

application

location

products

Earthen Embankment

Southern Louisiana

Geolon® Geotextile vs. Geogrid

This case study is referenced from: Proceedings of the GRI-17 Conference "Hot Topics in Geosynthetics IV" R.M. Koerner, G.R. Koerner, Y.G. Hsuan And M.V. Ashley, Eds., Gill Publications, Folsom, PA 2003

THE CHALLENGE

A 3.3 m (11.0 ft) elevation levee on swamp lands was needed to protect the New Orleans Metro from hurricane surge. The New Orleans District (NOD) of the US Army Corps of Engineers has constructed geosynthetic reinforced levees in southern Louisiana for more than 20 years. Post-construction analysis have revealed these sections are performing far better than anticipated. A more aggressive design may prove equally effective and more cost efficient. A levee test section was created to directly compare geotextiles with geogrids, to determine the most efficient and effective use of reinforcement.

THE DESIGN

Preliminary cost estimates were generated to compare an unreinforced design with the proposed geosyn-

thetic reinforced design. Because of increased right-of-way acquisitions, clearing costs, and material, the unreinforced design was projected to be the most expensive and most difficult to construct. Estimated savings for a geosynthetic reinforced design was \$824,607, or 19%.

Native soils consisted of high water content clays with sporadic lenses of silts, organics, and shells. Shear strengths of the foundation soils within the first 9.1 m (30 ft) did not exceed 10kN/m (685 lbs/ft). Elevations ranged from +1.5 m (+5 ft) National Geodetic Vertical Datum (NGVD) to below sea level. Standing water was present with trees and other vegetative cover typical to marshes.

CONSTRUCTION

To further examine the usefulness of reinforcement, the total 274.5 m (900 ft) levee test section was divided evenly into three separate 91.5 m (300 ft) reaches. The first reach contained a single layer of 85kN/m (5824

lbs/ft) high tenacity woven geotextile. The second reach contained a single layer of 85kN/m (5824 lbs/ft) uniaxial punch-drawn polyethylene geogrid. The third reach contained a double layer of punch-drawn geogrid with a 57kN/m (3905 lbs/ft) uniaxial polyethylene geogrid in the top and a 17.5kN/m (1199 lbs/ft) biaxial polypropylene geogrid in the bottom. Monitoring instrumentation was placed within the levee including strain gauges on the various reinforcements. All geotextiles and geogrids were designed with 5% strain.

PERFORMANCE

Lateral displacements, consolidations, and pore water pressures were all monitored with instrumentation, and it was determined that all three reaches of the test section were sta-

JOB OWNER:

Army Corp of Engineers

ENGINEER:

R.J. Varuso, P.E. & J.B. Grieshaber, P.E.



Though both the geogrid and geotextiles performed as expected, the geotextile is the logical choice for this application.



The installed cost of the geogrid test section was 46% more than the installation cost of the Geolon® geotextile.

ble and performing within expectations. The designed allowed for 5% strain within the various geogrids and geotextiles. The largest average recorded strains for the geotextile, single layer geogrid, and double layer geogrid were 3.6%, 2.6%, and 3.0%, respectively. In addition, foundation soils within 3 m (10 ft) experienced approximately 135% increase in shear strength, aided by the semi-rigid geosynthetic platform. It is anticipated that these soils will continue to consolidate, thereby causing the elevation of the levee to drop below the required 3.3 m (11.0 ft). It is common to place a second lift on levees in subsequent years following initial construction. For stability, it is typically required to place additional soils on the adjacent berms. Because none of the geosynthetics reached their design potential, their available strength can be utilized in the second lift design, reducing the size of the stability berms. **The cost savings for the second lift for this project is estimated at \$2,387,683, or 78%!**

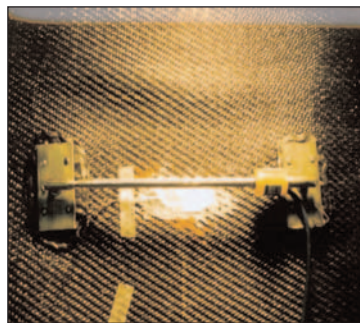
GEOGRID VS GEOTEXTILE

As expected, the geotextile required more strain than the geogrid to develop the required strength for stability. This slight difference in strain might indicate that the geogrid outperformed the geotextile. However, the installed costs of the geotextile test section saved \$339,551 (46%) over the installed cost of the geogrid section. Since both materials performed equally well, utilizing geotextiles instead of geogrids seems to be the logical choice.

Mirafi® Construction Products is a manufacturer of uniaxial and biaxial geogrids, as well as geotextiles.



In this test, both woven polypropylene and woven polyester geotextiles are compared to geogrids.



Monitoring instrumentation was placed within the levee.

For more information: www.mirafi.com

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