Threading the Trenchless Needle ... Precisely

Phoenix-based Specialized Services Co. Employs Laser Guided Boring System at Underground Storage Facility

By Randy Happel

Laser guided boring is primarily used for water and sewer line installation, but that didn't stop one contractor from using the method on a delicate project for a crude oil company's facility.

During the more than 40 years since Arvid Veidmark Jr. founded Specialized Services Co. (SSC) — a leading trenchless installation contractor based in Phoenix — members of the Veidmark family have celebrated many accomplishments. They now have another success story to attach to the list of firsts on the company's well-documented resume.

Although some of the faces have changed at SSC since 1969, the vision of the founding Veidmark — to provide a valuable service to the community — is still very much intact today, evidenced by the vision and dedication of wife Marcia, along with sons Arvid III, Aaron and Abe. SSC's recognition, and much of the company's success for that matter, can be attributed to a close-knit family committed to embracing new and innovative underground technologies; most recently, a laser guided boring system used to complete a delicate trenchless installation for Plains Midstream Canada.

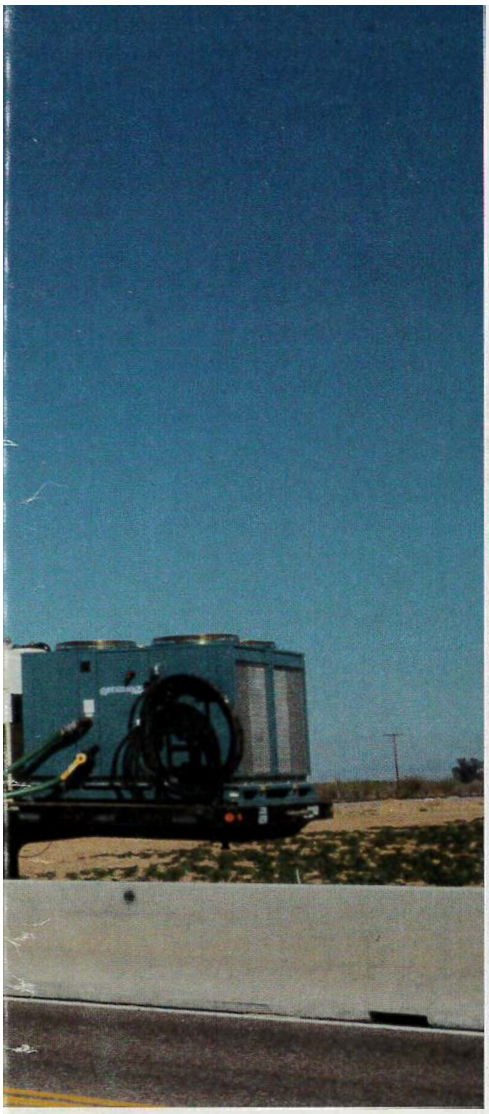
Faster Fill Flow

Project owner Plains Midstream Canada, headquartered in Houston, is involved in crude oil transportation, gathering, marketing, terminalling and storage as well as marketing and storage of liquefied petroleum gas (LPG). Plains Midstream selected SSC to install sleeves at three locations to accommodate a new line being added to the underground infrastructure used to load and unload LPG from tankers and railcars at the Bumstead facility, an underground LPG storage cavern located along the Interstate 10 corridor between Phoenix and Los Angeles.

Situated some 2,000 ft belowground, at the juncture of a major rail line and tanker truck transit point, the 133 million-gallon facility is comprised of three underground salt-dome storage caverns, a 24-car rail rack and three truck racks on the surface with the capability to unload six trucks simultaneously. To expedite the loading and unloading of tankers and railcars more quickly, Plains Midstream installed an additional 6-in. high-pressure gas line.

The component of the project awarded to SSC involved installing six separate 12-in. steel casing sleeves, 3/8-in. wall thickness, at three separate locations. Abe Veidmark, vice president of the auger division for SSC, explains the challenges faced by the accomplished trenchless installation contractor and the decision to use an innovative new approach for completing these intricate bores.

"It wasn't so much the ground conditions or pitch, but rather the pinpoint accuracy of the line grade we needed to achieve for us to succeed," Abe says. "When installing smaller material with standard auger boring, it is nearly impossible to steer with



the accuracy required for all of these bores. In all likelihood there would have been a good deal of drifting [with auger boring], something inherent with this method for shorter distances. All of these bores were less than 200 ft."

Precision-Fine Boring

After reviewing the specifications and intricacies they would face at each of the three sites, Arvid Veidmark III, executive vice president and senior estimator for SSC, recommended an innovative, alternative approach. Months prior, he attended a demonstration facilitated by trenchless experts with Vermeer highlighting a new laser guided boring system that had the capability to complete smaller-diameter bores with pinpoint accuracy and strict on-grade precision. Although designed primarily for sewer and water projects, the two felt the AXIS guided boring system was just the answer they were looking for.

AXIS is a pit-launched trenchless installation method designed to achieve pinpoint, on-grade accuracy while eliminating some of the difficult steps associated with other installation techniques. The system was designed to install 8- to 18-in. pipe at lengths up to 350 ft though larger diameter and longer length bores have been completed. AXIS is also capable of maintaining the strict tolerance and accuracy required for the types of installations facing SSC as specified in the Plains Midstream job. The system requires an entry pit where the core of the AXIS system is placed, comprised of the rack, drill casings, drill head and pipe laser. Located outside the launch pit is the vacuum power unit, vacuum tank and the rack power unit.

Once lowered into the pit, the drill head, with self-contained camera connected to a monitor on the operator console, projects the laser beam on the target. With the camera viewing the laser beam on the target, the operator can accurately monitor the target grade and make adjustments, ever so slightly, along the bore path, if the drill head begins to move off course. Rotation and thrust from the carriage assembly resumes as the first drill casing is pushed through the hole, and the process is repeated with subsequent sections of drill casing until the drill head reaches the exit pit.

"The only way we would have attempted it using a jack and bore approach would have been to upsize to a 30-in. diameter bore casing, then steer the 30-in. casing back through," Abe says. "Accuracy was of paramount importance. It was also such a small footprint that would have made it difficult to initially set up one of our big rigs there."

Railroads, Right-of-Ways and a Rose Garden

Two of the three installations involved railroad crossings that required strict adherence to very narrow right-of-way tolerances established by the railroad. The first site required SSC to complete two 148-ft bores at approximately 10 ft deep, while the third location — two 180-ft shots — called for crossing beneath seven separate sets of tracks to the terminal site where natural gas is offloaded from the transporting railcars. Positioned close by was a large underground fiber-optic cable that limited the position and excavation depth of the bore pit.

"The location of the reception pit was sort of questionable, but we really didn't have much leeway because of where the fiber-optic cable was positioned," Abe explains. "This was a situation that reinforced the need for pinpoint accuracy ... something that would have been difficult to accomplish using traditional auger boring. We had to hit the target pretty much dead on, stopping within inches short of the cable."

Although the two railroad crossings presented the SSC crew with accuracy challenges that alone would have been enough to discourage participation by most contractors, it was the second leg of this three-fold installation project that the Veidmark brothers, despite their extensive experience in trenchless construction, had not previously encountered — a one-of-a-kind rose garden.

"When we surveyed the second site to identify where the entry and exit pits should be dug, we discovered an irrigation canal that supplied water to this immense rose garden," Abe says. "The bore plan specified two bores within relative close proximity parallel to the canal. Come to find out this was no ordinary rose garden, but rather the only one in the world where this special variety of roses are grown. This itty-bitty plot contained tens of millions of dollars-worth of these roses. If we would have tried the traditional auger bore approach, there's a good chance we could have drifted right into this multi-million-dollar garden of roses."

Staying the Course

Abe reiterates the need for precision, comparing the boring process and subsequent installation at each of the three sites to that of a double-barrel shotgun.

"We had to complete two bores, side by side, within 2 in. and maintain that same accuracy for 200 ft," Abe says. "Think of it as a shotgun with two 12-in. barrels extending 200 ft that we needed to keep at least 2 ft from the irrigation canal, the lifeline to a multimillion-dollar rose garden. I was very thankful to have the accuracy of the AXIS system."

Equipment staging and footprint was also a consideration for the Veidmark crew as they reviewed the options facing them to select entry and exit pit locations at each of the three sites. According to Abe, aside from the additional space needed to stage the various components of the AXIS sys-

tem (compared to auger boring or horizontal directional drilling), the area required for excavating staging and receiving pits is minimal.

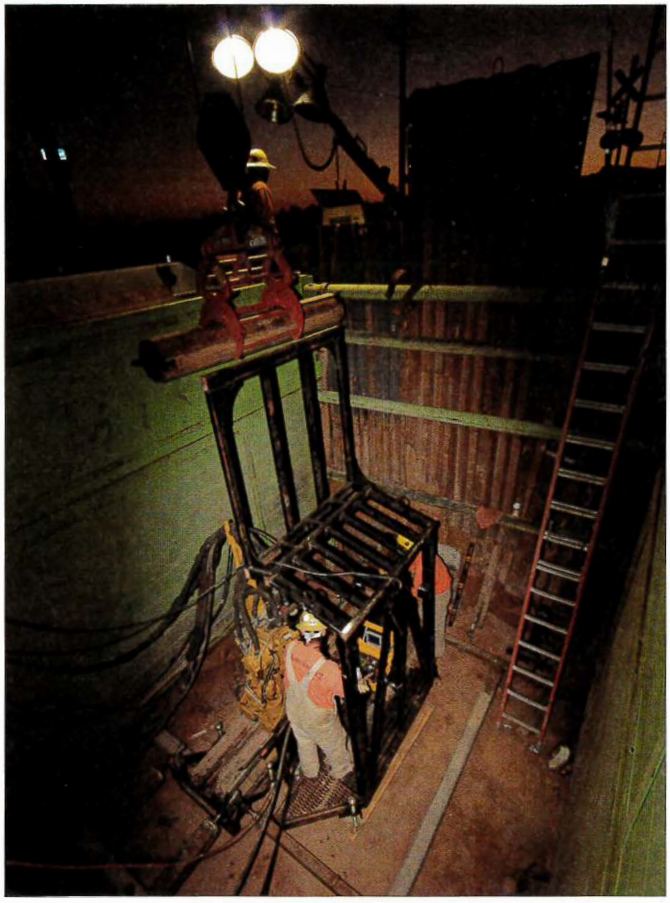
After determining locations and excavating the launch and exit pits, the SSC crew shored up the walls with metal bracing, set the laser to the desired grade and depth, and lowered the leveling frame and rack assembly into the launch pit. The first 6.5-ft drill casing was then placed in the rack carriage and drilling was began.

"It's a relatively quick process once everything is in place," Abe says. "Ground conditions were ideal so that wasn't a factor. We completed the first two bores without any problems, the second in less than four hours, which is really good. We popped through precisely on target in the exit pit, and disconnected the bit, attached the pulling head and pulled the casing back through."

Abe explains that the vacuum excavation unit used by the AXIS guided boring system requires a fair amount of water to facilitate the removal of spoil. However, he goes on to say that the vacuum system ultimately enhances production rates because the need to suspend drilling operations to manually handle spoil within the launch pit is eliminated. The system also helps provide a cleaner pit environment.

Installing the casing was a breeze at two of the three locations — bores of 200 ft and 180 ft, respectively — as the SSC crew was able to weld the entire length of casing segments together, allowing them to pull the material back through the AXIS-created bore path in one continuous shot. This was accomplished by digging a ditch beyond the exit pit and placing the entire expanse of material within, a strategy that wasn't possible at the final location due to the position of the large fiber optic cable.

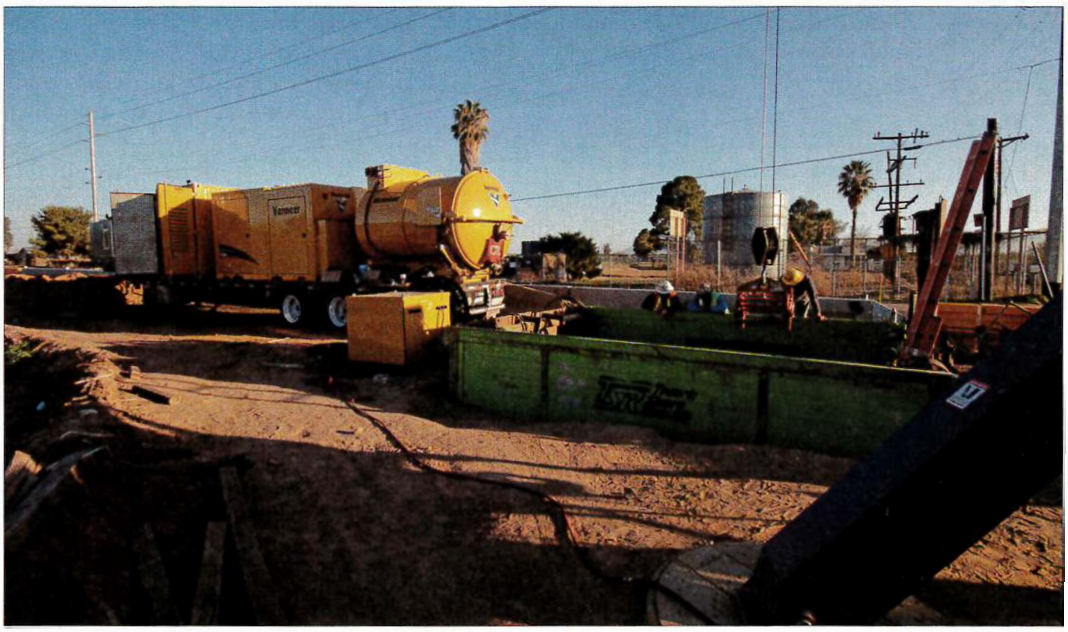
"At the third location, since the fiber [cable] was in direct line with the bore path, we were limited to pulling back the steel casing in increments of 10 ft," Abe says. "This required us to weld each segment together in the pit, repeating the process until the entire 150-ft shot was complete. We were also required to pressure test each weld, which slowed the process down quite a bit."



Specialized Services Co. used a laser guided boring system to install lines in a liquids petroleum gas facility.

With the exception of a few minor learning-curve glitches that Veidmark explains were quickly fixed by the AXIS system experts at Vermeer, the six bores were completed on-target, on-line and on-grade. And despite the guided boring system having been used primarily for water and sewer installation previously, the bores completed by SSC substantiate the versatility of AXIS, regardless of the application.

"The capability to maintain the target so precisely and the confidence to know that you will hit your end target exactly where intended is a huge advantage for the AXIS system," Abe says. "The cost is another huge advantage. I would have been very nervous to attempt this with just a traditional auger because of the 12-in. diameter. You just don't know for sure where it's going to go. That's certainly not the case with AXIS."



Laser guided boring is typically used in water and sewer line installation, but proved versatile enough for this petroleum project.

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