LMK Technologies

STUBBY™ MAIN TO LATERAL CONNECTION LINER

Specification Document

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SPECIFICATION DOCUMENT

1. SIGNIFICANCE AND USE:

This specification is for use by designers, engineers who specify, regulatory agencies, owners, and inspection organizations who are involved in the rehabilitation of sewer service laterals through the use of resin-impregnated tubes installed within an existing sewer lateral connection. As for any specification, modifications may be required for specific job conditions.

2. INTENT:

This specification covers requirements and test methods for the reconstruction of a sewer service main connection without excavation. The lateral pipe shall be remotely accessed from the main pipe. This shall be accomplished by the installation of a single-piece resin impregnated one-piece main/lateral lining tube assembly by means of air inflation. The liner is pressed against the main and lateral host pipes by pressurizing a TEE-shaped bladder that is held in place until the thermo-set resins have cured. When cured, the liner tube shall extend over six-inches of the service lateral and eighteen-inches for the full circumference of the main pipe (6-inches on each side of a 4-inch lateral pipe) forming a continuous, one-piece, tight fitting, corrosion resistant and verifiable non-leaking lateral connection liner. The Main/Lateral CIPP Lining material shall be in accordance with ASTM F2561-20 “Standard Practice for Rehabilitation of a Sewer Service Lateral and its Connection to the Main Using a One-Piece Main and Lateral Cured-in Place Liner”

3. GENERAL

The reconstruction shall be accomplished using a non-woven textile tube of particular length and a thermo-set resin with physical and chemical properties appropriate for the application. The mainline portion of the liner is physically attached to the lateral portion forming a one-piece main/lateral liner. The lateral tube and main sheet shall be saturated with an approved thermo-set resin. The tube is positioned on a lateral bladder and the main sheet is wrapped tightly around a main bladder forming a main tube. When the T-shaped bladder is properly positioned at the lateral connection, the lateral bladder and lateral liner are located within the lateral pipe. The mainline bladder is inflated pressing the main liner against the host pipe. The lateral bladder is inflated to press the liner against the lateral pipe. Once the resin-saturated liner is cured, the T-shaped bladder is removed.

4. MATERIAL:

4.1 Liner Assembly - The liner assembly shall be continuous in length and consist of one or more layers of absorbent textile material i.e. needle punched felt, circular knit or circular braid that meet the requirements of ASTM F1216 and ASTM D5813 Sections 6 and 8. The textile tubes shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe segments, and flexibility to fit irregular pipe sections. The wet-out textile tube and sheet shall meet ASTM F1216, 7.2 as applicable, and shall have a uniform thickness with 5% to 10% excess resin distribution that when compressed at installation pressures will meet or exceed the design thickness after final cure.

4.2 Mainline Assembly - The mainsheet and lateral tube shall be a one-piece assembly formed in the shape of a “T” or “WYE”. No intermediate or encapsulated elastomeric layers shall be in the textile that may cause de-lamination in the cured in-place pipe. The main sheet will be flat with one end overlapping the second end and sized accordingly to create a tubular lining equal to the inner diameter of the main pipe. The lateral tube will be continuous in length and the wall thickness shall be uniform. The lateral tube will be capable of conforming to offset joints, bells, and disfigured pipe sections.

5. Resin System

5.1 The resin/liner system shall conform to ASTM D5813 Section 8.2.2.

5.2 The resin shall be a corrosion resistant polyester, vinyl ester, epoxy or silicate resin and catalyst system that when properly cured within the composite liner assembly, meets the requirements of ASTM F1216, the physical properties herein, and those which are to be utilized in the design of the CIPP, for this project.

5.3 The resin shall produce CIPP, which will comply with the structural and chemical resistance requirements of ASTM F1216.

Table 1: CIPP Initial Structural Properties

Property	ASTM Test	Minimum Value	
		psi	(MPa)
Flexural Strength	D790	4,500	(31)
Flexural Modulus	D790	250,000	(1,724)

6. Design Considerations:

6.1 The CIPP shall be designed per ASTM F2561-20 which incorporates ASTM F1216 Appendix X1, D2990, D790 and D5813.

6.2 The CIPP design for the lateral tube shall assume no bonding to the original pipe.

7. Installation Recommendations:

7.1 Access Safety – Prior to entering access areas such as manholes, an excavation pit, performing inspection or cleaning operations, an evaluation of the atmosphere to determine the presence of toxic or flammable vapors or lack of oxygen shall be undertaken in accordance with local, state, or federal safety regulations.

7.2 Cleaning and Inspection – As per NASSCO Standards.

7.2.1 Accessing the Lateral – The lateral pipe shall be remotely accessed from the main pipe for purposes of cleaning, pre-inspection, liner insertion and post inspection.

7.2.2 When required, the main pipe flows will be by-passed. The pumping system shall be sized for normal to peak flow conditions. The upstream manhole shall be monitored at all times and an emergency deflating system will be incorporated so that the plugs may be removed at any time without requiring confined space entry.

7.2.3 Inspection of Pipelines – The interior of the pipeline shall be carefully inspected to determine the location of any condition that shall prevent proper installation, such as roots, and collapsed or crushed pipe sections. Inspection of the main and lateral pipes shall be accomplished by using internal CCTV equipment remotely positioned from within the main pipe. These conditions shall be noted. Experienced personnel trained in locating breaks, obstacles, and service connections by closed circuit television shall perform inspection of pipelines.

7.2.4 Line Obstructions – The existing service lateral shall be clear of obstructions that prevent the proper insertion and expansion of the lining system. Changes in pipe size shall be accommodated, if the lateral tube is sized according to the pipe diameter and condition. Obstructions may include dropped or offset joints of no more than 20% of inside pipe diameter.

7.3 Resin Impregnation – The lateral tube and mainline tubes shall be vacuum-impregnated with resin (wet-out) under controlled conditions. The volume of resin used shall be sufficient to fill all voids in the textile lining material at nominal thickness and diameter. The volume shall be adjusted by adding 5% to 10% excess resin for the change in resin volume due to polymerization and to allow for any migration of resin into the cracks and joints in the original pipe. No dry or unsaturated area in the mainline sheet or lateral tube shall be acceptable upon visual inspection.

7.4 Liner Insertion –The mainline liner shall be wrapped around the T-shaped inflatable bladder device and held firmly by placing two (2) rubber bands around each end of the main liner. A hydrophilic gasket seal will be placed over the lateral tube portion and secured to the main line with two (2) stainless steel snaps. The lateral tube surrounds the lateral bladder. The inflatable bladder/liner assembly is inserted and positioned at the lateral connection by use of a self-propelled robot.

7.5 Bladder – The main bladder shall be inflated causing the main sheet to unwrap and expand, embedding the hydrophilic gasket seal between the main liner and the main pipe at the main to lateral connection. The lateral bladder shall be inflated pressing the lateral liner tube against the interior surface of the lateral pipe. The Main/Lateral bladder assembly shall extend past all ends of the liner, so no cutting or trimming is required.

7.6 Curing –The liner is chemically cured at ambient temperatures. The curing of the CIPP must take into account the existing pipe material, the resin system, and ground conditions (temperature, moisture level, and thermal conductivity of the soil). The manufacturer's recommended cure schedule shall be submitted.

8. Finish:

The finished CIPP shall be continuous over six-inches of the sewer service lateral and 18" of the full circumference of the main pipe. The CIPP shall be smooth with minimal wrinkling. The CIPP shall be free of dry spots, lifts, and delaminated portions. The CIPP shall taper at each of the three ends providing a smooth transition for accommodating video equipment and maintaining proper sewer flows. After the work is completed, the installer will provide the owner with video footage documenting the repair and the visual markings identifying the sewer lateral address as completed work. The finished product must provide an airtight/ watertight verifiable non-leaking connection between the main sewer and sewer service lateral.

9. Recommended Inspection And Testing Practices:

9.1 Sampling – As designated by the purchaser in the purchase agreement, the preparation of a CIPP sample is required. The sample shall be prepared by securing a flat plate mold using the textile tube material and resin system as used for the rehabilitated pipe.

9.1.1 Length – The minimum length of the sample must be able to produce at least five specimens for testing in accordance with ASTM D790-03.

9.2 Conditioning – Condition the test specimens at 73.4 ± 3.6º F (23 ± 2ºC) and 50 ± 5% relative humidity for not less than 40 hour prior to test in accordance with Practice ASTM D618, for those tests where conditioning is required.

9.3 Short-Term Flexural (Bending) Properties – The initial tangent flexural modulus of elasticity and flexural stress shall be measured for gravity and pressure pipe applications in accordance with Test Method D790 and shall meet the minimum requirements of Table 1.

9.4 CIPP Wall Thickness – The minimum wall thickness at any point shall not be less than 87.5% of the specified design thickness as agreed upon between purchaser and seller.

10. Design Considerations:

The design of the cured in-place lateral liner system is largely a function of the condition of the existing pipeline and the loads stipulated by the customer's specification.

11. Payment

Price includes traffic control, permits, by-pass pumping and video documentation. Unit prices shall be submitted for the following items:

11.1 Mobilization Lump Sum.

11.2 Lateral cleaning/ video inspection from cleanout to main per lineal foot.

11.3 Set-up for each manhole-to-manhole segment.

11.4 Stubby™ Main/Lateral connection and extending six-inches up into the lateral.

12. Key Words:

Sewer lateral lines, cured-in-place pipe, CIPP, main pipe, lateral pipe, main to lateral connection, tube, junction lining, textile tube, lateral tube, sheet, textile sheet, main sheet, vacuum impregnate, T-shaped bladder, liner/bladder assembly, continuous, felt, knit, resin,, inflation, ambient cure, , one-piece, "T", TEE, WYE, hydrophilic gasket seal, rubber bands, resin, polyester, silicate, epoxy, lateral identification, Stubby™.