Publication Abstract

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Optimization of Drilled Shaft Design for A Highway Bridge in Arizona Using Load Test Results

John C. Niedzielski, Samer R. Rabab'ah, A. Frances Ackerman

The existing US-70 Bridge over the Gila River at Bylas, Arizona is planned to be replaced due to its current poor condition. The replacement bridge is planned to be a 15-span, 1,904-foot (580 meter) long bridge, the third-longest bridge in the state highway system. Within the Gila River floodplain, granular alluvial soil is underlain by cohesive lacustrine soil; bedrock was expected due to nearby terrain but not encountered within the geotechnical exploration depth of 166.5 feet (51 meters) or less. Based on the anticipated loading conditions, design scour depths and the soil conditions, the full structural loads are carried by large diameter drilled shafts; therefore accurately determining the axial capacity of the proposed drilled shafts has important practical and safety implications. The conventional methods for axial capacity determination may be overly conservative to use for design in the site's layered granular and hard clay soils. An Osterberg cell load test was performed to obtain detailed information on the load transfer from the drilled shaft in side friction and base resistance to allow optimization of the bridge foundation design. The fullscale field test played a significant role in the design of the project's deep foundations, notably, by incorporating the specific subsoil properties and consequently, an exact prediction of the load-settlement behavior under loading. This paper provides the results of the geotechnical site investigations, drilled shaft load testing procedures, and shaft load distribution from the load test results. Comparisons were developed between predicted axial capacities of drilled shafts using several design methodologies and the axial capacity measured from static load testing. The load test results showed that underestimation of the axial capacity is evident using conventional methodologies. The exact prediction of the load-settlement behavior under loading combined with a site-specific design approach, resulted in a substantial reduction of foundation costs due to reduced drilled shaft dimensions.

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