

SOIL STABILIZATION USING INDUSTRIAL WASTE

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ABSTRACT:

Due to rapid increase in urbanization, the lands are required essentially. The role of land in developments is very important. For the development of any country or nations sufficient land should be available, but the land resources are limited. Some of them are suitable for structures or buildings, but there are some land resources which are not suitable for structures for example soft soil. Soft soils have low bearing capacity. Due to this reason, it is not suitable for structures. The bearing capacity of soft soil can be maximize are increased with the help of some industrial wastes and by using some methods. Soils are made stronger and more durable by mixing additive materials. In particular, the use of waste provides environmental and economic advantages for this case. Wastes form in large quantities, however, which create storage problems. The main objectives of the soil stabilization is to increase the bearing capacity of the clay soil, it's resistance to weathering process and soil permeability. IS: 10500-2012..

Key words: *Black cotton, soil stabilization, bagasse ash unconfined compressive strength test, standard proctor test.*

1. INTRODUCTION:

Improvement of physical, hydraulic, mechanical and chemical properties of poor soil is called soil stabilization. India produces an enormous amount of different types of waste materials as byproducts from

different sectors like industrial, agricultural, etc. These waste materials if not deposited safely it may be hazardous. The amount and type of waste generated increases with increase in population. These wastes remain in the environment for longer duration since it is unused. Waste materials such as industrial waste sand, rice husk, wheat husk offer a cheaper method for stabilizing marginal soils. As an added benefit, utilizing waste materials in soil stabilization applications keeps these materials from being dumped into Landfills, thereby saving already depleting landfill space. In many set of circumstances, road service layers, foundation layers and construction material cannot utilize the soil directly. The rising cost of the land and huge demand for high rise buildings makes the improvement of soil at a site unavoidable. Therefore, it is required to revamp the quality of the soil. The expansive soil used in this research also known as black cotton soil.

OBJECTIVES: The main objectives of conducting this study include:

- The main objective of the study is to enhance the quality of the soil using the rice husk ash and sugarcane straw waste.
- Addition of such material will enhance both physicals well as chemical properties of the soil. This research undertakes the use of agricultural waste in stabilizing black cotton soil, various attempts have been made to improve the strength of soil using different chemical

additives in combination with straw ash. Therefore, by using agriculture waste various properties of soil are improved.

- The physical properties of soil include horization, color, texture, structure, consistency and bulk density.
- The chemical properties consist of soil cation exchange and soil reaction that is pH value.

COLLECTION OF MATERIALS:

- Black cotton soil
- Industrial waste sand
- Rice husk ash
- Bagasse ash
- Wheat husk ash industrial waste is collected

2. METHODOLOGIES:

- Collection of materials.
- Tests conducted on Black cotton.
- Partial replacement of Black cotton soil with Bagasse ash intervals of 2.5%, 5%, 7.5%, 10%, to get optimum strength compared to 0%.
- Compare the Index, Engineering properties and strength parameter of Black cotton soil, with and without replacement of Bagasse ash .
- Results and Discussions
- Conclusion

3. EXPERIMENTAL INVESTIGATION

these experiments were conducted in project

- Specific gravity
- Liquid limit
- Plastic limit
- Plastic index
- Proctor compaction test
- California Bearing Ratio test

4. ADVANTAGES:

- It improves the strength of the soil, thus, increasing the soil bearing capacity.
- It is more economical both in terms of cost and energy to increase the bearing capacity of the soil rather than going for deep foundation or raft foundation. It is also used to provide more stability to the soil in slopes or other such places.
- Sometimes soil stabilization is also used to prevent soil erosion or formation of dust, which is very useful especially in dry and arid weather.
- Stabilization is also done for soil water-proof; this prevents water from entering into the soil and hence helps the soil from losing its strength.
- It helps in reducing the soil volume change due to change in temperature of moisture content. Stabilization improves the workability and the durability of the soil.

5. RESULT:

it has been observed that with increasing the percentage of SCBA in black cotton soil, the degree of expansiveness decreases. The value of DFS for black cotton soil is determined 55% and in addition SCBA. The maximum dry density and optimum moisture content is 1.708 gm/cc and 18.2% determined but when 5% SCBA is added in black cotton soil, the maximum dry density and optimum moisture content are increased up to 1.740 gm/cc and 16.4% respectively. It is also observed that when up to 5% SCBA is mixed in black cotton soil, the UCS and CBR value increasing.

Specimen Name	MDD (gm/cc)	OMC (%)
BCS	1.708	18.2
BCS+2.5% SCBA	1.724	17.8
BCS+5% SCBA	1.740	16.4
BCS+7.5% SCBA	1.712	18.4
BCS+10% SCBA	1.686	20.2

LIQUID LIMIT & PLASTIC LIMIT

Specimen Name	Liquid limit	Plastic limit	Plasticity index	Specimen classification
	WL %	WP %	P.I %	
Soil	54.880	26.64	27.94	CH
Soil + 2.5% SCBA	57.36	27.64	29.72	CH
Soil + 5% SCBA	58.74	28.945	29.80	CH
Soil + 7.5% SCBA	46.45	25.28	21.17	CI
Soil + 10% SCBA	41.48	23.865	17.62	CI
Soil + 12.5% SCBA	33.94	19.475	14.47	CL

CALIFORNIA BEARING RATIO TEST

Specimen Name	CBR Value (%)	% Variations
BCS	9.56	-
BCS+2.5%SCBA	9.71	1.53
BCS+5%SCBA	10.15	6.11
BCS+7.5%SCBA	9.34	-2.29
BCS+10%SCBA	8.91	-6.87
BCS+12.5%SCBA	8.61	-9.92

FREE SWELL INDEX

Specimen Name	Free swell index%	Degree of expansiveness	Percentage decrease %
BCS	55.00	VERY HIGH	-
BCS +2.5% SCBA	50.00	HIGH	9.09
BCS + 5% SCBA	47.62	HIGH	13.42
BCS +7.5% SCBA	33.33	MODERATE	39.40
BCS +10% SCBA	28.57	MODERATE	48.05
BCS+12.5%SCBA	19.05	LOW	65.36

6. CONCLUSION:

Black cotton soil is an expansive material, when soil is dry it becomes shrink and soil is wet it becomes swelling nature. So, black cotton soil is not suitable for construction purpose because of its shrink-swell nature. We have to improve their characteristics by mixing miscellaneous material i.e., bagasse ash to the black cotton soil by using ground improvement High expansive black cotton soil can be effectively utilized by as a geotechnical material by addition of 2.5 to 7.5% of Bagasse ash At this dosage of admixture black cotton soil can be behaves as non plastic and non swelling can reduce the problems of volume change. With increasing percentage decreases

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