

Two-Dimensional Analysis of Stacked Geosynthetic Tubes

By

Craig R. Klusman

Raymond H. Plaut, Chairman

Civil Engineering

(ABSTRACT)

Geosynthetic tubes filled with a slurry-mix are considered. The mix is usually dredged from a nearby area and pumped directly into the tubes. The tubes are used in a variety of applications including breakwaters, groins, and temporary levees. This thesis considers single and stacked geosynthetic tubes resting on rigid and deformable foundations.

A two-dimensional analysis is performed on the cross-section of a very long tube. The program Mathematica is utilized for the analysis. A few assumptions are made regarding the general behavior of the tube. The tube is assumed to be an inextensible membrane with no bending stiffness. To allow for a closed-form integral solution, it is assumed that no friction exists between the tubes and at the foundation.

A single tube, two stacked tubes, and a 2-1 formation are studied. Both rigid and deformable foundations are considered. The deformable foundation is modeled as a tensionless Winkler foundation with normal forces proportional to the downward deflection of the ground. An external water load on one side is also investigated for a single tube and a 2-1 formation, with rigid blocks to prevent the structure from sliding along the ground. Example cross-sectional profiles are given. Results from the analysis include structure height, circumferential tension, and ground deflections.