

SPECIFICATIONS FOR INSTALLING CURED-IN-PLACE-PIPE (CIPP) LATERAL LINING INVERSION METHOD FOR REHABILITATION OF EXISTING PIPELINES

1.00 Intent

The intent of this cured-in-place lateral lining specification is to provide reconstruction of sewer collection laterals without excavating the entire existing pipeline.

2.00 General

The existing pipe reconstruction will be accomplished using a scrim reinforced liner tube measured to exact length and inside diameter utilizing a thermosetting resin that meets required physical and chemical resistance properties. The scrim reinforced liner will be impregnated with resin then loaded into an approved air pressured launching system. The liner will be aligned to the open end of the existing lateral pipe. Once the liner is aligned, the launching system will invert the resin-impregnated liner with air pressure. The inversion process is completed once the liner has fully inverted to the sewer main collection pipe, stopping at the connection. The liner will be open to allow the calibration tube to invert beyond the liner end at the sewer main connection. A calibration tube is then inverted into the liner holding the liner in place during the curing process. At no time will the calibration tube lose air pressure and be re-pressurized during the inversion process. The calibration tube will be sealed at the sewer main, holding air pressure to secure the liner against the existing host pipe until the liner is fully cured. After the resin-impregnated liner is fully cured, the calibration tube is removed. The sewer lateral collection pipe will be immediately televised for the inspector's approval. A copy of the televised inspection must be recorded on VHS format for future reference.

3.00 Materials

The liner tube will consist of scrim reinforcement and needled felt. The liner tube will be fabricated together using a butt stitched seam sealing process with a heat welded sealing tape to ensure airtight seal. The liner tube is to be manufactured in the United States by Perma-Liner Industries, LLC. The liner tube will be capable of carrying resin and withstanding installation pressures and curing temperatures. The liner tube will be lined on one side with a translucent impermeable chemically resistant polyvinylchloride (PVC) waterproof coating. This coating will be on the inner lateral collection lined pipe after curing is completed. The coating will provide a smooth and seamless inner wall.

The resin will be a two-part, 100% solids epoxy containing no styrene. The epoxy resin shall be formulated to have a gel (pot) life adequate for the project. The epoxy shall cure by raising its temperature to exothermic levels by circulating heated water inside of the CIPP.

The scrim reinforced / seam stitched / heat welded seam tape / felt liner tube and resin will upon installation meet and/or exceed minimum testing standards as required by ICC, ASTM, IAPMO and ANSI/NSF International. All materials must have 3rd party testing provided by independent laboratory. The materials must be ANSI/NSF Standard-14 approved, IAPMO Certified for small diameter pipe lining in Sewer Pipes and Vents, and must be certified by the International Code Council for the International Plumbing Code and the International Residential Code. The scrim reinforced / seam stitched / heat welded seam tape / felt liner tube and resin must have NSF Standard 14, and ICC-ES denoted on the tube.

3.01 <u>Required Cured-In-Place Lateral Lining Standards</u>	<u>Minimum</u>
Flexural Strength (ASTM D-790)	4,500 PSI
Flexural Modulus (ASTM D-790)	250,000 PSI
Tensile Strength (ASTM D-638)	3,000 PSI
Compressive Strength (ASTM D-695)	4,000 PSI
Tensile Elongation (ASTM D-638)	5 PSI
Chemical Resistance (ASTM D-543)	< 20% loss
Leakage Test* (NSF Standard 14)	0/gal/in/day

* Leakage test performed by ANSI/NSF International

All final test results are to be performed by an A2LA accredited laboratory.

Manufacturer must have United States based manufacturing head quarters. The manufacturer must have at least 10 years of manufacturing / supplying C.I.P.P. Air Inversion Liner Tube and Materials. The manufacturing plant has a Quality Assurance / Quality Control program in place and overseen by NSF International and IAPMO R&T Laboratories.

4.00 Inversion Process (ASTM F 1216)

Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion And Curing of a Resin-Impregnated Tube

- 4.01** The owner shall be notified 24 hours in advance of project start time. No building utilities, such as toilets, sinks, dishwasher, laundry washer, bath tubs or sump pumps will be used during the installation and curing process. Generally no by-pass pumping is needed.
- 4.02** Lateral Sewer Collection Pipe must be cleaned thoroughly prior to installation of liner. All sand, rocks, gravel, grease, mud, sludge, and other debris must be removed from the invert to permit proper installation. Roots will need to be removed to the extent necessary to effectively line the entire pipe.
- 4.03** The existing Lateral Sewer Collection Pipe will be inspected using a mini-televising color camera system capable of viewing the interior condition of the host pipe. The TV inspection must be performed within 5 hours prior to installation of liner tube.
- 4.04** The resin-impregnated liner tube will be kept clean and loaded directly into the air pressured launching system. The launching system will be aligned to the existing host pipe for proper installation.
- 4.05** The resin will not be contaminated and/or diluted prior to installation.
- 4.06** The liner tube will be inverted using air pressure, inverting the liner inside-out until the liner tube reaches the sewer main collection pipeline. The liner tube will be open and not sealed off. The liner tube will be designed to fit tightly against the host pipe annular space and gaps. A calibration tube will be inverted inside the liner tube to ensure the liner is tight against the host pipe until fully cured. The resin-impregnated liner tube will cure when properly cycled with circulated heated water.
- 4.07** The calibration tube used will be designed to tolerate the temperatures of curing with dry heated water. Once the calibration tube is installed, heated water will be introduced in order to raise the liners temperature over that which is necessary to initiate the curing process of the resin (that which is determined by the resin manufacturer). Once the calibration tube is filled, the water is circulated through the boiler to maintain is elevated temperature. Only systems with proper circulation capabilities will be accepted. The liner will then be taken through a proper cool down cycle in order to harden the epoxy resin.

- 4.08 Once the curing process is finished, the calibration tube is removed and the lateral sewer collection pipe is immediately inspected for final acceptance. The new lined pipe will be free of any foreign objects providing a smooth, seamless and continuous lined pipe from entry point to main sewer connection pipe.
- 4.09 Any liner tube protruding from the lateral sewer collection pipe into the main sewer pipeline will be removed by remote robotic cutting equipment.
- 4.10 A final TV Inspection of the lined lateral collection sewer pipe will be recorded and provided to the owner for final approval.

5.00 Final Acceptance

In addition to any specific acceptance criteria specified in the contract, the following standards shall be satisfied before final acceptance of the liner installation:

5.01 Finish

The finished pipe shall be continuous over the length of a run and be free from defects.

5.02 Defects

Any defects, which will affect the integrity of the installed pipe, will be repaired as directed by the owner.

5.03 Leakage

No visible leakage through the liner will be allowed.

6.00 Payment

Payment for the work included in this section will be in accordance with the prices set forth in the contract for the quantity of work performed. Progress payments will be made monthly based on the work performed during that month.