Helical Piers and Polyurethane Injection For Building Stabilization

Project

Adesa Auto Auction
Building Underpinning

Location

Tampa, FL

CHALLENGE

The subject site was previously used as a municipal landfill from approximately 1959 to 1989. An auto auction building, and associated parking lots were first constructed at the site following closure of the landfill in 1989. A building addition occurred in 1995 to add more auto auction lanes and make the total building footprint an area of approximately 25,800 square feet. Due to the extent of building settlement, an elevation survey of the building floor slab was performed in 2020, which showed a maximum elevation difference of 4 inches at the office spaces and 7.5 inches at the auto lanes. At outside parking lot areas, elevation differences up to 18 inches were observed. Five soil borings were advanced across the site in 2020, with one boring located inside the building and another boring located directly outside the building. A 2.5-foot void was observed below the slab at the interior boring. The building borings showed landfill debris extending to depths of 19 to 24 feet. The 2020 engineering study recommended deep foundation support for stabilization of the interior slab and exterior footings. Another area of concern was the electrical and IT rooms, which had multiple electrical conduits running below the rooms. Deep soil stabilization was specified in these areas to limit future settlement of the conduits. Some of the interior slab locations had tight access and would require installation equipment capable of fitting through standard office doorways.

SOLUTION

LRE partnered with RE&A Engineering in 2021 to develop a stabilization plan for the building. A ground penetrating radar (GPR) study was performed to document the location of the floor slab structural reinforcement and the depth of concrete cover above the reinforcement. Core samples taken from the slab showed #4 rebar with concrete thickness ranging from 4.1 to 6.2 inches in three locations. Swiss Hammer tests were also performed on the slab at the three core locations which showed concrete compressive strengths ranging from 7100 to 8100 psi. All this information was used to determine the appropriate spacing for the slab deep foundation elements. Helical piers were selected as the ideal solution for both the slab and footing underpinning given the ability to install in tight locations and around existing conduits and slab reinforcement. Push Pier systems were also evaluated, but the slip-fit connection provided by the push pier couplers were considered unsuitable due to concerns regarding the voids below the slab and within the landfill debris. The final stabilization plan for the building floor slab and exterior footings included 1,038 helical pier locations. To address the conduit support at the electrical and IT rooms, deep injection of polyurethan foam was recommended for these areas to stabilize the upper soils and limit future movement. Polyurethane foam injection would also be used to fill voids below the floor slab.

The Model 287 (2.875-inch O.D. by 0.203-inch wall) helical pier system with either 8”-10” or single 8-inch helix plate configurations were selected for the slab support. Slab brackets were used with the Model 287 helical piers at 914 locations. The slab piers had service compression loads (design working loads) of 5 kips and were installed on an

Exterior footing condition prior to underpinning

Auto auction lanes prior to underpinning

Electrical and IT room area conduits

Void under electrical room prior to PolyLevel injection

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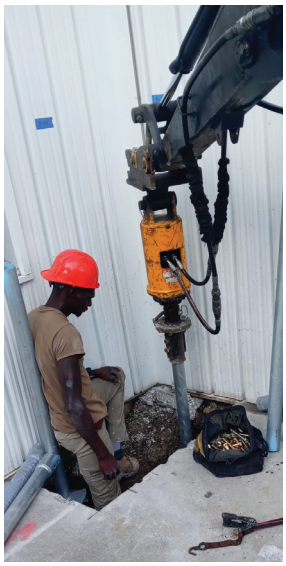
approximate 5-foot grid to average depths of 24.2 feet. The Model 287 helical pier system with an 8”-10” helix plate configuration was used with the FS288BL2 side-load underpinning bracket at 113 exterior pier locations. Eleven of the exterior footing piers were eliminated from the original stabilization plan due to electrical and/or drainage line conflicts. The exterior footing piers had service compression loads of 10 kips and were installed to average depths of 23.2 feet. The slab and exterior footing helical piers were installed to torque-correlated ultimate capacities of at least two times the service load. The pier installation occurred over a nine-month period with multiple phases of work required to allow the business to continue operation without interruption. After the slab pier installation was complete, a self-leveling grout overlay was applied to level the slab surface.

The conduit stabilization at the electrical and IT rooms consisted of 24 locations for deep injection of polyurethane foam with injection pipe lengths of 3, 7 and 14 feet. PolyLevel® PL400 was the chosen foam for the application, given its high strength, fast reaction time, low weight, and hydrophobic properties. The slab was monitored at several locations for movement during the foam injection process. A total of 860 pounds of PolyLevel PL400 polyurethane foam was injected over a two-day period.

Deep injection tubes for PolyLevel installation at Electrical and IT Rooms



Installing helical pier at exterior footing

Installing helical slab pier in tight access area

Installing helical slab pier in auction lane area

Exterior footing helical pier with underpinning bracket installed

Concrete finish at slab pier locations

Exterior pier locations backfilled, and concrete finished

PROJECT SUMMARY

Structural Engineer:	Kimley-Horn
Geotechnical Engineer:	ECS
Helical Pier Designer:	RE&A
Helical Pier Installer:	LRE Foundation Repair
PolyLevel Installer:	LRE Foundation Repair
Products Installed:	(913) Foundation Supportworks® Model 287 Slab Piers, Service Compression Loads of 5 kips, Installed Average Depth of 24.2 feet; (114) Foundation Supportworks® Model 287 Underpinning Piers, Service Compression Loads of 10 kips, Installed Average Depth of 23.2 feet; 860 lbs. of Foundation Supportworks® PolyLevel® PL400

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

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