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PURSUANCE OF WASTE MARBLE POWDER TO IMPROVE SOIL STABILIZATION

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Abstract - *In India, pick up in nation coupled mutually heavy-laden loads of vehicles conveying heavier stresses concentrates especially on roads continually in clayey disgrace zones which create related problems for pavements and hereafter need expected stabilized. In this design, at willingly the analysis of sensible disgrace is done to confirm engineering properties as per relevant by coordinating exploration bring to a meet tests and to manage the understanding in properties separately utilizing waste marble powder in dosages of 10%, 20%, 30%, 40%, 45% and 50%by weight of soil. The CBR and UCS tests are detailed for untreated and treated soils with optimum dosages of waste marble powder and the readings are recorded. With the restore in the percentage backup OMC has been decreasing and MDD has been increasing. The value of CBR is also shows a progressive improvement with change in percentage of marble dust. Understanding the progressions in subgrade quality, the conventional outline systems of the asphalt layers based upon the sub grade quality boot be worked out utilizing IRC code and comparative cost-conscious cost using km.*

Key Words: CBR, MDD, Marble Powder, OMC, Stabilization, UCS

1. INTRODUCTION

Roads going over extensive soil areas are sustain serious pain bringing most poor execution and expanded upkeep cost. India is faced mutually saving and redesigning the pavement position, these demand the confidence of utilizing waste material for improving the security of soils. Expansive soils hide huge regions in a few nations of the world and in India too. These soils experience volumetric changes by the whole of the riches in dampness cheerful because of the survival of the mineral Montmorillonite. Along these lines, in this review, a fundamental stride is being taken to conclude financial usage of waste materials utilizing waste marble powder by trying to preserve the wastage of soil material by enhancing the properties as using requirements of pavement design from its arranged use.

2. LITERATURE REVIEW

1) **V.Keshavan et al (2017)** the clay soil has a poverty-stricken supporting capacity and large change in album on variations of moisture content. Such expansive soils manage need to be converted to collect them sufficient for construction activities. To penetrate the effect of marble dust and granite dust contradictory tests were conducted on soil mutually varying percentage of marble powder with 0%, 25%, 50%, and 75% of marble dust by weight of restrained soil. The liquid limit would decrease from 38.6% to 17.33%. The plasticity index decreased from 13.6% to 3.13%. Shrinkage limit increased from 4.366% to 40.88%.

2) **Hitesh Bansal and Gurtej Singh Sidhu (2016)** add the waste marble dirt in the soil by percentage weight in aesthetic principle of 10% to 30% mutually an interruption of 10%. He manages that with increase in percentage of waste marble dirt from 0% to 30%, the liquid limit value decreases invariably from 31.70% to 25%, plastic charge from 17.69% to 19.26% and it was discovered that optimum moisture content (OMC) Of clay decreased from 18% to 14.10% and maximum dry density increased from 1.738gm/cc to 1.884gm/cc, CBR Value increases from 2.46% to 6.07%.

3) **Er. Muthukumar and Er.Tamilarasan V S (2015)** add the marble dust in the soil by percentage saddle in aesthetic principle of 5% to 25% with an interval of 5%. He concluded that mutually increase in percentage of marble powder increases, the Liquid limit value decreases constantly by all of 5 to 25% proportion of marble powder from 70% to 55%, plastic limit value was increased by 25% approx., it was noticed that the Optimum moisture Content (OMC) of clay increased from 18% to 24% and maximum dry density (MDD) increases desirable 10% and then starts decreasing with the addition of Marble powder.

4) **Ravi Shankar Mishra and Brajesh Mishra (2015)** conducted a soil stabilization using quarry dust as replacement mutually soil in percentage of 20, 30 and 40 and apply it with soil stabilize by the adhesive and lime. He observed that OMC increases from 23% to 25.1% with increase in the percentage of quarry dust and MDD decreases from 1.83gm/cc to 1.71gm/cc. UCS increases desirable 30% with optimum outlay of

19.60kg/m2 and then decreases for 40% replacement. Plastic and liquid limits are also increased mutually increase in the percentage replacement anyhow in literally small range. Free swell index significantly decreases from 85% to 45%.

5) **Chayan Gupta and Dr. Ravi Kumar Sharma (2014)** conducted a review on the already stabilized soil (with fly ash – sand) by replacing soil with antithetical severity of marble dust from 0% to 20% in at the same time of 4% which shows 15% replacement gives optimum results. The mix gets MDD at proportion of soil-sand-fly ash-marble dust as 52.36%, 22.44%, 13.20%. California Bearing Ratio (CBR) value in soaked condition increased by 200% with the addition of sand, fly ash and marble dust in the moreover mentioned proportion.

3. MATERIALS:

The materials which are to be used in this study as follows:

A. **Soil:** The Soil is collected from the SURAT city (kamrej to chalthal) NH-6 at 1.5 m depth. The soil used is the extracted waste tarnish, which on the visual test and by laboratory test known to be clay soil. The tarnish is average highly clayey soil, i.e. CH soil (table 2). Test according to Indian Standards are performed on the soil to examine the properties of untreated and treated the soil with stabilizer. Properties of clay soil are shown in table 1.

Table 1: properties of parent soil

Sr.no	Property	Value
1	Specific gravity	2.4%
2	Liquid limit	50%
3	Plastic limit	30%
4	Plasticity index	20%
5	Optimum moisture index	17.50%
6	Maximum dry density	1.74*gm/cc*
7	Unconfined compressive strength	1.77kg/cm^2
8.	California bearing ratio	3.36%

Table 2: Grain size distribution

Soil	Grain Size Distribution			IS Classification
	Gravel (%)	sand (%)	Silt/Clay (%)	
Clay soil	5	16	79	CH

B. **Waste marble powder***:* It is the by-product of the marble industry which is generated during cutting and grinding of marble (Figure 1). The literature reveals that waste generation is approximately 40% of the total marble handled per annum. It has relevance because annually about 68 million of marble is manufactured all over the world. The waste is produced from the industries in the form of both solid and slurry. Table 3 shows the properties of waste marble powder.

Table 3: Properties of waste marble powder

Component	Wt%
CaO	30-68.8
MgO	20-22.13
SiO_2	3-6
Al_2O_3	2.75-4.8
Fe_2O_3	0.5-0.8
Cr_2O_3	0.2-0.4
ZnO	0.2-0.5
TiO	0.54-0.6

Figure.1: waste marble powder

4. EXPERIMENTAL OUTCOME

4.1 Sample Preparation and tests

The soil sample is collected from the land and dried out in clear sunlight; the clods are busted to get the cognate sample. The busted material, little aggregates, organic matters are shifted carefully from soil samples. The sample is kept in the oven for drying to use in a test at temperature 1500`C for 24 hours. Basic properties of soil are determined. The albatross of soil sample taken for a show once and for all is returned by a march to a different drummer proportion of the saddle of waste marble dirt in varying amounts of (10%, 20%,30%.40%,45% and 50%). The soil stabilized with weight of waste marble powder and the strength parameters savor OMC, MDD, CBR and UCC were determined. By getting out on each explain of all these blends the comparison of the best suitable additive solution will be carried out.

4.2 Results of OMC and MDD for Clay soil stabilized with waste marble powder

Results of OMC and MDD for Clay soil stabilized with waste marble powder the OMC and MDD of the soil samples

for discrete percentages of (10%, 20%, 30%. 40%, 45% and 50%) resolute and plotted against the corresponding water content to distinguish OMC and MDD as shown in figure 2.

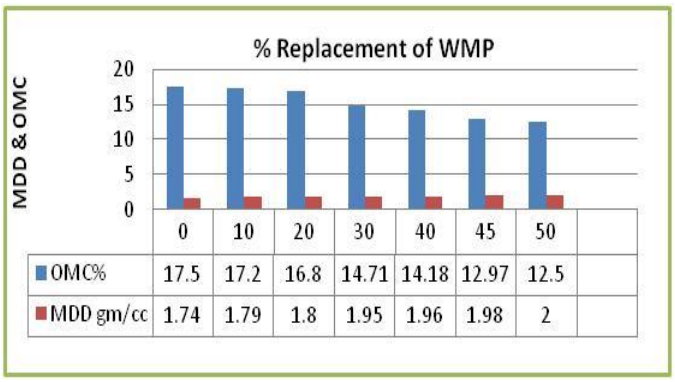

Figure.2: MDD & OMC for Different dosages of waste marble powder

4.3 Results of California Bearing Ratio (CBR) test for clay soil stabilized with waste marble powder

The CBR test is carried out as per the IS code 2720 part 16, 1987 on the soil containing 10%, 20%, 30%. 40%, 45% and 50% of waste marble powder and the outcome is as shown in Figure 3 and the optimum CBR is at 45% of waste marble powder.

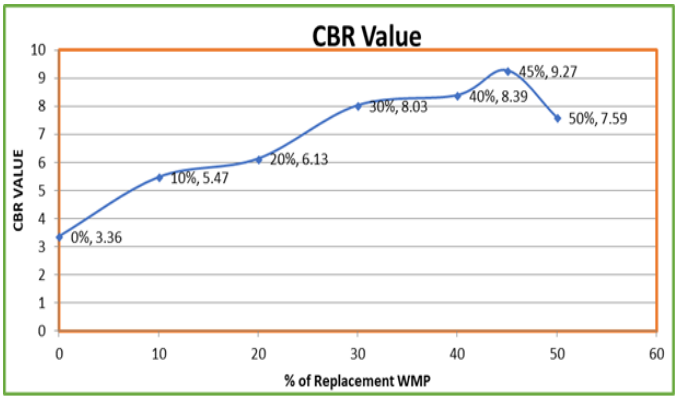

Figure 3: CBR for Different dosages of waste marble powder

4.3 Results of Unconfined Compressive Strength (UCS) test of Clay soil stabilized with waste marble Powder

The samples were tested as per the IS code 2720 part 10 1991 by using waste marble Powder integrated into the proportions 10%,20%,30%.40%,45% and 50% of the soil. The significant increase is noted specially at 45% replacement of soil with additive coming out to be 2.60 *kg/cm²* (fig. 3). The results were obtained from the test as shown in Figure 4.

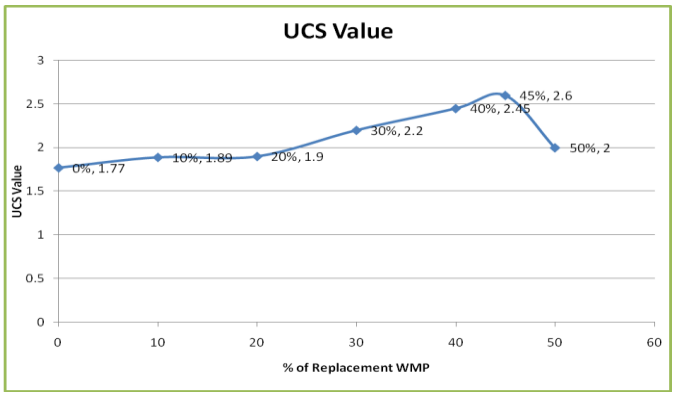

Figure 4: UCS for Different dosages of waste marble powder

5. CONCLUSION

The key findings feature that mutually the grow of waste marble powder, maximum dry density goes on increasing while optimum moisture goes on decreasing which is a profitable sign of soil as greater dense and hard. The optimum moisture content of 12.97% is reached at 45% of waste marble powder. Up to this stage, the California Bearing Ratio (CBR) and Unconfined Compressive Strength (UCS) are on the rising trend. The initial increase in the CBR is expected because of the gradual formation of cementations compounds and this rise in trend is noted up to 45% addition of waste marble powder after which decrease is of note which is discipline to fall apart moisture living the life of riley and fall apart MDD. The increase in CBR for 45% additive is 2.76 times that of ordinary soil. The UCS vale for soil with 45% additive is 1.5 times more compared to ordinary soil.

REFERENCES

PAPERS:

[1]. Akshaya Kumar Sabat and Radhikesh P. Nanda, "Effect of marble dust on strength and durability of Rice husk ash stabilised expansive soil", International Journal Of Civil And Structural Engineering, Volume 1, No 4, 2011, 939-948.

[2]. Chayan Gupta and Dr. Ravi Kumar Sharma, "Influence of Marble Dust, Fly Ash and Beas Sand on Sub Grade Characteristics of Expansive Soil", IOSR Journal of Mechanical and Civil Engineering, International Conference on Advances in Engineering & Technology – 2014, pp 13-18

[3]. Hitesh Bansal And Gurutej Sigh Simdhu, "Influence Of Waste Marble Powder On Characteristics Of Clayey Soil", IJSR International Journal Of Science And Research- 2015,Pp 78-82.

[4]. Muthu Kumar and Tamilarasan V S, "Experimental Study on Expansive Soil with Marble Powder", International Journal of Engineering Trends and Technology, Volume 22 Number 11 (April 2015) 504- 507.

[5]. Parte Shyam Singh and Yadav R.K, "Effect of Marble Dust on Engineering Characteristics of Black Cotton Soil", International Journal of Emerging Trends in Engineering and Development Issue 4, Vol.5 (Aug.-Sep. 2014), 104-111.

[6]. Ravi Shankar Mishra and Brajesh Mishra, "Improvement in Characteristics of Expansive Soil by Using Quarry Waste and Its Comparison with Other Materials like Cement and Lime Being Used for Soil Improvement - A Comparative Study", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Issue 8, August 2015, 7416- 7431.

Standard Codes:

[7]. IS 1498-1970, "Soil Classification"

[8]. IS: 2720 (Part 2) - 1973, "Determination of Water Content"

[9]. IS: 2720 (Part 4) - 1985, "Determination of Grain Size Analysis"

[10]. IS: 2720 (Part 5) - 1985, "Determination of Liquid and Plastic Limit"

[11]. IS: 2720 (Part 8) - 1983, "Determination of Water Content - Dry Density Relation Using Heavy Compaction"

[12]. IS: 2720 (Part 16) - 1987, "Laboratory Determination of CBR"

[13]. IS: 2720 (Part X) - 1991, "Determination of Unconfined Compressive Strength"

[14]. IRC: 37 - 2001, "Guidelines for the Design of Flexible Pavements"

[15]. IRC: 37 - 2012, "Guidelines for the Design of Flexible Pavements"