Driven piles are deep foundation elements driven to a design tip depth or a design resistance. Design allowable compressive loads can vary from 25 to over 300 tons depending on the pile type and bearing strata characteristics. Common driven pile types include timber, precast prestressed concrete, steel H-piles, and pipe piles. The installed foundation element resists compressive, tension, and lateral loads. The technique has been used to support all types of structures.

Driven pile foundations have been used for centuries. This industry-wide experience has resulted in the development of several theoretical and empirical methods for determining the geotechnical capacity of a driven pile as a function of hammer energy and driving criteria. Quality control of driven piles includes high strain dynamic load testing, often referred to as “PDA” testing, and conventional compression and tension load testing. High strain dynamic load testing (ASTM D4945) allows engineers to establish the relationship between the driving energy, blow count, and pile resistance. Once this relationship is established, pile blow count can be used as an indicator of pile resistance during monitoring of the production pile installation.

Hayward Baker Inc. (HBI), North America’s leader in geotechnical construction, is committed to providing the most economical solution to satisfy the technical requirements of each project. Whether a situation is typical or unique, HBI has the experience and innovation to help engineers, contractors, and owners identify and implement the best solution. For a variety of subsurface and access conditions, driven piles may be the answer.
Timber Piles

For centuries timber piles have been used to support a variety of structures and can be a very cost effective pile for lighter structures where column loads are below 150 tons. Timber pile allowable compressive capacities typically range between 15 to 30 tons per pile. Timber piles are often not designed as end bearing piles since their tips can be damaged during driving to bear on a hard layer. Precautions, such as pressure treatment, prevent decay of wooden piling in areas with fluctuating water tables.

Northside Wastewater Treatment Plant
Wilmington, NC
Upgrades to the plant included several new structures that required deep foundation support. HBI installed pressure treated timber piles using two pile driving rigs to meet the project schedule. Each pile location was predrilled with a continuous flight auger to initially set and align the piles at the design locations. HBI safely drove the piles to capacity and within the acceptable tolerances.

Sweetwater Apartments
Charleston, SC
HBI drove pressure treated timber piles to provide the deep foundation for a 54 acre apartment community in a seismic area. Piles were driven through liquefiable sand and soft soils to an allowable compressive capacity of 25 tons achieved in an underlying stable bearing stratum.

Pedestrian Bridge
Crossville, TN
HBI installed pressure treated timber piles to support a replacement wooden pedestrian bridge. To facilitate the installation of the piles through unidentified soils, a pile point (a.k.a. driving shoe) was installed on the tip of each pile to protect the tip from brooming or splitting. Most of the piles encountered refusal at depths from 9 to 19 feet below the existing grade. HBI has piling rigs well suited for the access constraints typically encountered on pedestrian bridge projects.
Steel H-Piles

Steel H-piles are compact structural sections that can withstand installation involving difficult pile driving subsurface conditions. They are also easily spliced, making them attractive for sites where pile length is highly variable. Typically, H-pile allowable compressive capacities are between 60 and 150 tons per pile and are used for heavier structures such as elevated water tanks, office buildings, parking decks, bridges, and industrial applications. Steel H-piles are generally driven in soil conditions where high tip resistance will result in refusal, such as when bearing in bedrock.

Elevated Water Tank
Dahlgren, VA
To support a new 500,000 gallon water tank, HBI drove steel H-piles to an allowable compressive capacity of 67 tons. The specifications required the use of a Pile Driving Analyzer (PDA) for the first pile. Upon completion of the test pile, the engineer recommended driving the remaining piles to a minimum depth of 68 feet. Fifty-foot-long piles were initially driven to roughly 48 feet. An additional pile section was then spliced to the top of the initial section by a certified welder, and the pile was driven to the specified criteria.

McAlpine Creek Greenway
Charlotte, NC
Undefined fill and loose alluvial soils present at the site of four planned pedestrian bridges required a deep foundation system to support the structures. H-piles were selected since the piles would develop their capacity in end bearing. HBI installed steel H-piles that extended through the poor soil to bear in the very dense or hard residual soils or partially weathered rock.

Student Recreation Center
Greensboro, NC
HBI drove steel H-piles to provide the deep foundation for a new student center at the University of North Carolina, Greensboro. Piles were designed to bear on the surface of the bedrock, present between 25 to 95 feet below grade. The highly variable depth to rock made H-piles the most attractive solution given their ability to be spliced. H-piles were also selected because they do not require soil-producing predrilling to penetrate difficult subsurface conditions. This was particularly important as there were contaminants in the soil. HBI used two rigs working concurrently to meet an aggressive schedule.
Precast Concrete Piles

Precast prestressed concrete piles are generally square piles reinforced with prestressed tendons and used for allowable compressive capacities between 60 and 150 tons. Additional reinforcing can be used if required to meet seismic loads. They are a cost-effective piling option suitable for many ground conditions. Because of their resistance to corrosion they are used extensively in marine environments. This type of piling is often used when pile lengths are anticipated to be fairly uniform and are typically driven in soils that achieve capacity by frictional resistance.

**Elevated Water Tank**
Clinton, NC

HBI installed 12-inch-square prestressed concrete piles to embedment depths from 29 to 33 feet below grade to support a new 500,000 gallon elevated water tank. A continuous flight auger was used to predrill the upper 15 feet of each pile location to penetrate the firm to stiff silt and clay soils and reduce pile driving stresses. The piles were then driven until the allowable design compressive capacity of 60 tons was achieved. Despite site stability issues and limited working room with close proximity to neighboring structures, the team completed the work ahead of schedule and within budget.

**Elevated Water Tank**
Faison, NC

Concrete piles were chosen as the deep foundation system for an elevated water tank due to the anticipated uniform bearing depth. Two over-length indicator piles were PDA tested to determine the driving resistance, termination criteria, and production pile length. The remaining 14-inch-square piles were driven to a depth of 45 feet. These piles were designed for an allowable compressive capacity of 75 tons, tension capacity of 40 tons, and lateral capacity of 10 tons.

**Sweetwater Apartments**
Charleston, SC

In addition to timber piles that were driven at this site, the soil conditions and heavier column loads for one building resulted in prestressed concrete piles being a better solution for the structure. The piles were driven through the unsuitable soils and several feet into the Cooper Marl. Each pile had an allowable compressive capacity of 44 tons.
Steel Pipe Piles

As the name states, steel pipe piles are steel pipe sections driven vertically into the ground to become deep foundation elements. Pipe pile allowable compressive capacities range from 60 to 150 tons and diameters range from 7 to 30 inches. Steel pipe piles are typically used where geotechnical conditions produce increased pile capacity through soil displacement. Pipe piles can be spliced to address variable depth bearing layers.

**JM Stuart Station**
Aberdeen, OH
Expansion of this coal-fired power station included new silos, which required a deep foundation system. The foundation was supported by 12-inch-diameter pipe piles with an allowable compressive capacity of 30 tons. Overlength indicator piles determined capacity was reached at 60 feet. Pile locations were pre-augered with a continuous flight auger to a depth of roughly 10 feet, and then the piles were driven to depth.

**Solar Panel Array**
Lexington, NC
HBI installed galvanized pipe piles to embedment depths of 7 to 9 feet to provide a foundation system for solar panels at a new solar energy farm. The site’s hard residual soils required a high frequency variable movement vibratory hammer. The crew achieved safe and continuous production using specialty equipment that achieved rapid loading of pipes into the installation rig. Laser levels ensured that piles were installed to their specified elevation and were precisely aligned.

**Cemex Air to Heat Exchange**
Clinchfield, GA
A shallow foundation for the planned air to heat exchanger would have experienced excessive settlement due to expansive soils. Removal and replacement of the expansive soils was not an option because of existing underground utilities and old foundations. As an alternative, HBI installed pipe piles to depths from 37 to 40 feet to provide the necessary foundation support. Each planned pile location was vacuum excavated to a depth of 10 feet below grade to ensure that underground utilities were not damaged during installation.
Advantages of Hayward Baker’s Driven Piles

- Environmentally friendly
- Cost effective
- Wide variety of applications
- Adaptable
- Fast installation
- Comprehensive quality control

You have a strong partner with Hayward Baker

Hayward Baker Inc. (HBI) is North America’s leader in geotechnical construction, offering the full range of pre- and post-construction services for foundation rehabilitation, settlement control, liquefaction mitigation, soil stabilization, groundwater control, slope stability, excavation support, underpinning, and environmental remediation. HBI is annually ranked #1 in the profession by Engineering News-Record (ENR).

Headquartered in Hanover, Maryland, HBI has over 30 offices servicing North and Central America. Since its inception, HBI has established itself in the forefront of geotechnical specialty contracting, evolving and expanding to meet the increasingly complex needs of the construction community. HBI offers full design-build services for any geotechnical construction application.

HBI has the experience and innovation to assist engineers, contractors, and owners with identifying and constructing the most economical solution that satisfies the requirements of each project, typical or unique.

Driven H-piles for a new manufacturing facility.