



Effect of Compaction Energy on Engineering Properties of Expansive Soil

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Received 1 August 2017; Accepted 1 September 2017

Abstract

Swelling of expansive clays is one of the great hazards, a foundation engineer encounters. Each year expansive soils cause severe damage to residences, buildings, highways, pipelines, and other civil engineering structures. Strength and deformation parameters of soils are normally related to soil type and moisture. However, surprisingly limited focus has been directed to the compaction energy applied to the soil. Study presented herein is proposed to examine the effect of varying compaction energy of the engineering properties i.e. compaction characteristics, unconfined compressive strength, California bearing ratio and swell percentage of soil. When compaction energy increased from 237 KJ/m³ to 1197 KJ/m³, MDD increased from 1.61 g/cm³ to 1.75 g/cm³, OMC reduced from 31.55 percent to 21.63 percent, UCS increased from 110.8 to 230.6 KPa, and CBR increased from mere 1 percent to 10.2 percent. Results indicate substantial improvement in these properties. So, compacting soil at higher compaction energy levels can provide an effective approach for stabilization of expansive soils up to a particular limit. But if the soil is compacted more than this limit, an increase in swell potential of soil is noticed due to the reduction in permeability of soil.

Keywords: Expansive Soils; Compaction Energy; Compaction Characteristics; Unconfined Compressive Strength; Swell Potential; Soaked California Bearing Ratio.

1. Introduction

Field compaction of fine grained soils mostly involves adoption of numerous procedures and equipment with substantially varying compaction energy. Therefore, laboratory compaction tests are carried out at varying compaction energy levels e.g. standard proctor test and modified compaction test. While higher compaction generally gives improvement in engineering properties of soil, it can further result in undesirable swelling of expansive soils as well when these soils come in contact with moisture under non favorable conditions. Swelling and shrinkage of expansive soils is one of the major threats a foundation engineer faces Seed et al., 1962 [1]. Hence, to investigate the alteration of engineering properties of soil in relationship to compaction energy assumes exceptional interest. Severe damages occur to the structures built on these soils. Strength and deformation properties of soil are typically related to the soil type and moisture present in the soil. But a surprisingly limited consideration is paid to the effect of compaction energy applied to the soil. Compaction energy is one of the most significant parameters effecting the engineering properties of soil.

Study presented herein is designed to examine the effect of varying compaction energy on the engineering properties i.e. compaction characteristics (optimum moisture content OMC, maximum dry density MDD), unconfined compressive strength (UCS), California bearing ratio (CBR) and swell percentage of soil.

2. Literature Review

Attom, M. F, 1997 [2] investigated the effect of varying compaction energy on shear strength, permeability and swelling pressure of compacted cohesive soil. They discovered that with an increase in compaction energy, there is a rise

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