

THE BIG FIX:



San Diego's Sewer Renewal Program

By Steve Gibbs

Public works administration would be easy if infrastructure lasted forever. It does not. Roads, bridges and sewers eventually wear out. Even the pyramids are showing their age.

San Diego is not immune to deteriorating infrastructure, but the city is aggressively dealing with its aging sewer system. San Diego's Metropolitan Wastewater Department has developed a plan to rehabilitate a majority of its sewers over a 50-year period. The ambitious program is already well under way, with more than 200 miles of the 3,000-mile system rebuilt or newly lined.

The effort was not entirely voluntary. The city is under a consent decree from the EPA to repair its sewers in order to reduce overflows and leakage. San Diego has completed two phases of the massive project already with excellent results. The annual number of sewer overflows has been drastically reduced, and sewer lines are requiring much less daily maintenance.

"Before 2000, we had hundreds of sewer overflows each

year, largely due to root intrusion and deteriorating pipe joints. In 2000, there were 365 sewer overflows. In 2005 there were 63 overflows. We've reduced the problem dramatically," said Craig Whittemore, P.E., senior engineer for San Diego's Metropolitan Wastewater Department. "We anticipate even fewer overflows as we continue to renew our sewers."

Obviously, a project of this magnitude is expensive, especially if sewers have to be replaced rather than rehabilitated. A video inspection of about 1,500 miles of sewer reveals that many of the lines will require dig-and-replace efforts. But project officials are discovering that trenchless technologies are more than sufficient for many of the repairs and the city saves significant money when they utilize such methods.

According to Whittemore, the current budget for dig-and-replace projects is approximately \$2.3 million per mile. However, by utilizing modern trenchless methods, the cost drops to about \$800,000 per mile, a difference of

\$1.5 million every mile. Looked at another way, the city can rehabilitate almost three miles with trenchless technologies for every mile they dig and replace.

"Not only is there a tremendous cost savings, the work goes so much quicker," explained Whittemore. "That's why, whenever possible, we are pushing for rehab rather than dig and replace."

Competition Works

San Diego's experience provides a valuable case study in free-market capitalism. The city has learned that trenchless technologies, while not always applicable, are usually less expensive and faster than excavation and replacement. Now, thanks to business competition, San Diego's wastewater division is getting the best new trenchless technologies for less than they estimated.

In open bidding, the city has had submissions from companies that provide cured-in-place and spiral-wound trenchless products. In most instances, the spiral-wound technology (in this case Ribloc's Expanda) costs less and does not lose efficiency.

"Spiral-wound is definitely cheaper than CIPP (cured-in-place pipe) lining [in this case]," said Margaret Llagas, P.E., associate engineer for the City of San Diego. "For 8-in. pipe, we estimated the project at \$37 per linear foot. When the bids came in, the Expanda came out to be just under \$24 per linear foot. The CIPP product was around \$30."

Llagas was quick to point out that Expanda was more than just a good bargain.

"I think [Expanda] is a good product. I'm a great believer in trenchless technology," said Llagas. "With trenchless technology, we can greatly extend the life of the existing pipe with minimal disruption to the neighborhoods. When we videotape the line afterward, it looks like we have a new pipe."

City engineers have found that CIPP and spiral-wound methods each have their place in the city's sewer reconstruction program. About 50 percent of the city's older sewer mains are 8 in. in diameter. Those lines are, for the most part, being lined with Expanda in most recent contracts, which is designed for pipes 6 to 30 in. in diameter. The larger sewer lines in San Diego are being replaced or relined with cured-in-place methods.

Low-Hassle Rehab

Expanda by Ribloc is a tight-fitting, profile wall PVC system that is an economical alternative to traditional cured-in-

place sewer lining systems. Expanda is installed using a patented spiral winding technique that does not require heat or pressure to process the liner. The process is fast, quiet and can often be installed in a live sewer, effectively eliminating the need of costly bypass pumping.

The Expanda system utilizes a specially designed pipe-grade PVC liner with a unique double-locking configuration. The secondary lock is formed using hot melt adhesive, holding the liners at a constant diameter, smaller than the host pipe, as it is wound in the patented spiral winding machine at an existing insertion point, usually a man-



Once installed, Expanda is a continuous, tight-fitting PVC pipe from manhole to manhole.

hole. The winding machine inserts a high-strength steel wire between the primary and secondary locks as the edges of the profile are locked together.

After the liner is wound to the termination point, the end of the liner is held in position and the secondary lock is progressively severed by pulling the high-strength wire.

The edges of the profile are then free to slide relative to each other along the primary lock as the winding machine continues to wind more profile. The primary lock contains a slow-setting lubricant sealant that aids the expansion process by performing the function of a lubricant until it sets.

It is this mechanical process that causes the liner to expand. Expansion continues until the liner contacts the wall of the host pipe. Installation is fast and easy because Expanda can be installed without diverting the normal flow within the line; no bypass pumping is required.

“The installation process is very quick and requires less equipment than CIPP, and far less than dig-and-replace methods,” said Llagas. “They begin by cleaning out the roots and flushing the line. Then they install the Expanda.”

Although San Diego specifications require bypass pumping, Expanda may be installed in a live sewer. On the recently completed Phase C project, 59,000 lf of Expanda was installed on the project. A small number of installations required the sewer flow to be bypassed above-

ground due to high depth of flow in the pipe. The remaining lines on the project were installed without bypass pumping or interruption of the sewer operations.

Unlike CIPP methods, if a problem occurs during installation, the Expanda can easily be removed.

The city's approach to sewer rehabilitation is to address the entire sewer system including the main line pipe, the lateral pipe that connects the homeowner's property to the sewer system and the connection of the lateral pipe to the main sewer line. By addressing the entire system, the city effectively removes 95 percent of groundwater infiltration into the sewer system that occurs through cracked pipes and pipe joints. A total system approach also eliminates the potential of sanitary sewerage leaking out of the system, and prohibits tree roots from entering the sewer pipelines.

All rehabilitation systems specified by the city, including spiral wound PVC and CIPP, meet the same requirements designed to address these common problems. All city projects line the mainline pipe, line the service lateral pipe where necessary and require the installation of a "top hat" connection at all service lateral connections to the main.

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— Craig Whittemore, P.E.

Like many cities, San Diego has a lot of pipelines that run in backyard easements and environmentally sensitive locations. A key feature of the Expanda pipe system is that it is portable and can be installed 500 ft from the street. Work crews simply hand carry the equipment to the access manhole and provide hydraulic power from the truck on the street via two long hydraulic hoses.

San Diego has had great success lining in remote and canyon locations using the Expanda system. Because the system does not use hot water to process the liner, there is no potential for process water or chemical byproducts to harm the envi-

ronment as can happen with other processed liner product options. In addition, Expanda requires a small work area so pipes up to 700 ft in length can be lined from a lay down area measuring 10 X 10 ft.

An added bonus is lower daily maintenance.

"Lining the sewers eliminates root intrusion. Some of our sewers were on a very high maintenance schedule," said Llagas. "We had to cut out roots and clean out grease every six months. By lining these pipes, we went from a six-month cleaning schedule to a two- to three- year cleaning cycle," she explained.

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Pace of Progress

San Diego's sewer rehabilitation program is humming along nicely now as city officials and engineers have discovered the best and fastest ways of getting the work accomplished. Llagas noted that on pipes where spiral-wound technology can be used, they can line about 2,000 lf of pipe each week, and each relined pipe has an expected life span of 50 to 75 years.

Now that many of the city's worst lines are repaired, the pace will likely slow down a bit in coming years.

"Our current plan for 2008 calls for us to rehabilitate 30 more miles of sewer lines. We won't do any dig-and-replace unless there is some emergency," said Whittemore. "In 2009, we plan to do 35 miles of rehab and 10 miles of replacement, and beyond that, from 2010 to 2013, the plan calls for 25 miles of rehab and 20 miles of replacement per year.

"However, as we continue to access our lines, we are finding that we may be able to do more rehabilitation with trenchless technologies and less replacement," he continued. "We want to use trenchless methods whenever possible for a variety of reasons, including cost and convenience."

Steve Gibbs is a freelance writer based in Memphis, Tenn., with 20 years of experience covering public works and construction projects for regional and national publications.



Ribloc's patented spiral winding device is small enough to fit into existing manholes.

An advertisement for Michels Corporation. The top half shows a black and white aerial view of a construction site with a large pipe being installed. Below this is a red banner with the Michels Corporation logo, which consists of a stylized 'M' with 'MICHELS' above it and 'CORPORATION' below it. Underneath the logo, the text reads 'BUILDING AMERICA' and 'CHANGING THE WORLD'. The bottom half of the advertisement shows a large pipe being laid across a landscape. At the very bottom, there is a red banner with the phone number '820.583.3132', the website 'WWW.MICHELS.US', and the text 'AN EQUAL OPPORTUNITY EMPLOYER'.

