

B r e a k i n g

N e w

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W i t h o u t

B r e a k i n g


A n y


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T H E P E R F O R M A N C E L I N E R[®]


I N F R A S T R U C T U R E


Because of the high cost of traditional excavation repairs, cities and towns all over the country have made pipe rehabilitation a high priority issue.  Finding the most

cost-effective and longest-lasting method of repair is crucial to affordably maintain the complex web of underground utility service systems. It's understood that dysfunctional pipes are hazardous to our environment and society in general.  Disfigured pipe sections

allow groundwater infiltration and structural deterioration, causing sewer backups, collapse of sewers and even road cave-ins.  This results in millions of dollars of damage each

year. A number of things cause dysfunctional pipes: natural shifting of earth, intrusion of and erosion from groundwater, increased wear and tear from traffic, growing tree roots, and of course, faulty pipe installation procedures when initially constructed.  However,

in the final analysis it does not really matter how the pipes became damaged. The fact is they are, and they need to be fixed.  Until now, the choices to repair faulty

pipes involved either excavation to replace the pipe or a relining of the pipe from manhole to manhole.  Both are costly and, quite often, completely unnecessary. There is

a better way. And as you'll see, it's a remarkably innovative no-dig technology that will revolutionize the manner in which our industry approaches pipe rehabilitation.

The Safest, Easiest, Most Precise Long-Term Solution for Cured-in-Place Sectional and Lateral Pipelining.

While there are several no-dig systems already available, none can compare to the Performance Liner®. Developed by LMK Enterprises in 1994 in response to the glut of inferior restoration products on the market, the Performance Liner is now, quite simply, the most effective and environmentally sound no-dig system available. Which not only makes it the perfect alternative to costly excavation, but the most sensible alternative to competitive, less precise no-dig systems. The very nature of Performance Liner technology assures there will be no mess and that the sealing agent, or resin, will only come in contact with the pipe at the point of repair. This is a very important point, and one that will be defined in greater detail later in this brochure.



Benefits of the Performance Liner®

The Patented Seamless Technology

The liner tube is designed to meet the specific condition of the repair by providing a uniform thickness that allows for a continuous resin seal along the pipe wall. There are no overlapping sections or inconsistencies in the Performance Liner. These are problems common only in other spot repair and lateral lining methods.

The Patented Vacuum Impregnation System

This feature eliminates resin exposure to workers and the environment. It guarantees a thorough impregnation of the liner tube and ensures that there are no dry or soft spots.

The Patented Translucent Inversion Bladder

This mechanism enables the liner to be inverted, not just from the manhole, but from anywhere in the pipe. This means the resin is not wiped off. The new lining is then cured-in-place and becomes a structural seal in less than two hours. Utilizing our Inversion Installation process, the Performance Liner requires minimal equipment to get the job done.

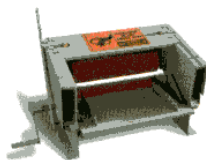
Designed to Ensure Longevity

Performance Liner is engineered to last. Each repair is developed from a state-of-the-art design guide based on ASTM-F1216 and AWWA-C950 specifications. We verify the liner design to the condition of the repair.



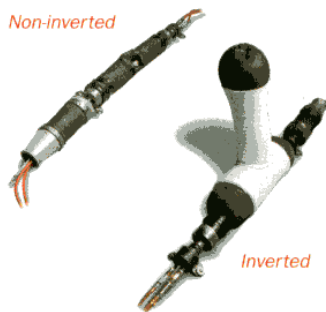
Inversion Lateral Launching Tank

Used to install lateral lining for diameters of 3 to 6 inches with lengths up to 100 feet.



Calibration Squeeze Roller

This device calibrates the amount of resin that is used to saturate the liner tube.



T-Liner Bladder Assembly

This device is remotely controlled to be positioned at a service connection. Once positioned, the one piece T-liner is inflated and inverted up the lateral.

Applications

L A T E R A L

Performance Liner Lateral system reconstructs 3"- 6" diameter pipe up to 100' in length. For installation, only one access point is required. Access to the lateral pipe may be gained from a small excavation in the right of way or through the mainline sewer requiring no excavation at all. Both provide a continuous lining inverted through the old lateral pipe. The end of the liner remains open so no cutting is required.

S E C T I O N A L

Performance Liner repairs sewer pipes from 6"- 42" diameter in continuous lengths up to 30'. The liner is contained within its own carrying device so the resin that provides a structural seal is not wiped off during the winching-in process. The resin only comes in contact with the pipe at the point of repair, allowing extra resin migration. The result is a structural, water tight seal. This unique inversion system can be installed anywhere in the pipe. All other systems use a liner wrapped around a plug which must be dragged into position and then inflated.

T - L I N I N G

The junction between the mainline and lateral pipes has been identified as the weakest point in a sewer system. Most problems here are caused by fractures, differential loading pressures and what is commonly known in the industry as hammer taps. These junctions allow for significant ground water infiltration and in most cases are structurally unsound. Until now a structural, water tight repair for this part of the sewer system was unavailable. The Performance Liner "T" System allows for the reconstruction of the mainline section and the lateral pipe by installing a one-piece T-Liner.

There is no adjoining of two separate liners required. The T-Liner is inserted through the mainline pipe requiring no excavation. Once positioned at the junction, the mainline portion is inflated and the Lateral Liner is inverted up the old lateral. The result is a one-piece structural seal for the junction in the sewer system.

A Commitment to Performance

Not only is Performance Liner, with its patented self-contained inversion system, a truly groundbreaking achievement in no-dig technology, the company that created it is breaking new ground with its unwavering commitment. LMK Enterprises, as a rule, only approves potential Performance Liner Licensees if they meet the strict, self-prescribed standards of LMK. As a result, Licensees of the Performance Liner system can be counted on to be top-notch, proven contractors committed to excellence. Of course, LMK also understands that along with commitments to innovation and excellence comes the need for educational support; precisely why LMK delivers unparalleled field support and on-site training to each of its contractors.

Ease, convenience, durability, economy and effectiveness: all part of what makes Performance Liner the most intelligent and realistic choice for no-dig restoration. Without the right solution, costs for long-term pipe restoration would soon be out of control. Fortunately, the Performance Liner is that solution. Isn't it time to put this incomparable new technology to work for you?

"We have used Performance Liner spot repairs on sanitary sewer rehabilitation projects with great success. Its use has proven to be a very cost effective method of repairing sewer lines and significantly reduces the inconveniences to the public that conventional methods of sewer repair pose, not to mention the safety hazards."

- Paul Prichard, Project Manager, City of Monroe, LA

"We have made extensive use of the Performance Liner method of trenchless spot repairs since the early days of its development. The system is a cost effective, efficient and a non-disruptive method of addressing isolated defects found in the sewer system."

**- Robert L. Clavel, P.E., Engineer-Manager,
Wheaton Sanitary District, Wheaton, IL**

"In instances where only a few short segments of damaged pipe exist within an otherwise sound pipeline, the Performance Liner provides a fast, structurally sound repair with minimum disruption and maximum economic benefits to the client."

**- Aaron E. Fundich, P.E., Robinson Engineering, Ltd.,
South Holland, IL**



The Performance Liner® Design Guide

The Performance Liner Design Guide is simple. It is a user-friendly "point and click" program developed for the designing of cured-in-place pipe (CIPP) for use in gravity sewer rehabilitation. This guide utilizes the latest technology based on procedures from American Water Works Association (AWWA) Standard C950, as well as the American Society for Testing and Materials (ASTM) F1216 Appendix X1 - *Design Considerations for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of Resin-Impregnated Tube*. The Performance Liner Design Guide aids in the calculation of the correct wall thickness for the Performance Liner CIPP system. For most applications a user only needs to enter values for pipe diameter, soil cover, soil type and ground water depth. Calculations are always kept up to date as values change.

In many cities, parts of the wastewater treatment systems are 100 or more years old and are in need of extensive restoration.

I N F R A S T R U C T U R E

The Sectional Restoration Process

1 The licensed applicator inspects the damaged section of pipe using internal pipe



inspection equipment.

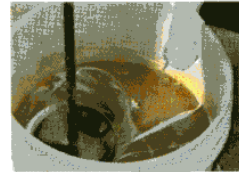
2 Documentation is made of the damaged section. All roots, debris and



protruding service connections are promptly removed.

3 A pre-measured

amount of resin and catalyst is provided for the liner



according to its diameter,

length and thickness.

4 The resin is introduced into the tubular liner and stays totally contained.

This ensures quality control for the remainder of the process.



5 The liner is

vacuum impregnated, allowing the tube to be fully saturated with resin. This eliminates air pockets,

providing a thorough wet-out



that can be inspected visually by the installer.

6 The resin saturated tube and inflation bladder are inserted into a carrying device that transports the

liner through the pipeline to the point of repair.



The resin, which provides the

structural seal, is protected and does not come in contact with the pipe until it reaches the point of

repair. **7** The carrying device is then introduced to the pipeline through a standard manhole

opening. This is accomplished by a single technician



without the need for hoisting

devices. **8** The carrying device is then positioned at the beginning of the repair and inverted through

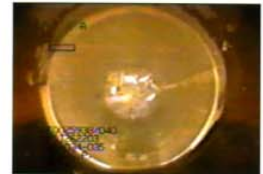


the damaged section. Continual documentation is performed as the liner conforms to the

host pipe. The CCTV monitors the placement of the liner, reassuring lining consistency. **9** The bladder is

reverted from within the cured-in-place pipe. This enables the installer to inspect the liner for a proper cure at

any time, without risk of damaging the liner. **10** The launcher and inflation bladder



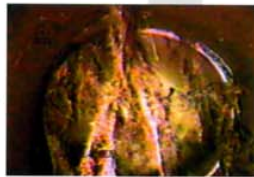
are removed and a final inspection is performed to document the proper opening of service laterals and the

integrity of the seamless pipe.

The Lateral Restoration Process

1 Access is gained through a small excavation at the property line or through the mainline sewer. The lateral

pipe is cleaned by removing



all roots and debris. **2** The vacuum impregnated liner is then



loaded into Performance Liner's unique inversion launching tank. **3** The liner is now position

at the point of entry. **4** The liner can now be inverted through the lateral pipe and expanded at approximately 6

PSI. The installer has the ability to control



speed and monitor the procedure

at the control panel. **5** Excess resin literally finds and penetrates all fractures and open joints. This provides

a structural seal which fully renews the old lateral pipe.



6 The liner cures in approximately :

hours,



leaving a smooth, jointless, one-piece, leak-free seal.

The Performance Liner

	The Performance Liner®	Wrap Around Pull-In
Configuration	The tubular liner allows the worker to pour the resin into the liner tube. This method is clean because the resin is contained.	Resin-soaked flat sheet liners are wrapped around a sewer plug and held with rubber bands, velcro, or another unreliable means of attachment.
Liner Impregnation	Vacuum impregnation provides a thorough wet-out of the entire liner ensuring the tube is completely filled with resin, not air, for a strong dense pipe.	Open resin pouring onto flat liner sheets and painting the liner is difficult to verify a thorough wet out and there is no evacuation of air.
Resin Migration	Extra resin that is added to the tubular liner will literally find and penetrate fractures and open joints in the pipe.	Flat sheet liners can only carry the amount of resin that the liner will absorb. Any additional resin that is added will only run off.
Versatility	Diameters up to 42" can be inserted through a standard 22" manhole opening because the liner/bladder assembly is collapsible.	Flat sheet liners that are wrapped around a sewer plug are difficult to maneuver and limit the diameter through manholes.
Installation	The liner is positioned at the point of repair and then inverted through the damaged section, never pulled through the damaged section.	Liners on a sewer plug are pulled through the damaged section with the risk of pipe pieces being snagged leaving a convoluted repair or even a total collapse.
Assurance	The resin is protected as the liner is carried to the point of repair within a unique launching device. <i>The resin that provides a structural seal only contacts the pipe at the point of repair.</i>	Liners with exposed resin allow the resin to become contaminated and wiped off during the winching-in process. There is no assurance for the quality or quantity of resin on exposed liners once it has been dragged through a pipeline.
Documentation	Inversion installation allows the installer to view the liner before, during and after, so that the placement is exactly where the repair needs to be. Once cured, the installer can view the repair by reverting the inflation bladder without risk of damaging the liner.	Wrapped liners are shorter than the plug and the liner cannot be viewed. Therefore, positioning is solely dependent on measuring. Once inflated the liner cannot be viewed. There is no assurance that the entire damaged section has been repaired until the liner has cured and the plug removed.
Length of Repair	A continuous length liner provides uniform wall thickness, so there are no varying diameters in lengths ranging from 3 to 30 feet.	Multiple short length liners that overlap one another leave varying diameters and inconsistent wall thickness.
Efficiency	Multiple repairs ranging from 3 to 30 feet in length can be installed in one day with a three man crew.	Process difficulties reduce productivity and multiple installations may be required for the same repair.
Safety	This system is clean and environmentally safe because there is no exposed resin.	This system requires handling of exposed resin soaked liners by the workers.
Industry Approved	Designed to meet or exceed AWWA C950 and ASTM-F1216-93 for the inversion of an impregnated felt tube. Each repair is designed according to the condition and parameters of the pipe by utilizing a state of the art design guide.	A generic liner that claims to be appropriate for every repair and for any condition. Not engineered for quality or longevity by using installation standards.

er Comparison Chart

	The Performance Liner®	Traditional Dig and Replace
Material	Cured in place pipe manufactured within ASTM specifications.	Section of pipe manufactured with ASTM specifications.
Access	Equipment is minimal and portable and can be installed through existing manholes without excavation.	Large heavy equipment is limited by access and difficulties arise due to surrounding structures.
Change Orders	There are no unforeseen conditions with the use of current technology for pipeline inspection. This allows the installer to review the pipeline condition for accurate contract pricing.	Excavations consistently have unknowns and possible change orders. The installers never know what difficulties may be encountered. This can lead to additional costs to the owner.
Time	A typical repair can be completed within 2 to 3 hours and is not relevant to the depth of the pipeline. Several repairs can be performed within a day with a three man crew.	Excavation is time consuming, usually requiring a 4 to 8 man crew. The time it takes to complete a repair is solely dependent on the depth of the pipeline and soil conditions.
Cost	Prices are consistent, relating directly to the diameter and length of repair.	Cost is based upon location, depth of pipe, surrounding utilities and access.
Safety	Since there is no digging, there is minimal risk to workers and no risk of damage to surrounding utilities.	Each day deaths occur from trench cave-ins and damaged utilities such as high pressure gas lines and high voltage power lines.
Social Costs	Repairs are done quickly with minimal disruption and no mess.	Street closings, large piles of dirt, heavy equipment, pavement restoration, noise and loss of business: all of which affect the economy.
Life Expectancy to Streets	No street restoration required since there is no excavation. There is no settlement for the repair section since the soil has been compacted for many years.	Settlement may occur under the new spliced in section of pipe leaving offset joints, dips, bumps and pot holes greatly reducing the life expectancy of streets.
Longevity	Performance Liner® is a cast in place pipe ensuring a long term structural repair. There is no risk of pipe damage from trench backfill and no pipe sections to pull apart.	Difficult to ensure pipe stability because of pipe bedding, compaction, splicing methods and materials.
Industry Acceptance	Because of high cost, disruption and liability, municipalities are specifying sectional and lateral lining all over the country.	In most cases, excavation will be the costly option.
End Result	A totally seamless, jointless pipe within a pipe that is installed quickly and cost effectively.	New pipe sections bring varying costs and unknown surprises.