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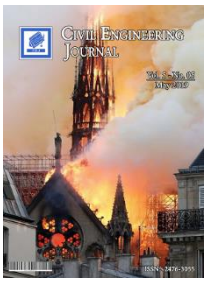

Effect of Soaking and Non-soaking Condition on Shear Strength Parameters of Sandy Soil Treated with Additives

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Abstract

The present paper aims to improve shear strength parameters: cohesion (c), and angle of internal friction (Ø) for sandy soil treated by additives before and after soaking. The samples of sandy soil were obtained from Karbala city and then classified as poorly graded sand (SP) with relative density Dr (30%) according to the system of (USCS). The experiment has three stages. In the first stage ,the soil was treated with three different percentages of cement (3 ,5 and 7%) of dry weight for the soil with three different percentages of water content (2, 4 and 8%) in each above percentage of cement, while the second stage includes (2%) of lime from soil weight mixed with each different percentage of cement . In the third stage, (50%) of polymer of cement weight was mixed with each different percentage of cement. An analysis of behavior sandy soils treated by additives was carried out with the Direct Shear Tests. All the samples were cured (3) days before and after soaking. The results of the experiment showed that increase in shear strength parameters of sandy soil; especially the angle of internal friction with the rate value (16.6 %) of cement only, (21.88 %) of cement with lime , (20.3%) of cement with the polymer before soaked condition. After soaking condition, it was increased with the rate value (14.3%) with cement only, (23.57%) of cement with lime, and (15.38%) of cement with the polymer as compared with soil in the natural state.

Keywords: Additives Soil; Sandy Soils; Shear Strength Parameters; Cement; Lime; Polymer.

1. Introduction

Ground improvement is a process that aims to enhance the engineering properties of the soils and generate an improved constriction material by increasing soil strength, durability, stiffness, and decreasing permeability and compressibility of sandy soils. Additives materials are one of the most important methods to improve the engineering properties of soil that are used to improve the engineering performance. For example, Lime stabilization and cement stabilization are the two common additives of the material methods .These additives materials are categorized as traditional and non-traditional materials. The combination of traditional additives includes (cement, lime, fly ash, and bitumen materials, while non-traditional additives includes various combinations such as (enzymes, polymer, resins, acid, calcium chloride, sodium chloride, and fiber reinforcement). Many researchers relatively have studied the effect of the stabilization agent on shear strength parameters Mitchell [1] showed that stabilization agents increase the effect of cohesion. Other researchers such as Lo, SR, and S PR Wardani [2] found out that the soil treated by cement presented a significant increase in both internal friction angle and cohesion. While Balmer [3] concluded that the value of the internal friction angle varies from (36.1º to 43.8º) for fine and coarse-grained stabilized soils. While the shear strength parameters: cohesion(c), and angle of internal friction (Ø) increase with increasing cement content according to Al-Aghbari et al. [4] and Shooshpasha, and Reza [5]. Ziaie-Moayed et al. [6] conducted research to improve the saline soils before and after soaking by using cement and polymer on shear strength and they concluded ;(1) the strength of soil

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