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EXPERIMENTAL INVESTICATION OF SOIL STABLIZATION BY USING COIR FIBRE AND GGBS POWDER

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Abstract: Soil is the major and most commonly used material in the filled of civil engineering. Where it is used construction, bricks, pavements. We are used in foundation .It should be provide considerable strength for the stability of the structure. The Study includes the properties of coir fibre and clay soil experimental workouts such as stress states during a California Bearing Ratio, Unconfined Compressive Test. Some situations construction of the clay soil not avoidable one therefore soil stabilization is one of the most commonly method to increase the engineering properties of soil ,As a result of stabilization , the bearing capacity of foundation of the structure is increased and its strength, water tightness, resistance to washout, it is also not affect for environment condition. The percentage of coconut coir fibre by Dry weight of soil is taken as 0.5%, 1%, 1.5%, 2%, 2.5%.The investigations showed that generally the engineering property which includes with addition of GGBS Powder. GGBS are added from 10%, 20%, 30%, 40%.The Maximum dry density increased and the optimum moisture content decreased with increasing GGBS content and at 40%.We get the maximum value of dry density.

Key Words:Experimental study, Stabilization, Clay Soil, Coir Fibre, GGBS Powder.Unconfined Compressive Strength Test, CBR Test.

I. INTRODUCTION

Soil stabilization in its general meaning considers every physical and chemical method employed to make a soil suitable for its required engineering purpose. In its specific meaning in foundation engineering, soil stabilization is a process to improve the soil strength by using additives in order to use as a foundation and carry the expected the loads. As the quality of a soil layer is increased, ability of that layer to distribute the load over a greater area is generally increased so, that a reduction in requirement thickness of the soil and surface layer may be permitted. The most common improvement achieved through stabilization include better soil gradation ,reduction of plasticity index or swelling potential, and increases in durability and strength. In wet weather, stabilization may be also the used to provide a working platform for construction operations. This type of soil improvement are referred to as soil modification or soil stabilization. The soil must first the classified as either a subgrade category or base category material.

Coir Fibre

There are many types of waste material found in in India like coal ash, stone quarry, plastics, recycled aggregate, geo synthetic materials and polythene bags,…etc. But coconut coir fibre is used in this research paper. The coir fibre is elastic enough to twist without breaking. So,this coir fibre waste can be used in stabilization of clay soil and its can be effective disposed off. Main advantage of coir material is this locally available and it is very cheap. This is bio degradable and hence do not created disposal problem in environment. The work has been done on the strength deformation behavior of fibre reinforced soil and it has been established beyond doubt. That addition of fibre in soil improves the overall engineering performance of soil. Fibre mixed with soil as been used in many countries in the resent past and further research is in progress for many hidden aspect of it. The number of an unsoaked and soaked CBR value and Unconfined compressive strength test have been conducted on soil and soil mixed with varying amount of coir fibre 0.5%, 1%, 1.5%, 2%.

Ground Granulated Blast Furnace Slag (GGBS)

Improve the properties of the existing materials by incorporating some other materials; This process is known as "soil stabilization ". The most approximate method will usually determine by economic consideration, for example with may be cheaper to stabilize a soil using relatively expansive additives rather then excavate and dispose of unsuitable materials and place suitable fill,as well as the properties of subgrade.

II. TESTING PROCEDURE

For studying, the effect of coconut coir fibre and GGBS powder on expansive soil, the coconut coir fibre was added from 0.5 to 2% and added from GGBS are 10% to 40%.The following test were conducted on expansive soil, coconut coir fibre and GGBS as per relevant IS code practice.

The experiments conducted are:

1.) Specific gravity test
2.) Compaction characteristics
3.) California Bearing Ratio test
4.) Unconfined compressive strength test
5.) Liquid limit test
6.) Plastic limit test

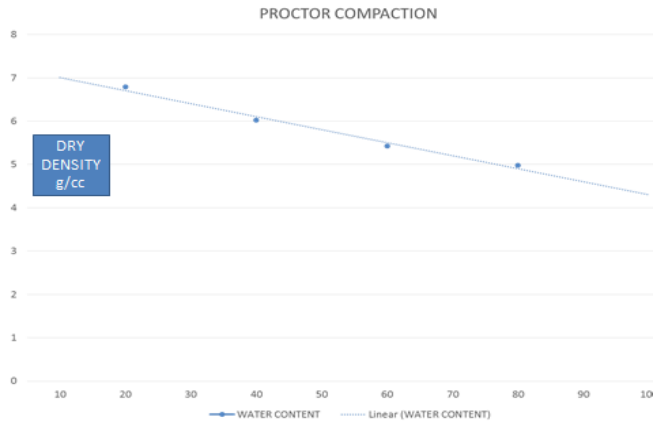
Table -1: Physical Characteristics of clay soil

S.NO	PROPERTIES OF CLAY SOIL	TEST VALUE
1.	Specific Gravity	2.08
2.	Liquid Limit(%)	82.92
3.	Plastic Limit(%)	33

4.	Proctor Compaction Test Optimum moisture content(%) Maximum dry density(g/cc)	20 6.79
5.	Unconfined Compressive Strength Test	1.25
6.	California Bearing Ratio Test	4.72

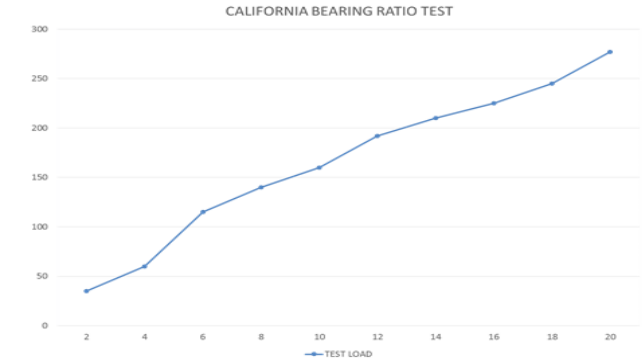
Fig -1: MATERIALS:

Chart-1:PROCTOR COMPACTION

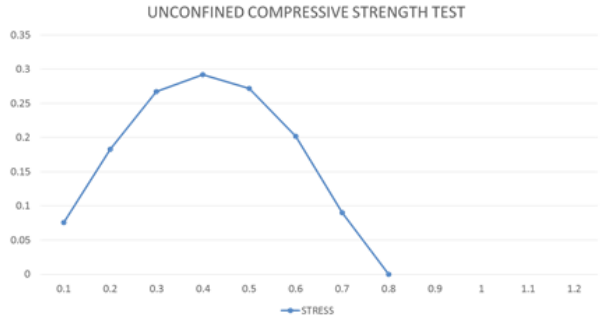


20= Water content
1=Dry density

CHART -2



50=Test load
CHART-3



0.05=Stress
0.1=Strain

2.1. TEST RESULTS OF MATERIAL CLAY SOIL (50%), GGBS (40%) AND COIR FIBRE (10%) ADDED

The various tests wear conducted on expansive soil mixed with coconut coir fiber in different proportions as per relevant IS code of practice. The test results obtained from various laboratory investigations are summarized.

TABLE 2-RESULTS OF MATERIAL CLAY SOIL (50%), GGBS (40%) AND COIR FIBRE (10%) ADDED

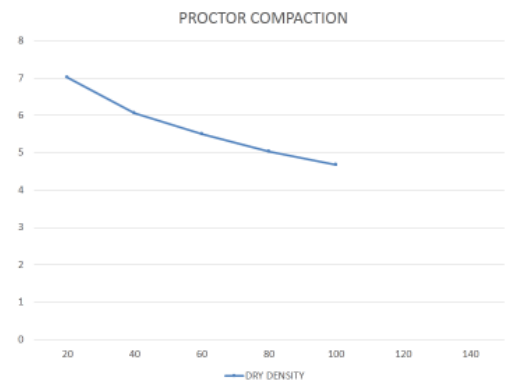
S.NO	PROPERTIES	TEST RESULT
1.	Specific Gravity	2.68
2.	Proctor Compaction: Maximum Dry Density(g/cc) Optimum Moisture Content %	 7.09 20
3.	Liquid Limit Test- Flow Index(I) -	76 115.03
4.	Plastic Limit Test (%)	44.46
5.	California Bearing Ratio(CBR) (%)	6.02
6.	Unconfined Compressive Strength kg/cm³	2.321

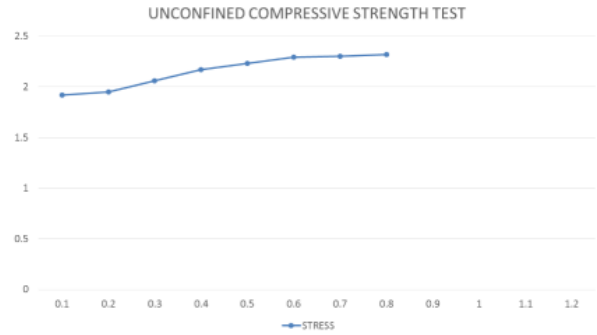
2.2 SPECIFIC GRAVITY TEST

Soil with various amounts of GGBS (0 to 40%) and coir fiber (10%) added to determine effect on the specific gravity of soil.

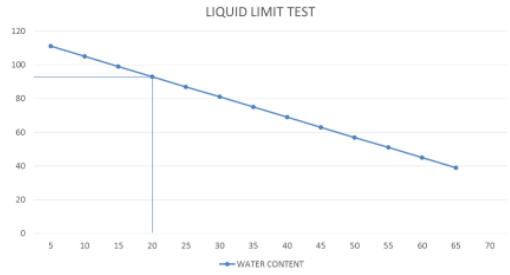
2.3 PROCTOR COMPACTION TEST

Standard proctor compaction test wear used to establish the dry density –moisture content relationship and carried out the test of soil with various amounts of GGBS and coir fiber added consider the effect of GGBS (0%to 40%) and coir fiber (10%) on optimum moisture content and maximum dry density the test of soil.



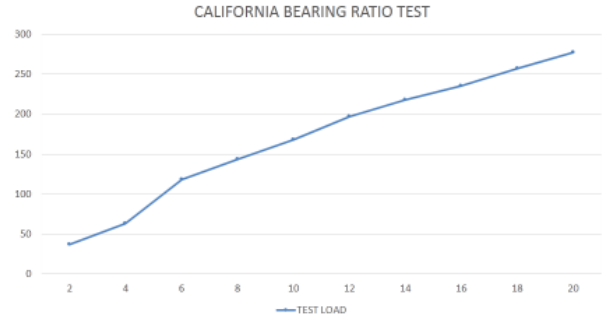


2.4 LIQUID LIMIT TEST



2.4 CALIFORNIA BEARING RATIO TEST (CBR)

Soil with various amounts GGBS (0 to 40%) and coir fiber (10%) added to determine the effect on California bearing ratio test of soil.



2.5 UNCONFIND COMPRESSIVE STRENGTH TEST

Soil with various amounts of GGBS (0 to 40%) and coir fiber (10%) added to determine the effect on compressive strength of soil.

III. CONCLUSIONS

By analysis of result the following conclusion may be drawn:

- With the increases of GGBS and COIR FIBER percentage optimum moisture content goes on decreasing while maximum dry density goes on increasing, hence compatibility of soil increases and making soil more dense and hard
- With percentage increases of GGBS and COIR FIBER specific gravity goes on increasing, thus making the soil denser
- With the increases of GGBS and COIR FIBER percentage, percentage finer goes on decreases, which strengthens the soil.
- With the increase of GGBS and COIR FIBER percentage liquid limit increase and plastic limit decreases, which makes the soil less plastic and hence plasticity index reduced.
- With the increases of GGBS and COIR FIBER percentage compressive strength increases that means arrangement of soil particles are very closely, which reduce the voids.
- CBR value for increase in percentage of GGBS and COIR FIBER that show the densification of soil takes place and more suitable for foundation.
- If GGBS and COIR FIBER percentage increases CBR value, compressive strength are also increased.

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