

Large-Diameter Drilled Shafts Cooper River Bridge, Charleston, SC

Ben C. Gerwick, Inc. was responsible for the design of the drilled shaft foundations for the new Cooper River Bridge in Charleston, SC, working in collaboration with Parsons Brinckerhoff Quade & Douglas, Inc. on the main span, and Buckland & Taylor Ltd. on the high level approaches.

Ben C. Gerwick, Inc. examined different aspects of drilled shaft solutions using permanent casings as forms. Non-linear soil-structure interaction analyses were conducted for individual piers for different load cases and site conditions, comprising more than 400, 6-10 ft diameter shafts.

Due to the high seismicity in the region, potential vessel impact and hurricanes, large lateral loads are involved. Among various types of foundations, drilled shafts were selected for their high capacity against lateral loading.

The main towers are founded on groups of 11 large-diameter drilled

shafts with tip elevations as much as 220 ft below the waterline.

The piers are protected from ship collision by artificial rock islands.

The high level approach piers are supported on pairs of 6-10 ft diameter drilled shafts. The piers across Town Creek are protected by a fender system also founded on drilled shafts.

The bearing layer at the site is Cooper Marl, a stiff to very stiff lightly cemented calcareous sandy clay or sandy silt that underlies coastal sediments of interbedded clays and sands. The layer is more than 300 ft deep and appears at elevations from 40-70 ft below mean sea level. An elaborate geotechnical investigation has been conducted on the site, including a load test program on full-scale shafts under axial and lateral loads. The results of the tests were used to calibrate the lateral and axial soil resistance.

Year of Completion: 2005

Construction Cost: \$631M

Client: South Carolina
Department of Transportation



Drilled shafts for the high level approach piers.



Drilled shafts for the mid-river main bridge piers.



Load-out of drilled shaft rebar cages.

Services Performed:

- Non-linear Soil-Structure Interaction Analyses
- Consulting on Construction Issues

Detailed Design of:

- Drilled Shaft Foundations
- Pile Caps
- Town Creek Fender System and Drilled Shaft Foundations
- Artificial Pier Protection Islands