# mile marker

## Sacramento, Calif., takes on North America's largest CIPP project

***By Jayne Bringer***

In September 2009, Insituform embarked on North America's largest-ever cured-in-place pipe (CIPP) rehabilitation project. The project encompassed more than 8 miles of sanitary sewer pipeline that had been installed in the 1960s and was in need of an upgrade due to advanced corrosion. It also is noteworthy for some of the enhanced products and green technologies used during site installation.

### Pipe Condition

The Sacramento Area Sewer District (SASD) Central Trunk sanitary sewer serves the southeastern portion of Sacramento, Calif., conveying wastewater to the Sacramento Regional Wastewater Treatment Plant. Constructed in the early 1960s using unlined reinforced concrete pipe, the Central Trunk sewer pipeline is located near businesses, in residential neighborhoods and in major traffic corridors. Portions of this sewer cross residential backyards, Highway 99 and an environmentally sensitive area, and one section runs parallel to the Union Pacific Railroad.

When advanced corrosion was discovered, the Central Trunk was sprayed annually with an anti-corrosive coating. But based on the most recent observations, more aggressive measures were needed to ensure pipeline integrity. Sections of the concrete sewer had lost 3 in. to 4 in. of thickness, exposing rebar and compromising the pipe's integrity.

Air-inversion technology at SASD.

SASD worked with consultant West Yost Associates—an engineering consulting firm specializing in water, wastewater and storm water design—to design the rehabilitation of approximately 3,009 ft of 33-in.-diameter; 10,753 ft of 42-in.-diameter; 11,870 ft of 48-in.-diameter; 9,273 ft of 54-in.-diameter; and 9,769 ft of 60-in.-diameter pipe of the Central Trunk using CIPP. At more than 44,600 ft, these combined sections rendered this project the largest of its kind to date in North America.

The job was awarded to Insituform Technologies Inc., and the notice to proceed was issued in May 2009. Before the start of construction, Insituform proposed to use its iPlus Composite product, which aims to require less resin and provide increased structural integrity with significantly less diameter reduction when compared to conventional CIPP materials. Using the assumption that the host pipe was completely deteriorated, the iPlus Composite was designed as a brand-new, structural pipe within the existing host pipe.

Construction commenced in September 2009 and was completed in September 2010. Based on suitability for specific site conditions, three different CIPP installation methods were implemented on the job. This included 21,000 ft of air-inversion steam-cure (AISC), 4,700 ft of the traditional water-inversion water-cure and 18,900 ft of onsite wet-out. In the onsite wet-out method, the tube was impregnated with resin while

simultaneously installing into the existing pipeline.

## Bypassing Needs

The installation of CIPP sometimes requires full sewer bypass around the segment being lined. Peak dry-weather flows in the Central Trunk can reach 24 million gal per day (mgd), requiring extensive bypass pumps and piping. For this project, Insituform and subcontractor Godwin Pumps devised a diversion plan that plugged and rerouted flows rather than using expensive bypass. This method also reduced the noise and traffic impacts.

The Highway 99 crossing illustrates an example of a particular area where a bypass system was necessary. Due to the depth of the Central Trunk and the volume of flow, a 14-ft-deep pit was constructed over the pipeline in an open field to house five Heidra HS300 hydraulic submersible pumps capable of bypassing 22 mgd.

## Minimal Disruption

One of SASD's goals was to minimize disruption to the community. This task was achieved by implementing a proactive public outreach program and utilizing the composite-reinforced CIPP trenchless rehabilitation method. As a proven technology in use for 40 years, CIPP requires minimal digging and reduces impact to surface features and roads, the environment, and homes and businesses in the community.

A variety of equipment, materials and installation methods were used during the course of the Central Trunk sewer rehabilitation project to make it more efficient from both a timing and environmental standpoint.

## Environmentally Sound

Fiber reinforcement gave the iPlus Composite liner used in this project added strength with a thinner tube—requiring less resin, which means less weight and less fuel required to transport the product, and less energy required to cure the product. This helped the installation team meet California's state trucking limits.

Along these same green lines, low-emission technology was designed and built into the fleet of boiler trucks


The original pipe corrosion is evidenced here.

One of the district's goals was to minimize impact to surface features and roads, the environment, and homes and businesses.

used in the installation process. A traditional diesel-fired boiler will emit 100 to 150 ppm of nitrous oxide (NOx), the predominant cause of smog and considered a great health risk. The new low-emission boilers are capable of obtaining a NOx rating of 9 ppm. This greatly reduces the already low emissions involved with the CIPP installation process.

## Efficiency

Using the AISC method of installation added to the project's efficiency and provided additional environmental benefits. These included:

- Reducing water usage by up to 95%;
- Reducing energy usage by 50%;
- Virtually eliminating discharge of process water into sewers;
- Eliminating grade limitations;
- Shortening cool-down period following cure, which allows lateral reinstatement to take place sooner; and
- Minimizing jobsite footprint by using special installation equipment.

The Central Trunk sewer rehabilitation project is an example of how composite-reinforced CIPP can be used to reduce the number of onsite wet-outs and field splices required, thereby improving overall project efficiency. In some cases, two installations can be combined into one. This project originally had scheduled 64 separate installations, but only 61 were needed because larger sections of tube could be transported in one shipment. In these ways, using the CIPP liner helped maintain the aggressive project schedule and achieve Sacramento's goals. SWS

**Jayne Bringer is senior marketing specialist for Insituform Technologies. Bringer can be reached at jbringer@insituform.com or 636.530.3329.**

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