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AN EXPERIMENTAL STUDY ON STRENGTH PROPERTIES OF CLAYEY SOIL WHEN STABILIZED BY DEMOLITION WASTES

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ABSTRACT

Clay is a natural material composed primarily of fine grain materials. It consists of many particles that have plastic and adhesive properties. Clay also possesses small voids and pores. So, it's capable of retaining water. In this condition it tends to expand and shrink which can lead to settlement. When exposed to increments of water, clay tends to soften and liquefy.Clay often causes difficulties in construction with its low strength and high compressibility. This weak soil may also cause damage to the foundation of building.Admixtures are frequently used in practice to stabilize soil and to improve their load carrying capacity. Demolition Waste is added to the soft clay soils to investigate the relative strength.Demolition waste is generated from the demolition of the buildings or bridges etc. after completion of life period. So, we are using Demolition waste to investigate their role in influencing the strength parameters of the clayey soil.

Keywords: Admixtures, Clay, Demolition Waste, High Compressibility, Strength.

I. INTRODUCTION

Soil is an assemblage of discrete solid particles of organic or in organic composition with void spacing among the particles filled with air or water or both. This fundamental composition of air, water or both gives rise to unique engineering properties.

Black cotton soils are highly clay soil grayish to blackish in color. They contain montmorillonite clay mineral which has high expensive characteristics black cotton soil have low shrinkage limit and high optimum moisture content it is highly sensitive to moisture change's, compressible sub grade material. Hence the sub grade and its undesirable characteristics to be modified using a suitable stabilization technique. Stabilization involves the methods to use for modifying the properties of a soil to improve its engineering performance.

Soil stabilization is the technique introduced many years ago with main objective to render this soil capable of meeting the requirements of the specific engineering projects. The stabilization of the problematic soils is very important for many of the geotechnical engineering application such as pavement structures, road ways,building foundations, channel and reservoir linings, irrigation systems, water lines, and sewer lines to avoid damage due to settle of soft soil or to the swelling action of expensive soil.

An architect can design a building based on soil characteristics. That building has perhaps life span of 80 to 100 years. When it reaches the life span losses its stability and also may have a structural Damage so it will might become dangerous to whoever living in the structure and also surrounding buildings around the structure.

II. METHODOLOGY

In this experimental study demolition waste was added to black cotton soil for stabilization. As per study the demolition waste is collected from the after completion of buildings or bridges etc. of its life period. First, we conducted different tests on soil sample for determining the soil properties then the demolition waste is added to the soil with different percentages like 5%, 10%, 15%, 20%, etc. Then compaction and UCC tests on soil sample with different percentages of demolition wastes were conducted. It is intended to obtain the optimum Demolition Waste from view point of compaction and unconfined compressive strength characteristics.

Step1: Soil collection
Step2: Demolition Waste collection
Step3: Sieving the Demolition waste
Step4: Conducting the tests on collected soil sample
Step5: Add demolition waste to the soil
Step6: Conducting Compaction and UCC tests on soil sample with different %of demolition waste.

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Step7: Finding the optimum percentage of Demolition Waste from view point of Compaction and Unconfined Compression.

III. MATERIALS AND EXPERIMENTAL WORK

In this study we used Black cotton soil and Construction Demolition waste. Black cotton soil is collected from Gudlavalleru village, Krishna District, Andhra Pradesh. Demolition Waste is collected from kowtharam village, Krishna District, Andhra Pradesh. Different tests are conducted on Black cotton soil then Demolition waste is added to black cotton soil conduct compaction and UCC tests with various percentages of Demolition waste.

Black Cotton Soil

Black soil is a sedimentary type of soil that is found in place of its origin, i.e., it is not transmitted from its original place. It is formed by the wear and tear of the specific rock. The moderate climatic condition and volcanic erupted igneous or basalt rock as a parent rock is required for the formation of black soil.

Though it is very good soil for cultivation but is problematic soil for civil engineering work due to its swelling and shrinkage property so soil stabilization is done by using some additives like Demolition wastes (we are using Demolition wastes as additive)**.**

Demolition Waste

Construction demolition waste are generated whenever any construction or Demolition activity takes place, such as, building roads, bridges, fly over, subway, remodelling etc. It consists mostly of inert and non-biodegradable material such as concrete, plaster, metal, wood, plastics etc. In this study we are taken concrete, plaster and brick waste. Demolition can either by manmade process or by natural disasters such as earthquakes, floods, hurricanes, etc.

In this study the demolition waste is passed through 425 microns IS sieve the obtained demolition waste is added to black cotton soil for stabilization in certain percentages up to obtain the optimum dosage of demolition waste for increasing the strength of the soil.


Figure1: Black Cotton Soil.**Figure 2:** Demolition Waste

Tests to be Conducted on Soil Sample

- Specific Gravity
- Liquid Limit Test
- Plastic Limit Test
- Standard Proctor Compaction Test
- Unconfined Compression Test

Tests to be Conducted on Soil Sample When Mixing with Demolition Waste

- Standard proctor Compaction Test
- Unconfined Compression Test

IV. RESULTS AND DISCUSSION

Properties of Black Cotton Soil

In order to determine the Specific gravity, Atterberg's limits, optimum moisture content and dry density, I.S heavy compaction test and Unconfined Compression test were conducted on the soil. The soil is classified as "CH" as per I.S Classification.

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Table 1. Properties of Black Cotton soil

Properties	Black cotton soil
Specific gravity	2.54
Liquid limit	88.8%
Plastic limit	33.86%
Plasticity index	54.94%
Soil Classification as per ISSC	CH
Optimum Moisture Content	32.8%
Maximum Dry Density	1.348g/cc
Unconfined Compressive Strength	87.22kN/m²
Undrained Cohesion	43.61kN/m²

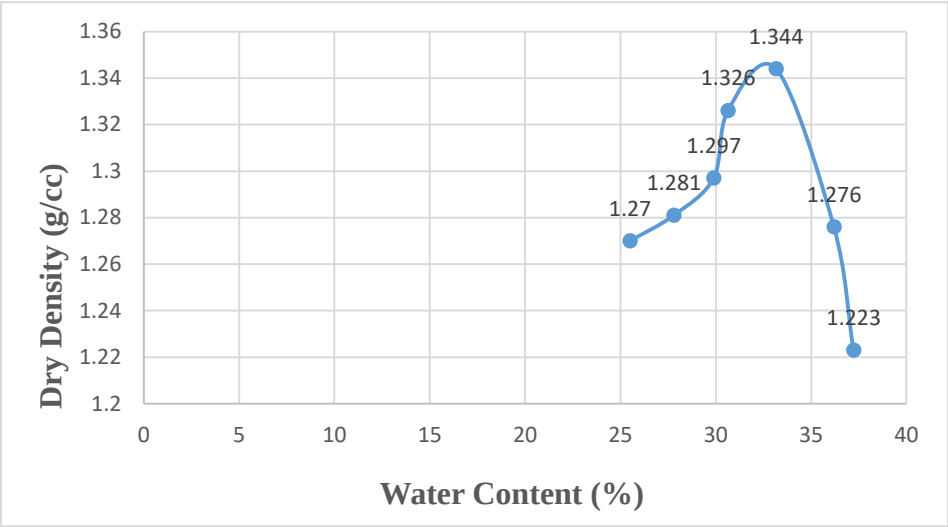

Figure3: Compaction of soil untreated with Demolition Waste

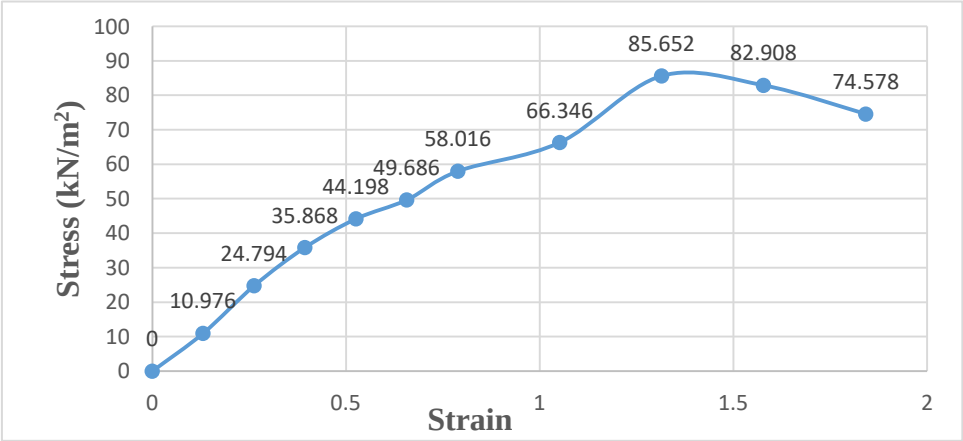

Figure 4: Unconfined Compression of soil untreated with Demolition Waste

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Compaction Properties of Soil When Treated with and without Demolition Waste

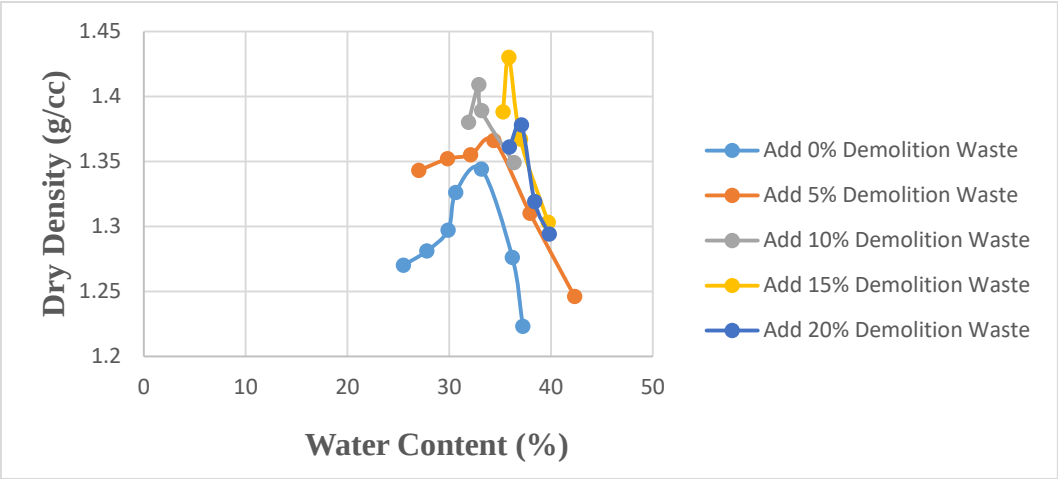

Figure 5: Compaction of soil treated with and without Demolition Waste

Table 2: Values of MDD and OMC for Different Percentages of Demolition waste

Percentages of Demolition waste (%)	OMC (%)	MDD g/cc
0	32.8	1.348
5	34	1.368
10	34.9	1.409
15	35.7	1.43
20	36.9	1.38

Unconfined Compressive Strength of Soil When Treated with and without Demolition Waste

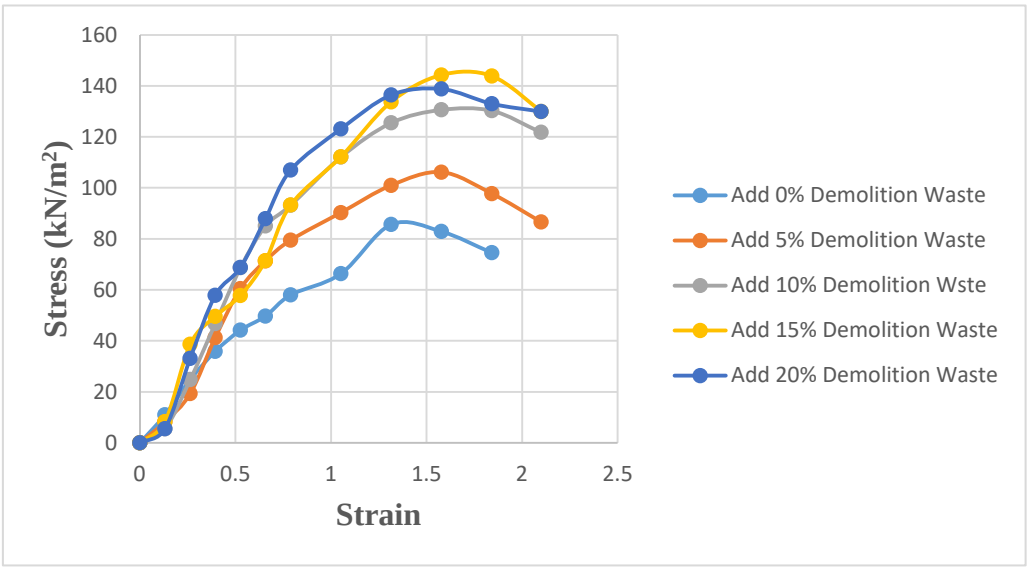

Figure 6: UCCof soil treated with and without Demolition Waste

Table 3: UCC Values for Different Percentages of Demolition Waste

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Percentage of Demolition Waste (%)	UCC Value (kN/m^2)
0	87.22
5	106.23
10	132.1
15	145.41
20	139.9

V. CONCLUSION

The following conclusions can be drawn from the study conducted on locally available soil and Demolition Waste.

- The OMC values of soil were gradually increased upon addition of demolition wastes.
- The MDD values of soil were increased initially later decreased.
- The soil with 15% addition of demolition waste was made as optimum, where it holds MDD.
- The UCC of soil also increased initially and decreased with increase in percentage of demolition waste.
- The increased MDD value at addition of 15% demolition waste to soil was seen to 6.08% improved from Normal soil.
- The OMC value at addition of 15% demolition waste to soil was seen to increase by 8.84% than the OMC for Normal soil.
- UCC also observed to been increased by 66.67% when compared to strength of Normal soil.

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