JOB STORY

Thinking Outside of the Box

Arrow Directional Boring Puts an Innovative Spin on an Everyday Process

BY NICK ZUBKO, ASSOCIATE EDITOR

Arrow Directional Boring, based in Coral Springs, Fla., was hired to install four pipelines to run water, sewer, reclamation and construction lines to a new housing development.

Preparing for hurricane season is one of the annual rituals thousands of Florida residents don't really look forward to every year.

Located along the Atlantic coast between Cape Canaveral and West Palm Beach, the city of Port St. Lucie is a regular participant. But recently, it may have been one of the unluckiest examples, having been hit by three major hurricanes within the last two years — first Frances, then Jeanne and finally Wilma in October 2005.

But as a testament to its resilience and what the area has to offer, Port St. Lucie is still one of the most prosperous cities in the country. It was even listed as the nation's fastest growing city (among populations of 100,000 or more) back in 2003-2004 — reporting an increase of 12 percent that year. And the trend doesn't really seem to be slowing down, as the city continues to build new communities across new areas of town. But as always, expansion often results in discovering new obstacles along the way.

Before Kolter Signature Homes, a local homebuilder in Port St. Lucie, could get construction of a new 2,000-home development under way, it needed to have the underground infrastructure run out to the

1,500-acre plot of land that in no time will be bustling with playing children, minivans and backyard cookouts. The company hired Centerline Utilities to put in the infrastructure and they in turn hired and subcontracted the bores to Arrow Directional Boring, a utility contractor based in nearby Coral Springs, to install the water, sewer, reclamation and communication lines for the new development.

When Preparation Pays Off

Arrow bid the project in February and soon the crew started planning its approach. The task at hand — to figure out the best and most efficient way to install four separate 350-ft steel casings (14-, 20-, 24- and 42-in. in diameter) crossing beneath the Florida East Coast Railroad (FEC) and two drainage canals. Spaced only 10 ft apart, the four pipelines were designed to tie in to existing lines on the other side of the development. Custom stainless steel casing spacers were attached to the 30-in. main to affix three 2-in. conduits for the development's future communication needs.

From the start, one primary concern was how to maintain sufficient cover over each of the bores to leave the railway undisturbed. However, this proved challenging as the terrain had significant variance in elevation and traveling under the canals only allowed 3 ft of cover. Initially, the project was approached using jack-and-bore technique, but according to Jeff Blake, president of Arrow Directional Boring, the proximity of the water table created such loose soil conditions that it might not be able to support the railroad. So they had to look for another solution.

"Because we were going under the FEC Railway, we didn't want to have any settlement of the tracks for obvious reasons," Blake explains. "So we had to avoid over-cutting the bore and creating a void where the tracks could settle. Neither jack-and-bore nor microtunneling were cost-effective options, so what we came up with was a new type of boring."

Instead, the crew used an American Augers DD-140, with a TT Technologies 18-in. Grundoram Goliath pipe ramming tool attached to the end of each pipe. While the pipe was being pulled, it was also being rammed from the other end. The process was created after Blake and his crew looked at pipe ramming and a process called "slick boring," where either jack-and-bore or pipe ramming is used in conjunction with bentonite, which keeps the wall of the steel pipe slicked up. This process took that idea one step further.

"We set the drill rig up about 700 ft away, got the drill stem down and flat at the exact elevation, drilled across to our pit and pulled the pipe back with a reamer in front of it and a hammer behind it," he explains. "We needed the strength of the hammer in the back to help push the pipe and the strength of a 140,000-lb drill rig to pull it and keep that steel casing perfectly flat across the entire bore. In the end, we only over-cut the hole by a few inches. This way we didn't create a void in the ground surrounding the pipe."

Arrow had performed pipe ramming using this slick method in the past, in addition to jack-and-boring

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with bentonite assist. However, the combination of directional drilling and pipe ramming — other than for a rescue attempt — had never been attempted. Blake notes that there were a variety of different factors involved to make the process possible. First, there needed to be a large enough area to set up the entire length of pipe — and to launch the drill rig far enough back.

"It can't be used everywhere, but if jobsite space is unlimited [as it was in this case] it can prove to be a viable alternative to conventional methods," Blake explains. "Ground conditions were also a big factor, in addition to the amount of groundwater. There were three different types of soil to contend with, including a loose, wet soil, clay and the aquifer."

Even the Best Laid Plans...

Even with weeks of preparation, Arrow's crew was still subject to Murphy's Law on a variety of occasions. The water table was a constant concern, lurking beneath a 3-ft thick layer of clay, shale, sand and marl, which provided a relatively sticky bore path. As a result, crews also experienced a significant flow of water. But Blake says the challenge was exacerbated when the dewatering company that he hired ended up delaying the project by almost three weeks.

"We had to bring in another company out of Daytona called Atlas Dewatering, which used Thompson Pumps. After that, we dewatered the area in three days, whereas the other company couldn't do it in 18 days," Blake explains. "We had a pit that was 50 by 160 ft long by 20 ft deep to keep dry, and it was quite a challenge."

Weather also played a significant role, as the project received a fair amount of rain both during preparation and during the installation of the pipe. When crews first surveyed the project site back in February, Blake recalls that it was perfectly dry. But by the time they returned in July, more than 3 ft of water had filled the drainage canals on both sides of the jobsite.

In spite of everything, crews were able to finish the entire project by the middle of September — spanning just over two months from start to finish. But most of that time was spent preparing the pipes for the ramming. For example, welders were hired to perform a triple-pass on the 42-in. pipe, because of the significant impact the ramming tool delivered to the steel. Good, solid welds were important in order to ensure that the casing didn't come apart during the ramming.

"There was a methodology that was the most challenging thing about this project," Blake notes. "There was a lot of preparation involved. There was about six weeks of preparation on the job, but all four pipelines were installed in less than a week; and the 42-inch line was actually installed in just about four hours. So the bulk of the job was preparation. Once we figured out the best way to do the job, the process worked flawlessly." **UC**