

Study on Stabilization of Expansive Soil by using Marble Dust with Sisal Fiber

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ABSTRACT

- Soil is very important in civil engineering constructions. The poor engineering properties of the local soils may present many difficulties for construction and therefore need to improve their engineering properties. Stabilization techniques can be used to improve the properties of soil.
- Soil stabilization improves various engineering properties e.g. bearing capacity, compressibility, strength, and various other properties of soil. In this study the impact of Marble Dust to improve the strength of soil.
- The effect of varying percentage of marble dust with sisal fiber on properties of Expansive Soil.

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INTRODUCTION

Expansive soil is found in the central part of the country. It is found in the state of Maharashtra, Madhya Pradesh, Karnataka, Andhra Pradesh, Tamil Nadu and Uttar Pradesh. This soil has been formed from basalt or traps and contains the clay minerals montmorillonite. Basically the black cotton soil has fine-grained clay particles which cause a massive change in volume with change in moisture conditions, i.e. it swells excessively when wet and shrinks during dry period. Hence black cotton soil is also known as expansive soil.

Marble dust

Marble has been commonly used as a building material since the ancient times. Consequently, Marble waste as a by-product is a very important material which requires adequate environmental disposal effort. In addition, recycling waste without proper management can result in environmental problems greater than the waste itself.

Marble dust is a waste product formed during the production of marble. A large quantity of powder is generated during the cutting process. The result is that about 25% of the original marble mass is lost in the form of dust. Leaving these waste materials to the environment directly can cause environmental problems such as increase in the soil alkalinity, affects the plants, affects the human body etc.

Sisal fibers

A large part of Central India and a portion of South India are covered with Expansive soils. These soils have high swelling and shrinkage characteristics and extremely low CBR value and shear strength. Hence, there is need for improvement of these properties. The present study is aimed at determining the behavior of Expansive soil reinforced with Sisal fiber in a random manner. The soil used is a type of Expansive soil collected. The fibers are cut to different lengths (1.5cm to 3.0cm) and mixed randomly with soil in varying percentages 0.50% by dry weight of soil and compacted to maximum dry

density at optimum moisture content. The test results indicate a reduction in the maximum dry density and the optimum moisture content of soil due to the addition of sisal fiber.

The objectives of the research are outlined below:
 ➤ To study the combined effect of varying percentage of optimum quantity of Marble dust and optimum quantity of Sisal Fiber on properties of Soil.

Objectives

Results

Modified Proctor’s Test Results for Soil MD mix with different fiber concentration and fiber.

The changes in properties are also very high and MDD value achieved is up to 1.97gm/cc at fiber density concentration of 0.50 percent.

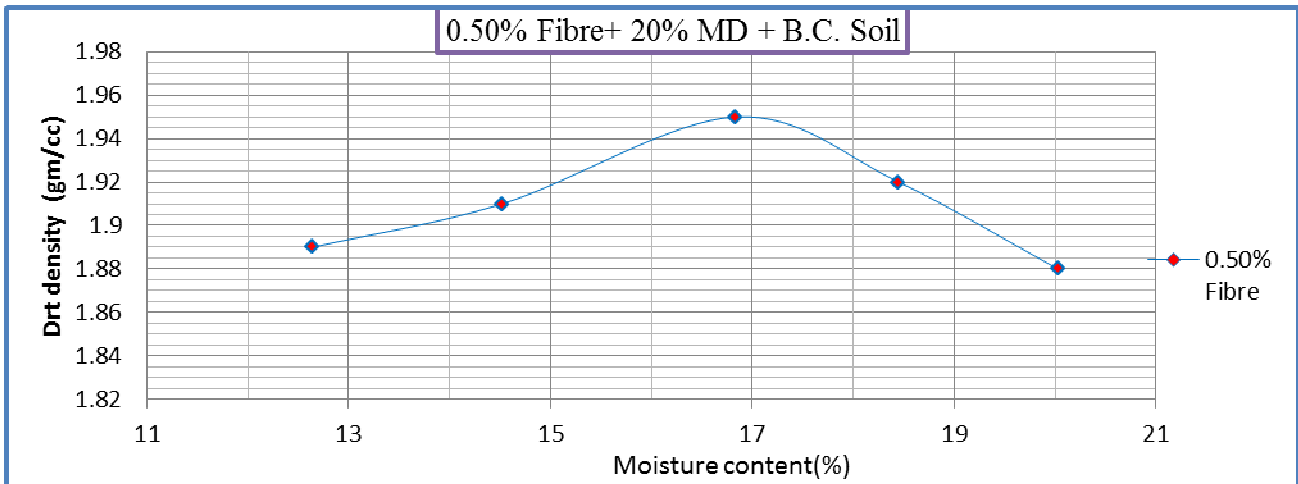


Figure 1: MDD and OMC graph for 0.50 percent fiber and 20 percent MD mixed with B.C Soil

From the analysis of results presented in Table 5.5, it is evaluated that there is gain in change & results are slightly lower than previous maintained. From these last outcomes, it is evaluated that rate of increment in engineering properties of mix or combination is high, but after that properties get lowered down. Thus, outcome is that the fiber concentration where highest result is obtained is at 0.5% Fiber + 20 % MD + Expansive soil sample.

California Bearing Ratio (CBR) Test

The CBR Tests were executed out on clayey soil (B.C Soil), Clayey Soil treated with altered percentages of marble dust ranges from 0 % to 20 %, then Soil- marble dust mix with altered fiber concentration 0.50 % and then soil- marble dust -fiber mix. The tests were executed out by static compaction after four days soaking in water

CBR Test Results for Clayey Soil, Clayey Soil treated with varied percentage of MD

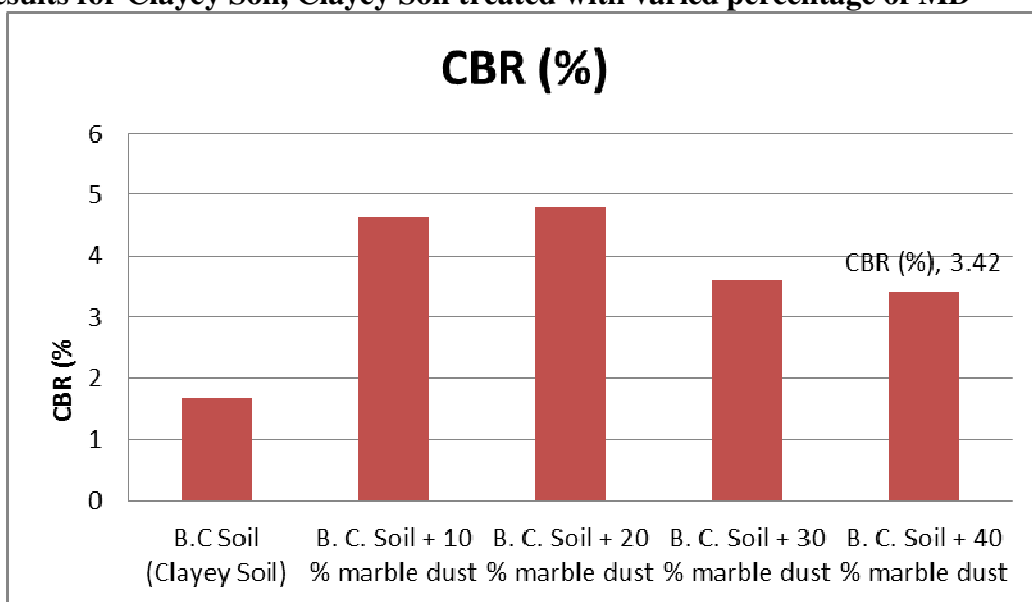


Figure 2: CBR graph for Clayey Soil, Clayey Soil treated with Marble dust

At 20 % MD .50% Fibre mix with B.C soil, CBR value of soil gets increased from 1.68 to 4.79 at OMC of 16.84 % and MDD of 1.97gm/cm³.

Combined results .50% fiber with 20 percent MD in B.C Soil

Properties	20% MD + B.C Soil + 0.50% Sisal Fiber
M.D.D. (gm/cc)	1.97
O.M.C. (%)	16.84
CBR (%) (Soaked)	6.96

Conclusion-

Based on the experimental investigation the following conclusion is given within the limitation of the test result.

- Soaked CBR value of 20% marble dust mixed soil raises up to 0.50% fiber content and after this value starts decreasing.
- In above study, Expansive soil was used and favorable quantity of Marble dust and Sisal fiber are 20% and 0.50 % respectively for achieving maximum soaked CBR.

Future scope of work

- In Further different fibers as reinforcing & treating with other chemicals like lime bitumen & other mixtures & also studying the changed Physico-mechanical & chemical properties of Expansive soil.

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