



Amtrak Boat Support

Providence, Rhode Island

The Geopier GP3® system reduced construction costs, provided a faster construction schedule, limited noise and vibration impacts and facilitated “conventional” foundation construction

Description: Five hundred twenty feet of depressed railroad “boat” at a congested site with low overhead restrictions.

Subsurface Conditions: A 4 to 13 thick layer of granular fill consisting of very loose to very dense fine to coarse sand with varying amounts of silt and gravel. Beneath the fill is up to 10 feet of peat and organic silt. Groundwater levels were encountered at depths ranging from 4 to 11.5 feet.

Geopier Solution: Geopier Rammed Aggregate Pier® (RAP) elements with design capacities ranging from 40 kips (in peat areas) to 100 kips (in sand areas) were installed beneath the railroad “boat” section to provide an allowable bearing pressure of 4,000 psf and limit settlement to less than 3/4-inch (1/2-inch at utility crossings). Lateral soil resistance was also a primary design consideration. Use of the Geopier GP3® system reduced construction costs, provided a faster construction schedule, limited noise and vibration



impacts, and facilitated “conventional” foundation construction. A total of 459 RAP elements were installed on the project. The Geopier solution was completed on schedule, within budget and with no significant post-construction settlements at a considerably lower cost compared to deep foundations or overexcavation and replacement.

PROJECT TEAM

Owner:
Amtrak

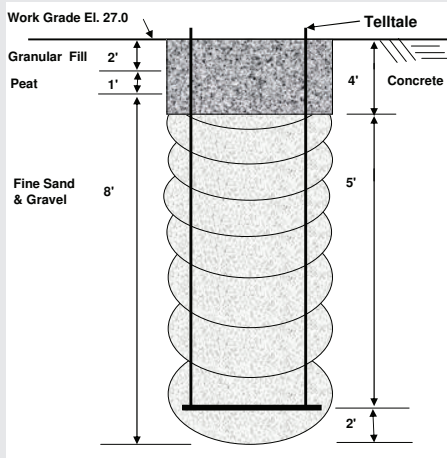
Geotechnical Engineer:
GZA GeoEnvironmental, Inc.

Structural Engineer:
DMJM/Harris

Geopier Installer:
Helical Drilling, Inc.

Geopier Designer:
Design/Build Geotechnical, LLC

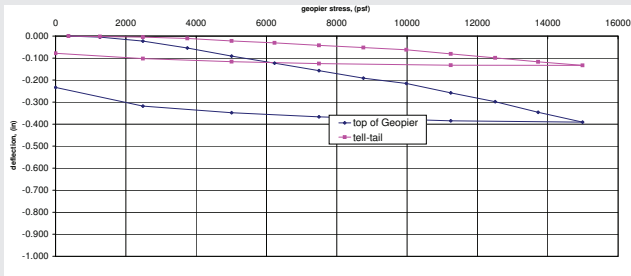
MODULUS TEST PIER SETUP



The non-production Geopier Rammed Aggregate Pier™ (RAP) used for modulus testing was installed through the granular fill, peat and fine sand and gravel. 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 five feet in the pier 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.

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MODULUS TEST RESULTS



The results of the modulus test indicate that a deflection of 0.258 inches was observed at the maximum top-of-RAP design stress of 11,242 psf. The corresponding RAP stiffness modulus of 303 pci exceeded the assumed design stiffness of 150 pci by more than double. At the 150% design stress level of 14,990 psf, a deflection of 0.133 inches was noted. The corresponding RAP stiffness value was 266 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.