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AN EXPERIMENTAL STUDY OF SOIL STABILIZATION USING MARBLE DUST

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Abstract: The primary target of this review is to research the utilization of waste marble dust in settling soil and to assess the impacts of marble dust on CBR upsides of unsaturated soil via doing standard delegate tests and CBR tests on various soil tests. The outcomes acquired are looked at for the three different level of marble residue and surmisings are drawn towards the bearing strength of soil with various mix of marble dust.

In this review, squander limestone residue and waste dolomitic marble dust, results of marble industry, were utilized for adjustment of clayey soils. The marble dust expansion proportions which have been examined were 10%, 15% and 20% by weight. Marble dust played a recognizable part in the hydration cycle in view of high calcium content. Gotten results showed that marble dust expansion to the earth tests will lessen the expense of developing designs on hazardous soils, and finding new use regions for squander marble residue will diminish ecological contamination. Using waste marble dust materials in tricky soils will have extraordinary commitment to the economy and preservation of assets.

1.INTRODUCTION

Soil Stabilization is the adjustment of soils to upgrade their actual properties. Adjustment can expand the shear strength of a dirt or potentially control the psychologist enlarge properties of a dirt, consequently working on the heap bearing limit of a sub-level to help asphalts and foundations1. The Engineering Properties of soil are relied upon the many focuses like minerals, water table, soil water conduct and so forth which change according to region to region. Because of which we can't get want properties appropriate to our requirements of development. To determine this issue we have procedure called adjustment which

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means to stable or to alter or to further develop the dirt properties in certain way. So we can have a development works which satisfy our necessities and goal.

"Soil adjustment can be made sense of as the expanding or keeping up with the dirt properties by physical and synthetic modification of soil to improve their designing properties."

Adjustment considers the foundation of plan models as well as the assurance of the legitimate substance added substance and admixture rate to be used to accomplish the ideal designing properties. Advantages of the adjustment cycle can incorporate higher obstruction values, decrease in versatility, lower permeability, reduction of pavement thickness, end of unearthing material pulling or taking care of. Soil properties change an incredible arrangement and development of designs relies a ton upon the bearing limit of the dirt, subsequently, we want to settle the dirt which makes it more straightforward to foresee the heap bearing limit of the dirt and even work on the heap bearing limit. The degree of the dirt is likewise a vital property to remember while working with soils. The dirts might be all around evaluated which is attractive as it has less number of voids or consistently reviewed which however sounds stable yet has more voids. In this way, it is smarter to combine various sorts of soils as one to further develop the dirt strength properties. It is over the top expensive to supplant the mediocre soil completely soil and consequently, soil adjustment is what to search for in these cases.

2.LITERATURE REVIEW

Adarsh Minhas (2016) [1] has learned about adjustment of alluvial soil utilizing marble residue and found that the expansion of marble powder in the dirt example the OMC expanded. This shows a variety in OMC because of the expansion of marble powder. All in three cases (5, 10, and 15%) of marble residue to the alluvial soil shows same variety in OMC. What's more, conspicuous improvement found in CBR values when normal soil is supplanted by the expansion of marble dust.

(2016) [2] has learned about the way of behaving of Soil for Sub Grade by utilizing Marble Dust and Ground Granulated Blast Furnace Slag and found that The attributes of soils change essentially with Marble dust-GGBS content. The Optimum Moisture Content (OMC) increments and Maximum Dry Density (MDD) diminishes with expansion in level of Marble dust-GGBS and With increments 20%-20% of Marble dust and GGBS rate compressive strength of soil increments.. CBR an incentive for drenched and unsoaked condition increments with expansions in level of Marble dust and GGBS.

Altug (2015) [3] the principal objective of this examination was to explore the chance of using waste marble dust in balancing out risky soils (particularly enlarging muds). The marble dust expansion proportions which have been contemplated were 0 %, 5

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%, 10 %, 20 % and 30 % by weight. Physical, mechanical and compound properties of soil and marble dust tests were examined.

Stoltz et al. (2014) [4] tested the impact of enduring of lime treated clayey soils by substitute patterns of wetting and drying on the hydro-mechanical properties of the settled soil. The consequences of the review showed a dynamic expansion in expanding and loss of solidarity of the settled soil with expansion in number of wetting and drying cycles.

Sachin N. Bhavsar and Ankit J. Patel (2014) [5] has learned about Effect of waste material on enlarging and shrinkage properties of clayey soil and they finished up From that their outcomes obviously distinguished that for the substitution of soil by stabilizer the straight shrinkage is lessening for the both settling specialists.

Sabat and Nanda (2011) [6] had concentrated on the impacts of marble dust on strength and solidness of rice husk debris balanced out far reaching soil and found that expansion of marble dust expanded the strength, diminished the enlarging pressure and made the dirt rice husk debris blends sturdy. The ideal extent of soil: rice husk debris: marble dust was viewed as 70:10:20

3.MATERIALS AND METHOD

The soil used for this study was collected from a small pond near Ottu village in Sirsa district. Various tests - like liquid limit, plastic limit, proctor compaction test and CBR test are performed. After performing these all tests I found that the liquid limit and plastic limit of soil is very high and CBR value of this soil is very low. These type of soils are not suitable for road construction because of high swelling and shrinkage properties. Thus to increase various properties of such soil it should be needed to stabilize.

The stabilizer material used for the study was marble dust. The marble dust was collected from a marble cutting and polishing industry (The Makrana marble industry) in Makrana village of Nagaur district.

A. Experimental Metrix

Liquid limit test, plastic limit test, Standard Proctor Test, California bearing ratio(CBR) test were carried out for both natural soils and with the addition of marble dust with three different percentages (10%, 15% & 20%)

4.RESULTS AND DISCUSSION

The Various tests are directed on dark cotton soil blended in with marble dust in various extent according to IS code of training.

Test results variety of LL, PL, PC and CBR are displayed in Table1 to 9.

Table I shows that fluid cutoff increments as the level of marble dust increments. In table 2 plastic cutoff test shows that pliancy recorded additionally increments upto 15% substitution and afterward somewhat diminishes at 20%. As the outcomes shows that the Optimum Moisture Content (OMC) increments and Maximum Dry Density

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(MDD) diminishes with expansion in level of Marble dust. When contrasted with untreated soil, the rate expansion in OMC at 15% expansion of Marble dust is 22.39% because of progress in pliancy record and fluid breaking point. The rising level of marble dust with soil expands the pliancy file and diminishes the enlarging properties of soil. This is extremely useful to control volume changes in soil because of clayey particles. The CBR worth of the dirt is expanded with expanding request of marble dust rate. The ideal outcomes were found when soil was settled with 15% marble dust. The CBR esteem is expanded from 2.40 % to 14.6%

Index Properties

Liquid limit of soil with different marble content:

Table 1: liquid limit.

Marble dust (%)	Liquid limit (at 25 no of blows)
0	38.15
10	42.921
15	41.08
20	42.15

Comparison of liquid limit with different marble dust percentage Plastic Limit

Table 2: Plasticity index of soil.

Marble dust (%)	Plasticity index (%)
0	15.0
10	20.041
15	20.19
20	19.64

PROCTOR COMPACTION TEST

Table 3: OMC and MDD of soil when Marble dust: 0%.

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Sample No	1	2	3
Weight of mould (kg)	4.732	4.732	4.732
Volume of mould cc	1000	1000	1000
Number of blows	25	25	25
Weight of wet soil + mould (kg)	6.794	6.704	6.744
Bulk density (kg/m3)	2.02	1.972	2.01
Weight of soil sample taken for oven dry (gms)	39.36	47.01	26.4
Weight of soil sample after oven dried (gms)	32.14	37.83	21.82
Weight of water (gms)	7.22	9.18	4.58
Water content (%)	22.46	24.26	20.98
Dry density (kg/m3)	1.674	1.642	1.655

Table 4: OMC and MDD of soil when Marble dust: 10%.

Sample No	1	2	3
Weight of mould (kg)	4.732	4.732	4.732
Volume of mould cc	1000	1000	1000
Number of blows	25	25	25
Weight of wet soil + mould (kg)	6.798	6.766	6.67
Bulk density (kg/m3)	2.066	2.034	1.938
Weight of soil sample taken for oven dry (gms)	130	110.04	150
Weight of soil sample after oven dried (gms)	114.24	95.92	134.05
Weight of water (gms)	15.76	14.72	15.95
Water content (%)	18.32	21.17	15.72
Dry density (kg/m3)	1.7461	1.6786	1.6747

Table 5: OMC and MDD of soil when Marble dust: 15%.

Sample No	1	2	3
Weight of mould (kg)	4.732	4.732	4.732
Volume of mould cc	1000	1000	1000
Number of blows	25	25	25
Weight of wet soil + mould (kg)	6.746	6.778	6.788
Bulk density (kg/m3)	2.014	2.046	2.056
Weight of soil sample taken for oven dry (gms)	107.04	78.8	96.84
Weight of soil sample after oven dried (gms)	92.36	65	81.97

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Weight of water (gms)	14.68	13.8	14.87
Water content (%) dust	15.89	21.24	18.14
Dry density (kg/m^3)	1.7378	1.6875	1.7403

Table 6: OMC and MDD of soil when Marble dust: 20%.

Sample No	1	2	3
Weight of mould (kg)	4.732	4.732	4.732
Volume of mould cc	1000	1000	1000
Number of blows	25	25	25
Weight of wet soil + mould (kg)	6.68	6.734	6.788
Bulk density (kg/m3)	1.956	2.002	2.056
Weight of soil sample taken for oven dry (gms)	101	68.77	90.56
Weight of soil sample after oven dried (gms)	88.47	59.33	76.4
Weight of water (gms)	12.53	9.44	14.16
Water content (%)	22.4	15.91	18.54
Dry density (kg/m^3)	1.598	1.725	1.734

CBR TEST RESULTS

Table 7: CBR test of soil when Marble dust 0%.

Dial Gauge Reading	Proving Ring Reading	Penetration	Load (kg)
0	0	0	0
50	1	0.5	1.299378186
100	4	1	5.197512742
150	8	1.5	10.39502548
200	12	2	15.59253823
250	17	2.5	22.08942915
300	21	3	27.2869419
350	25	3.5	32.48445464
400	30	4	38.98134557
450	35	4.5	45.47823649
500	38	5	49.37637105
550	42	5.5	54.57388379
600	46	6	59.77139653
650	50	6.5	64.96890928
700	54	7	70.16642202
750	59	7.5	76.66331295
800	64	8	83.16020387
850	67	8.5	87.05833843
900	70	9	90.95647299

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950	73	9.5	94.85460754
1000	76	10	98.7527421
1050	79	10.5	102.6508767
1100	82	11	106.5490112
1150	85	11.5	110.4471458
1200	88	12	114.3452803
1250	90	12.5	116.9440367
	Penetration (mm)	CBR	
	2.5	**1.612367092**	
	5	**2.4027431**	

Table 8: CBR test of soil when Marble dust: 10%.

Dial Gauge Reading	Proving Ring Reading	Penetration	Load (kg)
0	0	0	0
50	11	0.5	14.29316004
100	30	1	38.98134557
150	48	1.5	62.37015291
200	70	2	90.95647299
250	**87**	2.5	113.0459021
300	107	3	139.0334659
350	130	3.5	168.9191641
400	143	4	185.8110805
450	156	4.5	202.7029969
500	**171**	5	222.1936697
550	184	5.5	239.0855861
600	198	6	257.2768807
650	211	6.5	274.1687971
700	223	7	289.7613354
750	234	7.5	304.0544954
800	245	8	318.3476555
850	256	8.5	332.6408155
900	267	9	346.9339755
950	278	9.5	361.2271356
1000	289	10	375.5202956
1050	290	10.5	376.8196738
1100	300	11	389.8134557
1150	310	11.5	402.8072375
1200	320	12	415.8010194
1250	328	12.5	426.1960449
	Penetration (mm)	CBR	
	2.5	8.251525704	
	5	**10.812344**	

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Table 9: CBR test of soil when Marble dust: 15%.

Dial Gauge Reading	Proving Ring Reading	Penetration	Load (kg)
0	0	0	0
50	13	0.5	16.8919164
100	31	1	40.2807238
150	57	1.5	74.0645566
200	84	2	109.147768
250	118	2.5	153.326626
300	142	3	184.511702
350	166	3.5	215.696779
400	190	4	246.881855
450	212	4.5	275.468175
500	231	5	300.156361
550	254	5.5	330.042059
600	277	6	359.927757
650	300	6.5	389.813456
700	320	7	415.801019
750	339	7.5	440.489205
800	357	8	463.878012
850	375	8.5	487.26682
900	392	9	509.356249
950	408	9.5	530.1463
1000	424	10	550.936351
1050	439	10.5	570.427023
1100	452	11	587.31894
1150	464	11.5	602.911478
1200	476	12	618.504016
1250	487	12.5	632.797176
	Penetration(mm)	CBR	
	2.5	11.19172452	
	5	**14.6061489**	

Table 10: CBR test of soil when Marble dust: 20%.

Dial Gauge Reading	Proving Ring Reading	Penetration	Load (kg)
0	0	0	0
50	14	0.5	18.1912946
100	38	1	49.376371
150	60	1.5	77.9626911
200	85	2	110.447146
250	**110**	2.5	142.9316
300	130	3	168.919164
350	150	3.5	194.906728
400	169	4	219.594913
450	190	4.5	246.881855
500	**209**	5	271.570041

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550	230	5.5	298.856983
600	249	6	323.545168
650	268	6.5	348.233354
700	287	7	372.921539
750	305	7.5	396.310347
800	323	8	419.699154
850	340	8.5	441.788583
900	355	9	461.279256
950	370	9.5	480.769929
1000	386	10	501.55998
1050	400	10.5	519.751274
1100	415	11	539.241947
1150	429	11.5	557.433242
1200	442	12	574.325158
1250	455	12.5	591.217074
	Penetration (mm)	CBR	
	2.5	10.43296353	
	5	**13.2150871**	

5.CONCLUSION

The expansion of the marble residue to the dirt diminishes the mud items and subsequently increments in the level of coarser particles. By and large it tends to be presumed that dirt balanced out with marble residue can be viewed as great ground improvement method, particularly in designing undertakings on frail soils where it can go about as a substitute to profound/pontoon establishments, decreasing the expense as well as energy.

REFERENCES

[1]. Adarsh Minhas, (2016). "Soil Stabilization of Alluvial Soil by Using Marble Powder", International Journal Of Civil Engineering And Technology (IJCIET), Volume 7, Issue 5, Pp. 87–92, 2016.

[2]. Tarkeshwar Pramanik, Shyam Kishor Kumar and J.P. Singh, (2016). "Study The Behaviour of Soil for Sub Grade by Using Marble Dust and Ground Granulated Blast Furnace Slag", International Journal of Innovative Research in Science, Engineering and Technology, ISSN : 2319-8753, 2016 [3]. Altug saygili (2015). Uses of Waste Marble Dust for Stabilization of Clayey Soil' ISSN 1392–1320. Materials science (Medziagotyra). 21(4).

[4]. Stoltz, G, Cuisinier, O & Masrouri, F (2014). 'Weathering of a lime- treated clayey soil by drying and wetting cycles', Engineering Geology, vol. 181, pp. 281–289. [5]. Sachin N. Bhavsar and Ankit J. Patel, (2014). "Effect of waste material on swelling and shrinkage properties of clayey soil", International Journal of Application or Innovation in Engineering &

Management (IJAIEM), Volume 3, Issue 11, ISSN 2319 – 4847, 2014.

[6]. A. K. Sabat and R. P. Nanda, (2011). "Effect of Marble Dust on Strength and Durability of Rice Husk Ash Stabilized Expansive Soil," International Journal of Civil and Structural Engineering, 1(4), 939-948, 2011.