

Underground Installation of PA 12 Gas Pipe: A Case Study in Louisiana

Background

Teel-manufactured PA 12 gas pipe was successfully installed in Zachary, Louisiana in the summer of 2023 on a project that replaced approximately 600' of leaking steel pipe along a gas distribution pipeline. The project was the second successful installation of Teel's PA 12 under a 2019 Pipeline and Hazardous Materials Safety Administration (PHMSA) Mega Rule approving the material for broad use in the US gas pipe market.



Original steel pipe suspended over the canal

Zachary Gas Utility District #1 had been struggling to maintain a stretch of steel gas pipe suspended over a canal running through a deep ravine. The pipe remained above ground because the ravine would have made a conventional trenching installation extremely difficult and expensive. Machinery would have had to remove a stand of trees and a greater than usual amount of earth, all while struggling to stay upright on the steep angles. While polyethylene (PE) gas pipe could be installed with horizontal directional drilling, replacing the section with PE was not possible because of the required operating pressure of 250psi. As a result, the steel pipe remained in place and exposed. Over time, physical and environmental damage took a toll, resulting in leaks and needed repairs. The necessary upkeep and hazard potential meant the stretch needed to be addressed with a more sustainable solution.

While investigating their options, the utility heard about PA 12 gas pipe from Groebner, a manufacturing representative and distribution company. The utility determined it would be more cost- and labor-effective to replace the stretch with PA 12 pipe, as it could both maintain the required gas pressure and be installed underground and through the canal by horizontal directional drilling (HDD), which would reduce physical and environmental damage to the pipe over time.

PA 12 Training

The utility ordered 1,000' of 4" PA 12 pipe from Teel. While the utility's installation crew included veteran PE gas pipe installers, none had any prior experience working with PA 12, so the utility also invited representatives from Teel, Evonik (the original developer of PA 12 material), and Groebner to provide training to their staff before the installation. The training involved eight hours of classroom and hands-on instruction focused on PA 12's material properties and the fusion of pipe segments in the field.



Ryan Ellis of Groebner offers instruction on fusing PA 12.



Utility crew performing a PA12 fusion during training.



Bend back test.

Trainees did multiple successful PA 12 fusions during the training and performed visual inspections, bend back tests, and crush tests on the pipe.

The same type of fusion equipment, either manual or hydraulic, is used for both PA 12 and PE gas pipe. In this case, the crew chose to use manual fusion tools. Fusion procedures for PA 12 and PE are also very similar, PA 12 merely requiring hotter and longer weld times and different equipment settings. Since the transitional step from PE to PA 12 was not significant, the crew was able to learn the process in just the eight-hour day of training to be ready for the installation.

Installation

During installation, the 40' pipe segments were laid out and fused together before being pulled underground. Each fusion took about 1 hour, slightly longer than typical for a PA 12 fusion due to the elevated Louisiana summer temperatures the crew experienced at the time of installation. Under normal conditions, 4" PA 12 pipe segments require approximately 2 minutes under heat and approximately 45 minutes of cooling time, making PA 12 fusion significantly faster than welding steel.



PA 12 segments laid together for fusion.



Crew examining the mechanical weak link.

PA 12-to-steel connector pieces were also fused onto the leading and trailing ends of the full length of pipe so it could be welded to the remaining steel pipe infrastructure. The utility purchased the pre-made, commercially available connector pieces and had them delivered prior to installation.

To prevent pipe breakage during the HDD installation, a mechanical weak link was created. One of the PA 12-to-steel transition pieces was welded onto a coupler with a clevis. Then a section of 3" PE pipe was attached to the pipe length so that if the HDD installation should encounter any problems, the PE section would break before the PA 12 and the process could be stopped and adjusted (the link did not break during the installation).

A boring machine then pulled the pipe underground and through the canal. The full length of fused pipe was then pressure tested to 252 psi and showed no leaking joints.



Boring machine in operation

The entire process of fusing the pipe and installing it via HDD was accomplished in one day. In subsequent days, the PA 12-to-steel fittings were welded to the remaining steel pipe.

Conclusion

Teel was glad to see another successful installation of its PA 12 gas pipe. The utility crew was pleased with the performance of PA 12 and the operating pressures it could maintain, showing interest in it for future projects. Max Cummings, Teel's technical development engineer and training representative at the installation said it was good to see how the crew reacted to how PA 12 behaves compared to the



Demonstrating PA 12 pipe's smooth surface.



One of the crew resting the weight of an excavator on a section of PA 12 pipe.



polyethylene gas pipe they were familiar with. He said they were intrigued by the lab and field tests they participated in and were impressed with how quickly PA 12 fuses together compared to welding steel.

As an option that combines the installation benefits of PE with a much higher operating pressure, PA 12 is an option Teel is pleased to be able to offer to the distribution market as a solution for replacing steel pipe at moderate pressures.