SECTION 809
CURED-IN-PLACE PIPE (CIPP) LATERALS

809-1 DESCRIPTION: This Work consists of installing a cured-in-place pipe (CIPP) liner to stabilize structural defects and construction inadequacies in sanitary sewer service laterals and service/mainline connections.

809-2 SCOPE OF WORK:

a. Contractor shall provide materials, labor, equipment, and services necessary for: sewer flow control, pre-installation cleaning, rehabilitation of existing sanitary sewer service laterals by lining, sealing connections to existing sewer main, pre- and post-construction Closed Circuit Television inspection (CCTV) in accordance with Section 815, and final testing of the CIPP system.

b. The rehabilitation of service lateral main line connections shall be done by the installation of a resin-impregnated, flexible, felt tube inverted into the existing service lateral, approximately 12 – 24 inches, utilizing a pressure apparatus positioned in the mainline pipe. Curing shall be accomplished by ambient cure or other approved method to cure the resin into a hard impermeable pipe-within-a-pipe. When cured, the service lateral connection repair shall extend over the length of inversion in a tight fitting, watertight pipe-within-a-pipe to effect a watertight seal with the rehabilitated service lateral pipe. In addition, the lateral connection repair shall seal to the mainline pipe by means of a resin-impregnated flexible felt flange integral with the service lateral felt tube portion or by means of a resin-impregnated one-piece main and lateral cured-in-place liner that will have a watertight seal with the mainline

c. The Work required by the Contract Documents may include just the installation of a service lateral connection sealing and repair product or the installation of this and a service lateral liner. If the work requires both products, the completed product may either be a one piece liner from the main line seal to the cleanout or a two piece liner consisting of service lateral main line connection overlapped by the service lateral liner. The completed product will be a watertight pipe-within-a-pipe, mechanically bonded to the host pipe from the cleanout to the main line with a watertight seal with the main line pipe. The liner shall be smooth, hard, strong, and chemically inert.

809-2.1 Qualifications:

a. CIPP Contractors shall have a minimum of two (2) years of active continuous experience installing CIPP lateral liners in pipe of similar size, length and configuration as proposed in the project. In addition, Contractor shall have successfully installed CIPP liner product in at least 2,000 laterals in wastewater collection system applications.

b. Field supervisory personnel employed by the CIPP Contractor will have at least two (2) years of experience in the performance of the work and tasks as stated in the Contract Documents.

809-3 MATERIALS:

a. All components used in this process will be selected from the Qualified Product List (QPL) or an approved equal. The required principal components are based on materials developed by the impregnation of an absorbent carrier material shaped into a tube of the correct size to fit the host pipe. This sleeve is expanded to the inner wall of the host pipe and cured in place to obtain a hard plastic sleeve mechanically bonded to the host pipe.

b. The flexible polyester felt top hat is a tube insert that shall be fabricated to the proper size for the lateral and host pipe. The proper fit will allow the top hat to key into the internal surface irregularities of the lateral joint and neatly fit tight to the internal circumference of the lateral. The top hat tube shall be a laminate made of non-woven fiber materials that allows for circumferential stretching and angular alignment with the lateral pipe connection geometry during insertion.

c. The carrier material for the tubes shall be of fibrous absorbent composition tailored to achieve the following:

1. Allow the migration of resin from its internal structure by compressing to a thickness of less than 90% of its uncompressed thickness under a pressure of 1psi.

2. The carrier material must consist of non-degradable fibers such as polyester or polypropylene or corrosion resistant fiberglass. The carrier may use stitched or glued joints of material with sufficient strength to comply with the minimum requirement of this specification (Table 1).

Table 1
CIPP Initial Structural Properties
(ASTM F1216)

Property	**ASTM Method**	**Minimum Value**
Tensile Strength	D638	3,000 psi
Flexural Strength	D790	4,500 psi
Modulus of Elasticity	D790	250,000 psi

3. The material must have an abrasion resistant, chemically resistant, fully bonded coated surface in the lateral portion to ensure that on curing a smooth surface free from blemishes, pinholes or loose non wetted fibers.

4. Where fiberglass is used, a surface veil or a layer of felt must be used to prevent osmosis or wicking of the strands.

5. The resin used to impregnate the liner must be a resin cured by light, heat or chemicals via the use of accelerators. As an alternative, any other safe energy source, which does not involve the use of electrical current within the main sewer, may be used when evidence can be supplied of the intrinsic safety of the method. PET resins, resin filters, resin additives, and resin enhancement agents are prohibited. Only neat resins are acceptable. Old resins and reworked resins are prohibited, regardless of whether or not they are mixed with new resin.

6. Proven resistance to the municipal wastewater environment that may comprise, as a minimum, all of the following factors:

i. Immersion in septic sewage at temperatures up to 75 degrees F.

ii. Exposure in hydrogen sulfide gas from septic sewage at temperatures up to 75 degrees F.

iii. Proven resistance to ultra-violet light (sunlight) at any stage prior to installation.

iv. Solvent free epoxy, polyester, silicate, and vinyl ester resins are acceptable.

v. Shall not contain silicones, stereates, or natural waxes that would adversely affect the adhesives properties or any other chemical or physical properties of the CIPP liner.

809-4 SUBMITTALS:

a. Prior to receiving the Notice to Proceed at the pre-construction meeting, the Contractor or manufacturer shall submit all data sheets for CIPP materials to be used on the project. These include at a minimum the tube, resin, and catalyst materials.

b. **Qualifications:** Submit documentation showing that the Contractor and personnel meet the minimum required qualifications stated in Section 809-2.1. Include a list of projects showing Contractor's experience with the use of the same pipe material, length and diameter (or larger). Information must include, but not be limited to date and duration of work, location, pipe information (i.e. length, diameter, depth of installation, pipe material, etc.), project owner information (i.e. name, address, telephone number, contact person), and the contents handled by the pipeline (water, wastewater, etc.). **The apparent low bidder shall complete and submit the required qualifications to the Engineer within ten (10) days after the bid opening.**

c. The Standard Dimension Ratio (SDR) is the ratio of the outside diameter (OD) of the pipe to its minimum wall thickness. All CIPP wall thicknesses, SDR's by diameters, and depth ranges corresponding to the requirements of the Contract Documents, must be submitted to the Engineer for approval prior to installation.

d. Prior to installation, the manufacturer shall provide the inversion pressures necessary for proper insertion and tube installation. The tube manufacturer shall provide the minimum pressure required to hold the tube tight against the existing host pipe, and the maximum allowable pressure that will not damage the tube. Forces or pressures shall be limited so the tube is not stretched longitudinally by more than 5% of the original length.

e. The proposed bypassing system shall be approved in advance by the Engineer. The acceptance of the bypassing system in advance by the Engineer shall, in no way, relieve the Contractor of responsibility or public liability.

f. Traffic Control shall be the responsibility of the Contractor. Any necessary lane closures shall require a permit from the Traffic Division of the DPW or the La DOTD. Copies of the permits shall be submitted to the Engineer prior to commencing Work.

g. Post-construction CCTV inspection videos.

809-5 DESIGN PARAMETERS:

a. The CIPP system felt or fiberglass and resin composite shall have the minimum physical properties given below and in accordance with the guidelines in the appendix of ASTM F1216.

1. Design Life: 50 years
2. Pipe Diameters: Per Contract Documents

3. Ovality: 2%
4. Pipe Condition: Fully deteriorated
5. External Water: ground surface
6. Flexural Strength: 4,500 psi
7. Short Term Flexural Modulus: 250,000 psi
8. Reduction Factor: 50%
9. Long Term Flexural Modulus: 125,000 psi
10. k (enhancement Factor): 7
11. Soil Modules: 1,000 psi
12. Soil Density: 120 pcf
13. Highway Live Load: AASHTO HS20-44
14. Safety Factor: 2 minimum
15. Min. Thickness 3 mm
16. If calculations require thicker wall, round to the next higher multiple of 0.5 mm.

b. Any layers of the tube that are not saturated with resin prior to insertion into the existing host pipe shall not be included in the required design structural CIPP wall thickness.

809-6 PREPARATIONS:

a. Temporary flow control shall be carried out in accordance with Section 813. Prior to shutdown of private service laterals, provide notification and comply with the requirements as specified in Section 808. Contractor shall provide for the transfer of flow, through or around the section or sections of host pipe that are to be repaired.

b. Delivery, storage and handling of approved products are the responsibility of the Contractor. The Contractor shall keep them safe from damage and stored with the proper environmental containment as outlined by the manufacturer. No products should be used that have exceeded the designated shelf life as outlined by the manufacturer. Remove damaged products from site. Promptly replace damaged products with new products at no additional cost to the Owner.

c. Contractor shall video inspect the service lateral immediately prior to the repairs of the lateral and connection. The Contractor shall use a self-leveling camera to determine the structural condition of the service lateral in accordance with Section 815. The Contractor will notify the Engineer immediately if the inspection reveals an obstruction or other condition exists that will interfere with the proper installation an acceptable lateral liner or lateral connection sealing and repair product.

d. The section of lateral pipe to be lined must be free of debris, obstructions, scale or any other material that reduces the effective diameter of the pipe.

e. All necessary work to repair the lateral-main joint shall be completed prior to commencing any service lateral pipe lining operation described herein.

f. If the service lateral lining process requires the installation of a cleanout, the Engineer must approve the Work before it is done.

809-7 LATERAL CONNECTION SEALING AND REPAIR PRODUCT INSTALLATION: All service lateral connections along a mainline to be CIPP lined shall receive a lateral connection sealing and repair product after installation of the mainline liner, unless the lateral has been recently replaced by a point repair or remove and replacement resulting in a new connection. After suitable cleaning and video inspection, introduce the fiberglass lateral connection sealing and repair product (top hat) from the mainline into the lateral as follows:

a. A flexible resin impregnated top hat tube that is sized to the service laterals will be inserted into the service lateral by means of a robotic manipulator device. The robotic device, together with a television camera, will be used to align the repair product with the service lateral connection opening. Air pressure, supplied to the applicator through an air hose, shall be used to insert the top hat into the service lateral pipe. The insertion pressure will be adjusted to fully deploy the top hat into the service lateral connection and hold it tight to the main and lateral pipe walls.

b. A resin-impregnated sample shall be retained by the installer for each installation to provide verification of the curing process taking place in the host pipe. This sample shall be hung in the entry manhole to simulate ambient conditions of the host pipe.

c. The inserted product will be inspected using a CCTV camera to confirm the product is correctly positioned and/or centered in the lateral opening prior to curing.

d. The pressure apparatus shall include a bladder of sufficient length in both the main and service lateral lines to extend beyond the ends of both the lateral tube and main line brim segments. A smooth transition from top hat to the pipe diameters without a step, ridge or gap between the product and the inner diameters of the service lateral and mainline host pipes must be achieved.

e. After insertion is completed, the manufacturer's recommended pressure must be maintained on the impregnated product for the duration of the curing process. The liner is chemically cured at ambient temperatures or by a suitable heat source. The heating equipment shall be capable of delivering a mixture of steam and air throughout the liner bladder assembly to uniformly raise the temperature above the temperature required to cure the resin. 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 heat source temperatures shall be monitored and logged during the cure and cool down cycles. Once the sample piece in the manhole has cured, the bladder is deflated, removed from connection and returned to the manhole to repeat the cycle. Contractor shall recover the sample piece and label with upstream and downstream manhole numbers and footage from upstream manhole to service connection. Sample shall be submitted for testing.

f. The top hat insert shall seal to the inside wall of the mainline at least 2.5 - 3 inches around the host lateral opening and to the lateral wall 12-24 inches into the lateral pipe from the main host pipe. This bond seal shall be created by the resin cure and aided with the use of hydrophilic gaskets or hydrophilic caulk. The cured top hat must attain the cured physical strength of the lateral liner.

g. The Contractor shall install the top hat into the service lateral connection within five (5) days of the main line CIPP liner installation.

809-8 LATERAL CIPP INSTALLATION:

a. After the top hat connection has properly cured, the CIPP service lateral pipe is installed. See Section 808-11 of these specifications for the proper installation method.

b. The internal wall color of the cured liner must be a light reflective color so that clear detailed CCTV inspection can be accomplished.

c. The lateral CIPP must overlap the top hat installation a minimum of six (6) inches in the lateral host pipe and be properly cured and sealed according to manufacturer's recommendations.

d. Install CIPP as outlined in the latest version of ASTM F1216 for direct inversion installations.

809-9 INSPECTION AND TESTING:

a. Finished liner shall be free from visual defects such as foreign inclusions, dry spots, keel, boat hull, fins, pinholes, wrinkles, and other deformities.

b. All re-established services shall be smoke tested prior to backfill. Failures shall be completely removed and replaced until a successful test is achieved at no additional cost to the Owner.

c. Testing requirements of Section 808-21(a) and (c) shall also apply to service lateral lining and lateral connection sealing and repair products. The resin-impregnated sample for each installation shall be retained, labeled in accordance with Section 809-7 (e), and submitted to an independent laboratory, approved by the Owner.

d. The Engineer and the Contractor shall inspect each installation visually by CCTV. No infiltration of groundwater should be observed. The repair sleeve should be monitored for excessive wrinkling, exposed unwetted fibers, pinhole leaks, and infiltration around the terminations. The pre- and post-construction CCTV inspection documentation in DVD format will become the property of the Owner. The test shall be repeated at no additional cost to the Owner until the results are satisfactory to the Engineer.

809-10 POST INSTALLATION CLEANING: At the conclusion of the Work, the Contractor shall thoroughly clean the entire new lined pipe by flushing with water or other means to remove all debris or other material that may have entered during the construction period.

809-11 PATENTS: The Contractor shall warrant and hold harmless the Owner against all claims of patent infringement and any loss thereof for any type of sewer pipe lining process used in the Work.

809-12 MEASUREMENT:

a. **Sewer CIPP Service Lateral Lining:** Measurement for service lateral rehabilitation by a cured-in-place process shall be on a linear foot basis, to the nearest whole foot, measured from the lateral cleanout to the mainline connection point minus 12 inches.

b. **Lateral Connection Sealing and Repair Product:** The lateral connection sealing and repair product or top hat (12” – 24” in length) shall be paid for each.

809-13 PAYMENT:

a. **Sewer CIPP Service Lateral Lining:** Payment for this item will be full compensation for sewer flow control, public notification, traffic control, any required excavation and restoration to uncover cleanouts, sewer pipe cleaning, root removal, installation of the lateral liner, inspection, pre- and post-construction CCTV inspection, equipment retrieval, testing, and clean-up in accordance with the Specifications.

b. **Lateral Connection Sealing and Repair Product:** Payment for this item will be full compensation for sewer flow control, public notification, traffic control, any required excavation and restoration to uncover cleanouts, sewer pipe cleaning, root removal, cutting & brushing service line connection (if necessary); installation of the top hat,

inspection, pre- and post-construction CCTV inspection, equipment retrieval, testing, and clean-up in accordance with the Specifications.

809-14 PAY ITEMS:

Item No.	Item	Unit
8091000	Sewer CIPP Service Lateral Lining	Linear Foot
8092000	Lateral Connection Sealing and Repair Product (12-24" top hat)	Each