

Swelling potential and treatment of expansive soil

Osama Mohammad Abu-Hujair

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Abstract

Expansive soils which are defined as those soils whose volume changes under the effect of wetting and drying cycles are associated with the problems and failures that have been observed in construction field as reported from many parts of the world including Saudi Arabia. Therefore, this study is an attempt to have a better understanding for their behavior to find out effective solutions for their problems. Three locations were chosen from the Eastern Province of Saudi Arabia for detailed investigation, where both disturbed and undisturbed samples were collected. The first part of the study concentrated on the determination of geotechnical, mineralogical and physio-chemical properties of those soils. The second part discussed mainly the swelling potential of Al-Qatif clay using five different procedures. This includes direct and indirect procedures which were then used to predict heave and compare it with the results of a field swell test to find out which technique can closely simulate the field measurements. The last part of this study concentrated on mechanical and chemical treatment of the investigated soils.

Lime and potassium nitrate were used for the chemical treatment. The chemical treatment was conducted using both disturbed and undisturbed approaches. In the disturbed approach a different percentage of chemicals were mixed with soil, while in the undisturbed approach the chemicals were injected into soil samples.

The effect of chemical treatment on the mineralogical composition was investigated using X-ray diffraction technique and scanning electron microscope to trace if there is any changes has taken place in the soil fabric and composition.