

## SECTION 02767

### LATERAL SERVICE PIPE REHABILITATION

#### PART 1 -- GENERAL

##### 1.01 SCOPE OF WORK

- A. The Work detailed in this Section includes requirements for rehabilitation (rehab) of service lateral connections, service lateral pipe, or both (collectively "lateral rehab") with minimal excavation. When completed the work shall be structurally sound and watertight
- B. It is the intent of this specification to provide for the rehabilitation of laterals without installation of new cleanouts, to avoid potential conflicts with other existing subsurface utilities and minimize disturbance.
  - 1. There are very few existing cleanouts, and the installation of lateral rehab materials from the main without a cleanout shall be pursued where practical. A written notice is required from the Owner for the installation of cleanouts. Where the Owner determines that cleanouts are needed, they will be paid separately as bid.
- C. The Contractor shall furnish all labor, materials, accessories, equipment and tools necessary for installation and testing as shown on the Rehabilitation Summary Plan and CCTV Review Summary Tables included in Appendices A and C respectively of the Contract Specifications and as specified herein. These services include, but are not limited to, cleaning and television inspection of the laterals to be lined, diversion of flow, liner installation, quality controls, providing samples for performance testing, warranty, etc.
  - 1. The cost of pre-CCTV inspection and cleaning (light or heavy) for CIPLP work shall be paid for under separate items. See Section 01200 Measurement and Payment.
- D. Cured-in-place, lateral pipe lining (CIPLP) is specified as an acceptable product for lining all laterals specified on the Rehabilitation Summary Plan and CCTV Review Summary Tables included in Appendices A and C respectively of the Contract Specifications.
  - 1. A connection seal is a required part of each CIPLP and is included in the bid price for CIPLP.
- E. CIPP Connection Seals (Top Hat or T): This type of work is applicable where the condition of the lateral opening allows for CIPP rehab from the connection to 5-feet up into the lateral pipe.
  - 1. The quality of connections at break-in lateral not identified in Rehabilitation Summary Plan and CCTV Review Summary Tables included in Appendices A and C respectively of the Contract Specifications, or lateral rehab shall be assessed after CIPP of mainline sewers and lateral re-instatement. Connection seals shall be installed as directed by the Owner and shall extend up to 5-feet up the lateral pipe based on the site-specific configuration of the connections. This shall be paid for as a separate item.

## 1.02 RELATED WORK

- A. Specification 02650- Sewer Line Cleaning.
- B. Specification 02651- CCTV Inspection.
- C. Specification 02765 – Cured-in-Place-Pipe (CIPP)
- D. Specification 02766 – Hydrophilic End Seals
- E. Specification 02800 – Manhole Rehabilitation

## 1.03 SUBMITTALS

- A. Contractor shall make submittals as described herein and in accordance with the procedures and requirements set forth in the General Conditions Division 1 and Section 01300 - Submittals.
- B. After contract award, the following submittals are required:
  - 1. Documentation as outlined herein under paragraph 1.05 A, including installation references of projects that are similar in size and scope to this project. The submittal shall include, at a minimum, the client contacts name, phone number, and the diameter and footage of pipe rehabilitated. Documentation for product and installation experience must be satisfactory to the Engineer.
  - 2. Submit detailed installation plan and schedule to be coordinated and approved by Owner and Engineer. This plan shall describe all preparation work, cleaning operations, pre-CCTV inspections, control and diversion of sanitary sewer flows, lining production schedule and location, shipping and storage requirements, liner curing procedures including method and heat-up/cool-down rates, curing temperature and duration, final CCTV inspection, and testing procedures.
  - 3. Supervisor/laborer certifications associated with the CIPLP installation process and basic safety requirements (e.g., VDOT MOT, CSE, OSHA 10-hour)
  - 4. Virginia P.E. Certification Form.
  - 5. Submit design calculations, design data and specification data sheets listing all parameters used in the CIPLP design and thickness calculations based on ASTM F1216 for “fully deteriorated gravity pipe conditions.”. The CIPLP design submittal shall be sealed and signed by a Virginia licensed P.E. and shall include a table of required CIPLP wall thicknesses by diameter, ovality and depth. Submit P.E. certification form for all CIPLP design data.
  - 6. Proposed wetout log form.
  - 7. Proposed installation and cure forms/records.

8. A detailed description of the proposed procedures for removal of any existing blockages in the lateral that may be encountered.
  9. Product data on fabric tube, fiberglass laminate, end seal, flexible membrane, resin, etc.
- B. After installation of the liner, the following submittals are required:
1. Various test results as specified herein under paragraph 3.07.
  2. Documentation as specified herein for the Cure Report under Paragraph 3.04 B.
  3. Documentation as specified herein for the Television Survey under Paragraph 3.01 B and 3.06.
- C. Submit Weekly During Construction:
1. Updated plans and project schedules.
  2. Process control forms to include wetout logs, inversion and cure logs, and tap reinstatement logs.
    - a. Curing log shall include temperatures, pressures, and times during the curing process to document that a proper cure has been achieved. Curing log is to be submitted immediately after the curing is complete for each line segment that is rehabilitated.
  3. Confirmation of installed quantities to support no less than monthly billing.
  4. P.E. stamped designs not covered by approved design tables.
- D. Submit Daily During Construction:
1. CIPLP samples obtained during installation.
  2. Post installation videos.

#### 1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM D5813 — Standard Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems.
2. ASTM F1216 — Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
3. ASTM F1743 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP).

4. APS Test and Inspection Code - Test for CIPP Water Tightness.
  5. NASSCO CIPP Inspector Certification Program Training Manual
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.
- C. Additional ASTM, ANSI, NACE, AWWA standards and other reference standards or specifications directly or indirectly referenced in this Specification are applicable.

#### 1.05 QUALIFICATIONS AND EXPERIENCE

- A. The Contractor performing the lateral rehab work shall be fully qualified, experienced and equipped to complete this work expeditiously and in a satisfactory manner and shall be certified and/or licensed as an installer by the CIPLP manufacturer. Only commercially proven products and installers with substantial track records will be approved. In addition, the Contractor shall verify they meet the following requirements:
1. A description of the laterals rehab contractor/subcontractor firm's experience, including an overview of the firm, location of the primary office(s) supporting field crews, number and type of field crews, field equipment and maintenance support, applicable certifications/licenses, laterals rehab materials (including 3rd party qualification test reports), thickness design method, installation process and QA/QC program.
  2. The Contractor shall submit the number of years of experience in installing CIPLP lining.
  3. The Contractor shall submit the name of the CIPLP lining manufacturer and supplier for this work and previous work listed below.
  4. The Contractor shall submit a certified statement from the manufacturer that he/she is a certified and/or licensed installer of the CIPLP lining.
  5. The Contractor shall submit a minimum of three municipal clients that the Contractor has performed this type of work for, including names, phone numbers, linear footage, and a description of the actual work performed.
  6. The lateral rehab Contractor must have a minimum 3 years' experience installing at least 1,500 EA of the proposed product(s) employing the installation/process method proposed
- B. Project Delivery Team:
1. Team Members: The Contractor's project delivery team (proposed project manager, field engineer, superintendent, foremen) shall have demonstrated experience in providing adequate systems to schedule, manage, and control all activities (including subcontractor activities) on projects of similar size and nature. Experience that will be verified prior to award includes delivery of projects on

schedule, installation of high-quality laterals rehab products that meet specifications, coordination with the general contractor and control and timely resolution of problems and changes.

2. Experience: The laterals rehab delivery team must have a minimum of three years' experience installing the proposed product with the installation method(s) proposed. Successful installation of at least 500 EA of the proposed product on projects of similar scope and nature to the project being bid is required.
3. Superintendent: The Contractor's field superintendent for the Work shall have a minimum of three years concentrated laterals rehab experience, with at least one year as a crew leader.
4. Process/Manufacturer Certifications: Installers shall be certified by the process/materials manufacturers.

C. Materials and Installation Process:

1. Product experience shall include a minimum of:
  - a. Three years market experience.
  - b. 3,000 rehabilitated laterals in the last five years. Applications experience shall include a minimum of 4" to 8" diameter laterals installed from 8" to 24" diameter mains.
  - c. Third-party qualifications test results meeting applicable standards for chemical resistance and physical properties.
  - d. Manufacturer materials certifications (including design properties used for determining thickness) supported by 3rd-party qualifications tests.
  - e. Manufacturer's recommended design method to be used by the Contractor's professional engineer (post award) shall include the detailed design procedure and supporting third-party references for the design method.
  - f. A description of the materials and installation process

- D. Inspection of the liner may be made by the representative of the Owner after delivery. The liner shall be subject to rejection at any time on account of failure to meet any of the requirements specified, even though sample liner may have been accepted as satisfactory at the place of manufacture. Liner rejected after delivery shall be marked for identification and shall be removed from the job site at once.

1.06 GUARANTEE

- A. All lateral rehab work shall be fully guaranteed by the Contractor and manufacturer for a period of one (1) year from the date of acceptance. The guarantee shall be provided via a notarized certificate of warranty or similar written affirmation and commitment to warranty

at the closeout of each assignment. During the warranty period, all defects discovered by the Owner shall be repaired or removed and replaced in a satisfactory manner at no cost to the Owner.

1. The Owner may conduct an independent inspection of the work at its own expense at any time prior to the completion of the guarantee period.
- B. Warranty inspection of laterals shall be incorporated in the warranty inspections of the CIPP mains approximately one (1) year after acceptance for payment. These inspections shall be limited to viewing the portion of the lateral viewable from the main without a lateral launch (i.e., no additional inspections associated with this Section).
- C. Any repair work completed by the Contractor to replace a defective or failed lining shall be warranted for an additional one (1) year from the date of acceptance of repaired work. Repair work shall be completed as specified in paragraph 3.06.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Care shall be taken in shipping, handling and storage to avoid damaging the liner. Extra care shall be taken during cold weather construction. The liner shall be accompanied by test reports certifying that the material conforms to the ASTM standards listed herein.
- B. Any liner damaged in shipment shall be replaced as directed by the Inspector. Damages include, but are not limited to, splits or tears, gouging, abrasions, flattening, ultra-violet (UV) degradation, and puncturing. Liners which have received damage shall be marked as rejected and removed at once from the job site.
- C. The liner shall be maintained at a proper temperature in refrigerated facilities to prevent premature curing at all times prior to installation. The liner shall be protected from UV light prior to installation. Any liner showing evidence of premature curing will be rejected for use and will be removed from the site immediately.

### PART 2 -- PRODUCTS

#### 2.01 MATERIALS AND MANUFACTURERS

- A. Product Manufacturers: Provide products by the following manufacturers, or an approved equal.
  1. Cured-in-place Lateral Pipe (CIPLP Systems):
    - a. T-Liner by LMK Enterprises, Inc.
    - b. Full-wrap Service Connection Seal + Lateral by BLD Services LLC
  2. CIPP Connection Seals:
    - a. T-Liner by LMK Enterprises, Inc.

- b. Full-wrap Shorty by LMK Enterprises, Inc.
- c. Full-wrap Service Connection Seal by BLD Services LLC

B. Materials:

- 1. CIPLP:
  - a. Felt tubes, resin and related materials shall conform to requirements provided in Section 02765 — Cured-in-place pipe (CIPP).
  - b. Where the connection seal and lateral liner are installed in two steps, materials/seals shall be provided to join the separately installed materials.
- 2. CIPP Connection Seals:
  - a. CIPLP connection seal felt tubes, resin and related materials shall conform to requirements provided in Section 02765 — Cured-in-place pipe (CIPP).

C. Design:

- 1. The Contractor and Contractor's Virginia professional engineer are responsible for design. The Owner's representative will review designs for general compliance with specifications and conformance with site-conditions.
- 2. CIPLP: Design of CIPLP shall conform to requirements and assumptions provided in Section 02765 — Cured-in-place pipe (CIPP).
- 3. CIPP Connection Seals: Design of CIPLP shall conform to requirements and assumptions provided in Section 02765 — Cured-in-place pipe (CIPP).

PART 3 -- EXECUTION

3.01 SUPERVISION AND COORDINATION OF WORK

- A. The Contractor shall provide adequate supervision of and coordination between all internal and Subcontractor crews to ensure work is performed safely, on schedule, and according to specified requirements. This supervision shall be provided by qualified individuals and shall include substantial time on the jobsites.
- B. The Contractor shall submit construction schedules for advance approval by the Owner to coordinate necessary plant operations.
- C. Work schedules shall be coordinated with the Owner to ensure that required field inspection by the Owner is provided.

### 3.02 PRE-INSTALLATION PROCEDURES

- A. Submittals: All requisite pre-installation submittals shall be accepted or approved prior to scheduling materials delivery or installation.
- B. Service Lateral Connection Identification: The Contractor is responsible for determining the location of all active services connections in advance of scheduling lateral rehab. The Contractor shall dye test as needed to verify active service connections.
- C. Lateral Preparation: The Contractor shall trim and/or brush preexisting CIPP lateral openings as needed to provide proper installation and sealing of the lateral connection.
  - 1. Any preparation of the existing inside wall of the CIPP main in the vicinity of the lateral connections shall be executed as recommended by the manufacturer to provide a proper installation and seal at the lateral connection. This preparation is considered incidental to lateral rehab and will not be additionally compensated.
- D. Pre-Installation CCTV and Cleaning: Pipeline cleaning and CCTV shall conform to the requirements of Sections 02650 — Sewer Line Cleaning and 02651 — CCTV Inspection.
  - 1. Where lateral lining is identified together with main line CIPP, any main line recleaning required to support lateral rehabilitation shall be performed by the Contractor at no additional cost to the Owner.
  - 2. Where lateral rehab is assigned separate from main line CIPP, any main line cleaning required to support lateral rehabilitation shall be paid separately under the line items bid for main line cleaning.
- E. Host Pipe Dimensions: It is the Contractor's responsibility to measure and verify inside diameter, length, alignment and condition (including but not limited to ovality, water load, and depth) of each asset designated for rehabilitation. Contractor shall use the data and information collected to verify the diameter (or equivalent diameter) of the existing host pipe. If physical conditions in the work area are encountered during the investigation that materially differ from those expected or ordinarily encountered, the Contractor shall notify the Owner.
  - 1. The Contractor shall not proceed until directed by the Owner in writing.

### 3.03 BYPASS PUMPING

- A. Bypass Pumping of Mains and Laterals: The Contractor shall maintain bypass of sewage flows as required to prevent sewage overflows, ensure that no flowing sewage comes into contact with sections of the sewer under repair, and to prevent blockage of mainline sewers due to the lateral rehabilitation work.
  - 1. Bypass pumping associated with lateral rehab is considered incidental to the work and shall not be paid for separately.



### 3.04 INSTALLATION

#### A. Cleanout Installation:

1. Cleanouts shall be installed as directed by the Owner, generally only where necessary to support CIPLP installation where installation from the main line is not practical.
2. Cleanouts shall be installed as detailed in this section and paid separately as detailed in Section 01200 Measurement and Payment.
3. Install a full-bodied PVC wye fitting on the lateral for each cleanout connection. Cleanouts shall be of the same nominal size as the lateral. Cleanouts shall be installed so that the cleanout opens in the direction of the flow of the lateral.
4. Cleanouts shall be extended vertically to the finished grade level. Cleanouts shall be installed at each change of direction of the horizontal lateral which are greater than 45 degrees.
5. Cleanouts shall be installed so that there is a clearance of not less than 18-inches for purpose of rodding.
6. Cleanouts shall be concrete encased from below the bottom of the wye connection to the finished grade level.
7. Cleanouts plugs shall not be covered with concrete or any other permanent finishing material. Plugs shall be left exposed in the lawn area. Bronze frame and cover shall be installed in paved or sidewalk areas.

#### B. CIPLP Installation:

1. Furnish and install the liner in the full length of lateral as shown on the Rehabilitation Summary Plan and CCTV Review Summary Tables included in Appendices A and C respectively of the Contract Specifications. The installation of the liner shall be in complete accordance with the applicable provisions herein and the manufacturers' installation requirements.
2. Manufacturer shall determine the minimum and maximum parameter limits including temperature, pressure, time and the like required for resin impregnation, inversion, curing, and cool-down of the CIPP installation. The Contractor shall submit descriptions of the manufacturer's standard CIPP installation procedures. The Owner's field inspector shall use these descriptions to ensure conformance with specifications and manufacturer recommendations.
3. The Contractor shall present to the Owner, for review, a description of his methods for avoiding liner stoppage due to conflict and friction with such points as the manhole entrance and the bend into the pipe entrance. He shall also present

plans for dealing with a liner stopped by snagging within the pipe. This information shall be rendered to the Owner in a timely fashion prior to the preconstruction conference.

4. Delivery, Storage, and Handling
  - a. Resin impregnated tube shall be stored and transported under refrigerated, ultraviolet light-free conditions according to manufacturer recommendations, and shall be installed and cured before the expiration of the shelf life.
  - b. The tube shall be handled to avoid cuts, tears, or abrasions and in a manner to minimize stretching during all phases of the delivery and installation process. Special care shall be taken to roller convey, pull, or lift the tubes to limit stretching and other potential deleterious effects as recommended by the manufacturer.
  - c. Any tubes removed from the host pipe prior to completing inversion and cure according to manufacturer recommendations may be rejected for reuse at the sole discretion of the Owner.
5. In the presence of the Engineer, the Contractor shall conduct a television inspection and physical measurement of each length of pipe. Contractor shall also conduct a CCTV inspection immediately prior to inserting the liner to confirm that conditions are acceptable for lining. Contractor shall obtain Engineer approval of the acceptability of the existing pipe condition prior to installation of CIPP.
6. The Contractor shall immediately notify the Owner of any construction delays taking place during the insertion operation. Such delays shall possibly require sampling and testing by an independent laboratory of portions of the cured liner at the Owner's discretion. The cost of such test shall be borne by the Contractor and no extra compensation will be allowed. Any failure of sample tests or a lack of immediate notification of delay shall be automatic cause for rejection of that part of the work at the Owner's discretion.
7. Sealing at Main and CIPLP End (End Seals):
  - a. The Contractor shall install a hydrophilic material between the CIPLP and host lateral pipe at the building end of the CIPLP (i.e., the upstream end). The end seal material properties, geometry, and installation method shall be as recommended and specifically approved by the manufacturer of the CIPLP system and approved by the Owner.
  - b. The installed CIPLP liner shall provide a watertight seal at the connection of the lateral pipe at the main. The connection seal material properties, geometry, and installation method shall be as recommended and specifically approved by the manufacturer of the CIPLP system and approved by the Owner.

8. The Contractor shall submit "wet out" and "cure" reports documenting the specific details of the liner's vacuum impregnation and saturation with resin and the CIPLP installation of the liner. A report shall be generated for each liner installation. A copy of all "wet out" and "cure" records shall be made available to the Owner upon request and shall be turned over to the Owner on a weekly basis and prior to request for payment. If the "wet out" and "cure" reports are not presented prior to a payment request for a repair work order, payment for the work will not be made and the request will be rejected. At a minimum, this report shall include, in addition to Contractor and Contract identification:
  - a. Line identification and location
  - b. Wet-out date
  - c. Sample identification(s) and technician
  - d. Installation (in sewer) date
  - e. Host sewer pipe inside diameter
  - f. Liner thickness
  - g. Liner length
  - h. Liner and resin batch numbers
  - i. Resin type
  - j. Wet out length
  - k. Roller spacing
  - l. Vacuum setting
  - m. Quantity of resin and catalyst utilized
  - n. Wet out technicians
  - o. Time wet out started and completed
  - p. Applicable remarks
  - q. (Heat cure) Boiler and liner heating fluid pressure and temperature versus time log during cure period
  
9. Resin Impregnation of the Flexible Tube (Wet Out): The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with

additional allowances for polymerization shrinkage and the loss of resin through cracks and irregularities in the original pipe wall. The volume of resin shall be adjusted by adding five to ten percent excess resin to account 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. Catalyst system or additives compatible with the resin and flexible tube shall be as recommended by the resin supplier and the CIPLP liner manufacturer.

- a. The resin impregnated flexible tube shall be handled to retard or prevent resin setting until it is ready for insertion. The wetout tube shall be loaded into and transported by installation equipment in a manner that assures avoidance of resin loss or washout, contamination, or other deleterious effects.
10. Tube Insertion: Submitted and accepted manufacturer's recommendations shall dictate the applicable method(s) of installation. Special care shall be taken to transport, position, pressurize, invert, and cure the CIPLP according to manufacturer's recommendations. If pulled into place, a power winch should be utilized, and care should be exercised not to damage the tube as a result of pull in friction. The tube should be pulled in or inverted through an existing manhole or approved access point and fully extend to the next designated manhole or termination point.
    - a. Installation methods selected by the Contractor and approved by the Owner shall minimize requirements for excavation while maximizing the length of lateral pipe lined.
    - b. CIPLP includes the connection seal at the main and the lateral pipe liner. These are measured and paid as detailed in Section 01200 Measurement and Payment.
  11. Curing shall be accomplished by utilizing the appropriate medium in accordance with the manufacturer's recommended cure schedule. The curing source or in and output temperatures shall be monitored and logged during the cure cycles if applicable. The manufacturer's recommended cure method and schedule shall be used for each line segment installed, and the liner wall thickness and the existing ground conditions regarding temperature, moisture level, and thermal conductivity of soil, per ASTM as applicable, shall be taken into account by the Contractor.
  12. For every segment of liner installed, the Contractor shall generate a report that documents installation, including sewer identification, date, time, weather conditions, boiler and liner heating fluid pressure and temperature versus time log during cure period, cool down report, etc. The reports shall be submitted to the Engineer prior to requesting payment.

- C. CIPP Connection Seals: Connection seals (top hats or T) shall be installed as directed by the OWNER, generally after the connections at CIPP at break-in laterals is confirmed after CIPP installation and lateral reinstatement. Connection seals shall extend up to 5-feet up the lateral pipe as defined by the site-specific configuration of the connections.
- D. Testing of samples shall be the responsibility of the Contractor. Where the diameter is greater than 15-inches, a plate sample shall be prepared. The test sample shall be fabricated from the material taken from the liner and cured in a clamped mold with the resin used in the liner construction placed in the down tube. Representative specimens from all installed liners are to be tested by an independent, ASTM certified laboratory. All test samples shall be clearly identified with the location, date of installation, and project name. The extraction and labeling of test specimens shall be done in the presence of the Owner. The Owner and Contractor shall, upon completion of sample extraction and labeling, both sign a chain-of-custody form that shall subsequently accompany the sample at all times and shall ultimately be received and signed at the testing laboratory. Test reports shall include a copy of the chain-of-custody form with all signatures to ensure that reported test results are for the correct sample.

Each sample shall be large enough to provide at least five total specimens for testing of thickness and for flexural properties per the following standards and procedures:

Thickness	ASTM D5813
Initial Flexural Strength	ASTM D790 Procedure A

All samples shall be prepared in accordance with ASTM F1216.

Results of the tests for each liner shall be mailed directly to the Owner within 30 days after the liner is installed.

### 3.05 REPAIR AND REPLACEMENT

- A. The Contractor shall outline specific repair or replacement procedures for potential defects that may occur in the installed CIPLP or lateral rehab. Repair and/or replacement procedures shall be as recommended by the manufacturer.
- B. Defects in the installed CIPLP that will not affect the operation and long-term life of the product shall be identified, defined, and submitted to the Owner for review and acceptance.
- C. Repairable defects shall be clearly defined and presented to the Owner by the Contractor along with a detailed step-by-step repair procedure, based on manufacturer's recommendations, resulting in a finished product meeting the requirements specified herein.
- D. Unrepairable defects shall be clearly defined and presented to the Owner by the Contractor, including a recommended procedure for the removal and replacement of the CIPLP, based on the manufacturer' recommendations.

### 3.06 POST-INSTALLATION CCTV INSPECTION

A. Cured-in-place Lateral Pipe and Connection Seals:

1. Main to Cleanout CIPLP: Following installation of each CIPLP liner, CCTV inspection of each lateral shall be carried out in accordance with the requirements of Section 02651 – CCTV Inspection. Post installation TV shall include panning of the upstream end of the CIPLP and the Connection Seal.
2. Connection Seals (top hats or T): Following installation of each Connection Seal, CCTV shall be carried out in accordance with the requirements of the Section 02651 - CCTV Inspection. Post installation TV shall be from the main line and include zoom TV of the upstream end of the lateral seal and panning the Connection Seal.
3. The post-installation CCTV inspections shall take place as soon after completion of each lateral liner as is feasible (normally immediately following installation), but in no case more than two (2) calendar days thereafter. The finished video shall be continuous over the entire length of the lateral and shall be completely free from visual defects.
  - a. All costs associated with the post-installation CCTV inspection shall be considered incidental to the CIPLP work and shall be included in the unit price per linear foot of CIPLP.
4. A field copy of the post-installation CCTV inspection video shall be submitted to the Owner for review within 24 hours of CIPP completion and at least two weeks prior to submission of payment for rehabilitation. Record pre and post videos shall be submitted no later than seven days after completion of each CIPLP or Connection Seal installation.
  - a. Videos shall be submitted in the form and format detailed in Section 02651 - CCTV Inspection.
5. Correction of failed CIPLP or CIPLP deemed defective from post-installation television inspection or test reports for structural values, thickness, etc., shall be repaired at no extra cost to the Owner before the Work will be considered substantially completed. The method of repair, which may require field or workshop demonstration, shall be approved by the Owner. After the defects are initially corrected, the sewer shall be re-inspected.
6. The Owner reserves the right to perform a follow up CCTV inspection one year following the installation of a CIPLP repair. Should any defect be found with the repair, the defect shall be corrected as specified by the Owner. Correction may include complete removal and renewal of the previously installed repair and re-inspection one year later. Correction of failed CIPLP or CIPLP deemed defective from in-warranty internal condition inspection or test reports for structural values, thickness, etc., shall be repaired or replaced at no extra cost to the Owner.

### 3.07 FIELD TESTING AND PRELIMINARY ACCEPTANCE

#### A. Cured-in-place Lateral Pipe and Connection Seals:

##### 1. Sample Preparation:

- a. Field-prepared restrained or plate sample testing is required for 10% of CIPLP installations. The Owner reserves the right to order additional testing at no additional cost when there are indications of relatively thin nominal thicknesses, irregular cures, or apparent deviations from manufacturer's recommendations.
- b. Label samples with the project number, date of installation, location, line section number, diameter and installed thickness. Samples designated by the OWNER for testing shall be jointly shipped by the Contractor and the field inspector to an approved laboratory employing the Owner's chain of custody forms and procedures.

##### 2. Testing:

- a. Materials testing and analysis shall be performed by an independent laboratory approved by the Owner. For gravity pipes the lab shall analyze samples according to ASTM D 790. Test results and chain of custody documentation shall be submitted by the lab directly to the Owner (with copy to the Contractor).

##### 3. Sample and Testing Cost: Making and preparing of samples is incidental to CIPP installation and will not be separately paid by the Owner. The Owner shall pay the cost of sample shipping and testing.

##### 4. Comparative Samples: The Contractor shall provide the field inspector coupons and waste end material for thickness spot checks. These samples are not intended to be sent to the lab for testing.

#### B. The finished CIPLP liner shall be continuous over the entire length of the installation. The liner shall be free from visual defects, damage, deflection, holes, delamination, uncured resin, etc. No pinholes, cracks, thin spots, dry spots, or other defects in the liner will be permitted. There shall be no visible infiltration through the liner or from behind the liner at manholes and service connections.

##### 1. Length: The CIPLP shall be continuous over the required installation length.

##### 2. Fit: The CIPLP shall fit tightly against the host CIPP main pipe and lateral pipe, allowing only for polymerization shrinkage defined by the manufacturer. There shall be no dry spots, lifts, ridges, splits, cracks, uncured resin, delamination or other defects in the CIPP lining. Wrinkles in the finished liner that cause significant backwater, reduce the pipe's hydraulic capacity or structural stability or that create voids between the liner and pipe wall will be unacceptable. Defective lining will be removed and the pipe re-lined at no additional cost to the Owner. If during the removal process, the host pipe is damaged, Contractor will perform a point repair at Contractor's own expense

3. Finish: The finished CIPP shall be continuous and free of defects such as foreign inclusions, splits, cracks, crazing, holes, breaks, lifts, tears, dry spots, pinholes, or delamination. The surface should be smooth and free of waviness throughout the pipe.
  4. Thickness: The installed thickness shall be no less than the minimum design thickness.
  5. Service Connections: All service connections shall be sealed, smoothly flowing, and without evidence of infiltration.
  6. End Seals: Ends shall be sealed against infiltration and transitioned to provide a smooth flow path for sanitary debris.
  7. Defects: If any defects are discovered after the CIPLP has been installed, they shall be repaired at the discretion of the Owner or removed and replaced with either a sound CIPLP or a new pipe at no additional cost to the Owner. The Contractor shall repair defective or failed CIPP identified as a result of post-installation CCTV inspection or test reports for structural values, thickness, or other defects. Obtain approval of the Owner for repair method, which may require field or workshop demonstration. A complete video from manhole to manhole shall be made of all repaired pipes.
  8. Groundwater infiltration through the liner shall be zero. Leakage testing of the CIPLP liner shall be accomplished during cure while under a positive head. Leakage shall be confirmed by three methods.
    - a. After the line has been lined, but before the services have been reinstated, low pressure air testing shall be utilized in accordance with UNI-BELL's guide UNI-B-6-98 or exfiltration testing in accordance with section 8.2 of ASTM F 1216.
    - b. After the laterals have been lined, CCTV shall confirm leakage free around the laterals.
    - c. A visual inspection shall be performed around the liner to manhole interface to confirm no leakage between the CIPLP liner and host pipe.
- B. Following installation of the liner, the Contractor shall conduct a final digitally recorded color television inspection of the completed work. Copies of these post-installation digital recordings, as well as the digital recordings made prior to the liner installation shall be submitted to the Engineer for approval and shall be retained by the Engineer. Payment will not be made for any CIPLP lining and lateral rehab until the Engineer has reviewed and approved these digital recordings. The Contractor shall submit the CD or DVD disks a minimum of two weeks in advance of any payment request to provide the Engineer ample time to review the recordings.
1. Preliminary acceptance of the CIPLP shall be based on the Owner's evaluation of the field observed installation, installation and curing data, and review of the TV digital



recordings. The field-observed installation, post-installation CCTV inspection, and review of certified test results. The following shall be evaluated:

3.08 FINAL ACCEPTANCE

- A. Final acceptance of the liner shall be based on the preliminary acceptance of the liner by the Engineer in Section 3.07 and on the results of the certified laboratory tests on the liner specimens in Section 3.04.
- B. Liners meeting or exceeding the certified thicknesses and specified strengths, as evidenced by the certified laboratory testing results, shall be paid for in full according to the contract unit rate for the finished diameter per linear foot.

3.09 CLEANUP

- C. After the lateral rehabilitation has been completed and accepted, the Contractor shall cleanup the entire project area and return the ground cover to the original or better condition. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor.

- END OF SECTION -

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