

BIG APPLE REHAB

By Tyler Henning

In “the city that never sleeps,” it seems only right that any construction job match the moniker of Manhattan. For the past two years, workers from contractor Halycon Construction and subcontractor Insituform Technologies Inc. have convened on different blocks of iconic Madison Avenue to rehabilitate a 140-year-old 48-in. water main running under the street. To alleviate the headaches that could happen by snarling New York City’s rush-hour traffic, workers quickly moved onto sections of the avenue each Friday night and worked until Monday morning. Over one weekend, the workers fixed between 500 ft and 1,000 ft of existing main.

140-year-old
Manhattan water main
rehabilitated through
trenchless methods

To understand how old this water main is, envision the Brooklyn Bridge under construction, Jesse James robbing a bank or Civil War hero Ulysses S. Grant as president of the U.S.: All were occurring at the same time New York City put in the water line. The cast-iron pipe served the city until the 1970s, when it went out of service for being leaky and troublesome. Forty years after being decommissioned, a stretch of the water main that runs from East 40th Street to East 79th Street on Madison Avenue is getting a unique overhaul.

Deciding on Rehabilitation

New York City’s Department of Environmental Protection (DEP) and Department of Design and Construction (DDC) decided to evaluate new technologies for rehabilitating water mains. With the heavy demand on New York’s streets, the city chose to use high-density polyethylene (HDPE) pipe

and Insituform’s InsituGuard installation process to lessen the time lanes of traffic would be closed to construction.

“The city decided to use HDPE for various reasons, which I venture to say are because it has no adverse effect for potable water use, its durability and the ability to implement a trenchless replacement method for the old cast-iron main in its water system,” said Jose Sanchez, resident engineer for the DDC.

“Open-cut methods would take six months (for a 1,000-ft-length installation),” said Christian Onyechi, engineer-in-charge for the Manhattan Infrastructure Div. of DDC. “The complete rehabilitation of the Madison Avenue line would take decades.”

Other concerns come into play when dealing with New York City’s underground. Amazing amounts of conduits, pipes and other infrastructure can be found just under the pavement. Surgically picking through miles of gas, electric, sewer and other lines would be an immense challenge.

The InsituGuard process creates a pipe within a pipe without the need to dig an open trench the length of the pipeline. To create the new pipe, lengths of HDPE pipe are butt-fused together with fusion machines. The pipe is then fed into a machine that folds the pipe, while workers band the folded pipe in place with plastic straps before inserting the new pipe into the existing main through a relatively small entry pit. The banded pipe is then pulled through the pipe by a machine located at a second pit that is blocks away.

Once the pipe is in place, the folded replacement pipe is filled with water and pressurized until the plastic bands snap. The pressurization forces the new pipe to regain its shape, forming a close fit with the original pipe. To complete the process, end fittings are attached and the pipe is reconnected and put back into service.

Drawing a Crowd

Many passersby were interested in why lanes of the road were closed or why long lengths of pipe were taking over the roadway. Concern turned to relief when the job was fully explained by workers and consultants on site. Some were amazed that all equipment and pipe could be out of sight by rush hour the next Monday. Not atypical of a trenchless job using HDPE, what once took weeks and months now can take days and appeases the general public when they learn of the minimal disruption that occurs.



The project appeased the general public because minimal disruption occurred.

PRODUCTS IN ACTION

Piggybacking

Two McElroy MegaMc 1648 machines were used to fuse the pipe. Ferguson Industrial Plastics provided the fusion machines, and fusion technicians and KWH sold the 1,200-mm DR 50 pipe for the project. All of the materials and machines were staged in New Jersey and trucked in for each weekend's rehabilitation.

Pipe fusion is a widely accepted process that joins two pieces of thermoplastic pipe together with heat and pressure. The butt-fusion process starts by "facing" or shaving the pipe ends simultaneously so that they can be joined together with heat to create a continuous, sealed pipeline. The welding of the pipes is accomplished by using a hot plate in contact with the pipe ends, which heats the plastic to a molten state. Then, after its

removal, the pipe ends are pressed together under a controlled force to form a weld that is as strong as or stronger than the pipe itself. Third-party industry research indicates that HDPE pipe and joints can have a life span of more than 100 years.

Having two machines on hand speeds up the fusion process when having the machines in a "piggybacking" formation. The piggybacking job site setup used in New York City is created when two fusion machines are staged in the same vicinity. A single fusion technician can perform fusion operations on one machine while a joint cools on the other machine. Cooling time is determined by the diameter and thickness of the pipe, so piggybacking allows for greater productivity on the job site.

On a weekend where 19 joints were required for

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a 1,000-ft-long length of pipe, Ferguson Industrial Plastics personnel completed the fusion joints in a time span from 6:20 p.m. Saturday night to 2:30 a.m. Sunday morning. A final tie-in was performed later Sunday as the InsituGuard installation continued.

Pipe Installation

The Insituform process begins with excavations of the entry and exit pits in order to remove any existing fittings. The pipe is then fused or welded into long lengths just before entering the diameter-reducing machine.

The diameter-reduction machine is the key to the process. A series of round rollers increasing in size help to alter the shape of the pipe, which results in a diameter reduction of up to 40% of the cross-sectional area. The pipe is fed through the roller by a hydraulically powered system that grips the pipe, pushes it toward the rollers, releases and then moves down the pipe to grip more to push toward the rollers.

The folded pipe is inserted into the existing pipe, and once the complete liner is in place and cut to length, end fittings are attached. The liner is then pressurized to snap the plastic bands that hold the pipe in a folded position. After the pipe takes its position, intermediate fittings are installed, if necessary, and the complete line is pressure tested, disinfected and returned to service. The open pits at each end are backfilled and reinstated.

By using this pipe to line the old cast-iron main, the New York City DEP and DDC put in place a system that should be leak-free for many years to come. The pipe offers tensile strength, toughness, long-term pressure rating and resistance to damage and cracking; its versatility allowed installation in a shortened amount of time with minimal public disruption. **WWD**

Tyler Henning is public relations specialist for McElroy Inc. Henning can be reached at henning@mcelroy.com.

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