issue 04, 2017
- [5] IS: 2720 (Part 5-1985, 6-1972) Methods of tests for soil - Determination of Atterberg's limits, Bureau of Indian Standards, New Delhi
- [6] IS: 2720 (Part 7) 1980, Methods of tests for soil - Determination of water content, dry density relation using light compaction, Bureau of Indian Standards, New Delhi
- [7] IS: 2720 (Part 16) 1987, Methods of tests for soil - Laboratory determination of CBR, Bureau of Indian Standards, New Delhi