

# WATER & WASTES DIGEST

## Pipeline Payoff

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### Trenchless pipelining solution saves critical brick storm sewer



**W**ith a population of less than 14,000, Warsaw, Ind.—the “Lake City”—is not an especially big town, but it is snuggled in the midst of four lakes and generates seasonally high quantities of storm water runoff to

the Tippecanoe River. Inflow and infiltration (I&I), with its resulting erosion, is an ongoing challenge. When a 48-in. storm sewer pipe made of paving brick and mortar appeared to be failing, the city took it very seriously. The proper response, however, was not immediately obvious.

“This is a round pipe made of brick and mortar,” said Warsaw Superintendent of Public Works Lacy Francis. “It sits low in the water table. There were some issues with the bottom of the pipe, and there were also long cracks running the length of a pipe—it seemed to be cracking like an egg. We worried that if bricks started falling out, there could be a sudden collapse.”

Warsaw needed a fix that was fast and structural. Given the state of municipal budgets, it also needed to be affordable. Francis had a solution in mind, but he was unsure where to find it. “I’d seen manholes rehabilitated with a ‘sling’ (centrifugally cast) method that coated the manhole with high-strength grouts,” Francis said. “I figured that it would work on horizontal pipe as well, even though I’d never seen it done.”

#### A New but Proven Method

Fortunately, a tradeshow led Francis to Iowa-based AP/M Permaform, which has been using the centrifugally cast, high-strength PermaCast system to repair and seal manholes since 1985. Thousands of challenging situations have proven that centrifugally compacted concrete is an effective and durable rehabilitation technique. And Francis’

intuition was correct: The centrifugally cast system has been adapted for use in horizontal pipe, with hundreds of successfully completed projects in the U.S.

Called CentriPipe, this horizontal lining system is based on a computer-controlled spincaster that is pulled backward through pipes. It precisely applies thin layers of high-strength grouts to build thicknesses engineered to seal and structurally reinforce failing pipe. The final product is waterproof, smooth and relatively thin so that flows are not restricted. It is especially cost-effective for larger-diameter pipe and costs less per foot than other trenchless repair methods.

For budget reasons, the rehabilitation of Warsaw’s critical pipe will take place over three years, with the first 700 ft lined in 2011. After comparing bids for lining from four companies, Warsaw selected Indiana-based ProForm Pipe Lining Inc. to apply CentriPipe. ProForm has been using the PermaCast method to do manhole lining for more than 10 years, and has begun using the CentriPipe method for horizontal pipe rehabilitation.

“I saw CentriPipe at a show. AP/M Permaform had a section of corrugated metal pipe lined as a test piece, and it made sense to me,” said ProForm President Marc Campbell. After working with the system on a few projects, he said: “My personal sense is that, for larger-diameter pipe, this is the way to go. It’s much less expensive than CIPP [cured-in-place pipe] and provides a stronger, more structural solution. The client gets more for their money. This is also better than epoxy coatings. We’ve worked with those before, and probably won’t do it again.”

#### Works in Warsaw

The Warsaw rehabilitation took about five weeks, but work with the spincaster took about one week, according to Campbell. “The rest of the time was spent plugging and patching the pipe,” he said.

After the pipe was plugged and dewatered, greater-than-expected I&I was discovered, so ProForm sealed the bottom with underwater cement. This also provided a smooth bottom surface for the spincaster sled to travel on.

Long cracks were sealed with MS-10000, a fiber-reinforced cement.



*This before-and-after comparison showcases how critically Warsaw needed a pipe rehabilitation.*

Working in both directions from a central manhole, the CentriPipe spincaster can be inserted through most manholes and requires minimal staging area. ProForm plugged holes, filled cracks, stabilized loose brick and cleaned the pipe with high-pressure jetting. Then PL-8000, a cementitious grout designed for brick and concrete pipe relining, was applied in two passes of about 0.5 in. each.

“AP/M Permaform engineers determined that a 1-in. thickness of grout was right for this pipe,” Campbell

said. “They also suggest that it be applied in two thinner layers to avoid slumping or peeling.”

The CentriPipe spincaster guidance system controls the application thickness by adjusting the withdrawal speed according to the project requirements. Several methods

are used to verify layer thickness during application. A thin-wire wet gauge is inserted into the grout at random points for precise spot checks of actual applied thickness. Bag counts (of PL-8000) are kept during passes to keep track of applied volume; these counts are compared to calculated volumes for the exact pipe lengths.

The passes are videotaped from the spincaster side during application, and they can be inspected visually from the other end of the pipe. “I could drop by during passes and watch the work being done, and that was reassuring,” Francis said. “And I’ll have a copy of the video for review later.”

Francis knows that the effectiveness of the project will have to be judged in five to 10 years to see how the new lining holds up. “I’m feeling good about it,” he said. In fact, Francis immediately contracted for additional CentriPipe rehabilitation of a 36-in. concrete storm sewer running underneath a railroad crossing. This is another application in which the solution has to be trenchless and, due to the pressure of the crossing, structural.

### **Pipelining Prize**

The CentriPipe method received an award at the 2011 No Dig conference in Washington, D.C., for a major sanitary sewer pipelining project in Westlake, Ohio. A number of state highway offices are specifying it for lining corrugated storm culverts because it saves time, money and traffic disruption.

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