

Project Spotlight: What Lies Beneath



Water ran against the bricks of this manhole, which is more than 80 years old, causing it to lose mortar and some of its bricks. Infiltration from a broken stormwater pipe nearby then made its way into the sanitary sewer system.

On an early winter morning in Parkersburg, West Virginia, collection system operators faced a major catastrophe when a garbage truck fell into a sinkhole adjacent to a manhole. Quick thinking and trenchless technology saved the day to return the area to service quickly, limiting the impact to local community businesses while protecting nearby buried utilities.

An older storm drain located on a hill by the local community hospital which drains to the Ohio River ran parallel to a manhole structure on a busy mixed use area street. Over the years, the storm drainpipe had deteriorated from the outside, and all its collected water was running up against the bricks of the 80-plus-year-old manhole structure. This resulted in a slow but steady degradation of the structure, causing mortar to erode and its bricks to fall out of its sides down into the sewer mains, which allowed backfill around the manhole to enter the sewer system.

Although the town had been performing annual preventive maintenance and CCTV inspection, the inflow and infiltration from the storm drain and structural issues were hidden, as assessments were typically conducted during dry weather conditions.

Limiting community disruption

The sinkhole surrounding the manhole structure, sewer mainline and storm drainline were situated in a busy thoroughfare, and there were numerous buried utilities adjacent. The community impact and risks were high for performing a dig-and-replace, so utilizing trenchless technology, if feasible, was Parkersburg's best option. The city called Advanced Rehabilitation Technologies (ART) of Bryan, Ohio, to look at the site and determine if it was a candidate for trenchless rehabilitation with the fast-curing manhole lining technologies they offered.

"Because I&I can be quite common in manholes, it would've been nearly impossible for the city to determine how long it took for the grout holding the bricks and the erosion in the manhole to take place," says Colton Shoemaker, project manager for ART. "The pressure from the I&I from the storm drain could have been ongoing for decades unseen, and then suddenly the situation turned ugly real fast. Even with a regular inspection program, if there wasn't any I&I present they could see visually with their cameras, something like this was just a hidden issue waiting to happen, and unfortunately for them it was just the luck of the draw."

ART determined that a trenchless solution was feasible using a variety of products from the OBIC product line to reinstate the manhole's structural integrity while not disturbing nearby utilities and limiting the amount of community disruption.

Rehabbing the manhole

City crews had done what they could to stabilize the surrounding area using plywood to hold back what backfill was remaining around the manhole to prevent any additional loss of bricks, backfill and structural integrity. They cleared around the area to create an easy deployment environment for the ART crews to begin prep work. Once the clearing was finished, ART was confident that the project could be completed within a few days.

The key to the project success would be in the preparation of the manhole structure, which was 16 feet deep and 4 feet in diameter. The first step was to make sure that no additional excess debris got into the lines feeding the manhole. Bricks that had come loose were reset in place and mortared in with hydraulic cement. This was followed by the application of a combination of four different hydrophilic and/or hydrophobic grouts from OBIC via injection to seal any infiltration on the side walls and bottom areas of the structure.

Once all water ingress was resolved, the structure needed to be cleaned. A 4,000 psi pressure wash of the whole structure was performed, and afterward, drying with a torpedo heater was completed. The structure's surface needed to be dry before spray-application of the lining could begin. Because it had been compromised, ART felt that to really secure the bottom floor of the manhole, reinforcing the weaker areas with 3/8-inch rebar was called for. After all these initial steps were complete, the structure was ready for the application of the lining, which would be executed in three stages.

The first stage used OBIC 1000, a fast-curing polyurea coating with an elongation of 400% that could shift with traffic loading and withstand the freeze-thaw cycles common in the region. This was spray-applied at approximately 50 mils thick over the entire structure's interior. The second stage of the lining saw the application of OBIC 1306, a high-density polyurethane foam that adds structural integrity to the manhole and fills in any spots with missing or reduced mortar. This created a smooth profile for the third and final stage, which was a spray application of another layer of OBIC 1000 at 50 mils.

The layers fully bond to the structure, sealing and anchoring it to become monolithic. In total, an average of 500 mils of material were applied to the manhole walls and bench, adding significant structural integrity.

After the manhole was fully repaired, city crews returned to perform backfilling around the manhole structure and repave the road, returning everything on the roadway back to service.

Attention to system health

Such a severe emergency has sparked more awareness for the city regarding inspection of its manholes, drainage lines and anything else that can impact collection system integrity. Anomalies such as unusual wear and tear due to excess debris entering a lift station are great indicators that something serious could be occurring upstream. Sanitary sewer overflows in a particular area could also be seen as clear warning signs of potential structural integrity loss that could be impossible to pinpoint during routine CCTV inspection.

"This emergency did create a lot of awareness in the importance of maintenance such as decreasing infiltration," says Shoemaker. "We've recently been able to reduce infiltration for a community up to 33% just by manhole lining alone. A small change can really help a city save money and reduce the burden at its treatment plant, not to mention avoid stressful events like this."

To prevent future problems, Parkersburg decided that a spot repair in the storm drain would be installed as a temporary fix and a follow-up CIPP lining would be performed to mitigate future water ingress to any structures along the system flow.