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LAVALLEY INDUSTRIES

Revolutionizes Pipe Safety, Productivity

ALSO INSIDE

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Lewisville, Texas, Sinkhole Emergency

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Jason LaValley sketched out on a hotel napkin a safer and more productive way to handle pipe on the jobsite. That innovation, and others he created, has revolutionized the HDD and pipeline jobsites. *By Sharon M. Bueno*

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LaValley Industries leadership team (l-r): Jason LaValley, Craig Larson and Jorge Prince.

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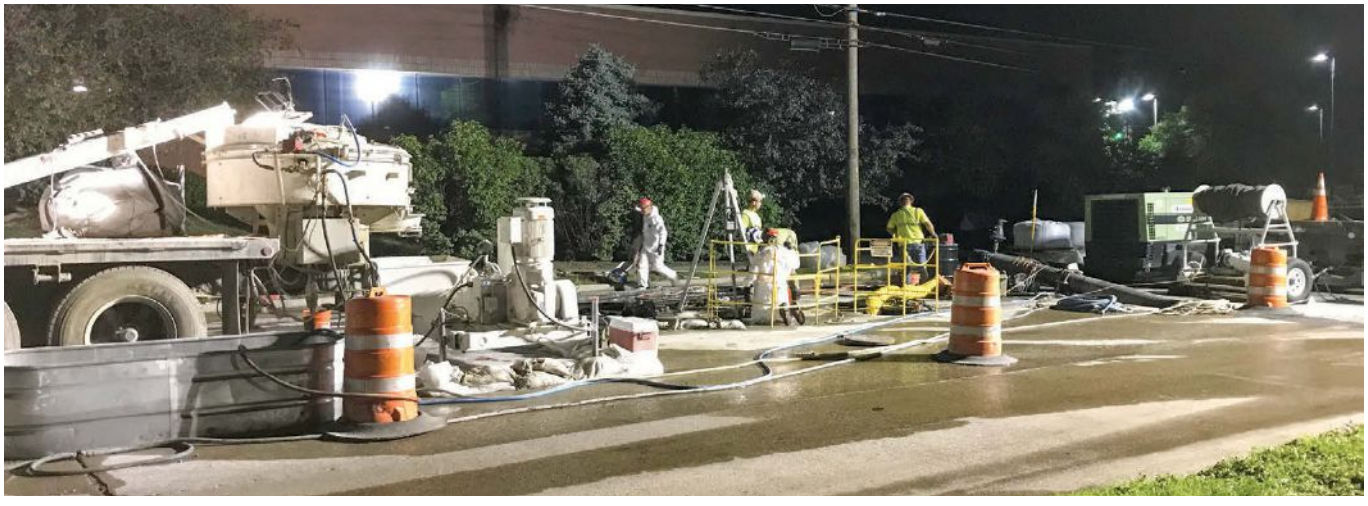
Geopolymer Lining

Used for Kentucky Combined Sewer System

By John Manijak and Terril Bentley



Even in ideal conditions, rehabilitating 1,400 ft of a 72-in. combination sewer with geopolymer mortar is challenging work for a crew experienced in using the sprayed-on material to restore the structural properties of a utility pipe. When real-world conditions are brought into play, that same project requires a contractor who understands precisely how to control conditions and apply material in the best manner possible to allow the work to be performed efficiently, safely and at a high level of quality.

Michels Corp. was contracted by the Regional Water Resource Agency of Owensboro/Daviess County (RWRA) to rehabilitate a combined sewer system it owns and operates in the Owensboro, Kentucky metropolitan area. Originally a 72-in. concrete pipe, multiple prior repairs resulted in the project consisting of 239 lf of 56-in. concrete pipe, 130 lf of 66-in. steel plate and 1,120 lf of 72-in. concrete pipe, changing diameter five times. The tunnel was located 50 ft below surface and accessible from two utility manholes 1,200 ft apart.

The RWRA manages approximately 540 miles of sewer lines, representing approximately 214 miles of sanitary sewers, 56 miles of force main, 147 miles of combined sewers, and 125 miles of laterals within the public right of way. RWRA also manages 54 pump stations and two wastewater treatment plants.

Michels is an infrastructure and energy contractor headquartered in Wisconsin with more than 40 permanent offices and yards throughout North America. Among a wide range of offerings to multiple markets, Michels performs extensive trenchless construction services focused on the installation and rehabilitation of pipes and other underground utilities.

The Michels crew arrived on site in Owensboro in May 2020 and completed the project over the next three months. In addition to dealing with learning how to work safely in the midst of a global pandemic, the crew was challenged by heavy rainfall more than twice the amount of a typical year. Here is a look at how the Michels crew handled the complexities of this project.

Bypass

A specially designed bypass system was installed prior to the start of the rehabilitation phase of the project. It consisted of 1,200 lf of 12-in. welded HDPE pipe used to reroute the 2.2 MGD dry weather flow around the repair site. The bypass piping system was buried at key intersections of the state transportation route to prevent traffic delays. Two large plugs (42 in. and 78 in.) were required to be installed to complete the bypass.

Application

GeoSpray geopolymer mortar was selected for the spray-on application. Based on engineering calculations and design, the geopolymer mortar was sprayed on at different thicknesses throughout the project, including 1 ¾ inches in a 259-lf section of 56-in. concrete; 2 ¼ in. in a 1,122-lf section of 72-in. concrete tunnel;

and 3 in. in a 130-lf section of steel plated tunnel. In addition, the crew applied 1 in. in 50 vf manhole shaft, covering a total of 11,250 sq ft, and approximately 325 lf of geopolymer fill in the belly of the pipe. In total, 670,000 lbs of geopolymer mortar was applied on the project.

Conditions

Rain. Maintaining a bypass system was demanding due to the fact that the pipe was part of a combined system that filled very quickly with any amount of rain. This challenge was compounded by the project being completed during a very rainy season that included a minimum of 12 days of rain. Since individual workers were mechanically lowered 50 ft down a 24-in. diameter manhole into the sewer tunnel, extreme caution was taken to return them to street level prior to any rain starting. After the crew was extracted, the plugs had to be removed to allow the combination wastewater to flow through the full diameter of the pipe.

Heat. Working in Kentucky from May to July with a product negatively impacted by heat is not an ideal combination. After enduring high temperatures a few days, the project management team decided to shift work operations to the evening hours, increasing the effectiveness of the crew and avoiding any premature curing of the geopolymer product.

Diameter. The tunnel had previously been repaired using sliplining methods multiple times in several sections throughout its lifetime, resulting in various diameters. When working in the smallest-diameter sections, the crew found themselves hand-spraying geopolymer in a tunnel that was only 4 1/2 ft from top to bottom.

Access. The crew completed the work with two access points located 1,200 lf from one another. As the material was mixed above ground, it was then pumped up to 600 ft from either point to reach the center of the project.

Infiltration. The city of Owensboro, Kentucky, sits on the banks of the Ohio River, which separates Indiana and Kentucky. At 50 ft in depth, the pipe location was well under the groundwater table. During the pipe preparation phase of the project, crews utilized grout injection techniques to prevent water infiltration from washing away any newly applied materials. The hydrophobic grout used was designed to react in the presence of water, expanding to seal off any inflow of water.

Conclusion

Although geopolymer applications may be newer to the sewer rehabilitation industry (within the last 10 years), when applied properly it produces a high-quality lining material. This manufactured rock possesses higher flexural strengths and has better chemical resistance than standard Portland-based cement materials. Possessing the ability of its components to fully react with one another to form an extended polymeric network, geopolymer mortar resists and eliminates cold joints after curing when applied to itself. Challenging conditions, such as weather, access, infiltration, or diameter changes will always be a factor when working underground. The final product is always a reflection of the result of the combination of choosing the right materials while employing experienced crews.

John Manijak is director of training and technical support. **Terril Bentley** is a project manager specializing in geopolymer and large projects. Both are part of Michels trenchless rehabilitation group.