



North American Society for Trenchless Technology  
2007 No-Dig Conference & Exhibition



San Diego, California  
April 15-20, 2007

Paper #

## PORTLAND BES ADVANCES IN SEWER MAINTENANCE AND REPAIRS BY OPERATING MULTIPLE CIPP CREWS.

Joe Dvorak<sup>1</sup> and Larry Kiest, Jr.<sup>2</sup>

<sup>1</sup> Bureau of Environmental Services, City of Portland, Portland, OR

<sup>2</sup> Department of Engineering and Design, LMK Enterprises, Inc., Ottawa, IL

**ABSTRACT:** This paper will discuss how the City of Portland has successfully attained a wealth of experience and knowledge through years of training and technology transfer which allows the city's crews to perform sewer repairs in a matter of hours that in some cases would normally consume weeks of heavy construction with serious disruption to the public at extreme cost.

The City of Portland, Bureau of Maintenance (BOM) has been installing cured in-place pipe (CIPP) with in-house crews since 1998 and today, operates one-full time lining crew. This crew has made repairs 50' deep and 50' long, in as little as one work day. In addition, six repair crews, who typically specialize in open-trench repairs, also install CIPP in laterals. Funding is currently underway to add an additional full-time lining crew specializing in mainline rehabilitation and T-Liners.

The city's lining operations consists of mobile units. The largest unit is housed in a 38-foot 3-axle 5<sup>th</sup> wheel trailer which is temperature controlled; outfitted with three phase AC generator, screw air compressors, vacuum pumps, lighting, safety equipment, wet-out table and storage

The city's crews are stocked with bulk lining tubes, bulk inversion bladder tubes and thermo-set resin. This "bulk lining" system allows the city crews to make repairs immediately when pipe conditions are critical. The City of Portland partnered with LMK Enterprises, Inc. in 1998 for lining materials, equipment and technology transfer. The lining trailers and installation units are custom built by LMK Fabrication, Inc. and Portland BES is supplied with Sectional and Lateral CIPP pipelining systems by LMK Enterprises. The main objective is to fix defective sanitary and storm piping as quickly as possible while minimizing disruption to the public, reducing environmental impact and maximizing cost saving to the department of BES.

## **I. INTRODUCTION:**

- A. The City of Portland is known as the city of bridges and Portland prides itself on keeping things moving not only above ground, but also below ground. The Bureau of Environmental Services (BES) is responsible for maintaining some 2,200 miles of the city's sanitary and stormwater collection system. Maintaining this vast network of sewer pipes involves identifying and repairing structural defects. Historically, the Bureau of Environmental Services has relied upon conventional excavation for making repairs to its sewer mains and sewer laterals.

## **II. HISTORY**

- A. In 1995, the city was faced with a failing 15 inch storm sewer. This particular storm line was laid on an extreme grade and in front of the KOIN Tower located downtown Portland. During heavy rainfall, the failing pipe contributed to flooding of the adjacent buildings underground parking garage. The city's Maintenance Engineer Tom Caufield contacted LMK to make repairs to the pipe using their cured-in place sectional process. LMK's crews installed two 15" x 30' CIPP sectional liners in one day and the problem was solved.

## **III. MUNICIPAL CIPP CREW**

- A. The success of the repairs made at the KOIN Tower promoted to the city's inquiry to adopt LMK's technology as a method for pipe repair for the Bureau of Environmental Services. In 1998, the city of Portland took possession of their first CIPP lining trailer. The trailer was a 30 foot self contained unit complete with temperature control, vacuum impregnation equipment, remote positioning and air inversion launching tools.

- B. The Bureau of Environmental Services appointed specific city employees to the city's new CIPP lining crew. The crew was trained by LMK's certified trainer. Training consisted of class room training and on-site training during actual liner installations within the city of Portland. The crew was



trained how to effectively repair sections of sewer mains by using a unique air inversion process that is chemically cured and therefore does not require hot water or steam which is typical with most CIPP lining systems. Educating the crew with proper handling of resins, mixing of resin and catalyst and vacuum impregnation was essential to ensuring a proper finished CIPP.

#### **IV. TECHNOLOGY**

- A. The city is pleased with the containment aspect of the inversion system as compared to traditional pull-in place sectional liners. This unique inverted sectional system complies with ASTM Standard F2599-06. The city crews deploy vacuum impregnation technology to apply the thermo-set resin to the liner tube as it is positioned within a translucent bladder. When the liner tube is positioned within the bladder tube, they are then referred to as a liner/bladder assembly. Since the bladder is translucent, the workers can visually verify the liner is thoroughly saturated ensuring no dry spots remain before liner insertion. Once the liner is resin impregnated, the liner/bladder assembly is loaded into a flexible tubular launching device. As the launching device is pulled to the point of repair, no resin is lost or contaminated since the wet-out liner tube is contained within the launching device.
- B. The city is also concerned about workers safety and the fact that the LMK system contains resin during resin impregnation is huge benefit to workers safety and environmental concerns.

#### **V. INVESTMENT AND SAVINGS:**

- A. The city's crew began installing liners in diameters of 8 – 12 inches and lengths up to 10 feet. One of the repairs the city's crew completed was on a very deep sewer, nearly 50 feet deep. The crew completed this repair in one day and the savings the city's crew achieved with this one repair more that covered the city's entire investment including training and equipment.

- B. Since 1998, the city's crew has become one of the most skilled crews for CIPP linings utilizing vacuum impregnation of ambient cure resins, air inversion techniques and ambient curing methods. The city's crews have expanded their capabilities by installing several linings in multiple line segments including cleaning, pre and post video documentation within one days work. Their experience and capabilities have expanded to liner diameters up to 24 inches and liner lengths up to 50 feet.



- C. The city's lining crews have produced savings that are significant. The Sectional Inversion Lining System has allowed the cities maintenance crews to make more repairs in less time than compared to traditional excavation. City crews make repairs faster and more efficient and save costly restoration to streets, curbs, sidewalks and avoid damage to trees.

#### **VI. CIPP LATERAL LINING:**

- A. With continued results from practicing the sectional inversion system, the city expanded their capabilities to include lateral lining. In 2000 the city purchased LMK's T-Liner system, a one piece main and lateral CIPP lining system that complies with ASTM F2561-06. This lateral lining system renews 16 inches of the main pipe (5 inches on each side of a 6 inch service connection) and the lateral pipe so both the lateral pipe and main connection is renewed. The entire installation is made remotely from the main pipe with absolutely no digging.



## **VII. EXPANDING CREWS CAPABILITIES:**

- A. Portland's crews have become so knowledgeable in the use of LMK's CIPP inversion system, that they have set-up a small version of LMK's manufacturing facility. Today, Portland's crews order liner tube and bladder tube in bulk, cut lining tubes and bladder tubes to the appropriate lengths and assemble the liner/bladder assemblies at Portland's Bureau of Environmental Services facility.
- B. Portland's crews not only assemble the liner/bladder assemblies, but they also calculate resin quantities and promote and mix bulk resin in-house. This in-house knowledge has earned Portland the opportunities to adjust the cure time based on site specific conditions for each repair. The bulk liner, bladder and resin system has taken Portland's crews to one of the highest level within LMK's group of installers. This advanced technology for Portland has also proven to be not only economical for the city's material purchases and adjustable for site conditions, but also has proven to be extremely beneficial in cases of emergency sewer repair situations.

## **VIII. MUNICIPAL HEROS:**

- A. Portland's success has not gone unnoticed by other municipalities. Many neighboring cities have visited Portland to see for themselves the success of the city's CIPP lining crew. Several municipalities have followed suit appropriating funds for their own municipal CIPP lining crew.
- B. Surrounding municipalities have also hired Portland's CIPP lining crew to make sewer repairs in areas where excavation would have been detrimental to their communities.

C. Currently, Portland operates one full-time lining crew, with six other repair crews with lateral lining capabilities. Portland is budgeting funds to expand to another complete lining crew. The results with the city's CIPP lining crew speak for itself, yet most residents don't even know the Bureau of Environmental Services repaired a failing sewer under their streets, walkways and landscaped areas. Many repairs are made at night extending a greater service to Portland's residents and businesses by minimizing traffic impacts and not requiring a reduction in sewer service.



## IX. CONCLUSION:

A. The city has completed more than 900 CIPP liner work-orders since 1998 making cost effective repairs to sewer mains and lateral pipes saving time and money. Not only does Portland work hard to keep their sewer collection system maintained, they accomplish their task by trenchless methods which keep residents and business moving.. The City of Portland has made an investment in their infrastructure and is leading the way for other municipalities to understand how city crews can make a huge impact on maintaining municipal infrastructure by utilizing modern technologies that are typically practiced by private contractors.

B. LMK holds 43 issued patents on methods for renewing lateral and main pipes. LMK has licensed their patent rights and Know How rights to 43 licensed installers and has licensee coverage in Argentina, Brazil, Canada, Denmark, Germany, Holland, Mexico, Singapore and the Far East, Sweden, and the United States. LMK recognizes the City of Portland as one of the most aggressive installers of LMK'S technology. Other municipal installers include Tulsa OK, Wichita KS, Charleston SC, Naperville IL, Rock River Sanitary District, Zanesville OH, Porter Tower City Authority PA, Village of Addison IL and the Village of Lombard.

