



ANISOTROPIC MECHANICAL BEHAVIOR OF RESEDIMENTED NILE SILTY CLAY

BY

Kareem Mohamed Salaheldin Mohamed

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Civil Engineering-Public works

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Title of Thesis:

Anisotropic Mechanical Behavior of the Resedimented Nile Silty Clay

Key Words:

Anisotropic; Resedimented; Yield surface; Mechanical behavior; Geotechnical characteristics; Consolidation characteristics.

Summary:

This research investigates the engineering behavior of Resedimented Nile Silty Clay (RNSC) in Egypt. The study involves tests for index properties, consolidation, undrained shear strength, and mechanical anisotropy. According to the USCS the Nile sediments are classified as high plasticity inorganic clay (CH). However, the grain size distribution of these sediments shows percentages of 70 silt and 30 clay on average. The thesis presents a standardized framework for resedimenting the Nile Silty Clay to provide testing specimens with minimum sample to sample variation. The process has given insights into the consolidation behavior of the sediments. A series of consolidated undrained triaxial tests at different preconsolidation pressures are performed to study the material shear strength, in order to calibrate the Modified Cam Clay model to the behavior of the sediments. Another series of triaxial tests are performed to study the mechanical anisotropy of the RNSC. The experiments involve drained compression and extension tests using different stress path directions on overconsolidated twin samples. The analysis of the test results determines the yield points and the shape of the yield surface in the stress space. The analysis shows the inherent anisotropy resulting from the resedimentation process. The asymmetry of the yield surface is tied to the anisotropy of the material fabric according to Oda (1993) and Akl and Louis (2013).

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