



PRODUCT SUBMITTAL DOCUMENT  
INFORMATION

---

CIPP LATERAL RENEWAL  
CONNECTION SYSTEM

MANENTRY LAPEL LINER

Updated 4-4-16

## Product Submittal Review

### **ITEM 1.**

**Manufacturer Company Name:** LMK Technologies, LLC

Contact Individual(s) Rick Gage  
Street Address: 1779 Chessie Lane  
City, State, Zip Code: Ottawa, IL 61350  
Telephone: 815.433.1275 ext105 Facsimile: 815.433.0107

**Product Submittal:** Installation Practice For Rehabilitation Of A Sewer Service Lateral Using A One-Piece Main Lapel/Brim, Hydrophilic Gasket And Lateral Cured-In-Place Liner Assembly Via Man- Entry Into Large 30 Inch Diameter And Larger Mainline Pipes.

Only Certified Licensed Installers by LMK are authorized to install the LMK ManEntry Lapel Liner in 30" mainline pipes or larger.

### **ITEM 2.**

#### ***INTENT:***

This specification covers material requirements, installation practices, and methods for the reconstruction of a sewer service lateral pipe and the main connection without excavation. The pipe renovation shall be accomplished by insertion and inflation of a resin impregnated, single-piece lateral and main, gasket sealed connection liner assembly. The main connection and hydrophilic gasket are fastened in place and the lateral liner is pressed against the lateral pipe by inflation and held under pressure until the thermo-set resin has cured. The lapel portion is pressed against the mainline pipe and then fastened to the host pipe with a stainless steel compression ring using standard concrete fasteners. When cured, the liner extends over a predetermined length of the service lateral and a portion of the main pipe at the connection and forms a continuous, single-piece, tight fitting, corrosion resistant and verifiable non-leaking Main/Lateral cured in-place pipe (CIPP) outfitted with a gasket seal.

### **ITEM 3.**

#### **Company Information:**

##### **Larry Kiest, Jr. President/Founder.**

Inventor of more than 110 issued patents teaching methods and apparatuses for the Rehabilitation of Underground Pipes, Conduits and similar Structures. Mr. Kiest is a Licensed Plumber in the State of Illinois, Advisory Board Member of Trenchless Technology Center Louisiana Tech University, Member of ASCE/ PINS Lateral Committee, served 2-terms Board Member of NASSCO (2008-2012), Original chairman that initiated the NASSCO Lateral Committee, Active Board Member NASTT (2012-current), Member of No-Dig Planning Committee, Member of AWWA Standards Committee, Member of WEF, Member WEF Collections Committee, V.P. and active board member 2010-current) of MSTT, Member of ASTM, and Chairman of Task Committee F17, subcommittee 17.67 standard practice for rehabilitation of a sewer service lateral using a one piece main and lateral cured-in-place liner installed by means of air inversion. Mr. Kiest has conducted business in the field of Trenchless

**ITEM 4.**

<b>4.0 The Technique</b>	The Man-Entry Lapel Liner repair renews the main/lateral connections and extends up into the lateral pipe for a designated length. The repair consist of a one-piece, continuous main and lateral lining that is vacuum impregnated with thermo-set resin; hereby referred to as a "Lapel Liner".				
<b>4.1 A brief description of the operation and technique; including materials and methods of installation.</b>	<p>The reconstruction will be accomplished using a non-woven fabric tube of particular length and a thermo-set resin with physical and chemical properties appropriate for the application. The mainline lapel/brim and lateral tube are vacuum impregnated with the resin and then placed inside the lateral pipe via man-entry into the mainline. The liner is then placed inside of the lateral and the brim pressed against the mainline. The brim and hydrophilic gasket are held in place with an appropriately sized stainless steel compression ring which is anchored into place. The lateral tube is pressed against the lateral pipe wall by using a rubber inflation device. The liner is then cured ambiently. Once cured, the lateral inflation device is removed. The end result is a one-piece structural lateral lining and mechanically fastened connection to the main that provides a verifiable non-leaking connection with all mainline pipe types by incorporating a compression connection gasket at the connection.</p> <p>The cured finished materials as described above will, upon installation inside the host pipe, exceed the minimum test standards specified by the American Society for Testing Methods F1216-07.</p> <p><u>Minimum Test Standards for CIPP ASTM F1216 Appendix X1</u></p> <table border="0" data-bbox="727 1192 1468 1262"><tr><td>FLEXURAL STRENGTH -ASTM D-790</td><td>4,500 PSI</td></tr><tr><td>FLEXURAL MODULUS -ASTM D-790</td><td>250,000 PSI</td></tr></table>	FLEXURAL STRENGTH -ASTM D-790	4,500 PSI	FLEXURAL MODULUS -ASTM D-790	250,000 PSI
FLEXURAL STRENGTH -ASTM D-790	4,500 PSI				
FLEXURAL MODULUS -ASTM D-790	250,000 PSI				
<b>4.2 Intended use: Structural Repair Crack/Joint Sealing of Root Intrusion and Water Infiltration</b>	The system is designed for fully deteriorated pipe conditions. Typical installations are a direct result of ground water infiltration, root intrusion and structural defects such as open joints, offset joints, broken or missing pipe sections and hammer taps. The new pipe exhibits a smoothbore interior that typically increases flow rates.				
<b>4.3 EXISTING SEWER (Main and Lateral)</b>	The system is compatible with most all types of pipes; V.C.P., Concrete, Cast Iron, P.V.C and existing main pipes that have been renewed by a CIPP process. Typically, full-length lining systems utilize an inner coating or film. Films may range from PVC, PU to PE. The system is compatible with all pipe materials due to the use of a mechanically fastened hydrophilic sealing connection compression gasket at the mainline/lateral connection.				
<b>4.4 Diameter Ranges</b>	Lateral: 3 – 24 inch diameters. Main: 30 inch and greater.				
<b>4.5 Circular and/or Non-Circular Capability</b>	The system can accommodate pipe ovality up to -20%.				

<b>4.6 Material Limitations</b>	This system is designed for gravity sewers and low pressure piping.
<b>4.7 Lining Material Composition and Construction</b>	Needle punched felt or proprietary knitted tubes coated with a chemically resistant impervious film. The tube is stitched using Nomex®, high-temp, high-strength thread. The tube is air-tight and flexible in design to reduce inversion pressures.
<b>4.8 Main/Lateral Jointing System</b>	The lining material is constructed as a one-piece lapel/brim shaped Main/Lateral fitting. The main lapel and lateral lining tube is stitched with high-temp Nomex® thread. Therefore, there is no joining of two separate liners during the installation process. The end product is a one-piece brim style main to lateral cured-in place pipe with the use of a hydrophilic gasket seal.
<b>4.9 Resin System</b>	Resin Systems include: LMK656 Non Filled ISO Polyester Resin LMK656EN Filled ISO Polyester Resin LMK770 Series Ambient Cured Epoxy Resin LMK100 Series VOC Free Vinyl Ester Resin
<b>4.10 Mechanical Properties</b>	Excess resin migrates into pipe defects allowing a mechanical anchoring. Concrete anchors (1/4" x 2 1/4") by Tapcon® are used to secure the stainless steel compression ring, cured-in-place lapel portion and hydrophilic hat style gasket.
<b>4.11 Physical Properties</b>	Flexural Strength 4,500-PSI "Minimum" Test Method: ASTM 790 Flexural Modulus 250,000-PSI "Minimum" Test Method: ASTM 790
<b>4.12 Corrosion attack</b>	Chemical Resistance Testing. Test Method: ASTM D5813 and F1216 See Independent Laboratory Testing: Microbac Corrosion Test.
<b>4.13 Resin Saturation Method</b>	The lapel liner is vacuum impregnated with a thermo-set resin.
<b>4.14 Gasket Sealing</b>	<b>The mainline connection</b> shall include a seamless molded flange shaped gasket.
<b>4.15 Effects of Line and Grade</b>	There are no effects caused by grade changes since air pressure is used to pressurize the liner against the host pipe until cured.
<b>4.16 Protruding Lateral Pipes</b>	It is recommended protrusions into the main pipe are cut flush to the host pipe.
<b>4.17 Reduction in Pipe Diameter, and its Effect</b>	The lateral liner exhibits a slick and typically smooth interior with a co-efficient that increases flow-rate. Minor wrinkling may occur and some wrinkling may occur based on actual inner pipe diameter, inner surface, pipe configuration and conditions.
<b>4.18 Homeowner Impact</b>	Homeowners and building occupants at a minimum will receive a door knob notice bulletin 48 hours prior to the scheduled work and personal contact is attempted to be made the day of the scheduled work. The notice bulletin summarizes the scope of work, tentative time of service disruption and home/building owner cooperation for non-use of water/sewer for a 2-hour period or less. A brief explanation of "Dry Fixture Traps" is also included.

#### **ITEM 5.**

<b>5.0 Sewer preparation</b>	The main and the laterals are cleaned utilizing high-pressure water
------------------------------	---

<b>involves cleaning and a flow stoppage or diversion period.</b>	and mechanical cleaning tools. Pressures may range from 2,000 to 4,000 PSI removing all roots, debris and obstructions. Cleaning of the lateral is performed from the main pipe. Any protruding service connections will be removed prior to liner insertion. The current condition of the pipe will be compared to the original designed condition to verify that design parameters have not changed. Normal mainline flows are plugged or by-passed during the process, depending on flow.
<b>5.1 Mainline Service</b>	Typical time for plugging the mainline is three-hours (3) or less. In some cases by-pass pumping will be required and used.
<b>5.2 Specific Requirements</b>	Access to the upstream and downstream manholes is mandatory.
<b>5.3 Cleanout System</b>	Lateral lengths 3.0-feet and less are renewed without the need for a cleanout. Lengths greater than 3.0-feet require a TEE shape, or back to back WYE shaped cleanout fittings located a minimum of two-feet (2') upstream from the terminal end of the lateral CIPP liner.
<b>5.4 Installation Crew and Equipment</b>	A typical crew consists of (3 to 4) technicians. A mobile wet out unit is required for onsite vacuum impregnated of the liner. Traffic disruption is minimal. The installation process is typically quick, efficient and non-disruptive with no need for surface restoration when compared to open cut replacement methods.
<b>5.5 Handling Sewer Access (i.e., existing manholes)</b>	Licensed and Trained Technicians remotely carry out the installation. Entry into a manhole is absolutely required. If confined entry is required, Federal, State and local laws apply.
<b>5.6 Inflation Method</b>	Air pressure is applied to the rubber inflation device causing the lateral tube to inflate.
<b>5.7 Maximum Length</b>	Maximum length for a continuous lateral lining is 18 inches for main to lateral connection where no cleanout exists.
<b>5.8 Curing Method</b>	The Resin/Catalyst packages are proprietary to LMK Technologies. The resin systems are either cured at ambient temperatures or steam cured. Polyester/Vinyl-ester Ambient: One hour pot time/one hour cure time.
<b>5.9 Removal of Inflation Device</b>	The inflation device is removed after curing.
<b>5.10 Equipment Removal</b>	Once cured, the equipment is removed from the mainline pipe.
<b>5.11 Document Final Video and Testing Procedures</b>	A final video inspection is performed from the main.
<b>5.12 Design Life</b>	50-Year Design Life based on assumption described in ASTM F1216 for the lateral liner. Appendix X1 and long-term creep as described in ASTM D2990.

**ITEM 6.**

**Advanced Materials:**

- **Liner Assembly**
- **Lapel Liner**
- **Man-entry Lapel Liner**
- **Vacuum Impregnation**
- **Installed from the main pipe up into the lateral**
- **10,000 hour CIPP chemical resistance testing ASTM D2990**
- **Flexible construction**
- **Gasket Sealing Technology (hydrophilic and/or compression gaskets)**
- **10,000 hour hydration/dehydration gasket sealing test**

**Respectfully Submitted By:**

**Larry Kiest, Jr.**

Larry Kiest, Jr. President LMK Technologies, LLC.

**REFERENCES:**

**PROJECT: TORONTO (Egg Shaped Brick Sewer Mains)**

**15 liners - 2015**

Adam Szulc, M. Eng.  
Civil Engineering Technologist  
District Contract Services  
1026 Finch Ave West  
Building "D", 2<sup>nd</sup> Floor  
Toronto, Ontario M3J 2E1  
Phone: 416-392-7845  
[aszulc@toronto.ca](mailto:aszulc@toronto.ca)

CONTRACTOR: D.M. Robichaud

**PROJECT: KANSAS CITY STREETCAR**

**19 liners - 2015**

Karine Papikian, P.E.  
Senior Project Manager, City of Kansas City, MO  
Water Services Department, Collection Systems Engineering  
Phone: 816-513-0300

Jeffery W. Heidrick, P.E., ENV SP  
Burns & McDonnell  
Associate Project Manager / Water  
9400 Ward Parkway  
Kansas City, MO 64114  
Phone 816-349-6769  
[jheidrick@burnsmcd.com](mailto:jheidrick@burnsmcd.com)

CONTRACTOR: Kissick Construction

**PROJECT: SYRACUSE, UT**

**132 liners - 2015**

Steve Lamb  
North Davis Sanitation District  
4252 West 200 S.  
Syracuse, UT 84075  
Phone 801-825-0712

CONTRACTOR: C & L Water