Steam Cured Large Diameter CIPP Sectional Liners
Make Fast Repairs in Sensitive Environmental Areas

Owner:
Sanitary District of Decatur
Contact: Greg Kuchy, PE, DEE

Engineer:
Bainbridge, Gee, Milanski and Associates, Inc.
Contact: Steve Bainbridge

General Contractor:
Visu-Sewer
Contact: Phil Romagna

Sectional CIPP Contractor:
Walden and Associates, Inc.
Contact: James Bohn

By-pass Pump Contractor:
VanDe Venter Engineering, Inc.
Contact: Nathan Gibson

Over a decade ago, there were many trenchless point repair systems available. Most would think of a trenchless point repair as a short 1 to 3 foot long repair sleeve used to repair a localized point in the main sewer pipe. Today, terminology has changed to include not only point repairs, but also spot repairs, part liners, and the broader term used is a sectional liner. The term sectional lining has been adopted because it refers to lining a section of the main pipe and over the past several years lining localized sections in lengths up to 100 feet.

These types of repairs utilize a cured in-place air inversion technique that is cured with ambient temperatures. Ambient cure systems are efficient and cost effective, though they are not a practical curing choice for large diameter linings. Thermo-set resins which are used in cured in-place pipe are mass dependant, meaning the greater volume of resin in a mass, the faster the resin will react and cure. There is also a concern for extreme exothermic temperatures with large masses of ambient cure resins.

The Decatur Sanitary District located in Decatur, IL was faced with numerous localized defects in several large diameter interceptor lines. The district included these repairs in the Lost Bridge/Steven Creek Interceptor I/I Reduction Project. The scope of work included CIPP MH-MH lining, chemical pipe joint grouting, manhole sealing and CIPP sectional lining in 24 and 30 inch lines. The contract was awarded to Visu-Sewer of Pewaukee, WI.

This project was a success through the use of a variety of trenchless technologies. Based on the CCTV inspection findings, the owner and engineer determined what would be the most economical and practical method of rehabilitation for each line segment. Visu-Sewer self-completed most of the project with exception to the sectional CIPP linings. Walden and Associates of East St. Louis, IL were subcontracted to complete the sectional lining portion of the project.

The Lost Bridge portion of this project runs along the shoreline of Lake Decatur, the primary water source for all of Decatur Metropolitan area. The interceptor line crosses many exclusive lakefront homes with extremely high ground water conditions. The Stevens Creek portion runs parallel to the creek with the interceptor crossing the creek on trestles at several locations. Work locations included heavily wooded areas, backyards and state roads. Due to access restrictions in some areas, a track style bobcat was used to move pumps, bucket machines, bypass hose and to haul air inversion launchers loaded with wet-out liners to the manholes. Several areas required the crew to haul the sectional inversion launcher and liner over 1,000 feet from the refrigerated truck to remote manholes. Some of these inversion launchers and wet out liners exceeded 30 inches in diameter, over 35 feet in length and weighing approximately 1,650 pounds.

VanDe Venter Engineering, Inc. of Fenton, MO engineered the by-pass pumping system for flows up to 1,500 GPM, at distances over 1,500 feet with up to 75 feet of height differences over the interceptor lines. The by-pass system was installed for each segment. Prior to lining and due to environmental concerns near the waterways, the pumping system was tested with potable water verifying the pumping system was leak free.

The specifications called for all CIPP to be a continuous lining with a uniform wall thickness for the length of the repair. Walden has been installing Sectional and Lateral CIPP linings since 1997 and their experience made it obvious that an ambient cure system was not an option for this project. Project Manager James Bohn contacted Larry Kiest Jr. of LMK Enterprises, Inc. to discuss steam-curing options. LMK is the manufacturer and technology provider of the air inversion sectional liner system. LMK agreed to make the large diameter sectional liners and provide on-site technical support to Walden's crew. The repairs would be the longest large diameter sectional liners installed by air inversion at various locations within the pipeline and steam cured.

The liners were made, inspected, tested and vacuum impregnated under a controlled environment at LMK's manufacturing/wet out facility and loaded into a reefer truck. The resin system used offers a pot life (working time after wet out) of approximately 30 days.

The sectional liner system included a needle punched felt tube within a translucent inversion bladder, referred to as a liner/bladder assembly.

The system used is unique as it allows the assembly to be drawn into a flexible inversion launcher made of a high tensile abrasion resistant reinforced polymer hose. The wet-out liner/bladder assembly was positioned within the launcher hose and was then lowered into the manhole and winched to the point of repair. The resin is never wiped off from being in contact with the pipe during the winching process because the wet-out liner is contained within the launcher. The launcher was pulled to the desired location for the liner to begin inverting through the damaged sections of pipe. Air pressure was used to invert these large sectional liners. Once the liners were fully inverted under pressure, steam was introduced to maintain a specific temperature and time. A thermo-coupler wire was incorporated into the furthest end of the inverting liner. The thermo-coupler provided critical data relating to the curing schedule.

Steam is quickly becoming a selected choice for curing due to the flexibility allowed especially in remote applications, as well as the increased production from faster curing when compared to hot water curing. One concern with steam is the condensation that is produced. This is a concern because too much condensation can result in uncured resin. This is inherent in the invert portion where pooling of water occurs and the resin is insulated from the heat source. LMK's proprietary condensation evacuation system was deployed eliminating any pooling of water and ensuring the liner was uniformly cured.

Walden's work resulted in the threat of SSO's being virtually eliminated in areas where the lining was performed, and one of these areas is adjacent to the water supply for the City of Decatur, said Gregory Kuchy of Sanitary District of Decatur.

Even with our past experience of installing large diameter sectional liners, I had substantial concerns about installing these liners with an ambient cure system. The steam cure system allowed us a lot of time to transport and install the liner without the concern of the liner curing too fast. When we had a problem, we simply threw the launcher loaded with a liner back into the refrigerated truck. "This steam cure inverted sectional liners worked so well, we are scheduling several other large diameter lining projects where we will be using this technology", said James Bohn of Walden and Associates.

Author: Joan Blythe V.P. LMK Enterprises, Inc.