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Stabilization of Black Cotton Soil Using Marble Dust Lime and Cement

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Abstract – The Black cotton soil is also termed as "Expansive soil". The B.C. soil properties are mainly influenced by the nature during various seasons like summer season it shrinks and during rainy season it get swells .the objective of The B.C. soils most likely to suitable for the agriculture purpose. In order to use for the construction field it's important to stabilize the Black cotton soil. There rein this study the black cotton soil properties are studied by using admixtures of marble dust lime concrete AMD cement. In this study the black cotton soil is collected from the bhalki at a depth of 1.5M and the marble dust was gathered from marble cutting industry Gulbarga area. These admixtures such as marble dust, lime, cement and concrete were mixed with clay for further purpose to carry out research. And the study which discussed about During the preceding of the test the B.C.soil properties are studied by various lab test and later admixtures W.C and MDLC are added to the soil in 5%,10%,15%,20%, by the weight of the B.C. soil and then soil properties are tested by SPT,UCS, and Direct test are conducted to find the MDD and OMC of a soil, compressive strength and shear parameters of a B.C.soil respectively

Key Word – Soil, Marble Dust (MD)

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INTRODUCTION

Expansive soil is ordinarily known as dark cotton soil because of their shading and reasonableness for developing cotton". It starts to develop and drawback pointlessly since the development in wetness content. Exactly when a planning synthesis is connected with dint cotton soil, it goes over either course of action or throws unforeseen upon the sentiment of concern and the residue growing weight. Plan and extension of the basic structure on and with expansive soil are evaluating tasks for geotechnical engineers. In situ improvement of soil properties using added substances is for the most part recommended as soil modification. Soil receiving is the place trademark or made materials are added to improve both the quality and soil robustness.

The dull cotton soil is an extensive sort of soil when associate with sogginess; due to this condition the quality and various properties of soil are very delicate. Due to separating of dull magma, for instance, Basalt rock by the sun, wind and storm dim cotton soil game plan occurs, it is basic to discuss the characteristics of dint cotton soil taking into account which there was an issue in different advancement broadens mostly Maharashtra, Gujarat, South Uttar Pradesh and a segment of the bits of Andhra Pradesh and Karnataka. The typical significance of dire cotton soil is 3.7rntrsaround.

Dull cotton soils are made of various minerals like Montmorinolite and Kaolinite. As Montrnorinolite is a ruling mineral the developing and shrinkage direct of these soils start essentially from this mineral. Broad kind of soil shows surprising behavior with different sorts of equalization. Soil modification is a technique to deal with soil and to keep up, change or redesign the presentation of soil.

Dim cotton soil withers when they lose their sogginess substance and swell when they start to hold the water. The swell capacity of clearing soils is affected by a bit of the component, for instance, initial water content, beginning thickness, aggregate, and kind of compaction.

Earth soils containing other mud minerals don't show e volume change credits likewise as those containing montmorillonite minerals. The extending soils of India have their beginning stage in submerged breaking down of basalt rock or suffering in-situ, the mineral montmorillonite is outlined under acid neutralizer condition.

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LITERATURE REVIEW

Sowmya V. Krishnamurthy et. al., (2017) In this paper, they utilized Lime and CSP as balancing out material, in which the y changed CSP in rates state, (0,3,6,9, 12) by weight of the dirt example, and shifting rates of lime say (3,6,9) by weight of the dirt example, from this they acquired a decent outcomes at 9°/c CSP + 6°/c lime, blends in Unconfined Compressive quality (MCS) whose worth get expanded by 228°/c ,when contrasted with Unconfined Compressive quality (UCS) of unique example.

Hitesh Bansal and Curtej Singh Sidhu (2016) Consolidate the unused marble soil in the dirt using the present style guideline of 10°/c to 30°/c, with an impedance of 10°/c. He deals with that with an increase in the level of waste marble SJ from 0°/c to 30°/c, past what many would consider conceivable worth reductions relent steadfastly from 31.70°/c to 25°/c, the plastic charge from 17.69°/c to 19.26°/c, and it was discovered that ideal clamminess content (OMC) of earth decreased from 18°/c to 14.10°/c, and the most conspicuous dry thickness reached out.

Er. Muthukumar and Er. Tamilarasan V. S. (2015) By using a rate saddle in an up market rule of 5°/e to 25°/c over some time, you can connect the marble dust in the earth. He instigated that normally increase in level marble powder works, past what many would consider conceivable worth reductions reliably by all of 5 to 25°/c level of marble powder from 70°/c to 55°/c, plastic cutoff respect was reached out by 25°/e approx., it was seen that the Optimum Soaked Quality Content (OMC) of earth stretched out from 18°/c to 24°/c and most absurd dry thickness (MDD) in earth stretched out from 18.

R. D. Babu, et. al., (2015) completed "An examination on the growing conduct of broad soil rewarded with Vitrified Polish Waste (VPW) and lime ".The hazardous sweeping soil was part supplanted with vitrified clean waste from 0°/c to 9°/c with an augmentation of 3°/c and further included with lime content fluctuating from 0°/c to 9°/c with the addition of 3°/c. The above said settling specialists made the risky sweeping soil nearly non growing, non-plastic, having better molecule direction under compaction for 9°/c lime added to 9°/c vitrified clean waste substitution in virgin broad soil. This is expected to the pozzolanic responses between soil, vitrified clean waste, and lime bringing about the development of a better-reduced soil framework. Subsequently, the investigation uncovers a moderately new adjustment elective using waste material from developing industry i.e., vitrified tile industry, and a locally accessible cover, lime, accordingly giving a twofold bit of leeway of alleviating the issues related with the waste removal and the risky extensive soil.

OBJECTIVES

- Determination of fitting marble residue, lime, and concrete substance at which the most extreme quality y of soil is gotten.
- Evaluation of soli dark it y qualities of mixed soil utilizing the distinctive level of marble residue, lime, and concrete.
- To give the elective answer for the removal of risky waste.
- To forestall the dirt disintegration and development of residue. To increment the quality, Bearing limit, and properties of soil.
- To make soil water close up which conducts water from going into the dirt and assist the dirt from extricating its condition'

RESEARCH METHODOLOGY

Preliminaries were passed on out first on the normal soil with no added substances in the research facility as Natural water content, explicit gravity, fluid cutoff, plastic breaking point, free swell record, compaction test, versatility list, and so on. So the impact of added substance could be handily estimated. In the current examination, marble Dust (MD), lime, and concrete we're utilized to explore the impact on assets of sweeping soil. The tests done to explore the impact of MD, lime, and concrete on the dirt properties are compaction tests, UCS. First, the impact of Marble dust 5, 10, 15, 20*/c and lime I,2, 4, 6°/o on the dirt properties was found independently, and the ideal °/c of Marble residue and lime was chosen. At that point with the ideal °/c of Marble dust as 5°/c and lime as I°/c and the concrete was included by differing the rate 0.25, 0.5, 0.75*/c. From these tests the ideal measure of MD and lime required for the improvement of soil and further examination could be resolved. The unconfined compresses' quality y test was led and contrasted these qualities and the estimations of untreated soil to decide its quality properties.

Experimental Work:

The normal water content is the ratio of the weight of water in a particular mass of soil to the weight of solids. It is utilized to decide bearing limit, settlement, and gives a thought of circumstances of soil in the field.

Apparatus required: Containers, Electric oven, weighing machine.

- Clean the vessel and take the erupt y weight of the 'easel with lid as (W i)gm.

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- Take a soil representative in the vessel and weigh it with lid as (Wi)gm.
- Keep the vessel in the broiler with. Covered laminated; dry the example to the consistent weight keeping up the temperature 1 10 degrees Celsius for a trial of 24hours.
- Record the last steady weight (W3) gm of the compartment with a dried soil test.

DATA ANALYSIS

1. Normal Soil:

The soil belongings of normal soil sample were set on in the laboratory by conducting various tests and were presented in Table I

Table 1: Index soil property

Natural Water Content (%)	L t.10
Free Swell Index Content (%)	40
Specific Gravity	2.63
Liquid Limit (%)	S2.3d
Plastic Limit (%)	45.50
Maximum Dry Density (g/cc)	l.d 15
Optimum Moisture Content (%)	2027
UCS value (kg/cm2)	10.87

From the results it was found that for parent soil the MDD obtained was I .6 I g/cc and the OMC corresponding to it was 20.27°/c. From the obtained MDD and OMC value the compressive strength of untreated soil was evaluated as 10.87kg/cm'.

Figure 1: Free swell index Experimental work

Figure 2: Liquid Limit and Plastic Limit Experimental Work

Table 2: OMC and MDD Results Treated For Different Blending Proportion of Soil

SL.NO	Description	OMC(%)	MDD (g/cc)
1	Clay Soil	20.27	1.61
2	Clay Soil+5%Marble Dust	23.05	1.64
3	Clay Soil+10%Marble Dust	24.44	1.62
4	Clay Soil+15%Marble Dust	25.51	1.60
5	Clay Soil+20%Marble Dust	28.25	1.56
6	Clay Soil+1% Lime	22.58	1.63
7	Clay Soil+2% Lime	11.10	1.55
8	Clay Soil+4% Lime	22.16	1.58
9	Clay Soil+6%Lime	19.62	1.58
10	Clay Soil+5%MD +1%Lime+0.25%Cement	18.8	1.68
11	Clay Soil+5%MD+1% Lime +0.5% Cement	26.02	1.66
12	Clay Soil+5%MD+1% Lime +0.75% Cement	18.8	1.68

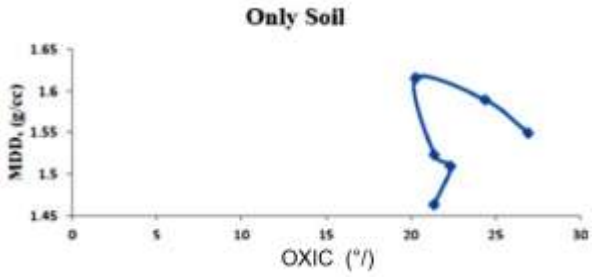

Figure 33: Indicating the results for comparison of MDD and OMC for normal soil

Table 3. Showing the results of UCS of clay with optimum of 5°/e MD and I °/c Lime:

Proportions	UCS values (kg/cm')
Clay soil	10f7
Clay soil+5°/c MD	I2.12
Clay soil+ I °/c Lirne	II.22

1. The best maximum dry density by proctor test was found to be I .64g/cc on addition of 5°/c MD.

2. The OMC content corresponding to above M DD is23.05°/c.

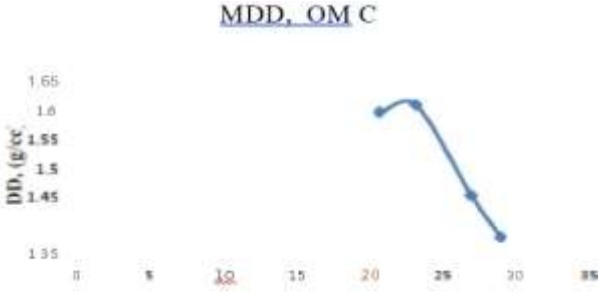

Figure 4: Indicating the results frir balancing of ADD and f3MC frir optimum of 1 to Lime

After effects of examination of MDD and OMC for changing the level of concrete:

1. For 5*/c MD+I*/c Lime-I- 0.25*/c Cement the most extreme dry thickness by delegate test was seen as 1.56g/cc and the Optimum dampness content relating to above worth is25.35*/c.

2. For 5*/c MD+I*/c Lime+O.5*/c Cement the most extreme dry thickness by delegate test was seen as 1.68g/cc and the Optimum dampness content relating to above worth is I8.8°/c.

3. For 5*/c MD+I*/c Lime+O.75*/c Cement the most extreme dry thickness by delegate test was seen as 1.66g/cc and the ideal dampness content relating to above worth is26.02*/c.

4. From the outcome it was discovered that with expansion 0.5*/c Cement with ideal of 5*/c MD and I */o Lime the quality of soil was expanded when contrasted with other level of concrete.

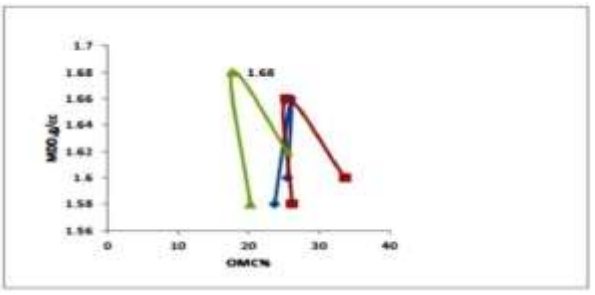

Figure 5: Indicating the results of comparison of MDD and OMC for varying the percentage of cement

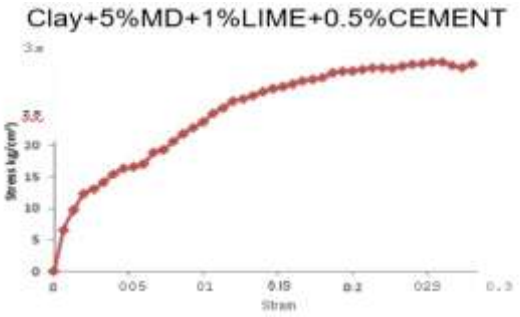

Figure 6: Indicating the value of UCS for Clay+5 % MD +1' u Lime+0.5% Cement

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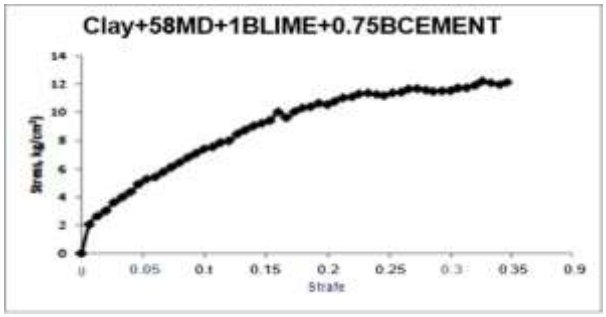

Figure7: Indicating the value of UCS for Clay+5 to **MD+1 WoLime+0.75'to cement.**

Diagrams shows the outcome contrasting for unconfined compressive quality for most extreme qualities compressive quality acquire for spacious extent of marble residue, lime and concrete. From the above outcome it shows that dirt rewarded with 5°/c of MD and I °/c of lime with changing a 0.5°/c of concrete invigorates the greatest incentive for compressive.

1. The unconfined compressive quality of dirt rewarded with ideal of 5°/ MMD, expands UCS incentive to I 2.12kg/cm2and for ideal of I °/slime the MCS esteem is I1.22kg/cm2

2. The unconfined compressive quality of mud rewarded with 5°/c MD +I° /slime + 0.25°/ cement builds U CS incentive to I3.28kg/cm2.

3. The unconfined compressive quality of mud rewarded with 5°/c MD+I°/slime+0.5°/c cement builds U CS incentive to 32.93kg/cm2, when contrasted with all the aftereffects of UCS this is seen as the best for expanding the quality.

4. The unconfined compressive quality of dirt rewarded with 5°/c MD+I°/slime+0.75°/c cement expands U CS incentive to I2.22kg/cm2.

CONCLUSION

The special gravity of black cotton soil is the increase with the freely expanding of marble residues lime and concrete and the Testing has shown that MD's 5*/o and I*/coflime lead to significant reduction in soil properties of clay soils. So 5*/c MD and I*/clime chose as the ideal rate, The most extreme dry density increase and the OMC T decreased significantly with the expansion of MD K of 5 µg/C and lime I*/O with changing level of cement, The unconfirmed compressive property y of this filth increases from 10.8kg/cm2, I2.12kg/crn2 and II.22kg/cm2 with an expansion of 5°/MMD and I°/slime ideal and for 5°/MMD, with a fluctuating level of I*/clim concrete (0.25* /c,0.5* /c and 0.75*/c), compressive quality y increased from 10.8Kg/crn2 to I 3.28kg/cm2, 32.93kg/cm2 and individually to 12.22kg/crn2, The best UCS respect is achieved with a mixture of marble dust (5°/c), lime (4°/c) and cement (0.5°/c), eg 32.93kg/cm2.

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