

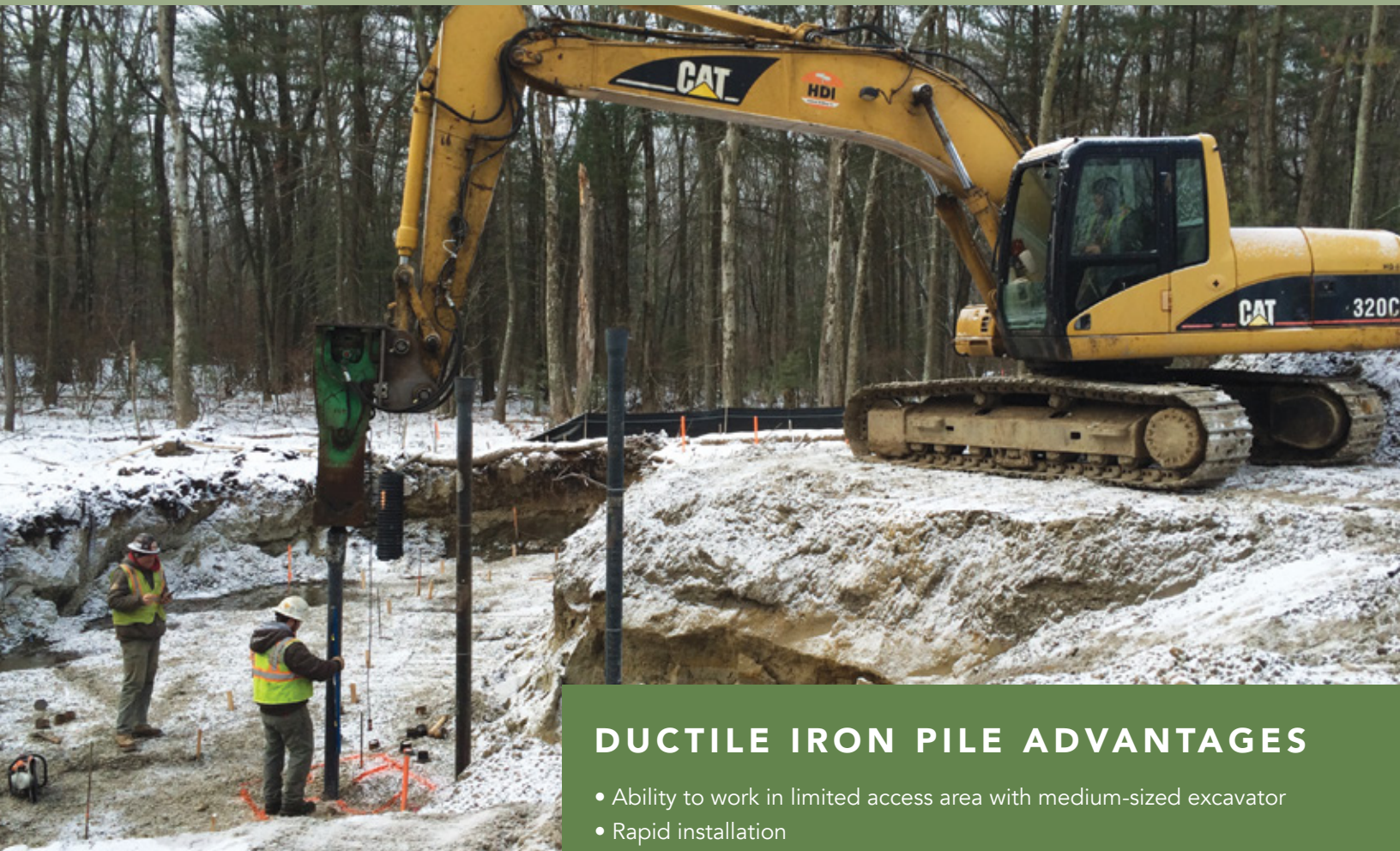
# CARMAX® DEALERSHIP SITE BRIDGE

Location: Westborough, MA

Project Type: Transportation



DUROTERRA



## DUCTILE IRON PILE ADVANTAGES

- Ability to work in limited access area with medium-sized excavator
- Rapid installation
- High capacity to match steel H-piles
- Battered installations for lateral resistance

## INTRODUCTION

Construction of the new CarMax® facility included a new dealership building as well as multiple parking lots. A 52-ft long single-span bridge was required to cross a small stream / wetland and provide access to a second parking area at the rear of the facility. Vertical and lateral loads on the 6.5 foot wide bridge abutments were 26.5 kips/ft and 3.1 kips/ft, respectively.

## GEOTECHNICAL CONDITIONS

The subsurface conditions encountered in four borings performed in the area of the bridge abutments generally consist of loose to medium dense glaciofluvial sand extending up to 28 feet followed by medium dense glacial till to about 35 feet. Weathered rock was encountered at depths ranging from 23 to 35 feet. Groundwater was encountered at depths of about 5 to 6 feet below grade at time of drilling.



## PROJECT CHALLENGES

Provide a cost-effective bridge foundation support at a limited-access construction site.

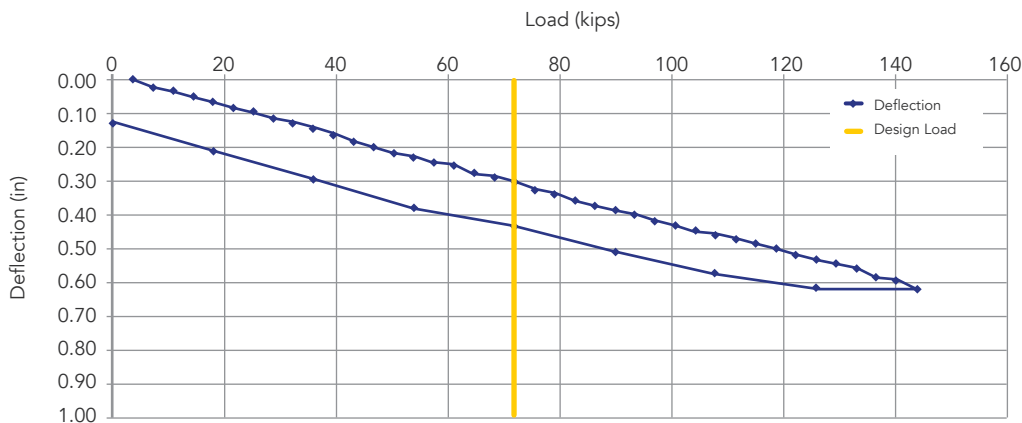
## DESIGN AND CONSTRUCTION SOLUTION

Support for the bridge foundations was initially designed for steel H-piles. Two rows of piles were designed within the 6.5 foot wide abutment footings. The front row of piles was designed with a batter to provide the lateral resistance. A Ductile Iron Pile alternative was presented to the site contractor on a 1:1 basis with the steel piles.

The Ductile Iron Pile system was selected based on cost, speed of installation and ease of access to the site. A Series 118/7.5 (118 mm diameter with 7.5 mm wall thickness) pile was selected for design. The pile was designed to develop capacity in end-bearing on the glacial till / rock.

A pre-production load test was performed at the site. The test pile was installed to terminate on rock at a depth of 36 feet. The pile exhibited a nearly linear load-deflection response with 0.31 inches of deflection at 72 kips (100% design load) and 0.62 inches of deflection at 144 kips (200%). Net deflection when unloaded was only 0.13 inches. Test results confirmed the alternate pile design.

Installation of the 32 piles occurred over a 3 day period in winter construction conditions. The piles were easily installed while working from variable grades. The mobile excavator and modular nature of the piles also made for quick installations on the opposite abutment across the small stream. The battered piles were installed by simply adjusting the inclination of the hammer during driving.



### PROJECT TEAM

**DIP Design/Build Partner:** Helical Drilling, Inc.

**Geotechnical Engineer:** McArdle Gannon Associates, Inc., Terracon, Inc.

**General Contractor:** EMJ Corporation

**Site Contractor:** Landmark Utilities & Site Excavation

**Structural Engineer:** Chappell Engineering Associates, LLC