

PARTNERSHIP BETWEEN SUPPLIER AND CONTRACTOR FORCES THE ISSUE

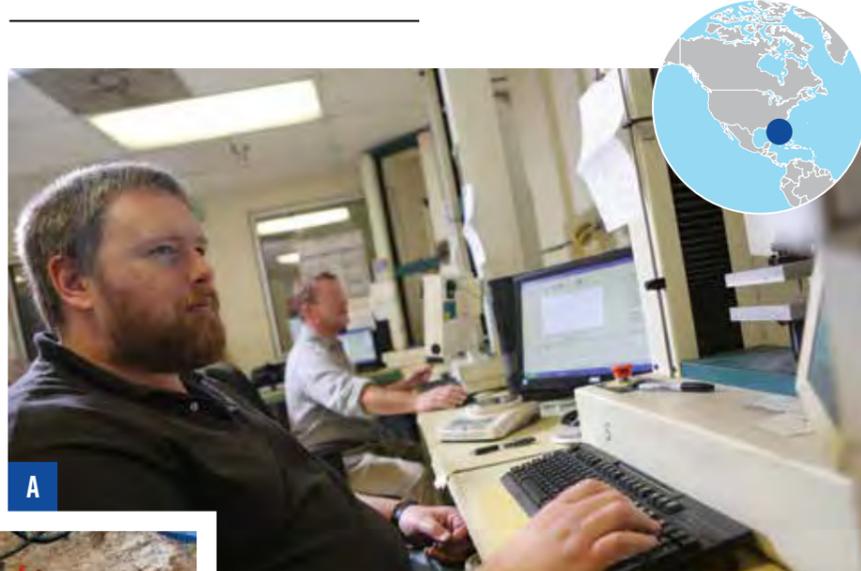
An impressive force main rehabilitation project in West Palm Beach, Florida – awarded to two different contractors for Phase 1 and Phase 2, respectively – has set records and provided a new level of confidence in the capability and reliability of fibre-reinforced CIPP for high pressure, large diameter and long-length pipe.

Phase 1 of the project, which was awarded *Trenchless Technology's* 2017 Project of the Year Award, included the rehabilitation of a more than 1,700 m, 48 inch (1,219 mm) prestressed concrete cylinder pipe. It required significant pre-planning and a sophisticated bypass system to ensure the pressure main would not be shut down during any phase of the project.

But that was just the beginning.

TRENCHLESS SOLUTION

Phase 2 of the cured-in-place pipe (CIPP) project, awarded to Lanzo Trenchless



A



B



A: An Applied Felts employee observes results during the company's rigorous 28-step testing system as part of the manufacturing process.

B: The sacrificial tube that enhanced the quality of the final product.

C: A diagram of Applied Felts' AquaCure PS glass-reinforced liner, which is custom-designed to meet the unique requirements of projects around the world.

Technologies of Deerfield Beach, Florida, included the additional rehabilitation of more than 1,830 m of pressure main and presented new challenges, including an even more complicated bypass system.

The 48 inch force mains deliver all of the sewage into the East Central Regional Water Reclamation Facility in West Palm Beach, which necessitates continuous flow at all times. Jacobs Engineering, which also

oversaw Phase 1 of the project, provided continuity to these record-setting projects.

While Phase 1 involved minimising disruption to the multi million dollar homes and a Jack Nicklaus designed golf course that are served by the massive sewer system, Phase 2 required the rehabilitation of pipes under major roadways serving the area including Military Drive (Route 809), a busy state highway.

Additionally, the bypass crossed a state road, Military Trail and two Palm Beach County roads: Roebuck and Haverhill. Sophisticated maintenance and traffic plans were required for this area, which includes a major school located within the project limits.

A temporary roadway approximately 1.6 km long was constructed to ensure school bus traffic would not be disrupted.

A thorough and multi-level public outreach program was conducted prior to the US\$7 million project so residents, businesses and others potentially affected by the construction would be fully informed and prepared. The awareness campaign included a newsletter, community and stakeholder meetings, a dedicated hotline for inquiries, and ongoing updates throughout the duration of the project, which launched in Spring 2017 and was completed the following November.

TESTING THE LIMITS

"Force mains in the US have been neglected," says Lanzo Director of Business Development Fred Tingberg Jr.

"These pipes are the most difficult to condition assess given bypass, access issues and the considerable costs required to simply understand the remaining lifespan expectancy. A great deal of rehabilitation work remains undone with catastrophic failure probability left to chance."

In a recent American Society of Civil Engineers conference paper titled 'Technical Viability of Renovating Segments of Existing Large Diameter Pressure Pipelines with Cured in Place (CIPP) and Other Thermoset Resin Lining Systems', Mr Tingberg and Black & Veatch's Ricardo Viera, PE, set out to identify the limits and capabilities of CIPP in pressure pipe applications for sewage force and water mains.

They interviewed American and European contractors, but were especially interested in the opinions of the international community since this type of rehabilitation is more commonly used outside the US.

"We inquired into reasonable lengths to be rehabilitated, epoxy versus vinyl ester resins, required access, maximum bend, and other technological-limiting criteria," says Mr Tingberg.

"Intelligence gained through the study greatly assisted in the West Palm Beach project. It was exciting to be involved in a rehabilitation project of this scope and complexity. We are grateful to be part of advancing pressure pipe rehabilitation technology here in the US."

BENEFICIAL PARTNERSHIP

Mr Tingberg says Lanzo partnered with Applied Felts to manufacture custom fibreglass-reinforced liners to tackle the massive project.

"We needed a high-quality, stand-alone

liner capable of withstanding a test pressure of 55 psi, based on an operating pressure expectation of 25-35 psi. We chose Applied Felts' AquaCure PS® product, which combines glass-reinforcement with traditional felt liner construction.

"There were many reasons we chose this product, including the fact that Applied Felts' partnership and ongoing innovation allowed us to customise the liner to fit the demands the project presented. However, from a manufacturing standpoint, AquaCure PS has the important characteristics this job required including fibreglass reinforcement to provide static, self-supporting properties. The liner was engineered to have the pressure resistance of a stand-alone AWWA Class IV pipe, with pressures exceeding 150 psi. The fact that the liner well exceeded our requirement of 55 psi gave us great peace of mind."

Lanzo recognised there was no room for error, so it lined and tested two runs of 48 inch pipe at their Pompano Beach facility prior to starting the project, to practice impregnation and installation techniques while ensuring the field system test satisfied the 55 psi test requirement.

It also worked hand-in-hand with Applied Felts and the resin provider, Interplastic Corporation, forming a team to oversee every step of the project.

ENSURING QUALITY

Applied Felts Technical Manager Mark Chandler says the company undertakes "strenuous testing" of its liners – including dye and electric wire current tests as part of standard quality control and assurance before leaving the plant – to ensure the successful application during its clients' rehabilitation activities.

"During Applied Felts' multi-stage production process, we continually test a variety of criteria including density, thickness, fibre distribution evenness, strength and weld-ability of the finished product," says Mr Chandler. Once the liner has been constructed, the material is then coated, using a 'single pass' extruded process to ensure there are no pinholes present. During this phase, tests are again conducted to monitor coating uniformity, mass and weight distribution.

"Continually checked throughout the process to ensure the product satisfies the

specification of a particular custom order, the finished liner is then sampled and destructively tested across a variety of quality characteristics, including density at various pressures, tensile strength, coating distribution and more.

"Finally, samples are cut and tested across several additional criteria to make sure the circumference, density, length, coating integrity, weld strengths and other properties have not been compromised; however, our involvement doesn't end with the shipment of the liner. In the case of the City of West Palm Beach, we, along with the other suppliers, were physically on the job site to help oversee a very stringent set of installation procedures for this unique project," he says.

And unique it was; the survey conducted by Mr Tingberg and Mr Viera indicated that a typical length of liner for a single CIPP shot of this type is, on average, 152 to 189 m. In the case of the City of West Palm Beach project, Lanzo was able to install the liner in seven individual shots of up to 335 m.

The benefit is that the longer the shot, the less the disruption and the greater the savings in both time and money.

"Basically, each shot was worth about US\$1 million," says Mr Tingberg.

"We were definitely white-knuckling it during the testing phase, because a single section failing in a pressure pipe application is unacceptable. We had a very high level of confidence in our testing, which included the ability of the liner to withstand over 20 t of thrust, as well as bridge the existing pipe condition, configuration and bends.

"We anticipated every possible challenge and were well prepared."

Mr Tingberg says he is hopeful that the successful execution of the project will encourage other municipalities to consider CIPP for force main rehabilitation.

"We invited approximately 50 municipalities and engineering firms to visit the West Palm Beach construction site, with our sign in register listing over 30 entities from all over the State of Florida. It's partnerships like the one we have with Applied Felts and the ongoing sharing of information with others in our industry that will contribute to excellence in the rehabilitation of pressure pipeline systems around the world." 

For more information visit www.appliedfelts.com