Stabilization of Soil Using Locally Available Industrial Waste

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ABSTRACT

A network of all weathered roads is a basic necessity for an economy to flourish. All developed countries are currently frontrunner in this field and developing countries are trying hard to connect its remote areas with all weathered roads. Construction of such roads not only takes time but also consumes economic resources of the country. For all types of pavements, a proper subgrade is most important requirement. Soil stabilization techniques are frequently called upon to improve the properties of subgrade. Locally available material, which otherwise is very poor, can be effectively used in subgrade by making use of soil stabilization techniques.

Soil stabilization implies the improvement in strength properties of soil available at the construction site. The strength properties which are usually taken in to account are respectively CBR value and unconfined compressive Strength of Soil. In this experimental study, the soil samples obtained from the vicinity of Shivalik Engineering College will be classified as per the Indian Standard. Tests will be carried out to ascertain the Index Properties of soil. A comparison of CBR value of soil samples in unsoaked and soaked condition will also be carried out. Industrial waste namely Fly-ash will be mixed in appropriate amount to the soil samples and its effect on CBR values in both soaked and unsoaked condition will be determined. The optimum amount of industrial waste giving best result in strength improvement of soil samples will be determined.

INTRODUCTION

1.1 SOIL STABILIZATION

Stabilization is the process of blending and mixing materials with a soil to improve the soil's strength and durability. The process may include blending soils to achieve a desired gradation or mixing commercially available additives that may alter the gradation, change the strength and durability, or act as a binder to cement the soil. Stabilization is commonly used for better soil gradation, reduction of the PI or swelling potential, and increased durability and strength. Soils stabilized by additives often provide an all-weather working platform for construction operations. These types of soil-quality improvements are referred to as soil modifications.

1.2 **USES OF STABILIZATION**

Pavement design is based on the premise that specified levels of quality will be achieved for each soil layer in the pavement system.

- Resist shearing within the layer.
- Avoid excessive elastic deflections that would result in fatigue cracking within the layer or in overlying layers.
- Prevent excessive permanent deformation through densification.

As the quality of a soil layer is increased, the ability of that layer to distribute the load over a greater area is generally increased enough to permit a reduction in the required thickness of the soil and surface layers.

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1.3 TYPES OF STABILIZERS

FLY ASH

Fly ash, when mixed with lime, can be used effectively to stabilize most coarse-and medium-grained soils .

BITUMINOUS

Most bituminous soil stabilization has been performed with asphalt cement, cutback asphalt, and asphalt emulsions.

1.4 Determination of CBR values

CBR test was developed by the california division of highways as a method of classifying and evaluating soil sub-grade and base course materials for flexiblepavement .

It is a penetration test, where in a std. piston having an area of $3m^2$ or 50mm dia. Is used to penetrate the soil at a std. rate of 1.25 mm/min.

The pressure upto a penetration of 12.5 mm and its ratio to the bearing value ofa std. crushed rock is termed as the CBR . In most cases CBR decreases as the penetration increases .

The ratio at 2.5 mm penetration is used as the CBR . In some case , the ratio at 5.0 mm penetration may be greater than that at 2.5 mm , If this occurs , the ratio at 5.0 mm should be used as CBR .

The load values on standard. Crushed stones are 1370kg and 2055 kg , at 2.5 mm and 5.0 mm penetration respectively

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3.1 The Formula of CBR value is given below

CBR= (Load carries by soil specimen / Load carries by standard specimen)*100

1.1 The average. CBR values of three test specimens is reported as the CBR value of the sample }

2 EXPERIMENTAL INVESTIGATION

3.1 MATERIAL USED

The material that we are going to use in this experimental study is obtained from the vicinity of Shivalik Engineering College. The IS classification of soil under investigation is SC.

3.2 INDEX PROPERTIES OF SOIL

1.	SPECIFIC GRAVITY	**2.0**	
2.	OPTIMUM MOISTURE CONTENT (%)	**13.92**	
3.	IS CLASSIFICATION OF SOIL	**Clayey Sand**	

3.3 CLASSIFICATION OF SOIL

The soil are classified on the basis on indian standard classification acc. to IS classification FOR (11/13) Tray only 13% of the total soil mass passes from 75µ sieve i.e coarse soil on further classifying the soil we found that more than 50 % passes through 4.75mm sieve i.e (sand).

The value of coeff.of uniformity =3.848 and coeff. Of curvature= 0.605 so from this we come to know that soil is a (well graded sand) (SW)

FOR (15/13) Tray only 24% of the total soil mass passes from 75µ sieve i.e coarse soil on further classifying the soil we found that but more than 50 % passes from 4.75mm sieve i.e (sand) poorly graded sand (SP)

3.4 STANDARD PROCTOR TEST

In standard proctor test a standard volume filled with soil in three layer. each layer is compacted by 25 blows of a standard hammer of weight 2.495 kg falling through 304.8mm knowing the wet weight of the compacted soil and its water content, the dry soil weight of the soil can be calculated. This test is repeated at a different water content. The dry unit weight of each sample is plotted against water content and the curve called compaction curve obtained. The water content correspond to maximum dry unit weight is known as (optimum moisture content)

RESULT

4.1 STANDARD PROCTOR TEST

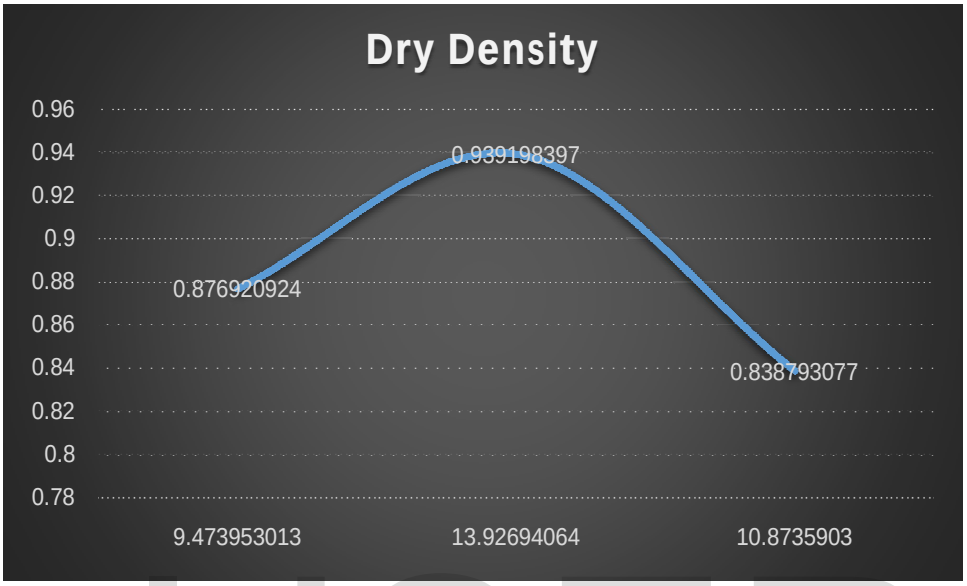
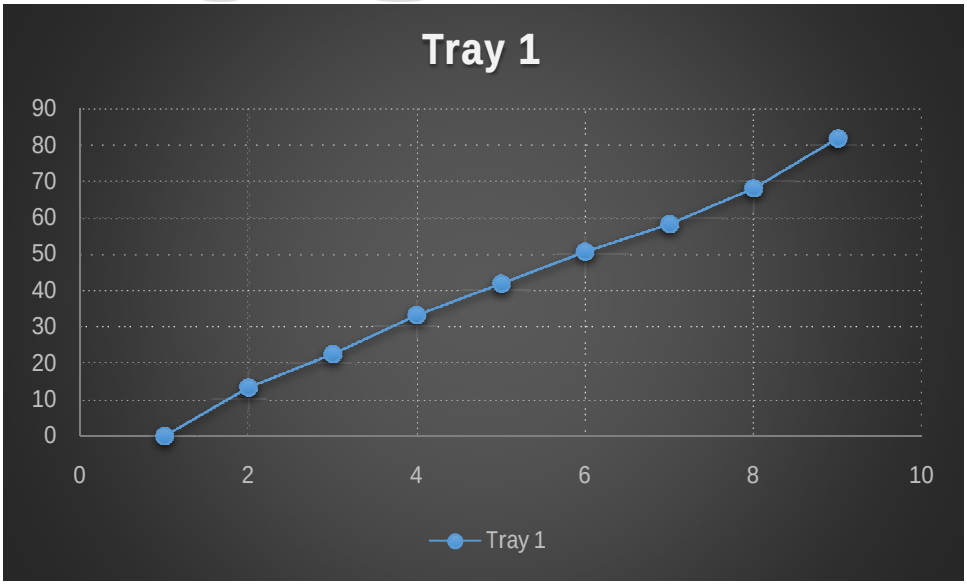


Fig.3.4.1

4.2 SIEVE ANALYSIS RESULT



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