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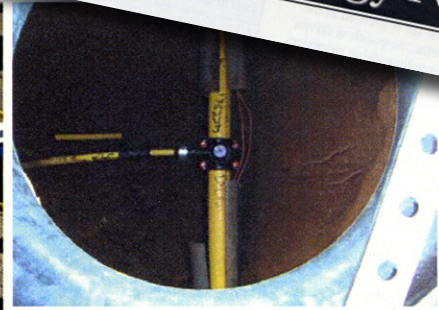
Southwest Gas Finds Big Savings with Keyhole Technology

In a little more than a year, Southwest Gas Corporation's Northern Nevada Division has gone from simply investigating the use of keyhole techniques to incorporating keyhole technology as a significant part of its maintenance activities.

In 2006, the division was tasked with a project to dig and inspect numerous valves and isolated steel pipe sections to determine material types and install test points and galvanic protection as warranted. With the majority of the digs located in paved areas, operations management noted that the project presented a good opportunity for implementing keyhole technology, and subsequently worked with its corporate staff groups and master pipeline contractor (Northern Pipeline) to secure the required keyhole apparatus and tooling.

"As expected," notes Byron Elkins, Manager of Operations Planning & Analysis for Southwest Gas, "utilizing the keyhole process for this project resulted in significant savings over conventional excavation methods. Conservatively speaking, the savings exceeded 38%."

Given the success of the keyhole dig-and-inspect project, the division initiated a feasibility study over the winter of 2006/2007 to determine if keyhole technology could be used to complete service-to-main (STM) tie-over activity in conjunction with PVC main-replacement



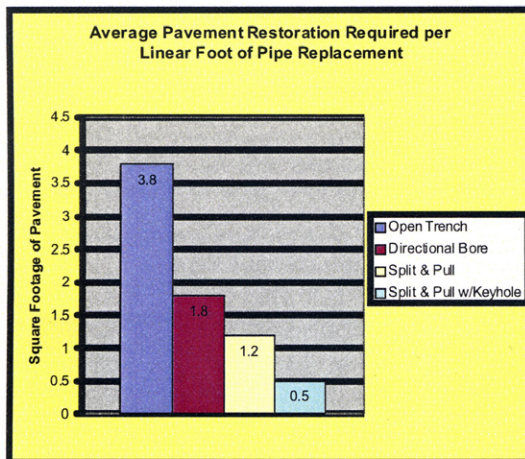
Left: STM(s) being completed with keyhole tools and apparatus. Right: Completed STM connection.

projects. (In 2001 and 2002, the division replaced all of its PVC services. Since then, it has been targeting PVC mains for replacement based on franchise projects and risk assessments.)

PVC main replacement is completed via a "split-and-pull" installation process where the main being replaced is isolated, a cable is inserted, and a splitting head attachment is pulled back through along with the new polyethylene (PE) main. The new PE main is essentially in the exact location of the old PVC main, which eliminates much of the logistical challenges associated with conventional open- and trenchless-installation methods. Since the services have already been replaced – and the STM connection would take place in the same location – it was desirable to complete the activity (in its entirety) within a single keyhole excavation. This was accomplished through use of a Lyall bolt-on service tee and associated keyhole tools; a Central Plastics' electrofusion coupling and fusion unit; and various Omega keyhole tools to facilitate pipe scraping, tracer wire connections, and electrofusion coupling alignment.

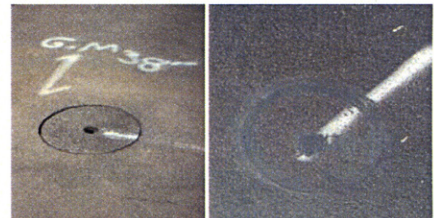
The company estimates that using keyhole technology and the "split-and-pull" method can provide an average reduction in pavement-restoration costs of almost 87% for main-replacement projects completed in blacktop. Given the continually increasing cost of oil-based products such as asphalt, using keyhole technology and innovative trenchless-installation methods whenever feasible is now a key consideration at Southwest Gas.

"The keyhole process greatly enhances the division's efforts to minimize the cost, inconvenience, and aesthetic impacts associated with conventional excavation and pavement restoration practices," says Elkins. "We are very excited about the advances in this technology and we appreciate the support and dedication of the entities that have helped us see this innovation to fruition."



Two pilot projects were successfully completed in April 2007. Based on the demonstrated benefits of keyhole technology, the division is expanding its keyhole STM methodology for PVC-replacement projects throughout its service areas in 2007.

With the exception of the main tie-in locations, keyhole methodology will allow crews to replace a daily average of 500 feet of PVC main (per crew) and complete multiple STM connections in a "one-stop-shop" setting.



Completed STM/Keyhole location.

