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Effect of Marble Dust and Burnt Brick Dust on Characteristics of Black Cotton Soil

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ABSTRACT

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. Stabilization of expansive soils with admixtures controls the potential of soils for a change in volume, and improves the strength of soils. The effects of burnt brick dust and marble dust on MDD, OMC, soaked CBR of expansive soil stabilized with MD and BDD has been found to be limited in literature. The objective of this paper is to study the effects of marble dust on MDD, OMC, soaked CBR, of an expansive soil stabilized with optimum percentage of MD and BDD. The effects of unsoake and soaked CBR value have been studied.

1. INTRODUCTION

The main objectives of this analysis were identified as follows:
1. To study the characteristic of soils.
2. To study the compaction characteristics of MD, BDD and Composite mix material soils.
3. To study the Bearing Value of virgin soil, soil+MD, soil+BBD and soil Composite of these two materials treated soils and hence to find out the optimum percentage of MD, BBD and Composite material required to stabilize the soils. To achieve the above objectives, an overview on MD and BBD stabilization of BC soil has been done and also, a review of various studies on geotechnical behavior (plasticity, swelling, and bearing value) of MD stabilized expansive soils was carried out and the literature review has been summarized in chapter 2. Indian standard (Methods of test for soils) codes are followed to conduct various soil tests.

I.

2. LITERATURE REVIEW

Expansive soils have been called the hidden disaster as the damage cost is more than the combined damage from natural disaster such as earthquakes, and floods said by **Jones and Holtz in 1973 .** Expansive soils are a worldwide issue that poses many challenges for civil engineers. These are considered a potential natural hazard, which may cause extensive damage to the structures if not properly treated. Such soils swell when giving an access to water and shrink after they dry out **(Al-Rawas et al., 2002).**

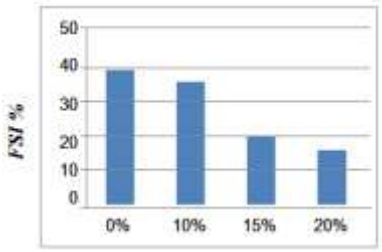
The issues with foundations on expansive soils have included heaving, cracking and break-up of pavements, roadways, building foundation, slab-on-grade members, channel and reservoir linings, irrigation systems, water lines, and sewer lines according to **Cokca, 2001.**

It is reported that damage to the structures due to expansive soils has been the most costly natural hazard in some countries (in United States more than the cost of damage from flooding, hurricanes, tornados and earthquakes on an average annual basis) for years by **Kehew, 1995; Shuai and Fredlund, 1998** .

3. RESULT AND DISCUSSION

3.1. Free Swell Index

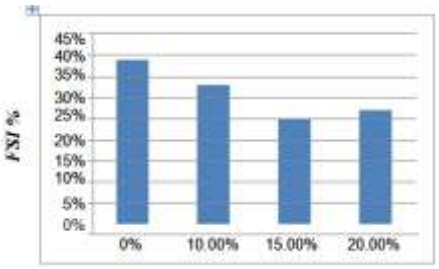
After performing the swell index test for the virgin soil and addition of marble dust and burnt brick dust, the following graph shows the variation of swelling.



% of BBD	FSI %
0 %	39.52
10%	36
15 %	20
20 %	16

Fig 3.1: Different Percentage of burnt brick dust

From the above fig 3.1, it shows that when 10% BBD is added into the expansive. Soil the swell index is 36% which is maximum and it decreases up to 16% BBD mix which is minimum.



% of MD	FSI
0 %	39%
10 %	33%
15 %	25%
20%	27%

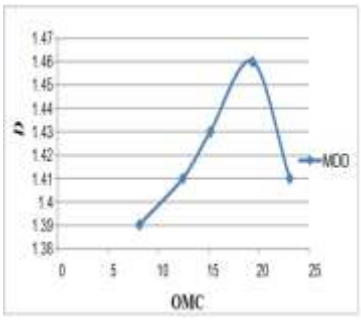
Fig 3.2: Different Percentage of Marble dust

From the above graph result, it shows that there is decrease in swelling percentage from 0% to 20% MD and the value of swelling percent is less at 15% MD and further addition of MD percentage it goes on increasing.

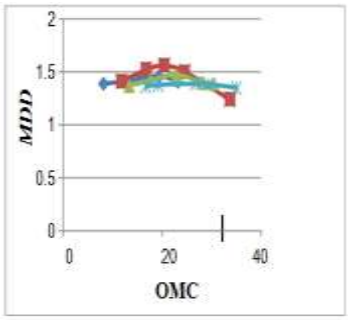
3.2 Proctor Test Result

The compaction characteristics of the soils have been studied by varying percentage the marble dust and burnt brick dust. The compaction curves showing optimum moisture contents and maximum dry density for different soils have been shown in Figure 3.3.

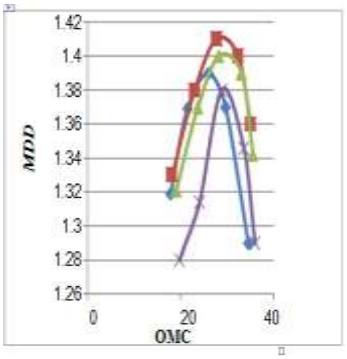
For original soil sample, the Optimum Moisture Content and maximum Dry Density is shown in below Graph.



OMC	MDD
9.4	1.46



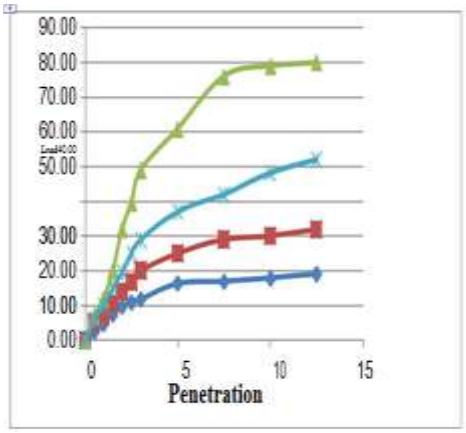
% of BBD	MDD	OMC
0 %	1.46	19.4
10 %	1.56	20.5
15 %	1.47	29.9
20 %	1.42	24.68



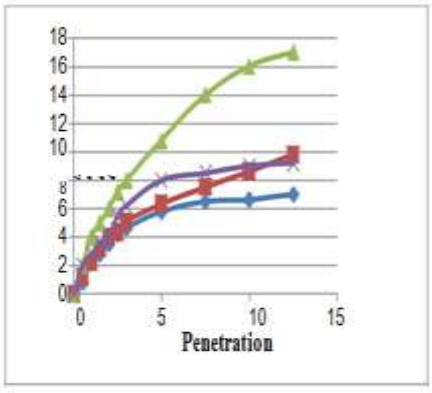
% of Composite	MDD	OMC
0 %	1.46	19.4
5% BBD+ 5 MD%	1.39	26.02
10% BBD+ 5 MD%	1.41	27.8
15% BBD+5 MD%	1.4	28.3

3.3. California Bearing Ratio Test

From the obtained results of MDD and OMC of different percentage if MD, BBD and composite of these two materials, separate CBR test was performed. The various test results of un-soak and soak CBRare shown in the below Figures.



% bbd	2.5 mm	5.0 mm
0%	12.3	11.71
10%	14.50	14.35
15%	17.57	16.11
20%	19.33	20.50



% MD	2.5 mm	5.0 mm
0%	1.90	1.85
10%	3.16	3.16
15%	2.41	2.34
20%	2.06	1.99

All the obtained result values are tabulated in the below table.

Sr. No.	Description	Proctor test		CBR (%)		Free Swell Index (%)
		OMC%	MDD%	Soak	Unsoak	
1	Virgin soil	19.4	1.46	1.85	4.86	39.52
2	soil+10%MD	20.5	1.56	1.27	12.30	36
3	soil+15% MD	29.9	1.47	4.98	14.50	20
4	Soil+20%MD	24.68	1.42	7.03	17.57	16
5	soil+10%BBD	**26.7**	**1.39**	**10.54**	**20.50**	**13**
6	soil+15% BBD	29.25	1.38	8.49	18.45	15
7	Soil+20%BBD	20.48	1.44	1.9	7.38	33
11	soil+5%BBD+5%MD	26.02	1.39	2.91	20.21	12
12	soil+10% BBD+5%MD	**27.8**	**1.41**	**3.89**	**22.93**	**6**
13	Soil+15%BBD+5%MD	28.3	1.4	3.10	21.97	8

4. CONCLUSIONS

Many of the important engineering properties of soils can be enhanced by the addition of MD and BDD. The properties of such soil-MD and soil-BBD mixtures vary and depend upon the type of soil. To develop an understanding of the possible mechanisms involved, a series of experiments through variation of parameters were carried out, based on which the following conclusions are drawn:

1. The Effects of both burnt brick dust and marble dust on the California bearing Ratio Test and swelling of expansive soil have been studied.

2. It is shown from the test results, that the addition of burnt brick dust and marble dust causes the beneficial changes in the engineering properties of soil.

3. From the proctor test result, it was found that increase in addition of MD in the expansive soil the OMC values increased and MDD is increased up to 10% addition on MD and further increased in MD i.e. at 10% and 20%, it decreased as compared to original soil.

5. When MD was added in the expansive soil, OMC was increased and MDD decreased. At 15 % BBD in soil MDD was 1.47 which is more than that of virgin soil.

6. Similar to the above results, when composite material was added in the soil OMC increased and MDD decreased.

7. From CBR test results it was found that unsoak CBR and soak CBR for virgin soil is 4.86 and 1.85 resp. After adding in BDD the soil unsoak and soak CBR value was 20.50% and 10.54% respectively.

8. When 15% MD was added in the soil, the unsoak and soak CBR values are 17.35% and 3.16% respectively which is more than other percentages of MD.

9. But when 10% BBD and 5% MD is added combine into the soil only unsoak CBR and soak CBR values was 22.93% and 3.89% resp.

10. Therefore we can conclude that the composite of lime and PPF is not so much suitable for this type of soil.

11. Free Swell Index of virgin soil was 39.52.When 10% MD and 20% in the soil; it is observed that swelling of soil was reduced to 13% and 33% respectively.

12. When 10% lime BBD and 5% MD material is added combine in the soil, FSI reduction is more than separate addition of BBD and MD and it was 6%.

13. The black cotton soil can be well stabilized with burnt brick dust and marble dust as black cotton soil converts to a well graded material on their addition.

14. From the results it is concluded that the impact of brick dust on black cotton soil is positive.

15. By replacing soil dry weight by brick dust it gives maximum improvement in the engineering properties of black cotton soil.

16. So use of brick dust is preferable for stabilization because it gives positive results as stabilizer and also it is a waste utilization.

5. REFERENCES

[1] Abd EI-Aziz, M.A. and Abo-Hashema, M.A. (2013) "Measured Effects on Engineering Properties of Clayey Subgrade using Lime-Homra Stabiliser," International
[2]Journal of Pavement Engineering, 14(4), 321-332. 2. AI-Azzo, S.I. (2009) "Treatment of Expansive Clayey Soil in AL-Wahda District at Mosul City with Crushed Lime Stone," Iraqi Journal of Earth Sciences, 9(2), 1-10.
[3] AL-Rawas, A.A. (2004) "Characterisation of Incinerator Ash Treated Expansive Soils," Proceedings of the ICE - Ground Improvement, 8(3), 127-135.
[4] Amadi, A.A., Lubem, S. (2014) "Assessing Stabilization Effectiveness of Combined Cement Kiln Dust and Quarry Fines on Pavement Subgrades Dominated by Black Cotton soil," Geotechnical and Geological Engineering, DOI 10.1007/s10706-014-97930.
[5] Amu, O. O., Fajobi, A.B. and Afekhuai, S.O. (2005) "Stabilizing Potential of Cement and Fly Ash Mixture on Expansive Clay Soil," Journal of Applied Sciences, 5(9), 16691673.
[6] Amu, O. O., Fajobi, A.B. and Oke, B.O. (2005) "Effect of Eggshell Powder on the Stabilizing Potential of Lime on an Expansive Clay Soil," Research Journal of Agriculture and Biological Sciences, 1(1), 80-84.
[7]Ashango, A.A. and Patra, N.R. (2014) "Static and Cyclic Properties of Clay Subgrade Stabilised with Rice Husk Ash and Portland Slag Cement," International Journal of Pavement Engineering, DOI: 10.1080/10298436.2014.893323.
[8] Attom, M. and Shatnawi, M. (2005) "Stabilisation of Clayey Soils using Hay Materials," Journal of Solid Waste Technology and Management, 31 (2), 84-92.
[9] Barazesh, A., Saba, H., Gharib, M. and Rad, M.Y. (2012) "Laboratory Investigation of the Effect of Eggshell Powder on Plasticity Index in Clay and Expansive Soils," European Journal of Experimental Biology, 2 (6), 2378-2384.
[10] Basha, E.A. Hashim, R. and Muntohar, A.S. (2003) 'Effect of the Cement- Rice Husk Ash on the Plasticity and Compaction of soil," Electronic Journal of Geotechnical Engineering, 8 (A).