Helical Tiebacks for Roadway Widening

Project

Anahuac National Wildlife Refuge Tiebacks

Location

Anahuac, TX

CHALLENGE

Located along the Gulf coast of Texas near Houston, the Anahuac National Wildlife Refuge encompasses 34,000 acres of protected coastal marsh and prairies. In 2008, Hurricane Ike damaged a significant portion of the existing unpaved roadways within the refuge, which were temporarily repaired. A 2.5 mile stretch of unpaved scenic roadway surrounding Shoveler Pond included six pullover viewing areas which required improvements for vehicle access. Erosion from tidal and storm activity would need to be mitigated along the roadway prior to any improvements. A comprehensive improvement plan was developed and approved by the U.S. Department of Transportation for this area of roadway, which included construction of a seawall along the pond side of the roadway along with raising the roadway elevation up to 2 feet prior to the placement of asphalt pavement. Soil borings were completed at each of the pullover locations and generally showed soft to stiff clay to a depth of about 10 feet underlain by stiff clay. Based on the soil conditions, tiebacks would be necessary for the lateral support of the seawall system. Access for tieback installation was complicated by the water directly adjacent to the pullover areas. The construction process was further complicated by requiring tieback installation prior to driving the vinyl sheet piling to accommodate smaller diameter holes through the sheet piling.

Roadway prior to construction with pond area to the left

SOLUTION

Helical tiebacks incorporated into a vinyl sheet pile wall were selected for the earth retention system because of the ability to install into the roadway with smaller equipment and the limited work areas. The shoring design consisted of vinyl sheet piling embedded 17 feet below existing grade with one row of tiebacks located 2 feet below the top of wall. The tiebacks would be battered 45 degrees into the roadway and connected to the vinyl sheet pile wall with a threaded rod and timber waler. The tieback design required 7-foot spacings with design working tension loads of 12.5 kips. A minimum factor of safety of 2.5 was specified for the tiebacks to meet

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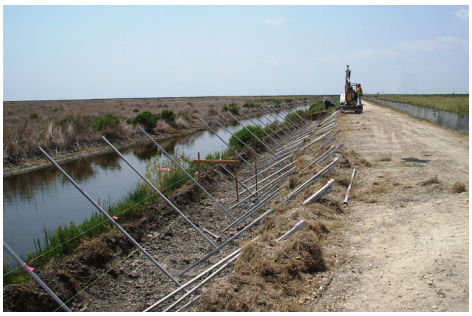
strict proof test failure criteria, resulting in a required ultimate axial tension capacity of 32 kips. Based on the tieback loading, the HA150 solid square shaft with a 10”-12”-14” helix plate configuration was selected. Proof tests were performed at 14 locations prior to construction of the wall to verify tieback performance. The production tiebacks were installed to 40-foot lengths and minimum termination torques of 3,200 ft-lb to achieve torque correlated ultimate capacities of 32 kips. With the 7-foot spacings, 195 tieback locations were required at the six pullout areas. The testing and tieback installation was performed over a period of 20 days.

Helical tieback installation

Proof testing helical tieback prior to sheet piling



Helical tiebacks installed prior to sheet piling

Roadway side of the seawall prior to backfill and pavement

Shoveler Pond side of the seawall with timber waler

Roadway side with backfill and pavement installed

PROJECT SUMMARY

Structural Engineer:	U.S. Department of Transportation/Brian D. Reinhardt
Geotechnical Engineer:	Tolunay-Wong Engineers
General Contractor:	Ledcor CMI, Inc.
Helical Pile Installer:	Baird Foundation Repair
Products Installed:	(195) Foundation Supportworks® Model HA150 Helical Tiebacks; Installed Lengths of 40 feet; Design working tension load of 12.5 kips.

For additional case study and technical information please visit Commercial.Supportworks.com.

BAIRD FOUNDATION REPAIR

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