Monitoring the rolling out of the liner

Sewer reline wins academic plaudits

A large-diameter CIPP installation eliminated the need to reroute a decrepit century-old storm sewer running beneath a crowded college campus in Georgia, US, says Mike Vellano

GEORGIA Institute of Technology, better known as Georgia Tech, spans more than 400 acres (162ha) in the heart of Atlanta, Georgia. The landscape is hilly, tree-filled and over time has become checkered with campus buildings ranging from administration, departmental, research and classrooms, to dormitories, student activity centres, parking garages and recreational facilities.

When Georgia Tech first opened its doors in October 1888, there were only 84 students attending the school. Today, more than 125 years later, the university boasts more than 21,000 undergraduate students and is ranked as one of the top 10 public universities in the US.

However, all this growth has taken its toll on the university's stormwater drainage system, and was adding to the city's growing stormwater management issues. Since 1951, when the institute began monitoring operations, stormwater run-off had risen from 8,920L/sec to today's 19,765L/sec, a more than two-fold increase.

Recognising that the ecological performance of its campus today is very different from what it was in the past (when there were fewer buildings, streets and sidewalks, and more natural vegetation), Georgia Tech implemented a comprehensive stormwater management and drainage improvement programme.

> "One of the big reasons for choosing CIPP is that we had a lot less surface disruption on campus"

One of the goals was to improve stormwater run-off, whereby Georgia Tech's contribution to the Atlanta storm sewer system would be reduced to 1951 hydrology conditions. Part of this plan included the development of the Eco-Commons, a natural retreat on campus where shrubs, trees and other native plants will enhance and promote the institute's historic landscape.

For phase I of the Eco-Commons stormwater infrastructure improvement project, it was determined that a section of an interceptor sewer line, which is owned by the City of Atlanta, was contributing to much of the increased stormwater runoff.

The line in question consisted of approximately 420m of 72in (1,828mm)-diameter reinforced concrete pipe (RCP). Adding to the complexity was an additional 30m of 78in (1,980mm) old rubble-wall storm tunnel construction that connected two sections of the pipe together. All of this lay just beneath several buildings, streets, sidewalks and well-manicured green space.

Early discussions and original plans called for the physical relocation of the line. However, because of what lay above it – building, streets, sidewalks and a lot of student traffic – it was the City of Atlanta that suggested a trenchless solution be used.

"The city proposed using CIPP [cured in place pipe] as an alternate method and we jumped at that opportunity," states Jerry Young, landscape project manager at Georgia Tech. "Since the city had had much success with CIPP in the past, its endorsement of this process helped us become more comfortable with a trenchless solution and get this job under way a lot faster."

CONTRACTOR SELECTION

Specifying a trenchless technology was also less disruptive, and a natural fit for the Eco-Commons goals of developing a sustainable area using environmentally friendly means of restoration.

However, Georgia Tech's lead contractor in charge of the Eco-Commons project, Manhattan Construction, had little experience of overseeing trenchless infrastructure repair methods.

"We were not very familiar with this technology when we started this. Manhattan is traditionally a vertical builder rather than being into underground infrastructure. [Georgia] Tech asked us to take on this role," says Don Bailey, senior project manager at Manhattan Construction. "Working closely with Jacobs Engineering, we did a tremendous amount of investigation as to what was the best way to line this pipe."

Steve Lindsey, project engineer for Jacobs Engineering, also expressed concern about the ability to restore the old arched pipe sections. "Given some of the unique rehabilitation aspects of this project, we felt that the contractor must also be well versed in multiple trenchless rehab methods," says Lindsey. "We knew that portions of this line would require some additional reconstruction."

Ultimately, four contracting firms were interviewed and asked to bid on the project. Based on a combination of experience, cost and a solution-based approach, IPR Southeast was awarded the project.

PRE-INSPECTION

Once the project was approved to proceed, the IPR team went to work fast. Since both the RC pipe and the arch pipe were well over 100 years old, the pre-installation inspection revealed quite a bit of preparatory work, in particular on the separate sections of 78in (1,981mm) brick arch culverts.

Fil Borroni, IPR Southeast business development manager, who also happens to be a Georgia Tech graduate, says: "Being familiar with the campus and the location of the storm drainage system in question, it was apparent that a trenchless solution was really the only cost-effective option."

IPR is nationally known for its solutions-based approach and is equally qualified to perform a variety of trenchless applications. For this unusual condition, IPR brought in its EcoCast crew to fill the annular arch space with a cementitious spray to match the incoming and outgoing 72in RCP lines.

The filling of the annular space allowed the lining crews to install CIPP straight through the portions of arch pipe to ensure a seamless liner from manhole to manhole. Once this and other standard preparation work was completed, the CIPP lining portion of this project was ready to start.

MINIMAL SURFACE DISRUPTION

"One of the big reasons for choosing the CIPP method is that we had a lot less surface disruption on campus. Safety was also a big issue. The original project would have taken months using open trench, and would have caused major headaches on campus," says Jerry Young.

"The whole time we were doing this project, we didn't really disturb anything. Students were able to walk safely past the construction site and, other than three entry pits, we didn't have to dig anything up."

"Considering the location of the line, it was determined that the CIPP lining would be broken down into three segments or 'shots' to complete the task," says Eric Simpson, project manager for IPR.

Liner stacked up and ready to go

The first shot, which was roughly 122m long, ran from State Street to Atlantic Drive. In its path were a car park, a campus building and a parking garage. The second shot, approximately 120m long, ran from the front of the garage on Atlantic Drive, beneath the street, and ended in a student recreational area called Glade Park. The third and final shot ran 170m from Glade Park, through a heavily wooded area and ended on Cherry Street.

EXPERIENCED CREWS

On the whole, large-diameter CIPP rehabilitation, in this case of 72in diameter, is much more complex than a typical 8in (200mm) liner job. The wet-out process alone takes up to eight hours before the first few feet can be inserted, and must be conducted on site right next to the entry pit.

"It is also critical for the resin's pot life to be long enough to last through the entire wet-out, insertion and curing process," adds Al Jedneak, vice-president of technology for IPR.

Because of installation lengths or 'reaches', Applied Felts, IPR's exclusive manufacturer of felt liner material, ensured that the liners were produced to the precise specifications and thickness required. This is why the experience of the product manufacturer and trenchless installation specialist is so critical to the success of a CIPP installation of this magnitude.

Pushing the liner through a manhole

As the first few feet of thoroughly saturated liner came off the line, it was immediately lowered into the hole and 'turned' into the pipe section. Water was then used to invert the liner into the pipe. For this particular job, it was calculated that a constant 10ft (3m) of head pressure was required to push the liner through.

On average, the liner moved through the old pipe at about 5.5m (18ft)/hr. Once it poked through at the end of each shot, IPR's boiler truck quickly heated the water up to 85ºC (185ºF) to activate the resin and begin the curing process. In each case, the liner cured in place after 4-6 hours. Once cured, laterals were restored and the line was placed back into service.

To keep the job moving along, IPR rotated two crews on 12-hour shifts and worked around the clock to complete the task.

In all, the contractor was able to complete the 422m (1,385ft), 72in-diameter relining in less than three weeks. Other than a few sidewalk and street closures for safety purposes, the staff and students were not inconvenienced.

The surface environment was relatively unscathed and the storm sewer system was rehabilitated to improve stormwater flow rates.

Credit must be given to the city of Atlanta, Georgia Tech University and Manhattan Construction for choosing a trenchless solution to rehabilitate the sewer lines and so avoiding the added cost, time, disruption and negative environmental impact they would have incurred by digging and replacing the old storm sewer system with a new one.

Mike Vellano is vice-president of sales and marketing for IPR, a US-based trenchless rehabilitation specialist