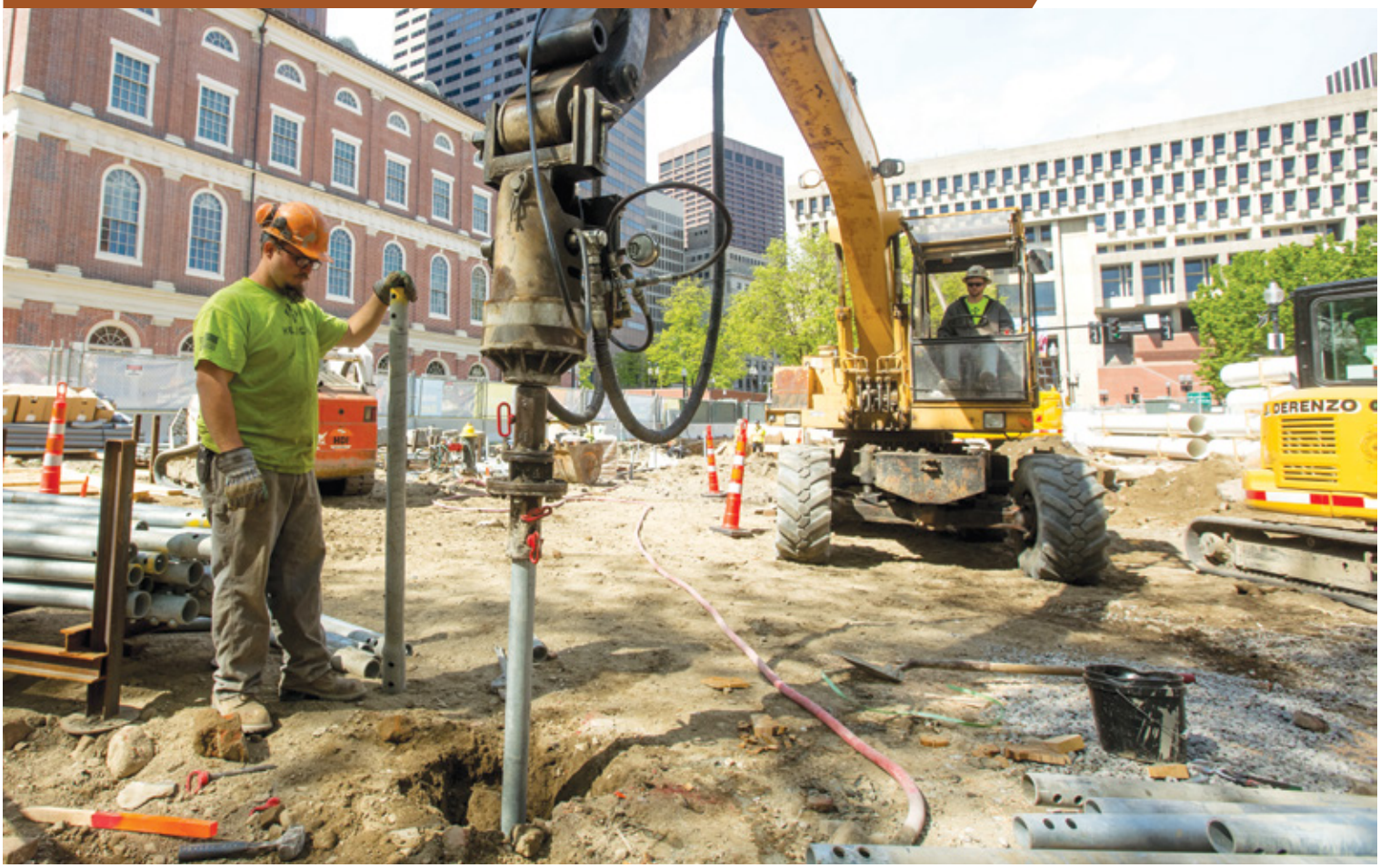
DEEP FOUNDATIONS / PILES

HELICAL PILES



FANEUIL HALL MARKETPLACE PAVILION

WWW.HELICALDRILLING.COM

INTRODUCTION

The project was part of a revitalization of Boston's historic Faneuil Hall Marketplace, which is located near the City's original coastline area that was filled in the 17th and 18th centuries to increase waterfront real estate.

The revitalization project included replacing an existing 1970's structure with a new, one-story, retail glass pavilion adjacent to Quincy Market. Structural column loads ranged from about 30 to 60 kips.

PROJECT CHALLENGES

Primary project challenges included: 1) construction in a sensitive, historic tourist area; 2) limited construction access; and 3) difficult subsurface soil conditions that are common along Boston's reclaimed waterfront.

Subsurface soil conditions generally consisted of 9 to 14 feet of unsuitable urban fill (soil mixed with miscellaneous man-made debris) over up to 5 feet of soft organic silt, over thick natural marine deposits (clay, silt, sand), overlying glacial till. The upper portion of the marine layer was relatively stiff/dense and became softer with depth. Glacial till was approximately 60- to 70-feet-deep. Remnants of previous structures, such as buried timber wharfs, were present in the fill to further complicate the already challenging subsurface conditions. Groundwater was encountered at 13 to 14 feet below the ground surface.

GEOTECHNICAL DESIGN/BUILD SOLUTION

Excavation, disposal, and replacement of the unsuitable fill and organic layers was deemed impractical due to premium costs associated with off-site soil disposal, excavation dewatering, and importing large quantities of structural fill.

The project team explored several piling options in lieu of excavation/replacement, including driven timber piles, drilled micropiles, drilled shafts, ductile iron piles, and helical piles. Driven timber piles were economically viable but were eliminated from consideration due to access issues and noise/vibration concerns. Drilled micropiles and drilled shafts both offered low-noise and low-vibration solutions, but were too expensive. Ductile iron piles and helical piles were both appealing options due to ease-of-access, low vibration, and relatively low cost. The team ultimately selected helical piles as the most suitable and cost-effective piling option.

Helical pile shafts are made of galvanized steel and are installed in short sections, each about 5- to 7-feet-long. Each pile consists of a lead helical section with welded screw-like bearing plates; subsequent straight-shaft sections are mechanically-fastened to the lead section as it is advanced into the ground. The piles are installed with a skid-steer or an excavator equipped with a high-power torque head, which is calibrated to directly correlate torque resistance with pile capacity.

The Pavilion's final structural design required 48 helical piles with an allowable compressive capacity of 30 kips each. The final pile design was performed by Helical and featured a galvanized 80 ksi steel pipe section manufactured by The Ideal Group. The piles consisted of a 27/8-inch-diameter, 0.276-inch-thick shaft with quadruple-helix (8-inch/10-inch/12-inch/14-inch) lead sections. The piles were designed to derive end-bearing capacity in the glacial till layer below the fill, organic silt, and marine layers.

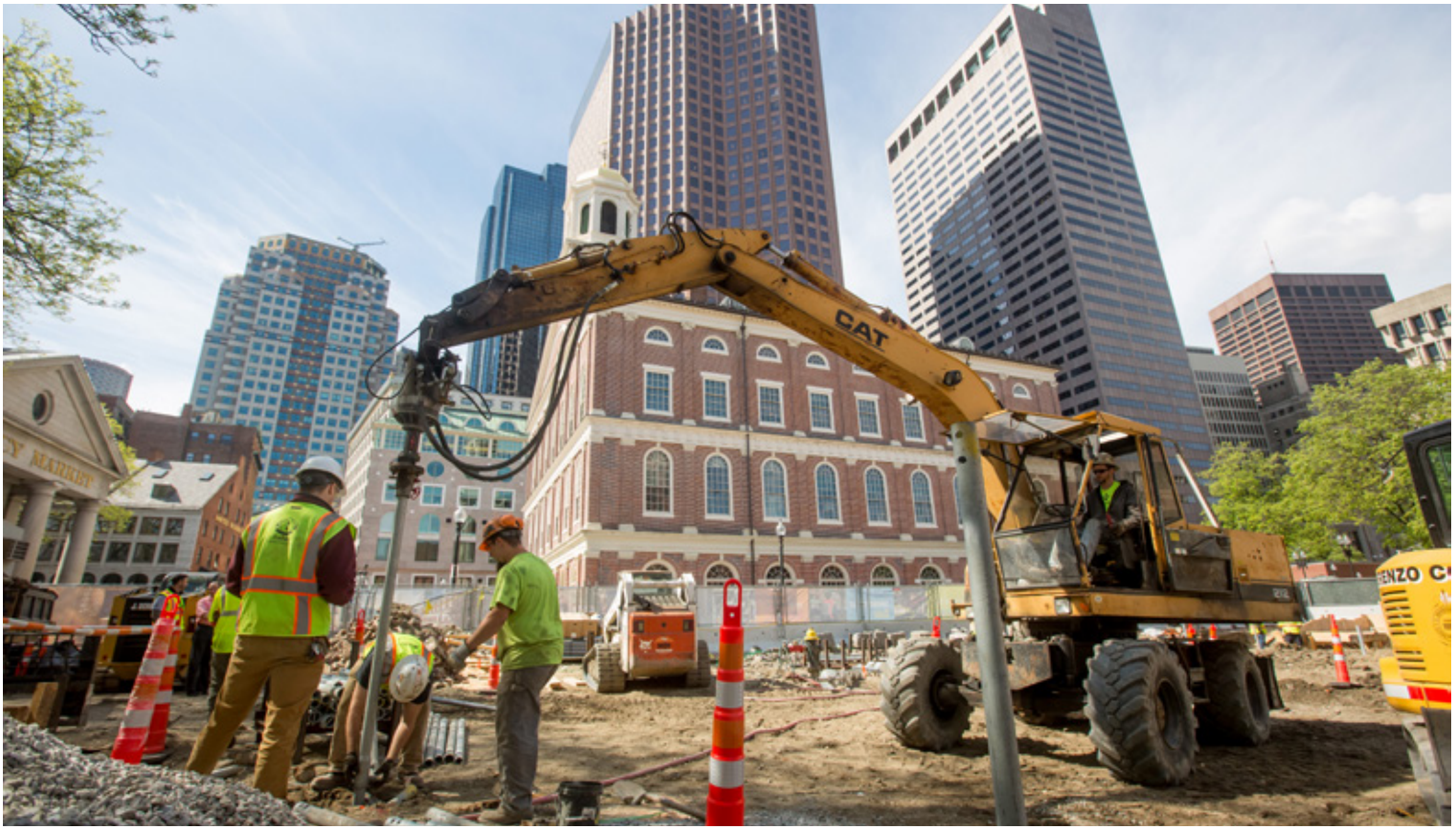
PILE INSTALLATION

Prior to the installation of production piles, the General Contractor pre-excavated pile locations to remove potential obstructions, including timbers and granite blocks. Pre-excavation proved to be worthwhile as all 48 piles were successfully installed at their planned locations. Upon completion, all helical piles were cutoff to their specified elevation and the interior of the pipe shaft was filled with neat cement grout to provide additional corrosion protection.

QUALITY ASSURANCE AND CONTROL

Helical's crew included a full-time Quality Control person to oversee pile testing and installation. A full-scale compression load test was successfully performed on a test pile that was loaded to 200% of the design capacity. The test results showed deflection of less than ½-inch at design capacity and less than ½-inch of net deflection upon completion of the test.

FANEUIL HALL MARKETPLACE PAVILION



HELICAL PILE ADVANTAGES:

- More economical that other low noise/vibration piles such as drilled micropiles and drilled shafts
- Eliminated the need to export/import large quantities of fill
- Little to no noise
- No vibrations
- No excess spoils
- No dewatering required
- Use of small equipment
- Rapid installation – only 8 days with mobilization and load testing

PROJECT DETAILS

Location: Boston, MA
Project Type: Retail
Service: Deep Foundations/Piles
Technique: Ductile Iron Piles
Geotechnical Challenge: Compression Load Resistance, Difficult Access, Low Vibration Construction, Unsuitable Soil Conditions