

WASTE MANAGEMENT MATERIAL RECOVERY FACILITY

Location: Philadelphia, PA

Project Type: Industrial



DUROTERRA™



DUCTILE IRON PILE ADVANTAGES

- Rapid installation
- Rapid delivery
- Easy adjustment to highly variable and deep rock profiles

PROJECT DESCRIPTION

The project consists of overhead box conveyors for the metal sorting warehouse at the Waste Management Philadelphia Yard. The conveyor foundations are situated near and inside an existing warehouse structure.

GEOTECHNICAL CONDITIONS

This project, situated near the Delaware River, encountered complex geotechnical conditions. The site features an upper layer of historic fill ranging from 8 to 23 feet thick, composed of a sand, silt, and clay matrix interspersed with gravel, organic deposits, and scattered construction debris. Beneath this, residual soils - comprised of clay, sand, and gravel - transition into weathered rock. Borings revealed highly variable schist bedrock at depths between 29 and 38 feet below the surface. Subsurface conditions varied significantly over short distances, presenting unique challenges for the project.

PROJECT CHALLENGES

Provide a rapid foundation support solution to address the deep soft and organic fill while ensuring effective support from highly variable bedrock, all within and near an existing building.

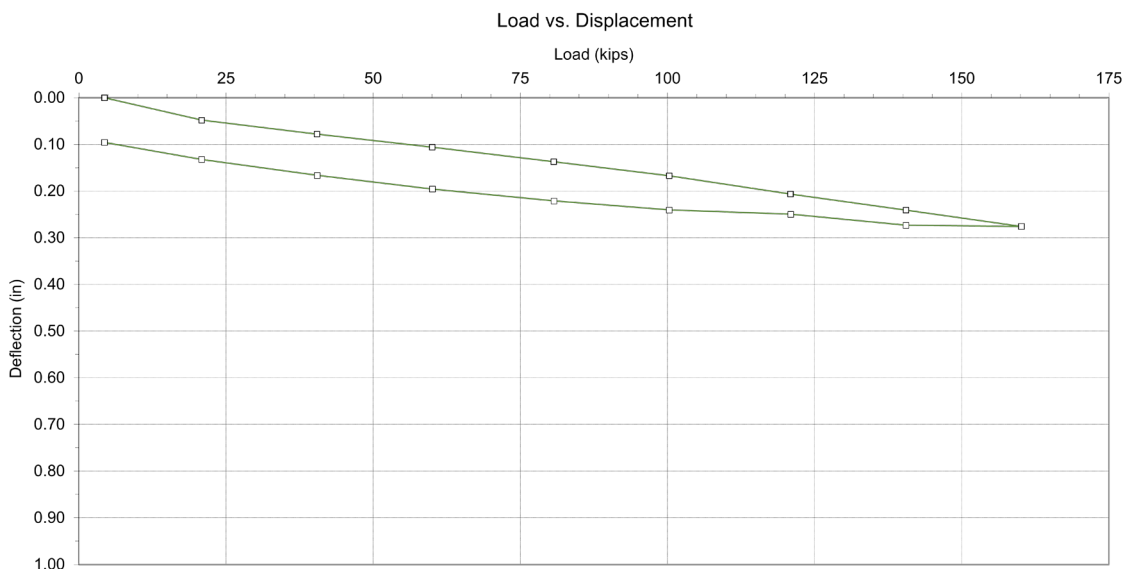


DESIGN AND CONSTRUCTION SOLUTION

The conveyor foundation system required pile service capacities of 80 kips (40 tons) in compression and 20 kips (10 tons) in tension. Several solutions were considered for foundation support including augercast piles, drilled shafts, and micropiles. Based on previous experience on this and similar sites in the area with variable rock conditions and shallow soft/organic deposits, GeoStructures, Inc. selected Ductile Iron Piles to address the service capacity needs. The Plug and Drive connection easily addressed the site variability without material waste.

GeoStructures, Inc. used an exterior grouted Ductile Iron Pile approach featuring a Series 118/7.5 (118 mm (4.65 in) outer diameter with 7.5 mm (0.30 in) wall thickness) pile with a 220 mm (8.7 in) diameter conical grout shoe driven to rock for compression capacity and grouted for tension capacity. A 4,000 psi neat-cement grout mixture was utilized to grout the Ductile Iron Pile during installation. A 42-ft long test pile was installed to achieve a set criterion of 1 inch or less of deflection in 50 seconds. Full-scale load testing was performed in general accordance with ASTM D-1143 on the test pile up to 200% of the design load to confirm the capacity. Test results showed a deflection of 0.14-in at the design load of 80 kips and only 0.28 inches at the maximum test load of 160 kips.

The Ductile Iron Piles are installed under each conveyor tower support landing. A 4 pile concrete cap is provided at each landing, for a total of 39 piles. An Atlas Copco HB2000 hammer installed on a John Deere excavator was used for installation. The installation of a total of 1,500 linear feet of Ductile Iron Pile material was completed in 5 working days. Installation depths ranged from 32 to 51 feet.



PROJECT TEAM

Architect: RRT Design & Construction
General Contractor: RRT Design & Construction
Geotechnical Engineer: Geo-Technology Associates
Structural Engineer: E.D. Pons Associates, P.C.
DIP Design/Builder: GeoStructures, Inc.