

The HON Company Manufacturing Facility Improvements

Location: Muscatine, IA

Project Type: Industrial



DUROTERRA™



DUCTILE IRON PILE ADVANTAGES

- Low vibration installation within existing building
- Ability to work in limited access and limited overhead areas
- Rapid installation
- Confirmation of capacity by achieving "set" on rock

INTRODUCTION

Multiple phases of both interior and exterior improvements at The HON Company manufacturing facility included construction of a warehouse renovation and expansion, a new conveyor bridge, a new interior 600-ton press foundation, and a new injection molding system. Design loads required compression and tension resistance depending on the specific foundation.

GEOTECHNICAL CONDITIONS

Soil conditions generally consisted of up to 9 feet of fill containing loose clayey sand and sandy clay. The fill was underlain by alluvial soils including very loose to loose clayey sand and soft clay up to 15 feet followed by very loose to loose sand extending to rock at depths of 31 to 35 feet below grade. Groundwater was encountered at about 10 feet below grade.



PROJECT CHALLENGES

Provide compression and tension resistance for foundation support of multiple interior and exterior facility improvements.

DESIGN AND CONSTRUCTION SOLUTION

The original scope of work for the warehouse conveyor bridge system specified helical piles to resist compression and tension loads. Ductile Iron Piles were provided as a VE alternative to reduce the potential for “spinning out” at the loose sand / rock interface and to provide a greater working capacity. As plans moved forward, Ductile Iron Piles were specified for the warehouse renovation and expansion project on the same complex. Subsequent foundation support work specified for DIPs also included the new interior 600-ton press foundation and the new injection molding system.

For all phases of work, a Series 118/7.5 Ductile Iron Pile (118 mm outer diameter and 7.5 mm wall thickness) was selected to provide a working capacity of up to 40 tons for foundation support. All piles were installed through the fill and loose soils to achieve “set” on the hard rock. In situations with only limited tension requirements, a center bar was inserted into the wet grout on the pile interior to develop resistance through friction along the pile shaft. In other cases where tension demands were up to 20 kips, each pile was driven with a 220 mm (8.7 inch) diameter oversized conical cap that enabled continuous grouting with sand-cement grout to fill the annular space around the pile thereby creating a grouted bond zone. Even though the piles were still “set” to rock, the construction of the grout-to-ground bond zone developed sufficient bond capacity to resist uplift loads.

A total of 165 piles have been installed throughout the different phases of construction at the facility.



PROJECT TEAM

DIP Installation Partner: Peterson Contractors, Inc.

DIP Design Partner: Ground Improvement Engineering, Inc.

Geotechnical Engineer: Terracon Consultants.

Structural Engineers: Morning Star Studio / Stanley Consultants, Inc.

General Contractor: Calacci Construction.