

MULTI-DIMENSIONAL SWELL BEHAVIOUR OF EXPANSIVE SHALES

Al-Shamrani, M A & Al-Mhaidib, A I

King Saud University, College of Engineering, Department of Civil Engineering, Riyadh, Saudi Arabia

SYNOPSIS

Preconstruction treatment or adequate selection and design of the foundation system, both rely on accurate estimates of the anticipated volume change of the underlying expansive soils. The vast majority of volume change testing of expansive soils has been performed under one-dimensional conditions in the oedometer. However, loading and wetting conditions followed in various oedometer testing methods do not represent the actual behavior in the field.

This paper presents the results of an experimental investigation in which the feasibility of using a stress path triaxial apparatus for evaluating the multi-dimensional swell behavior of expansive soils is examined. A series of triaxial swell tests is conducted on expansive shales from the central region of Saudi Arabia. The predicted vertical swells from those tests are compared with the actual field heave as well as the predictions obtained from oedometer tests. The applicability of the presented triaxial testing method is further ascertained by examining the influence of confinement and initial water content on the amount of the vertical swell of the tested soil. It has been found that the triaxial tests give a far better prediction of the measured field heave in comparison to oedometer tests which highly overestimate it. Both the confining pressure and initial water content have been found to significantly affect the magnitude of the vertical swell.