

**Specification for Lateral Reconstruction
of Sanitary Sewers by
MaxLiner™**

1. Intent

(1.1) It is the intent of this specification to provide for the reconstruction of existing service lateral sanitary sewer lines, normally with minimal excavation, by forming a new pipe within an existing deteriorated pipe, which has generally maintained its original shape. This will be accomplished by the installation of a resin impregnated flexible felt tube inverted into the existing service lateral utilizing a pressure apparatus positioned at a cleanout, basement drain or similar access point. Curing shall be accomplished abiently by compressed air or by circulating hot water, which will cure the resin into a hard, impermeable cured –in-place-pipe (CIPP). When cured, MaxLiner™ should extend over the length of the installation in a continuous, tight-fitting, structural, corrosion resistant and watertight CIPP pipe-within-a-pipe.

2. Materials

(2.1) **Resin** - The resin used shall be a 100% solids epoxy and hardener system specifically designed for the cured-in-place-pipe (CIPP) being installed.

(2.1)1. The resin shall be MaxPox 15 base resin with the appropriate MaxPox hardener. Pot life minimum shall be 16 minutes; pot life maximum shall be 75 minutes.

(2.1)2. The Resin and Liner system shall be ANSI/NSF 14 certified.

(2.1)3. The resin shall contain no styrene or other chemicals that have extreme malicious odors.

(2.2) **Liner Materials** – Lining materials for lateral pipe must provide the flexibility to line 45 to 90 degree bends that result in a finished liner that has a smooth inside radius. Liner material must be approved MaxLiner™ plain felt and knitted polyester liners with no reinforcement as part of the composite.

(2.2)1. MaxLiner™ liners and bends to be lined include:

(2.2)1.1 Max LinerTube up to 22.5 degrees

(2.2)1.2. Max FlexLiner up to 45 degrees

(2.2)1.3. Max WovoLiner up to 90 degrees

(2.3) **General Requirements of CIPP** – The finished pipe must be such that when the thermosetting resin cures, the total wall thickness will be a homogeneous and monolithic felt and resin composite matrix that will be chemically resistant to withstand internal exposure to domestic sewerage.

- (2.3)1. The minimum length shall be that deemed necessary by the engineer to effectively span the pipelining distance of the necessary sectional repair unless otherwise specified. The line length shall be verified in the field before impregnation of the tube with resin.
- (2.3)2. The outside of the tube, before installation, shall have an impermeable polymer coating. This coating will form the inner layer of the finished pipe and is required for enhancement of corrosion, flow and abrasion properties.
- (2.3)3. Appropriate flexibility and suitability of the MaxLiner™ tube shall be selected to match the configuration of the existing lateral service, i.e., bends and diameter transitions.

3. Reference Specifications

- (3.1) Installation and material tests of cured-in-place-pipe (CIPP) must meet the minimum requirements demonstrated in the following ASTM standards:

ASTM F-1216	Standard Practice for the Installation of Cured-in-Place-Pipe By Inversion Lining	
ASTM D-638	Test Method for Tensile Properties of Plastics	
	Tensile Strength	3,000 psi
ASTM D-790	Test Method of Flexural Properties of Plastics	
	Flexural Strength	4,500 psi
	Flexural Modulus	250,000 psi

- (3.2) National Association of Sewer Service Companies (NASSCO)

Wastewater Collection Systems Maintenance and Rehabilitation- 10th Edition:
Chapters titled “TV Inspection” and “Sewer Line Cleaning.”

4. Pipe Design

- (4.1) The MaxLiner™ pipe shall be designed to a minimum wall thickness based on the individual project parameters and the condition of the existing conduit. Prior to installation of the liner, design calculations, per ASTM F1216-98, shall be submitted to determine the minimum thickness of the liner to be installed. The pipe design shall have sufficient strength to support all dead loads, live loads and groundwater loads imposed. Regardless of design thickness determined above the following are suggested minimum thickness per diameters:

4” and 5” MaxLiner™	Minimum thickness – 3mm
6” and 8” MaxLiner™	Minimum thickness – 4mm

- (4.2) The contractor shall submit his price proposal based on the appropriate length, size, and existing pipe parameters designated in the Bid Item or Bid Proposal Section. The deterioration of sewers is an ongoing process. Should preconstruction inspections reveal the sewers to be in substantially different conditions than those in the design considerations, the contractor shall request such changes in reconstruction liner thickness, supporting such requests with design data. The deviation, if approved, shall be reflected by the appropriate addition or reduction in the unit cost for that size as agreed to by the owner or engineer.

5. Installation Responsibilities and Procedures

- (5.1) It shall be the responsibility of the Owner to locate and designate all access points open and accessible for the work, and provide rights of access to these points. The Owner shall also provide free access to water hydrants for cleaning, inversion and other work items requiring water.
- (5.2) Cleaning- Sewers shall be cleaned of all debris, roots and other materials that would block proper inversion of the cured-in-place-pipe. Utilizing high-pressure jet cleaning equipment, several passes are completed to assure all debris is removed from the pipe. If roots are present, root cutters or mechanical brushes are attached to the jet nozzle and are sent through the line to remove all root intrusions.
- (5.3) TV Inspection of Pipelines- Inspection of pipelines shall be performed by experienced personnel trained in locating breaks and obstacles by closed circuit television (CCTV). The interior of the pipeline shall be carefully inspected to determine the location of any conditions that may prevent proper installation of MaxLiner™ into the pipelines, and it shall be noted so that these conditions can be corrected. A videotape and suitable log shall be kept for later reference by the Owner.
- (5.4) Resin Impregnated of CIPP Tube - The Contractor shall designate a location where the tube shall be impregnated or "wet out" with resin, using Max CalibrationRollers and a "single-source" Max VacPump™ to thoroughly saturate the tube's felt fiber prior to installation. The impregnated tube shall be free of pinholes, resin voids and other defects after impregnation is completed.
- (5.5) Inversion of CIPP Tube - The wet-out MaxLiner Tube shall be loaded inside a pressure apparatus above ground. Air pressure, supplied to the pressure apparatus shall be used to invert the wet-out tube through the lateral pipe. The inversion head will be adjusted to be of sufficient pressure to cause the impregnated MaxLiner™ tube to invert completely in the lateral pipe. Care shall be taken during the curing process so as not to overstress the liner. If no access is available on one end of the installation, a calibration hose will be similarly inverted into the MaxLiner™ Tube in order to hold pressure and maintain a close fit during processing.

- (5.6) CIPP Processing (Curing) - In most circumstances, an accelerated ambient-temperature curing resin system will be utilized; however if a heat cure is required, the Installer shall supply a suitable heat source and water recirculation equipment. The requirement shall be capable of delivering hot water or other approved heat source throughout the section by means of a pre-strung hose to uniformly raise the water temperature above the temperature required to affect a cure of the resin. This temperature shall be determined by the resin/catalyst system employed.
- (5.6.1)1. If a heat cure is required, the heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing water supply. Water temperature in the line during the cure period shall be recommended by the resin manufacturer
- (5.6.1)2. Initial cure shall be deemed to be completed when inspection of the exposed portions of the MaxLiner™ appear to be hard and sound and the temperature gauge indicates that the temperature is of a magnitude to realize an exotherm. The cure period shall be of a duration recommended by the resin manufacturer, as modified for the MaxLiner process.
- (5.6.1)3. Cool-down – The Installer shall cool the hardened MaxLiner™ to a temperature below 100°F before relieving the pressure in the pressure apparatus. Cool-down may be accomplished by the introduction of cool air into the pressure apparatus to replace water being forced out of the pressure apparatus. Care shall be taken to maintain proper pressure throughout the cure and cool-down period.
- (5.7) Finish – The finished CIPP shall be continuous over the entire length of an inversion length and be free of dry spots, lifts, and delamination. The lateral CIPP shall not inhibit the CCTV post video inspection of the mainline or service lateral pipes.
- (5.8) After the work is completed, the Installer will provide the Owner with a videotape showing the completed work including the restored conditions.

6. Clean-up

- (6.1) Upon acceptance of the installation work, the Installer shall reinstate the project area affected by his operations.