

Installation of a 36-inch internal joint seal.



## Houston Joint Sealing Project Proves Complex But Effective

by Jeff Griffin, Senior Editor

Major utility construction and rehabilitation projects often require the use of many different technologies, including conventional excavation methods and several trenchless technologies.

It is not unusual for a project to incorporate installation of new infrastructure and rehabilitation of existing portions of a system.

For example, one of the many water infrastructure improvements completed in Houston in 2007 included installation of 12,700 feet of new 8- and 10-inch water distribution lines, valves and appurtenances in the right-of-way of heavily-traveled city streets to isolate existing 24-30- and 36-inch cast iron water mains for transmission use.

The project owner was the Houston Department of Public Works and Engineering, while the consulting engineering firm on the job was Lockwood, Andrews & Newnam (LAN) Inc., of Houston. Boyer Inc., also based in Houston, served as the general contractor. Boyer subcontracted joint seal work on the mains to Miller Pipeline Corp., Indianapolis, IN.

The existing mains had become a major maintenance burden for the owner due to

leaking lead caulked joints, said Greg J. Henry, P.E., LAN.

Constructed more than 50 years ago, the mains had been used primarily for distribution, and therefore had multiple service connections and could not be isolated for repair without placing customers out of water.

To address leaks and maintenance issues, it was necessary to install new small-diameter distribution lines and transfer those customer services before isolating the mains. In order to reduce public disturbance, both the new distribution lines and the rehabilitation of the large diameter pipe required the use of trenchless methods.

### Leaky joints

Henry said engineers began by researching the past repairs and performing some exploratory testing on the cast iron pipe. It was determined that the pipe was in good structural condition and all of the reported leaks over the past five-year period were caused by failed lead joints.

General contractor Boyer Inc. primarily used directional drilling methods and some open cut excavation to install the new pipe.

Internal joint sealing was completed in approximately 2,950 linear feet of 30-inch

water mains, 5,820 linear feet of 36-inch mains and 3,630 linear feet of 24-inch pipe mains.

"Our responsibility in the project was to make the cast-iron, cement-lined water mains bottle-tight using our WEKO-SEAL internal seals," said Terry Bell, Miller Pipeline WEKO-SEAL product manager. "All existing services had to be transferred and terminated, and the pipeline made bottle-tight."

Bell describes the WEKO-SEAL as an internal flexible rubber gasket that is used to mitigate infiltration and exfiltration in a variety of pipelines ranging in size from 18 inches through 216 inches and larger.

"We can seal elliptical, round, square, transition pipe and a multitude of other configurations," said Bell. "The beautiful part of this trenchless rehabilitation technology is that it is a permanent repair solution that has been used for over 27 years. It provides customers with years of worry-free maintenance at a fraction of the cost of conventional repair methods. The joints remain flexible to accommodate future movement, but remain bottle tight against leakage."

Bell said engineers initially were concerned that the cement lining needed to be removed at all seal locations due to possible porosity at elevated pressures.

"However," he said, "Miller Pipeline was able to determine that the lining was in very sound condition and the seals were placed atop the cement mortar lining in almost all cases. On particular joints with obvious lining concerns, Miller removed the lining and placed the seals on the cast-iron pipe. All pipeline segments receiving the WEKO-SEALS were individually air tested and subsequently hydrostatically tested by Boyer and passed with flying colors."

In cases where laterals or services were to be abandoned, Miller used stainless steel backing plates and sleeve/seal methods to withstand internal pressures and provide a bottle-tight seal.

### Four-part project

This project was divided into four phases. Access points to mains for personnel and materials were provided by Boyer personnel. Using six-to-eight person crews, Miller first inspected the lines and mapped locations of valves, services and joint count.

Work began in the 30-inch pipe, and 300 seals were installed over a three-week period.

In most cases, access points would be selected at valve locations or other fitting locations to remove such obstacles for ease of seal installations. Complicating this project was the inability in many cases to remove such obstacles. Miller Pipeline crews encountered several segments with butterfly valves within the pipeline section that required them to work as if the pipe were a "dead-end." (continued on page 34)

## Not A Job For Everyone

Imagine spending your work-day inside a buried pipe, surround by the pipe's walls, often with little room to move and perform the task at hand. It's definitely not a job for the claustrophobic.

"It takes a special individual to perform this type of work," says Terry Bell, Miller Pipeline WEKO-SEAL product manager. Specially-trained Miller Pipeline crews routinely install internal seals in pipe diameters as small as 24 and 30 inches.

"These crew members can spend the majority of an 8-10 hour day working inside the pipe with a break for lunch and an occasional stretch," Bell continues. "These individuals are confined space qualified and often have certifications in CPR, First Aid, 40-Hour Hazwhopper, SCBA, OSHA 10 and 30 Hour, lock-out tag-out, etc. Most of the guys performing these installations have been longtime employees of Miller and find themselves as sort of a gypsy traveling from project to project."

There's an old saying, "light can be found at the end of the tunnel," and for

internal seal installers the light is at the end of the pipe, but very little elsewhere.

"Seal installers," said Bell, "wear small battery operated LED light packs to illuminate their work areas, which can be easily identified with a minor's light worn on the head. They provide adequate light for the task at hand, but certainly don't illuminate much beyond. When batteries go dead and all is dark, it's time to look for the light at the end of the tunnel."

### Fresh air

Ventilating pipes to achieve adequate atmospheric conditions can sometimes be challenging, but a must for confined space entry.

"In almost all cases our crews use pneumatic air handlers that exchange the air within a pipe several times per minute," Bell explained. "Often we have open ended access on both ends of a pipe segment. Other times we ventilate through blow-offs, or other means available to obtain circulation."

Something that really takes some get-

ting used to are the various noises which are amplified inside a pipe, said Bell.

"Whether the sound is a pump kicking on, or the noise of water behind a valve, sometimes a worker is startled by the uncertainty of the source," he said. "To perform this type of work, personnel must stay alert! Miller Pipeline crews make sure they fully understand the shut-down methods before entry and eliminate all potential hazards before entry.

"Safety is a number one priority at Miller and these guys practice rescues and go over the dangers on a regular basis. It is absolutely essential that the atmosphere is continually monitored and adequate ventilation is in place. You must have confined space entry and access equipment as well as means for a rescue, should one become necessary.

"Our number one priority is to make sure everyone goes home to their family at the end of the day. In my opinion, nobody in the business is more suited for confined space entry than Miller Pipeline's WEKO-SEAL crews."

# Joint Sealing Project

**Below left:** One of the existing 24-inch valves discovered during the project. **Below right:** A new manway access was installed by a Boyer crew for this 24-inch pipe.



"We worked these sections with basically one way in and out, although the valves did provide adequate means for ventilation within the sections," Bell explained. "These scenarios require a heightened level of safety awareness, but our crews are well experienced to make the necessary adjustments."

The second phase consisted of approximately 300 seals in the 24-inch pipe and was completed in approximately three weeks.

Phase three included the 36-inch mains where 250 seals were installed over a three to 4-week period.

The final phase required more 24-inch pipe sealing and was completed in 2 ½ weeks which required the installation of 175 seals.

## 9 months

Miller Pipeline's part in the project was completed over a nine-month period working in intervals determined by Boyer Construction. In this case, Bell said, the general contractor was required to hydrostatically test all completed segments and install new main before additional segments became available to Miller.

Miller Pipeline Corporation is the manufacturer and installer of the WEKO-SEAL product. They are installed internally by skilled, confined-space entry qualified technicians with up to 1,500 feet between access points.

In addition to water lines, the WEKO-SEAL renewal system provides permanent, cost-efficient leak and infiltration sealing for wastewater, natural gas and industrial process piping while greatly reducing excavation cost. Seals are available for pipe with diameters of 18 inches and larger made of virtually any material and shape, including oval, square or those having compound angles.

The seals also have been used as end seals and joint seals for pipe lining systems to ensure a positive pressure-tight lining.

During the last two decades, Miller has handled over 275,000 failure-free installations of WEKO-SEAL internal seals in locations throughout the United States, Canada and Mexico.

For more than 50 years the company has provided quality construction, maintenance and rehabilitation services and products to natural gas utilities, and the municipal and industrial infrastructure markets throughout North America.

The company's corporate headquarters is in Indianapolis, IN, and there are 12 other regional offices coast to coast. The company employs approximately 1,400.

LAN is a national engineering firm offering planning, engineering, and program management services. As a subsidiary of Leo A Daly, one of the largest planning, architecture, engineering, and interior design firms in the United States, LAN has access to the expertise of more than 1,200 professionals in 22 offices in 16 cities worldwide.

Celebrating over 20 years in business, Boyer Inc. has earned its reputation by providing timely and cost-effective solutions for the rehabilitation and replacement of infrastructure. Boyer has experienced tremendous growth in recent years by responding to an ever-changing market and expanding its in-house services in order to maintain its ability to self-perform over 95 percent of all projects.

### For more information:

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