Underground car parks

PSU Milton S. Hershey West Garage

UNITED STATES

Owner
PSU Milton S. Hershey West Garage

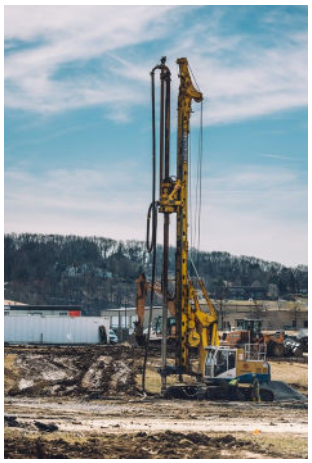
Engineer
ECS Mid-Atlantic, LLC

General contractor
Clayco

Dates of work
2018/12 2019/05

Main figures

Controlled Modulus Columns
560 EA.



Description

A construction project was proposed on the Penn State Milton S. Hershey Medical Center campus to accommodate the health system's continuing growth. As the Medical Center and Penn State College of Medicine campus undertakes several key expansion projects, including a planned research and education facility, demand for additional parking has increased. A new five-story, 1,200-space parking structure would provide for the planned growth, while also replacing parking spaces lost to expansion and construction.

Approved by the Penn State Board of Trustees, the new garage, along with a loop road on the west side of the Medical Center, was estimated at $35 million. The parking structure, which could expand to seven stories, would be built on an 80,640-sq-ft footprint. The project was to be constructed in an area with potential ground issues due to karstic formations and poor soils. Menard USA was contracted to provide ground improvement to address the compressible soils and voided karstic rock.

Ground conditions

The soils consisted of clayey fill and soft to hard lean clayey sand overlaying limestone interbedded with dolomite. The karstic dolomite is prone to dissolution in groundwater and is susceptible to voids, fractures and sinkholes. The top of bedrock, which is pinnacled at the site, varied from 10 feet to 43 ft below existing grade.

Solution

Micropiles were initially proposed for the project but were determined to be prohibitively costly with an extensive schedule. Menard proposed a hybrid solution, which included rock grouting the top 5 ft of bedrock beneath the footings and wall foundations and shallow Controlled Modulus Column (CMC)® rigid inclusion treatment of the fills and clayey sand above the bedrock. The combination of compaction grouting and CMC rigid inclusions delivered significant cost savings as compared to the original micropile scheme which would have required pile caps and grade beams. The compaction grouting and CMC rigid inclusion approach allowed for the use of spread footings and strip footings.

Menard installed approximately 560 CMC rigid inclusions to an average depth of 24 ft and maximum depth of 45 ft. Despite challenging winter weather conditions and delays related to the relocation of existing utilities, Menard completed work in eight weeks.

To support the construction of a five- story parking garage (with the capacity to expand to seven stories) on the Penn State Milton S. Hershey Medical Center campus, Menard USA installed 560 rigid inclusions, in addition to implementing Compaction Grouting to improve the overlying poor soils. Menard's hybrid solution provided a less costly alternative than the originally proposed micropiles which would have required pile caps and grade beams.