Engineering Behavior of Expansive Soil Stabilized Using Plastic Bottle Strips

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Introduction

In this project, soil stabilization has been done with the help of randomly distributed polypropylene fibers obtained from waste materials. The improvement in the shear strength parameters has been stressed upon and comparative studies have been carried out using different methods of shear resistance measurement.

The main objective of this study is to investigate the behaviour of Black cotton soil by adding waste plastic material in different volume proportions (0%,0.25%,0.50%,0.75% and1.0%)

Literature Review

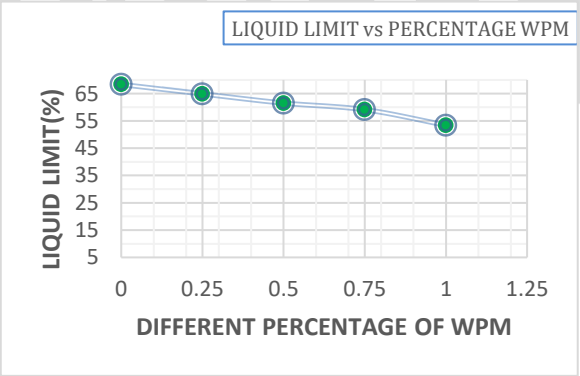
Memon et al., 2019, added PET strips as reinforcement in the fine sandy soil (Passing No. 40). The strips of (35*8) mm are mixed in the soil with 0.5%, 1.0%, 1.5% and 2.0% by dry weight of the soil to investigate soil bearing strength. They found that the maximum dry density of the soil is decreasing with smaller value by the increasing the PET strip content in the soil.
As well as, there is an increase in CBR value with an increase in the PET strip reinforcement up to 1.5% and then there is decrease in the CBR value. Generally, they found that the reinforcement of the clayey soil with PET strips is a useful technique to improve the soaked bearing capacity of the soil, and in their research has been found that the CBR has been enhanced by two times of that plain soil by addition of 1.5% of the waste plastic strips. So that, the best recommended parentage is 1.5%.

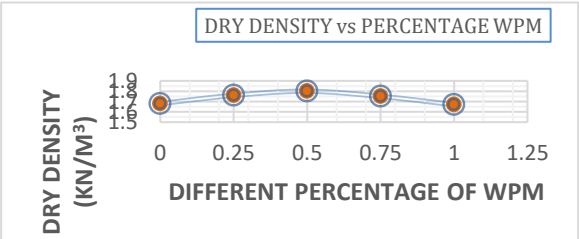
Methodology

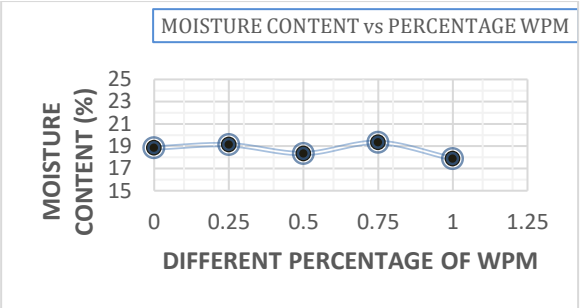
Index test on the natural and stabilized black cotton soils were carried out in accordance with the procedures outlined in IS 2720 (1985), for the stabilized soil specimens, step percentages of waste tire rubber material strip by dry weight of soil (0, 0.25, 0.50, & 1.0%) was introduced into the soil.
There were two materials used for this study: a representative clay type soil taken from Bole area near JEC campus and rectangular PET bottle strips. PET is a polymer, a substance consisting of a chain of repeating organic molecules with great molecular weight. Like most plastics, PET is ultimately derived from petroleum hydrocarbons. It is created by a reaction between terephthalic acid ($C_8H_6O_4$) and ethylene glycol ($C_2H_6O_2$).
The strips were prepared from waste plastic bottles that were collected from the nearby surroundings. The bottles were cleaned properly after collection and cut into 20 × 15 mm sized strips, manually using scissors and passing through 20mm sieve. The density of plastic in the range of 1.38-1.39 gm/mL.

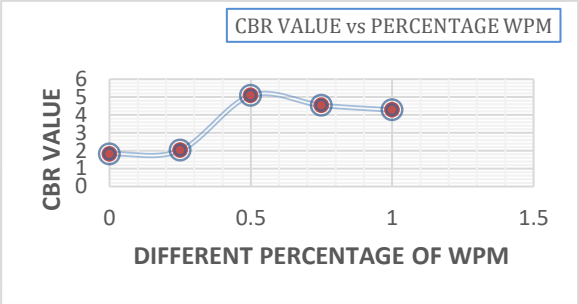
Results

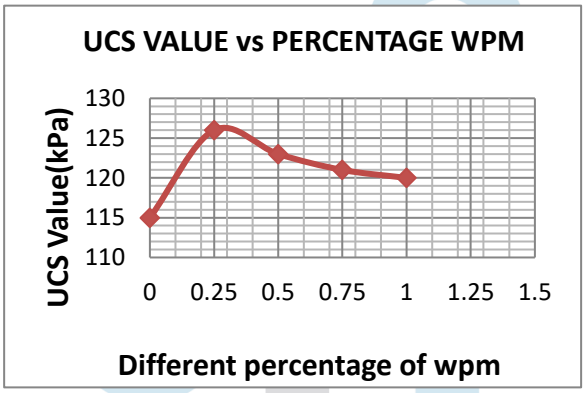
The following results came after the experiments: -











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