JIRET Vol.: 02 II Issue 01 II Pages 05-07 II Jan 2018

Stabilization of Expensive Soil by Using Marble Slurry

Jyoti Choudhary
Department of Civil, Government Polytechnic College, Alwar (Rajasthan)
E-mail: jyoti.alw1979@gmail.com

ISSN - 2456-7841

Abstract: Soil is the most important engineering material that is used in construction industries. Geological cycle continually taking place on the face of the earth that results in the formation of soil. Thus depending upon their geological formation, the soils of India have been classified as Red soil, Regur soil, Alluvial, Marshy etc. Among them one of the most important soil is 'Expansive soil'. In this paper we performed the physical properties and engineering properties of two samples of expansive soils (Kota local & Anta) and also the ash, ash time with the soils in different percentages. The main scope of paper is to study the effect of coal ash & (coal ash+ lime) on the various physical and engineering properties of expansive soils when they are mixed individually in different percentages in the soil as well as when their different combinations are mixed in the soil. It also aims at finding an optimum combination which can be practically used in the field in one form or the other such as CNS layer, base course,sub-base course etc.

http://www.sijiret.com/

Key Words: - Expensive Soil, Marble slurry, Coal ash, Lime, Stabilization etc.

ISSN - 2456-7841

http://www.sijiret.com/

INTRODUCTION

Expansive soil deposits in India are a boon to farmers but a problem to civil Engineers. Civil Engineering structures appearance large-scale damages due to heaving accompanied by loss of strength of these soils during rainy season and shrinkage during summer. Actually "Expansive soils" are those which swell considerably on absorption of water from outside and shrink on the removal of water. Although the phenomenon of swelling and shrinkage is not uncommon with most of soils (except sand and gravels), it is exhibited to a very marked degree only by certain clayey soils and hence, the term expansive soils are "Black-Cotton" soils or Regur soil" The responsible clay particles for swelling are monte and combination of montmorillonite and illite.

Due to the swelling and shrinkage, the volume changes associated with Black Cotton soil, which liable to cause considerable distress to structures involving their use or coming in contact with them Building cracks, Canal lining slides, beds of canals heave, roads get rutted and retaining structures etc. Basically the problem has assumed economic importance at the national plane, as approximately one third of the surficial deposits of the country are of Black Cotton soil These deposits are predominantly fall in the Deccan Plateau .The major states are Gujarat, Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu and MP. All these states are engaged in increasing the irrigation potential of their states. Heavy investments are made for the construction of dams, canals, cross drainage structures, roads and buildings. Several Kilometers of canals, large no. of dams & embankments are also constructed in these regions needing gigantic quantities of earth for construction.

The engineering properties of expansive soils were enhanced by various soil stabilization methods. These methods are able to create or improve desired properties in a weak soil to render it stable and useful for a specific purpose [2]. The improvements in engineering properties can include increase in soil strength (shear resistance), stiffness (resistance to deformation) and durability (wear resistance), reduction in swelling potential and plasticity of soil and other desirable characteristics [3].

Variation of expansive soil with depth varies from place to place and also depends upon environmental conditions. Natural deposits of expansive soil in the field are characterized by a general pattern of cracks. The soil profile averages about 1.0m in thickness, but in transported regions, it may be as much as 8.0m deep. According to the depth and deposit places its properties also vary.

It is clear that various types of civil engineering activities are taking place on black cotton soil deposits of civil engineering are taking. These activities increasing during the past few plan periods. To solve the problems arising out of these deposits to

ISSN - 2456-7728

http://www.sijiret.com/

civil engineering structure, several researchers are going on to understand the behavior of "black cotton soil". The black cotton soils, also known as "regurs". Their name is derived because of their black color & immense fertility for growing cotton, is one of the important residual soils of India. The black color is not due to the presence of organic matter, which is negligible but may be due to the presence of iron (Fe) & titanium (Ti) that exist in small quantity.

We can use marble slurry in soil foundation to increase soil physical and engineering properties of the expansive soils when they are mixed individually in different percentages in the soil as well as when there different combination are mixed in the soil. The marble slurry is a waste of marble which is got by marble work. Marble slurry is harmful for environmental hazards but also occupies enormous agriculture land, which could have been otherwise use for many other purposes. Some problems also associated with the marble slurry which is used with the "Expansive soil".

- High cost of transportation
- Uncertainty of product marketing for the user
- Quality of marble slurry in terms of unburnt coal

MATERIALS AND METHOD

Marble Slurry:

Marble slurry is disposed of several methods depending upon the methods of disposal.

Soil:

Sample of soil is collected is follows:

- Kota Local
- Anta (N.T.P.C.)

Water:

Potable tape water available from municipal supply was used. It was checked in found that the water was free from suspended impurities and it's pH is lies in between 6.5 to 8.5.

The clay soil was dried and then pulverized, and sieved through 4.75 mm sieve and 75 micron for different tests to determine its physical and mechanical properties. The soil samples for UCS tests were prepared and compacted at maximum dry density and optimum moisture content. A laboratory testing program was conducted on soil mixed with MWP at different contents 0%, 5% and 10% of dry soil weight. Soil- Marble slurry samples were subjected to laboratory experiments include Atterberg's limits (liquid limit and plastic limit), standard proctor, unconfined compression strength and free swell. The tests were performed in accordance to BS

Table 1: The properties of the soil studied addition of marble slurry 10%

Before	**After**
The liquid limit of sail is 18.40%	The liquid limit of soil is 23.80%
The plastic limit of soil is 15.33%	The plastic limit of soil is 19.10%
0¨°≥¥€Gπ ÆŠ•∏)∞: 7 Ď-W_p= 3.07%	Plasticity index Ip = WĎ¯W_p= 4.70%
Consistency index Ic = W_L- W / I_p= 5.34%	Consistency index Ic = W_L- W / I_p= 4.63%
Liquidity index I_L = 100- Ic = 94.66%	Liquidity index I_L = 100- Ic = 95.27%

Table 2: The properties of the soil studied addition of marble slurry 5%

Before	**After**
The liquid limit of sail is 18.40%	The liquid limit of soil is 21.12%
The plastic limit of soil is 15.17%	The plastic limit of soil is 17.20%
0¨°≥¥€Gπ ÆŠ•∏)∞: 7 Ď-W_p= 3.07%	Plasticity index Ip = WĎ¯W_p= 3.92%
Consistency index Ic = W_L- W / I_p= 5.34%	Consistency index Ic = W_L- W / I_p= 5.13%
Liquidity index I_L = 100- Ic = 94.66%	Liquidity index I_L = 100- Ic = 94.87%

RESULTS AND DISCUSSION

A critical behavior of expansive soil can be analysis by studying certain parameter of the soil and marble slurry mix ie. the physical properties of the samples taken from to different experiments. In this paper the various results are summarized which can be obtain by conducting the laboratory test. The various curves are drawn from the test results. In this paper, it is also discussed about the use of marble slurry. It is so being tested with different percentages of the stabilizer with the expansive soils samples.

We can analysis the test data of the plastic limit, liquid limit, plasiticity index, consistency index, liquidity index. After adding marble slurry in the soil we find that:

1. Liquid limit is firstly increase and continuously increased when the increase of percentage of marble slurry.

2. Plastic limit is same as increase.

3. Liquid limit (10% marble slurry) = 23.80%

Plastic limit (10% marble slurry) = 19.10%

ISSN - 2456-7841
http://www.sijiret.com/
ISSN - 2456-7841
http://www.sijiret.com/
ISSN - 2456-7728
http://www.sijiret.com/

Then Ip= 23.80-19.10=4.70%

4. Ic = (WL-W)

Ip

1c= 4.63 Then soil property is soft.

5. 1L =100-4.63= 95.27% then it is liquidity index.

The present investigation gives an idea about the index properties of the expansive soils. According to this expansive soils swell due to presence of marble slurry. The property of soil can be improved by adding marble slurry. The different percentages of marble slurry and soil plus marble slurry with the expansive soil have given appreciable results.

1. From the liquid limit tests are following inferences are down:

(a) The liquid limit of soil sample are continuously increased by adding the marble slurry

(b) Plastic limit of the soil sample increased of addition of marble slurry.

Two main reasons were identified for not using marble slurry

(a) A lack of knowledge about the application of marble slurry. The development of marble slurry is more driven by universities then by private industries consultants etc.

(b) Another issue was conservative people do not have the will to change and apply daring innovative solutions. Traditions methods dominate.

REFERENCES

1. Zumrawi M.M.E, Awad M, Effect of Bitumen and Fly Ash on Expensive Soil Properties, Journal of Scientific and Engineering Research, 4(9): 228-237, 2017.
2. Bhavsar S.N, Patel A.J, Analysis of Clayey Soil using Waste Material. Int. J Innov. Res. Sci. Technol. 1(6):125–130, 2014.
3. Zumrawi M.M.E, Eltayeb K.A, Laboratory Investigation of Expansive Soil Stabilized with Calcium Chloride. Int. J. Environ. Chem. Ecol. Geol. Geophys. Eng. 10 (2), 2016.
4. Okagbue C.O, Onyeobi T.U.S, Potential of marble dust to stabilize red tropical soils for road construction. J. Eng. Geol, 53(3-4): 371–380, 1999.
5. Ali R, Expansive Soil Stabilization Using Marble Dust and Bagasse Ash, Journal of Science and Research (IJSR), 3(6): 2812–2816, 2014.
6. Minhas A, Soil Stabilization of Alluvial Soil by using Marble powder, Int. J. Civ. Eng. Technol, 7(5): 87–92. 2016 Parameters for the Surat Region", Indian Geotechnical Conference
7. Dr. B.C. Punamia, Arun Kumar Jain & Ashok Kumar Jain "Soil Mechanics and Foundation"
8. Chee-Ming Chan and Meei-Hoan Ho, "The Potential of Using Rubber chips as a Soft Clay Stabilizer Enhancing Agent", Postgraduate Incentive Research Grant, University Tun Hussein Onn, Malaysia. 2010
9. Dr. K.R. Arora "Soil Mechanics and Foundation Engineering"
10. Berawala K. S. and Solanki C. H., "Empirical Correlations of Expansive Soils. 2010.

ISSN - 2456-7841 http://www.sijiret.com/ ISSN - 2456-7728 http://www.sijiret.com/