

280 MEEKER AVENUE

Location: Brooklyn, NY

Project Type: Residential



DUROTERRA™



DUCTILE IRON PILE ADVANTAGES

- Low vibrations
- Rapid installation compared with micropiles
- Cost-savings compared with micropiles
- Ability to work on constrained sites
- Demonstrated capacity through load testing

PROJECT DESCRIPTION

Construction consists of a new 8-story, 58,000 square foot residential building in the Williamsburg neighborhood of Brooklyn, NY. The project includes a total of 69 residential apartments. Foundation loads were up to about 500 kips at isolated foundations with greater loads at the elevator and stair mats.

GEOTECHNICAL CONDITIONS

Soil conditions consisted of urban fill extending up to 10 feet followed by a mix of stiff clay and silt and medium dense sand to depths of up to 30 feet where the soils transitioned into a medium dense to dense sand layer that extended to about 50 feet where very stiff to hard clay was encountered. The clay extends to the maximum explored depths of 102 feet.

PROJECT CHALLENGES

Provide low vibration foundation solution to support the building foundations on the constrained urban site.



DESIGN AND CONSTRUCTION SOLUTION

Construction of the 8-story building required foundation support to control settlement. Original plans for the structure featured 155 drilled micropiles with compression capacities of 75 tons. Minimum lengths of the micropiles were specified as 52 feet including a 22-ft bond length.

Due to the high cost and slow production of the micropiles, the project team explored alternative foundation options including ground improvement and Ductile Iron Piles. The ground improvement option was eliminated due to vibration concerns and challenges with working on the congested urban site. The Ductile Iron Pile solution was ultimately selected based on cost savings, rapid production and the ability to install the piles with limited vibrations using a medium-sized excavator on the tight site.

To provide settlement control while helping to minimize the foundation costs, GeoStructures, Inc. worked with the project design team to develop a solution using Ductile Iron Piles as rigid inclusions to support a disconnected shallow foundation. The approach featured a Series 118/7.5 Ductile Iron Pile installed with a 220 mm (8.7-inch) diameter grout shoe to construct an 8.5-inch displacement pile. The elements were designed for a compression capacity of 75 kips. The top-of-pile detail featured an oversized 18-inch square steel plate supporting a minimum 12-inch thick engineered aggregate pad over the top of the piles. Shallow foundations bearing on the engineered pad were then supported by groups of DIPs.

A full-scale load test was performed prior to construction. A Series 118/7.5 pile was installed with the 220 mm grout shoe to a depth of 33 feet below grade. Additional exterior grouted Ductile Iron Piles were installed with full-length high-strength centerbars to generate tension capacity to serve as reactions for the load test. The test was performed to 150 kips (200% of the design load). A top-of-pile deflection of only 0.20 inches was observed at the design load of 75 kips.

Following the load test program, a total of 216 Ductile Iron Piles were installed across the site. Neat cement grout was mixed on-site during the installation to maintain production and avoid delays associated with redi-mix grout deliveries. Production installation of the 31 ft (average) piles was completed in only 3 weeks. The modular nature of the system enabled the crew to easily mobilize into and work in the constrained work area. The low vibration installation allowed for work in the urban setting with no adverse impacts. Further, the displacement pile approach and controlled grouting operation limited the impacts of spoil generation associated with techniques like micropiles.

PROJECT TEAM

DIP Design/Build Partner: GeoStructures, Inc.

Geotechnical Engineer: Structural Engineering Technologies, P.C.

General Contractor: Prestige Construction

Structural Engineer: Structural Engineering Technologies, P.C.

Developer: CW Realty