Directional Drilling Provides Answers To City Congestion

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As the older areas of our cities build new structures on top of old ones and repave driveways, parking lots and alleyways our utility lines become more entangled. Conventional construction techniques begin to provide as many problems as solutions. Davis Corporation, as a contractor for Oklahoma Natural Gas (ONG), recently used directional drilling as an alternate method for rerouting a 12-inch natural gas pipeline in a heavily congested area of Tulsa. This innovative approach to solving a problem gave a quick and nondisruptive solution.

Davis Corporation of Healdton, OK, recently completed a difficult directional drilling job in Tulsa, OK. Among the obstacles to overcome was having to locate their bore pits in a narrow center medium f a busy street.

Complex Probelm

The problem ONG faced was how to reroute their pipeline across a small creek in a congested area where their existing pipeline had been paved over by parking lots. the creek was encased in this area by three parallel box culverts each 12-feet on every side for a total of 42-feet including additional cement footing. On the north side of their pipeline was a row of store fronts and small businesses. On the south side of their pipeline was 11th Street, a four-lane road that was formerly Route 66. Just 500 feet west of the creek was an elementary school. The street contained a 22-foot wide grass median that was two years ago selected as a pilot project for "Up With Trees in Tulsa". This area is in Tulsa's 500 year flood plain and it has a traditionally high water table. Normal pipeline construction could not avoid all of these obstacles without creating more problems.

The conventional approach would have been to excavate bore pits in a west bound lane of traffic and make a traditional straight bore under the 42 feet of cement. This would have required excessive amounts of shoring and dewatering equipment. The company was also concerned that the foundations under adjacent store fronts might begin to settle as a result of their close proximity to the open pits. Additionally, the company had to limit the risk of the deep excavations, both having people in them and exposing the public to them in such a high traffic area, heavily populated with small children.

The decision was made to move the pipeline to the center median of the adjacent road and to directionally drill under all the obstaclecs: the encased creek, two 22-inch sewage culverts, a fresh water pipeline and median crossover. This part of the pipeline could then be connected to the existing pipeline by two shallow conventional bores. With this approach, no dangerously deep pits had to be dug, traffic would have only minor disruptions and the construction time would be greatly reduced.

Preparing the Drill

A profile of the obstacles to be crossed was made. The drilling profile avoided each of them. The total length to be drilled was 605 feet. This is a short bore by directional drilling standards but it called for tight pilot hole control and the area allowed for both the rig set up and pipe fabrication was very limited. It was important to avoid the newly planted trees which meant the pipeline construction area was effectively only 15 feet wide. The drilling rig sat on a median crossover, an area only 22 feet wide. Working within such a confined and high traffic area were the biggest challenges.

The pipeline pull section was welded and tested before the drilling equipment was moved onto the project. The entire pipe was coated with a 20 mm thickness of fusion bonded epoxy plastic. The field joints were coated on site by Commercial Resins Company of Tulsa. The pipe was placed on padded rollers to be ready for the pull back operation.

Soil corings revealed that the top 17 feet of soil to be encountered was unconsolidated silt and clay. Beneath the silt and clay was a gray shale. Some lime-

stone streaks were spotted but shale was indicated to the bottom of the corings.

Drilling Operations

The pilot hole was drilled without any problems. The exit was perfect on length and six inches right of the stake.

The pilot hole was next reamed to an oversized diameter. An oil field hole opener with tungsten carbide inserts was used to cut the stiff shale.

Following the pre-reaming operation the pipeline was positioned for the pull back. A heavy bentonite slurry was prepared and pumped as the pipe was pulled. The pull back operation took three hours. Examination of the leading joint at the conclusion of the operation revealed no holidays.

The results were excellent. The drilling, reaming and pipe pulling operations had required four, 12-hour days. Much of the work had been slowed by the confined area. Although the shale formation did prove to be one that yields slow drilling, the overall project achieved all its objectives.

From a standpoint of public safety and community relations, the project was also successful. There were only minor traffic disruptions; no public eyesore was created; deep and dangerous excavations were eliminated; and the "Up With Trees in Tulsa" project of which ONG is a key sponsor was untouched. This project illustrated how environmental consciousness and innovative construction techniques can work hand in hand.

Davis' crew conducted the directional bore successfully for Oklahoma Natural Gas and achieved their goals of causing a minimum of disruptions to this busy area of Tulsa.