Pipe Bursting with VCP - Addressing Space Constraints in Densely Populated Areas

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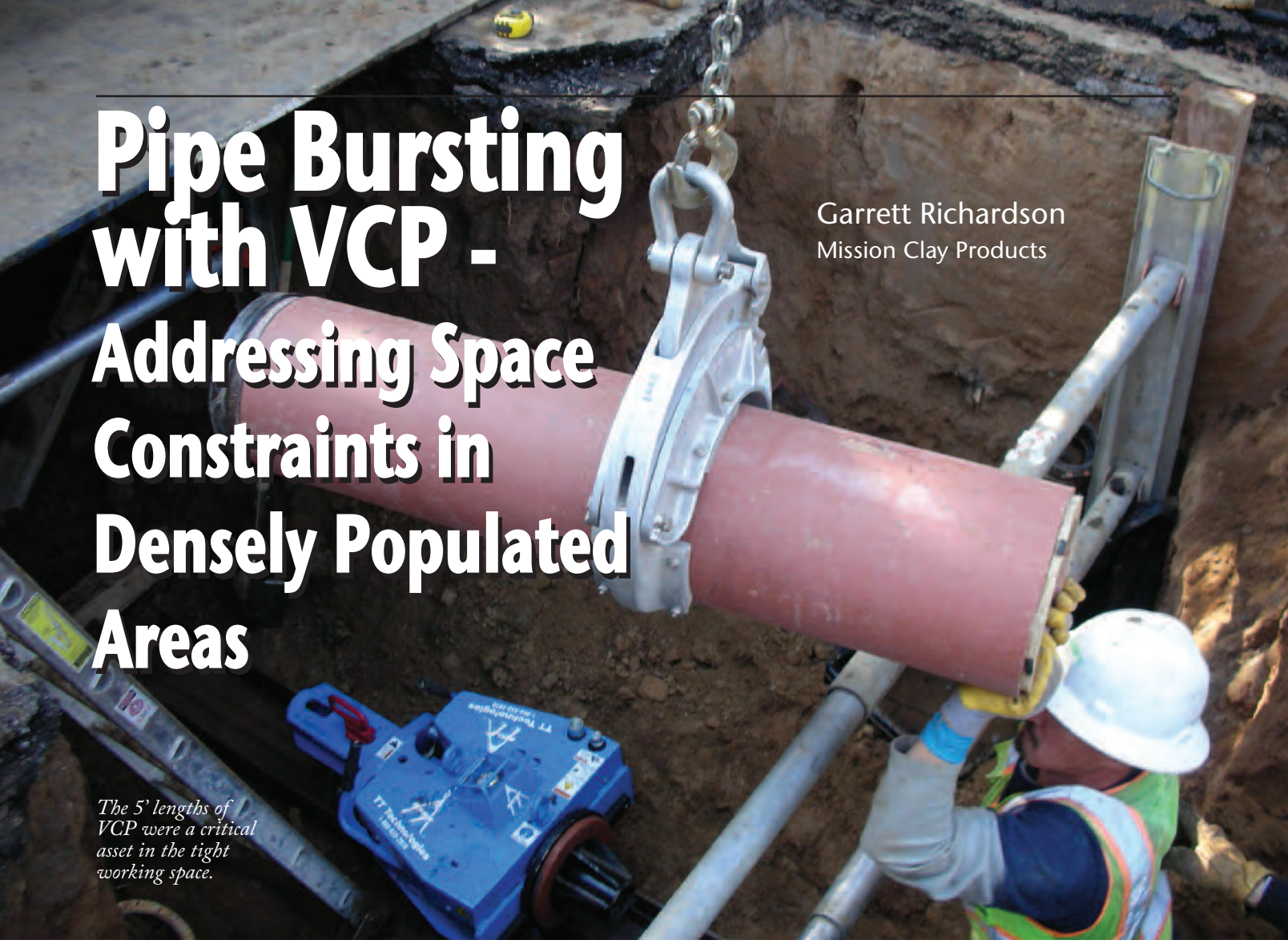

The 5' lengths of VCP were a critical asset in the tight working space.

The City of Riverside, California's wastewater collection system comprises 870 miles of pipelines and serves a population of 300,000, transporting approximately 31 million gallons daily. The Downtown Sewer Main Replacement was a small part of the Riverside Renaissance, a $1.57 billion investment in the community and the most ambitious program in Riverside's history. The project specified pipe bursting to replace a 6" sewer line, originally installed in the 1930s, with a new 8" line. This was needed to meet the needs of the current residents of the area.

The line to be replaced is located in a densely populated area of the central city that only allowed a very small project footprint. The small work area available caused a number of challenges for the installation. The alignment of the sewer to be replaced ran through narrow alleyways between residential buildings. A traditional open-cut installation would have blocked traffic access for residents and impacted adjacent streets, causing an unacceptable level of disruption to the community. The easements were very narrow and the available working space prohibited open excavation. Many of the buildings were multi-unit residences and disruption to their wastewater services had to be kept to a minimum. Rerouting the line during work was impractical, so it was critical that the line be returned to full service at the end of each day.

A trenchless installation minimized both the disruption to the community and the amount of space needed to manage the project. Pipe bursting was selected as the desired method due to the speed of installation, competitive cost in comparison to other available trenchless methods and the ability to upsize the pipe all while maintaining a very small construction footprint. The city chose to replace the existing 80-year old vitrified clay pipe (VCP) with new VCP with a projected service life of at least 200 years.

This unit maintains consistent pressure while the bursting head and a column of new pipe is being pulled forward.

"Many engineers still labor under the false impression that they must use a specific kind of pipe if they want to use this method," said Collins Orton of TT Technologies. "The truth is there are many options."

Bryan Vansell of Mission Clay Products agreed. "The best option is VCP. A jurisdiction's most valuable asset is normally their infrastructure. Maximizing that asset is only good business. No other pipe material delivers the proven performance and long life cycle of clay, and the ability to now use it for pipe bursting gives engineers and city managers some powerful options."

Strong collaboration is an essential starting point for any pipe bursting project. Pipe size and strength issues dictate changes in how the equipment is used and how the project is designed. The pipe bursting expander ring is designed to accommodate the exact outer diameter of the new pipe and minimize the amount of friction during the pull. On the Riverside project, a strong team effort resulted in two innovative approaches to address the multiple challenges encountered. The first innovation was a new design for a static pull pipe bursting machine. Machine manufacturer TT Technologies, Inc., working with the VCP manufacturer Mission Clay Products LLC, designed a new static

Using the new static pipe bursting method, the contractor was able to pull two lengths of 5' VCP at a time.

Bursting head is pulled into a 6" pipe to fracture and move the old pipe into the surrounding soil. The new pipe is an 8" VCP.

pull pipe bursting machine capable of installing segmented clay pipe. TT Technologies and the National Clay Pipe Institute worked closely with the City of Riverside's engineering division in the design phase of the project, offering advice and technical expertise on both method and material.

The hydraulically operated machine pushes interlocking steel "Quicklock" rods through the existing pipe, from the receiving pit to the launching pit. In the launching pit, the bursting head and expander are attached to the Quicklock bursting rods. The rods are fitted through each new NO-DIG® clay pipe segment, and then the assembled segments of pipe are held in compression behind the expander by a hydraulic-powered Squeezer device, an end place that fits behind the last piece of the pipe train. The Squeezer is pinned to the rods extended through the assembled sections of pipe, and actuated to push the joint "home". Hydraulic pressure is kept on the "Squeezer" and maintained throughout the pull. This ensures all of the new pipe joints are kept in compression (the joints stay together) thus maintaining joint integrity throughout the process. After each section of pipe is launched, additional sections of new pipe and rod are added and the process continues until the complete length of the pipe bursting run is achieved.

Efficiencies were realized by loading two 5' segments of pipe at a time. The expander and new pipe are pulled back toward the receiving pit, bursting the old pipe and displacing

Mission Clay's new TwisTee™ system allowed for quick reconnection of laterals.

The new TwisTee ™ tapping saddle made lateral installations significantly more efficient

the fragments into the surrounding soil. The equipment's jobsite footprint above ground is minimal, and was further reduced by the use of the stacked segments of clay pipe. This process, known as "Cartridge Loading" is very advantageous in crowded urban streets and alleys where "lay down" area for new pipe is not available. This method eliminated the need for a long laying area as required when using a fused pipe. The soils in this area were expandable and leant themselves very well to pipe bursting. The typical pipe bursting run length for this project was 250 linear feet. Each burst length was accomplished in about 2 hours after the specialty pipe bursting equipment and pipe was setup.

The second challenge was the number of sewer laterals. The multi-unit residences lining the alleyways meant a high concentration of laterals. In order to keep laterals in service for residents for the duration of the project, it was required that the contractor reconnect all laterals for each newly installed section at the end of each business day.

The innovation that addressed this challenge was a new tapping saddle developed by Mission Clay. Once a hole is cored in the mainline pipe, the EPDM

rubber saddle and ABS tee are installed by hand in seconds. The TwisTee™ tapping saddle twists into a grooved saddle expanding the saddle and locking it in as it goes. The contractor pre-excavated the lateral connections, completed a pipe bursting process, and then reconnected all laterals to the new mainline in the same day.

The depth of the sewer was minimal overall (generally 8 ft), which allowed the laterals to be excavated easily. As it was, "the number of laterals [80] was a problem. One real positive was that after the contractor's learning curve with the new method, I would say it was 30% faster, or more, than open trench," said Lonny Young, Principal Engineer, City of Riverside.

VCP's long lifespan makes it a preferred material for gravity sewers. Until recently however it was not considered an option for pipe bursting. With the success of the Riverside project, pipe bursting with VCP provides a proven new option for engineers.

"Partnership and communication between the city, equipment manufacturer, material supplier, and contractor is important," says Vansell. "That was something that was really a positive on this project. We all learned a lot from each other."

The Downtown Sewer Main Replacement by Pipe Bursting Method project included approximately 2300 lineal feet of sewer, specified VCP, to be installed by static pipe bursting. The Engineer's estimate was $693,000, and Arizona Pipeline Company of Corona, CA was awarded the contract with a bid of $630, 866. Construction began in early 2009. Mission Clay Products supplied NO-DIG VCP jacking pipe in 5' lengths, with 316 stainless collars and EPDM rubber compression gaskets. Arizona Pipeline used TT Technologies' Grundoburst 800G static burst machine.

Vansell was "excited by the opportunities presented by both the pipe bursting method and the TwisTee tapping saddle. We expect to see many more applications for both in the future."

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