

Pile Driving Templates and Procedures Used to Construct the Lake Borgne Surge Barrier – Innovation Description

Innovation Description: Innovations in construction through specialized equipment design and utilization met accelerated schedule demands in a challenging marine environment, which included deep soft unconsolidated soils subject to significant settlement and lack of lateral support.

Project Features: The \$1.1 billion IHNC-Lake Borgne Surge Barrier is the largest design-build civil works project in the history of the USACE. The backbone of the project and the largest section in scope and cost is the 26-foot-high concrete barrier wall, which stretches for 1.8 miles across the Mississippi River Gulf Outlet and the Golden Triangle Marsh and ties into the sector gates on the Gulf Intracoastal Waterway. Hurricane Katrina's 18-foot storm surge and seven-foot waves pushed deep into the center of New Orleans via the IHNC, overtopping and failing the floodwalls. The breach allowed 15 feet of floodwater to cover all of southeast New Orleans, causing catastrophic damage and loss of life. To reduce the risk of a recurrence of this type of event, the USACE undertook the construction of the IHNC Floodwall.

The RFP: The Shaw Group (Shaw), on behalf of the USACE, issued two separate RFPs for the construction of the floodwall: one for the north half and one for the south half. A team consisting of Traylor Bros. Inc., Weeks Marine, and Massman Construction (TMW), with Traylor as lead partner, responded to the fixed price-best value proposal on both projects. After review of the proposals, Shaw offered TMW both contracts, provided TMW would construct both within the contract duration of 18 months.

The Wall: The wall is constructed of five-foot-six-inch-diameter precast cylinder piles driven on six-foot spacing to a depth of -130 elevation. The six-inch space between the piles is closed with an 18-inch, five-sided precast closer pile at 60 feet long, imbedded in a three-foot-diameter grout column and reaching down to elevation -55. Piles are capped with precast concrete blocks 18 feet long and six feet high, weighting 90 tons, with a six-foot closer pour between each cap block. The wall is braced by steel battered piles three feet in diameter spaced at 12 feet on centers, 248 feet in length, driven on 1.5/1 (rise/run) batter.

Challenges: Within the four-month period between Notice of Award and Notice to Proceed, TMW designed and fabricated all of the specialized equipment needed to complete the project in 18 months. The contract specified that all pile templates be two-stage and capable of self-supporting the pile without aid of a crane. Given the necessity to work 24 hours a day, in all weather conditions and in a marine environment, and with the very poor soil conditions and the compressed construction schedule, conventional construction equipment and methods were inadequate.

The Innovative Solution: TMW designed, built, and employed a steel track girder system in 50-foot advanceable sections. The sections were supported on 36-inch, 135-foot-long steel pipe piles with one track on each side of the wall, allowing for self-propelled moveable pile templates and work platforms to be set above and straddle the wall. The pile driving templates weighed up to 600,000 pounds and had as many as three elevations in order to support the extremely dynamic loads of the longest steel pipe pile ever driven on a 1.5 to 1 batter.

This system not only provided support to achieve the necessary critical tolerances, but also allowed all seventeen major work activities to proceed in an assembly line method around the clock and in all weather conditions, exceeding the necessary 36 feet of wall per day required to meet the schedule; the team achieved a consistent 48 feet of wall production per day. In 18 months, more than one million man-hours were expended using this system, finishing on time and without a single lost time accident.

Awards: ENR's Award of Excellence Winner for 2013, Wayne Jones
Deep Foundations Institute 2011 Outstanding Project Award Recipient
ENR Best of the Best Award, 2011 – Best Civil Works/Infrastructure
USACE Superior Safety Performance Hurricane Protection Office, 2010

<http://enr.construction.com/people/awards/2013/0422-Wayne-E-Jones-Named-ENR8217s-2013-Award-of-Excellence-Recipient.asp>

<http://www.youtube.com/watch?v=EzliOxXIRas>

http://blogs.asce.org/ocea-project-finalist-inner-harbor-navigation-canal-surge-barrier/?utm_campaign=Comm-20140314-ASCENews%20Weekly&utm_medium=email&utm_source=Eloqua

Innovation Illustration: Pile Driving Templates and Procedures Used to Construct the Lake Borgne Surge Barrier



Closer Pile and Grout Plum Template and Platform



36-inch Battered Pile Template



Rail Mounted Side Load



66-inch Concrete Tower Pile Template



View of the Entire Production Line