

NCSU CENTER FOR TECHNOLOGY & INNOVATION PARKING GARAGE

Location: Raleigh, NC

Project Type: Parking Garage



DUROTERRA™



DUCTILE IRON PILE ADVANTAGES

- Rapid installation
- Low vibrations in sensitive installation area
- Reduced impact on existing structures by transferring loads to deeper bearing layers
- Compatibility with ground improvement solutions

PROJECT DESCRIPTION

Continued growth of the North Carolina State University's Non-Woven Institute (NWI) drove the development of a new industrial building. The new 3-story, 105,000 square foot center for Technology & Innovation on North Carolina State University's Centennial Campus will house both high-bay industrial laboratory and office space. The development also consists of a new 4-level, 26,000 square foot parking garage.

GEOTECHNICAL CONDITIONS

Subsurface explorations on the site encountered up to 14 feet of loose to medium dense fill underlain by residual soils consisting of very loose to medium dense silty sand and soft to stiff silt. Partially weathered rock (PWR) was encountered at depths ranging from 6 feet to more than 50 feet (maximum explored depth) across the site.

PROJECT CHALLENGES

Reducing loading/construction impact of new parking garage foundations on an existing underwater stormwater storage system.



DESIGN AND CONSTRUCTION SOLUTION

Geopier® ground improvement support was planned for the heavily-loaded parking garage foundations to control settlement. However, the presence of an existing underground stormwater storage system located along the perimeter building wall presented design and construction challenges. Footings bearing at elevations above the stormwater storage system would impart loads on the system and also cause vibrations during ground improvement installation. Alternatively, lowering of footings in this area presented constructability issues related to excavations.

A low vibration, driven Ductile Iron Pile solution was developed to support the parking garage footings adjacent to the storage system. The piles were designed to penetrate the fill and residual soils to terminate after achieving “set” on the weathered rock. Pile working loads up to 40 tons were generated through end-bearing on rock. The small diameter piles generate limited vibration during installation and effectively transfer foundation loads to the rock bearing layer to minimize impacts on the existing stormwater system.

GeoConstructors, Inc., installer of both Geopier® ground improvement and DuroTerra’s Ductile Iron Piles, offered a combined foundation solution to provide overall foundation support. The Ductile Iron Pile solution consisted of Series 118/7.5 (118 mm diameter with 7.5 mm wall thickness) piles installed to terminate on very dense weathered rock. A total of 24 Ductile Iron Piles were installed in 3 days. Pile lengths ranged from 14 to 29 feet before reaching “set” of 1 inch or less of movement in 50 seconds or more.



PROJECT TEAM

DIP Design/Build Partner: GeoStructures, Inc. / GeoConstructors, Inc.

Geotechnical Engineer: Mosher Engineering

Developer: KeyStone Corporation

General Contractor: Danis Construction Company

Structural Engineer: Fluhrer Reed Structural Engineers