

Trenchless TECHNOLOGY

Managing Manhole Maintenance

Des Moines city crews successfully take on major rehabilitation challenge

by Angus W. Stocking, L.S. — Aug 21, 2013

Des Moines, Iowa, is a quiet, prosperous community of 203,000. But Iowa's largest city has been severely tested by two major flood events in recent decades: The 'Great Flood of 1993' was the most devastating flood in U.S. history, according to the U.S. Geological Survey, and the Iowa Flood of 2008 was so devastating that it caused about \$64 billion worth of damages and is referred to as, 'Iowa's Katrina.'

The occasional flooding and high groundwater put intense pressure on Des Moines' aging sewer system. "Our main sewer infrastructure in most of the city is about 100 years old," explains Des Moines section chief Rick Powell, who's in charge of manhole rehabilitation and levee maintenance. "And it's almost all brick — brick lines and old brick manholes."

Managing manhole rehabilitation and maintenance is understandably an ongoing priority. For five years, the City of Des Moines has been sealing and structurally rehabilitating failing brick manholes without contractor assistance, using the PermaCast system and AP/M Permaform's City Self-Install Program. And even before the city bought its own application equipment, it used the system in test projects to evaluate the solution over time. Some of these date back 15 years, and are holding up well with no sign of failure. That long-term performance convinced Powell that the PermaCast system is cost-effective and durable.



"I think it saves taxpayers a lot of money in the long haul, and from what we've seen it will greatly extend the useful lifespan of our aging manholes," he says.

Systematic, Top to Bottom Rehabilitation

Des Moines' experiences with AP/M Permaform actually go back about 20 years, when the company's president, Bill Shook, demonstrated a manhole cleaning system based on high-pressure spin washing. That system evolved into PermaCast, which uses a patented, bi-directional robotic spincaster to apply thin layers of high-strength, fiber-reinforced cementitious grouts to the interior of failing manholes.

Prior to signing up for the Self-Install program, Des Moines didn't have a formal protocol for manhole repair. When manholes failed completely, they would be rebuilt with new materials. And sometimes various patching methods were used.

“These weren’t very good. It seemed like they ended up breaking down after just a few years,” Powell says. Now, city officials systematically rehabilitate manholes prior to failure. They don’t have a fixed annual goal for the number of manholes to be rehabilitated, but they do take advantage of good conditions. “When the weather is good, we’re able to repair up to five manholes a day,” Powell says, “That’s with an average depth per manhole of 10 to 12 ft.”

The is lowered from above, so crews are usually able to avoid confined space entry. The bi-directional feature is important in this regard; since the spray nozzle spins in one direction on the descent — clockwise or counterclockwise — and the opposite direction on the way up, there are typically no concrete ‘shadows’ caused by uneven bricks or other protrusions. This eliminates handwork. The result is, essentially, a smooth, watertight, completely structural new manhole that tightly adheres to, and stabilizes, the existing manhole. PermaCast can be used to repair brick, concrete, or even steel manholes.

The grout used is typically MS-10,000, or another specialty grout from AP/M Permaform. These are specially formulated for manhole rehabilitation, and if microbiologically induced corrosion (MIC) is an issue they can be mixed with ConmicShield, an anti-microbial additive that provides permanent corrosion protection.

“It’s a good system, and it lines the old manhole from top to bottom,” Powell says, “We usually apply a half-inch thick layer of concrete in one complete pass, and we find that is completely structural. If the old manhole is failing or especially bad, we might do another layer after the first layer has cured, for a total of about an inch.”

Training was initially provided by AP/M Permaform staff, who visited the site and worked with Des Moines crews in the field. But since then, Powell says, on-the-job training has been more than sufficient to get new employees started on the PermaCast crew. “It’s not really too complicated a process,” he says, “It’s become routine for us, and we treat it as an entry-level job for new employees. So, we have a lot of turnover on that crew, but we’re always able to consistently do high-quality work.”



Like many cities, Des Moines struggles to keep up with pressing infrastructure maintenance issues while also struggling to cope with shrinking budgets. In the case of manhole rehabilitation, Des Moines has learned that sometimes, doing it yourself is the best way to go.

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