

Lincolnway Energy Facility Nevada, Iowa

Geopier® Rammed Aggregate Piers™

Project Team

Geotechnical Engineer: Terracon, Inc.

Structural Engineer: Fagen Engineering, LLC

Owner: Lincolnway Energy, LLC

General Contractor: Fagen Engineering, LLC

Geopier Installer: Peterson Contractors, Inc.

Geopier Designer: GFC – Midwest

The performance of the modulus test at this site provided detailed Geopier Rammed Aggregate Pier performance information to develop a site-specific tank support solution.

Project Overview

Description:

Construction of a new ethanol production facility, including four, 50 foot diameter fermentation tanks and a 60 foot diameter beer well. Mat foundations for the beer well and fermentation tanks were designed for bearing pressures of 4,000 psf.

Subsurface Conditions:

Soft to medium-stiff lean clay over soft to stiff very sandy lean clay with strengths ranging from 1,000 to 4,500 psf. Below the upper clay, stiff to very hard sandy lean clay glacial till was encountered. Unconfirmed compression strengths ranged from 4,500 to 9,000 psf. Groundwater was encountered near seven feet below grade.

Geopier Solution:

Total and differential settlements of 3.5 inches and 1 inch, respectively were required for the tanks. The Geopier Intermediate Foundation System was developed to eliminate the need to overexcavate and replace up to nine feet of existing inadequate bearing materials. A total of 240, 30-inch diameter Geopier Rammed Aggregate Piers (RAPs) were



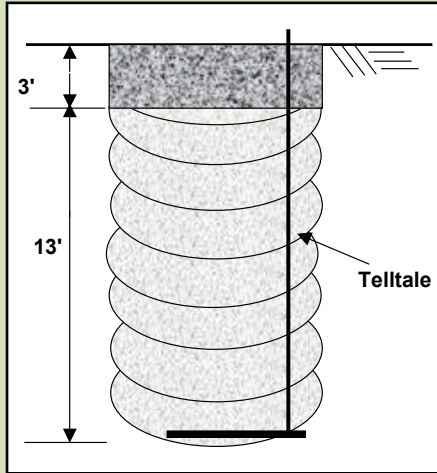
installed to depths of 12 to 13 feet to tag the glacial till. Modulus testing at the site indicated a stiffness of 70 pci was achieved at a design stress level of 26,000 psf, rather than the stiffness of 100 pci assumed in design. In order to provide settlement control to meet the project requirements an additional 35 RAPs were added beneath the tanks. The Geopier System provided significant cost savings and a schedule advantage compared to conventional overexcavation and replacement that would otherwise have been required.



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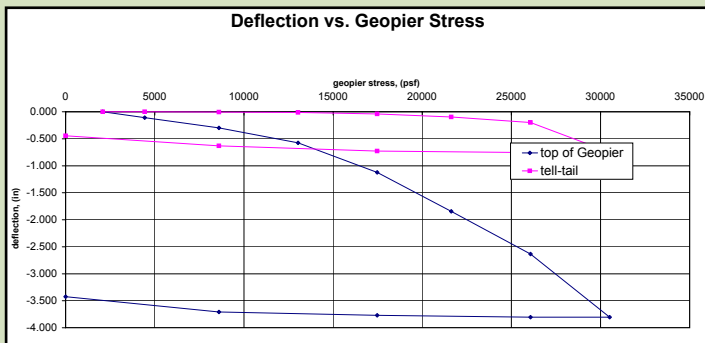
Modulus Test Pier Setup



The non-production Geopier RAP used for modulus testing was installed through the new silt fill and existing silty sand fill to tag the underlying glacial till by one foot. A steel telltale plate with sleeved rods extending to the ground surface was installed at a depth of two feet above the bottom of the RAP. Deflection measurements of the telltale assembly located at a depth of six feet in the RAP were taken during the modulus test. The results of the telltale deflection provided an indication of the amount of stress dissipation within the RAP. A two foot thick concrete cap was poured over the top of the RAP for testing purposes.

The performance of the modulus test at this site provided detailed Geopier Rammed Aggregate Pier performance information to develop a site-specific tank support solution.

Modulus Test Results



The results of the modulus test indicate that a deflection of 0.22 inches was observed at the maximum top-of-RAP design stress of 10,800 psf. The corresponding Geopier stiffness modulus of 345 pci exceeded the assumed design stiffness of 150 pci by more than double. At the 150% design stress level of 16,200 psf, a deflection of 0.35 inches was noted. The corresponding Geopier stiffness value was 320 pci. Only negligible telltale deflections were observed during the performance of the test, indicating negligible transfer of stresses to the bottom portion of the RAP.

FOR MORE INFORMATION

Contact Geopier Foundation Company at **800-371-7470**

or at **www.geopier.com**



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The Intermediate Foundation System