

Ultimate piling - KHL Group

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Two 130-ton capacity Tadano Mantis GTC-1200 cranes are a part of SGL Constructors' crawler crane fleet that are being utilized for pile driving and lifting work on the I-4 Ultimate project in Orlando.

The 21-mile portion of I-4 Interstate – through Orlando and Central Florida – is being transformed into a modern thoroughfare, which will greatly improve the lives of the driving public. In fact, the Florida Department of Transportation (FDOT) has named the project the I-4 Ultimate and they say it “will transform the region while connecting our communities, improving our economy and enhancing livability for everyone.”

The project is being built by a joint venture of Skanska, Granite and Lane – SGL Constructors, and involves the makeover of 15 major interchanges and 140 bridges. The construction will also include the addition of four variable rate toll express lanes, two in each direction.

The building of new interstate lanes and bridges is obvious to motorists on the jobsite but a great deal of work needs to happen before those structures are built. Though largely unseen, the below-the-surface preparation is essential to the project, according to a FDOT press release.

“The underground structures – usually steel or concrete pilings – are put there to create safe, stable foundations to hold bridges, overpasses, ramps and other structures in place,” the FDOT release stated.

“Approximately 7,000 pilings, ranging from about 40 to 120 feet in length, will be driven into the soil at strategic points along the 21-mile project.”

The steel pilings – known as H-piles because they form the shape of the letter “H” when viewed from the end – weigh about 89 pounds per linear foot. Square concrete piles weigh as much as 600 pounds per linear foot (depending on the cross-section).

Driving pile

Two 130-ton capacity Tadano Mantis GTC-1200 cranes are a part of SGL Constructors' crawler crane fleet that are being utilized for pile driving and lifting work on the project. The GTC-1200 is Tadano Mantis' largest telescopic boom crawler crane and is approved by the manufacturer for pile driving applications.

"Tadano Mantis cranes have many years of successful use in both vibratory and impact pile driving applications," said Ed Hisrich with Tadano Mantis. "For the vibratory pile driving work on the project, SGL utilizes several different vibratory hammers with the largest being an ICE 50ZR. For impact piling, the setup includes hanging leads and a D30-52 diesel hammer. For lifting work, the crane's 155-foot full power telescopic boom offers plenty of reach and lifting capacities are competitive when compared to similar sized lattice boom crawler cranes."

Tadano Mantis added several special options to the cranes for the SGL's intended applications, Hisrich said. A 28,000-pound bare drum line pull controlled free fall winch was added in the auxiliary winch position. The controlled free fall operation of the winch allows the pile hammer to follow the piles while maintaining a small amount of drag on the wire rope to avoid fouling of the wire rope on the winch drum.

When not pile driving, the controlled free fall option can be disabled for standard winch operation. Steel sheaves are provided in the boom head to give long life to the sheaves under the heavy duty pile driving applications. Cab top FOPS system that conforms to ISO 3449 Level II is mounted for added safety.

"The GTC-1200 is the ideal crane used to address multiple challenges in and around the I-4 project sites," said Hisrich.

Extend and retract

The full power, 155-foot telescopic boom is very efficient when compared to fixed length lattice booms. Automatic switching of "out of level" load charts in the AML-C rated capacity indicator system for 0 – 1.5°, 2.5° and 4.0° slope allow the contractor to set the crane for lifting work with less need for grading of lifting pads because the correct load chart is automatically selected by the AML-C system when the crane is positioned for lifting.

"The high tractive power and the ability to extend and retract the track frames on the fly without pinning them into place allow the crane to move easily through ungraded terrain and congested sites before positioning the crane with the tracks extended to perform pile driving work," Hisrich said. "Fast self-erection of the crane aids in efficiently moving the crane throughout the project site. Tadano Mantis' patented track frame retention system allows for quick removal of the track frames without the need for any tools. Radio control counterweight raising/lowering and pinning allows the counterweights to be loaded or removed from the ground. Radio controlled carbody jacks with auto-leveling allow for safe jacking of the crane to load it on the trailer."

To monitor noise and vibrations from the placement of pilings, engineers on the I-4 Ultimate project will deploy several strategies. One method includes the placement of seismographs that monitor ground vibration. The seismographs can send out cellular alerts to construction managers if higher-than-expected vibrations are detected.

“We are conservative with the thresholds that will set off the monitoring alerts; they are well below the levels that would normally cause structural damage,” said Shelley Gisclar, coordination engineer with SGL Constructors.

She noted that noise measurements are also taken during night-time construction activities, and the actual pile driving is done during the day-time hours. Readings from the sensors on the pilings that measure rates of movement also help engineers determine if the piles are set deep enough. Where necessary, the machinery can be adjusted to change the force and speed of the hammers.

Once at their proper depths, the upper ends of the piles stick out above ground and become part of a concrete slab that is built around them. That further locks the deeply rooted foundation into place, so it can help support the interstate’s largest structures from below.

Tadano Mantis sponsors the GTC-1200 on 3DLiftPlan.com.

“Using this web-based lift planning tool, the user can make basic lift plans or compute ground bearing pressures free of charge,” said Hisrich.