



By Rusty and Clayton Signor, Signor Enterprises, Aum, TX

In the heart of drilled pier country, a private residence on Lake Austin in Austin, Texas recently was completed by being supported on driven piles. Large residences on Lake Austin are not uncommon, but this project stands out because a world class architect was inspired by the driven pile material and created an internationally renowned pedestrian bridge.

Central Texas Pile Driving

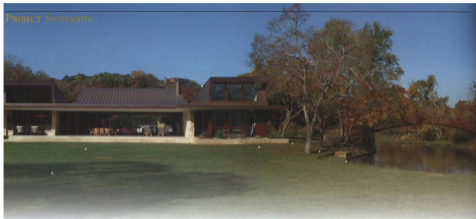
Driving piles in Central Texas has been an uphill battle in the last 25 years. Signor Enterprises, LP makes headway every time a rogue engineer, builder, or architect realizes the benefits of driven piles over drilled piers. The first utilization of piles for a house foundation in the area came when removing the spoils of cased piers caused a mess at the subdivision's entrance, and the Home Owners Association shut down the job. A structural engineer who had seen piles driven on the coast saw Signor Enterprises working on a nearby dock structure. He asked if the crane operating the drop hammer could come on shore to install piles for the house, and the rest is history. The next major landmark in pile driving in Central Texas was 15 years later after Rusty Signor, founder and owner of Signor Enterprises, heard a presentation on pile testing by Dr. George Goble at a Pile Driving Contractors Association Annual Conference. Dr. Goble described a pile demonstra-

tion he performed in Denver, Colorado where local engineers predicted the capacity of a pile by 85% on average. Rusty saw an opportunity to demonstrate the capacity of his driven piles by means of a hydraulic jack test in front of a group of BBQ-loving engineers. For a 6-5/8" schedule 40 closed-end pipe pile driven with a 2000 pound drop hammer, the static loading maxed out when the 60 ton jack met capacity with minimal deflection. The required allowable loading was doubled to 60 kips, so going through the trouble to get a 250 ton loading jack was deemed unnecessary. The battle was won for this project. Engineers learned a lesson of the capabilities of driven piles and the client saved half of his foundation cost.

Scope of Project

Over five years, this lakeside estate was phased into installing driven piles for the deep foundation of the primary residence and guest house, constructing a 2-slip boat dock supported on piles, erecting an 88 foot pedestrian bridge with vertical and battered pile supports, installing approximately 1650 linear feet of light gauge sheet piles, and driving piles and sheet piles for a top-down construction of a swimming pool. Three aspects of this phased project are of interest for discussion: using a dynamic pile test for value engineering the foundation piling and as a teaching tool, using battered piles

Lake Austin Lakeside Estate



and pile material to construct the pedestrian bridge, and using sheet piles for a top-down construction approach for the swimming pool.

Building Foundation Piles

Pile driving in Central Texas is relatively new for many geotechnical and structural engineers. This project helped to remove one of the biggest excuses to not use piles on Lake Austin besides the under designed bearing capacity for piles. At the time, there was a preconceived notion that as long as a foundation is not on the edge of the lake, the soil is strong enough to float a slab. By demonstrating pile driving and a dynamic pile test, Signor Enterprises removed this misconception from a number of engineers.

The main residence was located about 400 feet from the main body of the lake underlain by 50 feet of alluvial silt before a limestone base. Consistent with many lakeside sites, the ground had around a six foot thick top ground cap above the water table. During a demonstration, Signor Enterprises placed around 20 pilings in predrilled holes. While the guest engineers were eating lunch, the piles were pushed into the ground over 20 feet with just the weight of a 2000 pound drop hammer. (On other sites the piles have dropped this way without even the hammer weight on them). Some of the guests had a hard time swallowing their lunch as they had designed floating slabs on nearby homes. Yet the pilings for the swim-

ming pool immediately adjacent to the main body of the lake on this project (discussed later) had dramatically higher blow counts for their entire penetration. This proved that Lake Austin, a dammed portion of the Lower Colorado River, exhibits typical river deposits of larger-grained soils closer to the channel and finer-grained soils including organics further out.

The dynamic test demonstration performed by GRL Engineers, allowed the structural engineer to redesign the main foundation by a 23.5% reduction of the original 187 piles with double piles at beam intersections and as close to 4 foot on center spacing. The results of this test were used for further design of the guest house and the pool.



Top-Down Pool Construction

The swimming pool for this estate was designed to be constructed 5 feet below ground level and on the edge of the lagoon. The water table was 3 feet below the surface in highly saturated alluvial silts. Inspired by a Skyline Steel PDCA presentation, a top-down construction approach with sheet piles was chosen rather than conventional over-excavation due to the high water table, the weak soils, and the proximity to the lagoon. Sheet piling was driven around the perimeter of the pool and several well points were installed for dewatering. As the silt was so loose, the excavation was limited to small areas and then backfilled with gravel in order to keep the sheet pile toe deflecting inwards.

Pedestrian Bridge

The pedestrian bridge for this estate was built to connect the primary residence to the guest house across a lagoon. Signor Enterprises participated in the structural design which incorporated the pipe pile material as the primary support system. Battered piles were used to withstand the lateral thrust and the axial loads that were welded directly to the support structure of the bridge. The superstructure was the same pipe size as the piles, which were bent in four different arch radii pushing against these battered piles. The arched pipes were then tied together by half inch rods welded 2 inches apart, bent, and cut to various lengths to resemble the cat tails in the surrounding lagoon. This simple design brought about international recognition by articles in AIA publications and the following awards:

- 2008 Grand Award – Custom Home Design Awards
- 2008 Finalist – London International Creative Competition
- 2006 Architectural Review Awards for Emerging Architecture
- 2006 Design Award – Texas Society of Architects
- 2006 Small Projects Award – AIA National
- 2006 Merit Award – AIA Austin

Conclusion

The success of this project was directly tied to Signor Enterprises' involvement with the PDCA over the last decade. Without the informative technical seminars and the network of pile driving experts used for guidance, many of the progressive methods of construction would not have happened for a residence.

Project Description

- Project Title: Lake Austin Lakeside Estate
- Project Owner: Withheld on Request
- Architect: Miró Rivera Architects
- General Contractor: Don Crowell Builder Inc.
- Total Subcontract Amount: \$922,144
- Start Date: Fall 2004
- Completion Date: Fall 2009 ▼

Photos courtesy of Rusty and Clayton Signor, Signor Enterprises

