FOUNDATION SUPPORTWORKS®

CASE STUDY

Commercial

Models 150 and 175 Helical Tiebacks

Project: Marina Seawall Stabilization
Location: Panama City, FL
Date: January 2014

Challenge:

The original tieback system for two intersecting, perpendicular 15-foot high (above mudline) bulkhead seawalls constructed in the 1950s had begun to fail. The plain steel 5/8-inch diameter cables and connections for the deadman anchors were severely corroded and, in some cases, corroded completely to disconnect the waler beams from the anchors. Proposed repairs included a new tieback and waler system installed behind 1,085 feet of failing seawall. A geotechnical investigation identified a soil profile consisting primarily of loose sands with isolated seams of medium dense sand. Given the marginal soil strengths observed, grouted soil anchors had estimated installation lengths on the order of 60 feet behind the walls. However, sections of the walls required that anchor lengths be limited to approximately 45 feet to avoid interfering with the installation of auger cast piles proposed to support a new lighthouse. Helical tiebacks were then considered in an attempt to shorten potential tieback lengths. Helical tiebacks could also be installed on land rather than from a barge, allowing for a considerable cost savings by avoiding barge rental and captain's fees.

Solution:

The tieback system design included 182 helical tiebacks installed in a single row with a wall connection five feet down from the top of the wall. Soil directly behind the walls was excavated to allow installation of the tieback leads and extensions back beneath the excavator. One-hundred twenty-two (122) Model 150 (1.5-inch round corner square bar) and 60 Model 175 (1.75-inch round corner square bar) were installed to support design working tension loads of 22 kips and 30 kips, respectively. Helix plate configurations varied with the soil conditions, but included up to six plates (10"-12"-14"-16"-16"-16") for the HA150 shaft and eight plates (10"-12"-14"-16"-16"-16"-16"-16") for the HA175 shaft. The tiebacks were advanced to lengths from 35 to 45 feet and to torque-correlated ultimate capacities of at least twice the design working tension loads (FOS ≥ 2). Tieback installation angles generally varied from ten to 15 degrees. An 18-inch square precast concrete waler was mounted to the face of the seawall to distribute the tieback forces. All of the tiebacks were pre-tensioned to their respective design working loads with a calibrated hollow-core hydraulic cylinder. Six of the production tiebacks (three percent) were proof tested to 1.33 times the design working load. All of the tieback components were hot-dip galvanized for corrosion protection. The tieback components exposed beyond the waler beams were further coated with coal tar epoxy.

Excavation made behind seawall for tieback installation

Aligning HA175 lead section for advancement

Helical tiebacks with threaded rod extending through seawall; prior to pre-tensioning

Waler system on stabilized seawall

Project Summary

Project Engineer: MRD Associates
Geotechnical Engineer: Magnum Engineering
General Contractor: L and R Contracting
Certified Tieback Installer: Alpha Foundation Specialists
Product Installed: (122) FSI HA150 Helical Tiebacks, Design Working Tension Load of 22 kips; (60) FSI HA175 Helical Tiebacks, Design Working Tension Load of 30 kips; Tieback Lengths from 35 to 45 feet Behind the Seawalls