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ADMINISTRATION & MANAGEMENT | By Mitchell Hoeft and Paul Pasko III, PE

Structural cured-in-place pipe for trunk water main

Minnesota cities sign a joint powers agreement to install an emerging rehabilitation technique.

In the three decades since Insituform Technologies Inc. introduced the world to cured-in-place pipe (CIPP) technology, it's become a widely accepted rehabilitation technique for sanitary sewers. But until the last decade, no one's been able to adapt the concept for drinking water systems.

Three companies — one each in Belgium, Canada, and the United States — have developed lining systems designed specifically for pressure pipes. Though alike in many ways, each differs enough to make preparing an apples-to-apples set of bidding documents a challenge.

Last year, though, budget cuts, potential push back from recession-weary residents, and site-specific variables converged to prompt the Minnesota cities of Fridley, Golden Valley, and Hutchinson to give the process a try. Though their communities aren't adjacent, engineers for the three cities had gotten to know each other through American Public Works Association – Minnesota and City Engineers Association of Minnesota meetings.

Each city had a need, but a contract issued by just one of the three wouldn't be large enough to tempt contractors, all of which were out-of-state, to bid. Combined, however, their projects represented 1 mile of work. So working with a consulting firm — Short Elliott Hendrickson Inc. (SEH) — they'd each worked with on other projects, they decided to try bidding the job together.

"Our experience with structural CIPP for sewer rehabilitation has been good," says Mitchell Hoeft, a staff engineer for Golden Valley, an inner-ring suburb of Minneapolis-St. Paul. "We'd heard the industry claims for structural CIPP trunk water main pipe rehabilitation — how it can save more than 30% compared to open-cut construction, how its carbon footprint is 80% less than open-cut. We were convinced it was the way to go."

SEH facilitated meetings with the three cities and suggested awarding the work using a cooperative project agreement (CPA). Minnesota statute 471.59 ("Joint Exercise of Powers") gives cities, counties, and other government agencies the authority to enter such an agreement, also called a "joint powers agreement," with other units of government for projects and programs. All states allow such agreements.

An agreement establishes a board with the power to manage funds, enter contracts, hire employees — and sue (or be sued). Enacted in 1943, the law opened the door for widespread usage. In fact, the League of Minnesota Cities reports that in 2003 more than half the state's cities were using the law. Between 2004 and 2010, more than 1,800 agreements were in place. (For more information on cooperative agreements in Min-

OVERVIEW:

WHO: Cities of Fridley, Golden Valley, and Hutchinson, Minn.

WHAT: Shared contract for installing structural cured-in-place pipe (CIPP) into 1 mile of trunk water main pipe in three non-adjacent locations.

WHEN: 2010

SAVINGS: 10% less than an open-cut rehabilitation method

nesota and elsewhere, see "Prudent purchasing" beginning on page 45 of PUBLIC WORKS' June 2007 issue.)

SEH Project Manager Paul Pasko offered a justification for the arrangement that everyone could live with — the bottom line — and began developing a set of bid documents that would open the extremely narrow field of experienced contractors as wide as possible.

Owing to its experience with both joint authority and the rehabilitation method, Golden Valley took the lead as the agreement's contracting authority.

The most difficult hurdle was getting the three cities' management, attorneys, and council on board in time to keep the production schedule on track. Each wanted a parachute clause that would enable it to drop out for any reason and at any time until the contract was awarded. Even so, the other two cities agreed to give Golden Valley a partial payment of 95% of the engineering estimate of construction for their projects, due between contract award and the payout of the first contractor's first invoice.

CITY	PROJECT COST	PROJECT SIZE	PIPE SIZE LINED
Fridley	$346,057	2,100 linear feet	12-inch
Golden Valley	$214,899	960 linear feet	12-inch
Hutchinson	$613,799	2,440 linear feet	12-inch
TOTAL	**$1,174,755**	**5,500 linear feet**	

"From the engineering perspective, we were concerned that requiring the money up front might be a deal-breaker," Hoeft says. "Fortunately, we all believed in the process."

Like structural CIPP for sewers, the trunk water main pipe application uses robotically controlled cutting devices to restore flow to service pipes once the lining is cured and passes its pressure test. However, few contractors have enough experience with the robots developed specifically to reinstate water service pipes. So the bidding documents included a questionnaire each bidder had to complete to prove their competency not just installing structural CIPP, but also robotically reinstating water service pipes and suc-

Fer-Pal Construction crews pull Sanexen Environmental Services' resin-impregnated Aquapipe liner into the trunk water main pipe at an insertion pit measuring 4 feet by 8 feet and 8 feet deep. Photo: City of Golden Valley

A temporary water main network: water main, temporary fire hydrant, 1½-inch potable water service, and 4-inch fire service connected to the service pipe in the insertion pit. Photo: Sanexen Environmental Services

cessfully completing restoration measures. To help attract out-of-state contractors, the bidding documents were posted online using QuestCDN eBiDoc.

Without the robot, Pasko says, "we would've had to restore each water service pipe using an open-cut method calling for a pavement cut at every single service pipe. The robot saved us from having to make one pavement cut approximately every 50 feet, and minimized boulevard disruption and soil compaction issues."

The questionnaire results proved that two of the three bidders were competent installers: Insituform Technologies in Chesterfield, Mo. and Fer-Pal Construction USA LLC in Taylor, Mich. As the lowest responsible bidder, Fer-Pal was contracted to install Sanexen Environmental Services' Aquapipe (see box below to learn how the system works).

Managing short-season schedules

With the agreement in place, it was time to work out the logistics. Below-freezing air temperatures lop Minnesota's construction season short on both ends. Design for three non-adjacent locations had to be completed in time to receive the best bids that, in turn, gave contractors enough time to finish the projects by the end of summer.

"Freezing conditions don't affect just the temporary water main network," Hoeft says. "Once temperatures drop, we can't obtain our typical hot-mix asphalt to properly restore the 4-by-8-foot pits in roadways through which the lining was inserted into the pipe."

The project schedule concluded in late September 2010, at which point regular water service would be restored and the above-ground temporary water main network deactivated. SEH became the single manager of the production schedule for all three cities. Centralizing decision-making allowed design and bidding to proceed on schedule.

"Some of the partners asked for different pavement restoration and turf establishment methods, as well as temporary water main networks," Pasko says. "But for the most part, they agreed in advance on design, construction, and testing methods.

"We had to be ready with project-related material for whichever city had the first council meeting. Where typically we might have a month, we were turning documents around within a week or two. We prepared the special provisions for each city so they read consistently — regardless of project location — and we controlled the look of the plan."

Whenever possible, the firm tried to use the same bid-unit pay items across all three cities to balance the cost equally. For example, the "12-inch lining" pay item combined the pipe length for all three cities.

Standardizing mobilization costs was more difficult. "The project locations are miles apart, so that's a real cost in terms of transport," Pasko says. As a result, contractors were required to bid on separate lump sum pay items for each city.

Immediately after the bid, SEH applied the apparent low bidder's unit prices to each city's bid items to calculate each city's actual cost. These costs allowed each city to quickly verify it could afford its share of the overall project.

Lessons learned

Like any first-time project, there were small hiccups along the way.

A few pavement patches at the insertion pits settled during the winter, requiring infrared asphalt restoration this spring. In Golden Valley, the gate valves at numerous large-diameter water services were too close to the

REHABILITATING TRUNK WATER MAIN PIPE

Aquapipe is a structural cured-in-place pipe (CIPP) liner developed for the drinking water industry by Sanexen Environmental Services Inc. of Montreal. The product was designed to meet ASTM F1216 and F1743 guidelines for the rehabilitation of water mains and certified to NSF/ANSI Standard 61.

The liner is composed of a two-jacket, polyester-woven jacket that is winched into place. The inner jacket contains a polymeric inner membrane to keep it watertight.

Here's how the process works.

- A temporary bypass system is set up to maintain water service during installation.
- Access pits are dug and the existing pipe cleaned and prepped.
- The pipe is inspected by closed circuit television (CCTV) camera, and service connections plugged using robotic equipment to prevent the lining's resin from setting within the connection.
- The resin-impregnated liner is pulled into position and cured with hot water. The water activates the thermo-setting resins, which form a structural liner within the pipe.

The product is used for water mains ranging from 6 to 12 inches in diameter and in lengths up to 500 feet per insertion pit.

In addition to Sanexen, Insituform Technologies Inc. offers a trunk-lining system (InsituMain), as does NordiTube Technologies (Nordipipe).

WEB EXTRA

To see a robotically controlled cutting device reinstating a water service lateral from inside the pipe, look for the "Web extra" icon on our home page at **www.pwmag.com.**

Three companies offer lining systems developed specifically for pressurized water systems.

trunk water main pipe. Contractors replaced the valves to prevent lining resin fouling, but this was part of the scope of work.

"We ran into one 36-inch concrete electrical duct that didn't match the as-builts," Hoeft says, "but even with the $4,000 change order that caused, we're looking at change orders of less than 1% in total project cost."

If you'd like to enter a similar arrangement, he has three pieces of advice.

Bid early. "Contractors preferred bidding early in spring so they can properly schedule their summer work and minimize their exposure to liquidated damages."

Speaking of which, put liquidated damages to work for you. Make the contractor pay for not finishing the job by the contracted completion date.

For this project, installation and pavement restoration were to be finished by Nov. 5, 2010, because Minnesota weather makes work virtually impossible after then. From that date forward until the job was finished, $1,000/calendar day would've been deducted from what was owed the contractor.

Tighten the schedule and specifications to ensure the work is feasible for all partners. "One bid, three jobs, and one bid tab kept the bidding balanced between the cities," Hoeft says. "We believe all three received the biggest bang for the buck by approaching the projects cooperatively." PW

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