

30255 - CARROLLTON BASIN SEWER REHABILITATION NO. 14

Addendum Number 2

Date: 10/3/2023

Your reference is directed to Contract Number: 30255 for Carrollton Basin Sewer Rehabilitation No. 14 which is due 11:00 a.m. CST on October 12, 2023.

The addendum provides for the following:

1. Revisions to Specifications below.
 - a. Section 330130.76 Cured-In-Place Pipe Lining, **REPLACE** with updated version included herein.

This addendum consists of one (1) page, with twenty (20) pages of attachments.

This addendum shall be part of the Contract Documents as provided in the instructions to Bidders. Items herein are issued to add to, modify, and clarify the Contract Documents. These items shall have full force and effect as the Contract Documents, and the cost involved shall be included in the bid prices. Acknowledge receipt of the addendum by inserting its number on the Bid Form of the Bid Documents. Failure to do so will subject the bidder to rejection.

*** END OF ADDENDUM ***

SECTION 330130.76 – CURED-IN-PLACE PIPE LINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. The work consists of providing Cured-In-Place Pipe (CIPP) Liners for rehabilitation of sewer pipelines and sewer service laterals.
- B. The Contractor shall provide all supervision, labor, materials, equipment, tools, fuel, power, water and incidentals required to perform all CIPP activities.
- C. Section Includes:
 - 1. Cured-In-Place Pipe Liner Installation
 - 2. Post CIPP Liner Installation
 - 3. Reinstatement of Sewer Service Laterals
 - 4. Cured-In-Place Pipe Liner Service Lateral Installation
- D. Related Requirements:
 - 1. Section 015136 Temporary Water.
 - 2. Section 012200 Unit Prices.
 - 3. Section 013300 Submittal Procedures.
 - 4. Section 330130.03 Sewer Flow Control.
 - 5. Section 330130.13 Cleaning of Sewers.
 - 6. Section 330130.16 CCTV Inspection of Sewers.
 - 7. Section 330130.73 Rehabilitation of Sewers.
 - 8. Section 330505 Sewer Utilities Testing.

1.3 PRICE AND PAYMENT PROCEDURES

- A. See Section 012200, Unit Prices, for unit price requirements.
- B. Measurement:
 - 1. Length Measurement: Measurements will be made as the horizontal length dimension of material installed, excluding overlap, and measured in linear feet. Irregular horizontal lengths will be measured as a summation of equivalent non-overlapping lines, arc lengths, or other applicable geometry.
 - 2. Each Measurement: Measurements will be made per actual quantity of items fully installed, and measured per each. There will be no allowance for partial or fractional installations or quantities.

C. Payment:

1. Pipe Liner, CIPP: Payment for Pipe Liner, CIPP will be made at the respective Contract unit bid price as scheduled in Section 012200 per linear foot (Paragraph 1.3.B.1) as indicated in the drawings, installed in accordance with these specifications and adjusted by the Construction Manager with acceptable field measurements.
 - a. Pipe Liner, CIPP is broken down into specific pay-items based on nominal pipe diameter as per the unit price schedule in Section 012200 Unit Prices.
2. Service Lateral Liner, CIPP: Payment for Pipe Liner, CIPP will be made at the respective Contract unit bid price as scheduled in Section 012200 per each (Paragraph 1.3.B.2) as indicated in the drawings, installed in accordance with these specifications. There is no additional allowance for service laterals longer than typical.
 - a. Service Lateral Liner, CIPP is broken down into specific pay-items based on nominal pipe diameter of the service lateral and the nominal pipe diameter of the sewer mainline as per the unit price schedule in Section 012200 Unit Prices.
3. Cut Liner to Restore Existing House Connection: Payment for Pipe Liner, CIPP will be made at the respective Contract unit bid price as scheduled in Section 012200 per each (Paragraph 1.3.B.2) as indicated in the drawings, installed in accordance with these specifications and adjusted by the Construction Manager with acceptable field measurements.

D. Abandonment of CIPP Lining

1. If pre-installation CCTV inspection reveals that no CIPP Lining is required in the pipe segment between manholes, then CIPP Lining shall be abandoned at no compensation to the Contractor. The Contractor will instead be measured and paid in accordance with Section 33 01 30.13, Sewer Line Cleaning and in accordance with Section 33 01 30.16, CCTV Inspection of Sewers.

1.4 DEFINITIONS (NOT USED)

1.5 SUBMITTALS

A. Furnish Submittals in accordance with Section 013300, Submittal Procedures.

B. Product Data:

1. A safety plan and MSDS sheets (Material Safety Data Sheets) for all hazardous chemicals used or expected to be on-site including resin, catalyst, cleaners and repair agents.
2. The Contractor's written warranties for the duration specified.

C. Shop Drawings:

1. Shop drawings, plans, equipment catalog data, and written descriptions detailing short and long-term properties (providing all supporting test data) of all component materials and composite materials, and:

- a. CIPP lining supplier's name and a list of material manufacturers.
- b. CIPP lining schedules including field-verified lengths and diameters for all CIPP linings and appurtenances required. Plans should include map(s) showing insertion points, equipment and storage locations, and field wet-out locations for all CIPP installations.
- c. Detailed installation procedures including CIPP lining production schedule, acceptable inversion heads and pressures, inversion procedures, curing and cool-down procedures and temperatures, and times for each process stage.
- d. If a field wet-out procedure will be used for liner impregnation, submit a complete description of the proposed wet-out procedure with detailed information on equipment and material storage locations, resin volumes and/or weights, liner length, start times, finish times, resin injection locations, and any other pertinent data documenting the wet-out procedure.
- e. Procedure and materials to reinstate connecting sewers and laterals.
- f. Detailed method for addressing CIPP sampling requirements including location and size of each sample, method of removal, and method of liner repair and procedure for testing CIPP Liner.
- g. A complete list of service laterals, including relevant footage and diameter shall be submitted to the Owner and Engineer prior to initiating CIPP lining.

D. Design Data:

1. The Contractor shall calculate and submit to the Engineer for review after field verification of sizes and prior to ordering any material from the manufacturer, the required minimum thickness for the CIPP to be installed in each pipe reach based on the internal inspection data and the CIPP manufacturer's specifications.
2. Design data and specification data sheets listing all parameters used in the CIPP liner design and thickness calculations based on ASTM F 1216.
3. The contractor shall submit to the Engineer for review the lining manufacturer's complete design calculations for the liner, signed and sealed by a Professional Engineer registered in the State of Louisiana and certified by the manufacturer as to the compliance of his materials to the values used in the calculations. The buckling analysis shall account for the combination of dead load, live load, hydrostatic pressure and grout pressure (if any). The liner side support shall be considered as if provided by soil pressure against the liner. The existing pipe shall not be considered as providing any structural support. Modulus of soil reaction shall be 1000, corresponding to a moderate degree of compaction of bedding and a fine-grained soil as shown in AWWA Manual M45, Fiberglass Pipe Design.
4. Hydraulic Capacity - Overall, the hydraulic profile shall be maintained as large as possible. The CIPP shall provide at least 100 percent of the flow capacity of the original pipe before rehabilitation. In lieu of actual measurements, calculated capacities may be derived using commonly accepted equations and values of the Manning flow coefficients (designated "n" coefficients). The original pipe material and condition at the time of reconstruction will determine the Manning coefficient used in the host pipe. A Manning coefficient of 0.009 for a jointless, relatively smooth-wall cured-in-place pipe will be used for the lateral CIPP flow calculation.

A. Certifications:

1. Certification showing the Contractor (or lining Subcontractor) is currently licensed by the appropriate licensor to perform CIPP installation. All certifications shall be submitted to the Engineer before any materials are ordered.
 - a. Contractor shall provide his references of previous project lists going back 3-years including his customer's names, owner's contact name, phone number, owner's project number, owner's project name and the list must include the number of laterals rehabilitated as well as the number and type of connection seals installed.
 - b. The Contractor shall employ a minimum of 1 foreman and 2 crew members with experience of at least 50 liner installations.
2. Certification stating CIPP tube has been manufactured in accordance with ASTM F 1216 and resin is suitable for its intended use.
3. The Contractor shall provide certification that he has the required equipment to reinstate the service connections as specified herein.

B. Test Reports:

1. Provide manufacturer's test reports of CIPP sample(s).
2. Copies of previous physical properties tests as well as chemical resistance tests.

C. Manufacturer's Instructions

1. Manufacturers' shipping, storage, and handling recommendations for all CIPP system components.
2. Manufacturer's Instructions for temperature control, CIPP handling, insertion, curing, trimming and finishing, and QA/QC procedures.
3. Technical procedure or information regarding the control and mitigation of shrinkage and wrinkling during installation and cure of CIPP liner.

D. Sampling Procedures:

1. Sampling Procedures and locations for obtaining representative samples of the finished liner shall be provided by the Contractor before acceptance.

E. Field Inspection Records

1. Pre-installation and post-installation CCTV Inspection reports as specified herein.

1.6 REFERENCE STANDARDS

A. American Society for Testing Materials (ASTM), Latest Edition

1. ASTM D 543: Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
2. ASTM D 638: Standard Test Method for Tensile Properties of Plastics.
3. ASTM D 790: Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
4. ASTM D 2990: Standard Test Method for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.

5. ASTM D 5813: Standard Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems.
6. ASTM F 1216: Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
7. ASTM F 1743: Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pull-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP).
8. ASTM F 2019: Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP).

B. Sewerage and Water Board of New Orleans (S&WB)

1. General Specifications and Standard Drawings, current edition.
2. Sewer Overflow Abatement Plan, current edition.

1.7 PERFORMANCE REQUIREMENTS (NOT USED)

1.8 QUALITY ASSURANCE

- A. The Contractor shall have a minimum of two (2) years' experience in sewer line repairs by CIPP liner installation. The CIPP liner product manufacturer shall have a minimum installation history of two (2) years and 100,000 linear feet of furnished product including the sizes applicable for this project. Verifiable experience shall be submitted to the Owner upon request.
- B. All CIPP linings shall be from a single manufacturer. The Engineer and/or Owner may inspect the CIPP lining after delivery and reject any or all of the lining products if they fail to meet the requirements specified herein.
- C. The Contractor shall furnish on-site on a continuous basis one (1) additional operational robotic cutter assembly train and key spare components as a "stand-by" unit in the event of primary equipment breakdowns.

1.9 REGULATORY REQUIREMENTS

A. Occupational and Safety Health Administration (OSHA)

1. CFR 29, Part 1910.146: Permit Required Confined Spaces

1.10 FIELD CONDITIONS

- A. CIPP Lining shall not be installed if the Contractor does not have sufficient Sewer Flow Control to eliminate all sewer flow from the pipe for the required duration of pipe installation and curing or if the sewer pipelines have not been sufficiently cleaned as per Section 330130.13, Cleaning of Sewers.

1.11 DELIVERY, STORAGE AND HANDLING

- A. The materials shall be delivered to the job site in original unopened packaging and clearly labeled with the manufacturer's identification and printed instructions.

- B. The Contractor shall comply with the pipe manufacturer's printed recommendations for delivery, storage, and handling of all products.
- C. The Contractor shall keep products safe from damage. The Contractor shall promptly remove damaged products from the job site and replace damaged products with undamaged goods.
- D. The Contractor shall exercise adequate care during transportation, handling and installation to ensure the CIPP material is not torn, cut, or otherwise damaged. If any part or parts of the CIPP material becomes torn, cut or otherwise damaged before or during insertion, it shall be repaired or replaced in accordance with the manufacturer's recommendations and approval by the Engineer before proceeding at no additional cost to the Owner.
- E. If the flexible tube is impregnated with resin at the factory, it shall be transported, installed, and cured before expiration of the shelf life.
- F. The CIPP lining shall be maintained at a proper temperature in refrigerated facilities and protected from ultraviolet light at all times prior to installation to prevent premature curing. Any CIPP lining showing evidence of premature curing shall be rejected for use and immediately removed from the site.

1.12 WARRANTY

- A. The Contractor shall furnish an extended warranty for liner materials from the liner manufacturer for a total of five (5) years from the contractual date of Final Acceptance.
 - 1. If, at any time during the warranty period, any leakage, cracking, loss of bond, or other discontinuity is identified, the contractor shall make repairs acceptable and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS (NOT USED)

2.2 DESIGN CRITERIA

- A. The liner shall be designed in accordance with the procedures of ASTM F 1216. All material properties used in design calculations shall be long-term (time-corrected) values.
- B. The liner shall be structurally designed for a fully deteriorated host pipe/direct bury condition with no bonding to the existing pipe, prism loading, and live traffic loading. The liner shall be designed for the following conditions:
 - 1. Minimum Service Life: 50 years
 - 2. Soil Density: 120 pounds per cubic foot (pcf)
 - 3. Groundwater Depth: 3 feet below existing grade (ft)
 - 4. Live Loadings: AASHTO HS-20-44 live loading due to traffic, unless more stringent live loadings are applicable.
 - 5. Soil Modulus: 1,000 pounds per square inch (psi)
 - 6. Minimum Safety Factor: 2.0
 - 7. Ovality Factor: 2.0%

- 8. Maximum Deflection: 5.0% in vertical axis
 - 9. Long Term Modulus Reduction Factor: 50%
- C. The fully cured liner shall inherit the following minimum structural parameters:
- 1. Minimum structural standards:
 - a. Flexural Strength, ASTM D 790, 4,500 psi
 - b. Flexural Modulus of Elasticity, Short-Term, ASTM D 790, 250,000 psi
 - c. Flexural Modulus of Elasticity, Long-Term (50 year), ASTM D 790, 125,000 psi
- D. The design for the CIPP shall recognize any non-uniform cross section and the liner bifurcation present at the spring line of the pipe. Accounting for this condition by the use of an ovality reduction factor alone is unacceptable.

2.3 ASSEMBLIES

- A. All CIPP lining products shall comply with the latest versions of ASTM F 1216 - Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube, or ASTM F 1743 - Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP).
- B. Wall thickness of the CIPP liners shall be the thickness calculated by the manufacturer in accordance with ASTM F 1216 or the minimum thicknesses indicated in the following listing:
- 1. 6-inch to 8-inch diameter sewer
 - a. Depth of Sewer to Top of Pipe 3-ft to 20-ft: 6 mm thickness
 - 2. 10-inch diameter sewer
 - a. Depth of Sewer to Top of Pipe 3-ft to 15-ft: 6 mm thickness
 - b. Depth of Sewer to Top of Pipe 15-ft to 20-ft: 7.5 mm thickness
 - 3. 12-inch diameter sewer
 - a. Depth of Sewer to Top of Pipe 3-ft to 10-ft: 6 mm thickness
 - b. Depth of Sewer to Top of Pipe 10-ft to 17-ft: 7.5 mm thickness
 - c. Depth of Sewer to Top of Pipe 17-ft to 20-ft: 9 mm thickness
 - 4. 15-inch diameter sewer
 - a. Depth of Sewer to Top of Pipe 3-ft to 10-ft: 7.5 mm thickness
 - b. Depth of Sewer to Top of Pipe 10-ft to 15-ft: 9 mm thickness
 - c. Depth of Sewer to Top of Pipe 15-ft to 20-ft: 10.5 mm thickness
 - 5. 18-inch diameter sewer
 - a. Depth of Sewer to Top of Pipe 3-ft to 10-ft: 9 mm thickness
 - b. Depth of Sewer to Top of Pipe 10-ft to 15-ft: 10.5 mm thickness
 - c. Depth of Sewer to Top of Pipe 15-ft to 20-ft: 12 mm thickness

6. 21-inch diameter sewer
 - a. Depth of Sewer to Top of Pipe 3-ft to 10-ft: 10.5 mm thickness
 - b. Depth of Sewer to Top of Pipe 10-ft to 20-ft: 15 mm thickness
7. 24-inch diameter sewer
 - a. Depth of Sewer to Top of Pipe 3-ft to 10-ft: 12 mm thickness
 - b. Depth of Sewer to Top of Pipe 10-ft to 20-ft: 15 mm thickness
8. 27-inch diameter sewer
 - a. Depth of Sewer to Top of Pipe 3-ft to 10-ft: 12 mm thickness
 - b. Depth of Sewer to Top of Pipe 10-ft to 20-ft: 18 mm thickness
9. 30-inch diameter sewer
 - a. Depth of Sewer to Top of Pipe 3-ft to 10-ft: 15 mm thickness
 - b. Depth of Sewer to Top of Pipe 10-ft to 20-ft: 21 mm thickness
10. 36-inch diameter sewer
 - a. Depth of Sewer to Top of Pipe 3-ft to 20-ft: 24 mm thickness

C. Chemical Resistance:

1. The liner shall be fabricated from materials which, when complete, are chemically resistant to and will withstand internal exposure to domestic sewage having a pH range of 5 to 11 and temperatures up to 125-degrees Fahrenheit.
2. CIPP liners shall meet the minimum chemical resistance requirements in accordance with ASTM F 1216.

2.4 MATERIALS

A. General

1. The Contractor shall be responsible for control of all materials and process variables to provide a finish CIPP possessing the minimum properties specified in ASTM F 1216, and as required herein.

B. Liner

1. The flexible tube shall be one or more layers of needled felt or equivalent non-woven material manufactured under quality controlled conditions set by the manufacturer, and be capable of holding resin and withstanding installation pressures and curing temperatures. The tube shall be compatible with the resin system used, and shall contain no intermediate layers that delaminate after resin curing.
2. The outside layer of the tube shall be coated with an impermeable material compatible with the resin and fabric.

3. Tube material shall be able to stretch to fit irregular pipe sections and negotiate bends. The tube shall be fabricated to a size so that, when installed, it will fit snugly inside the circumference and length of the existing sewer and produce the required thickness after the resin is cured.
4. The minimum length of the flexible tube shall be as necessary to effectively and fully span the distance between manholes, with allowance for proper stretching or shrinkage due to pressure or expansion.
5. The tube shall contain no intermediate layers that may delaminate after resin curing. It shall not be possible to separate any layers with a probe or knife blade such that the layers separate cleanly or the probe or knife blade moves freely between the layers.
6. Allowance should be made for circumferential stretching during the installation and shrinkage of resin during curing and aging so that the final cured product is snug against the wall of the host pipe and free of fins and buckles.
7. The wall color of the interior pipe surface of the liner shall be of a light color with reflective nature to allow proper CCTV inspection.
8. The textile tube and sheet shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe segments.

C. Resin

1. The felt tubing shall be vacuum impregnated with a thermosetting resin system. The resin used shall be compatible with CIPP system used, and designated for use in sewers.
2. The resin shall be able to cure in the presence of water and the initiation temperature for cure shall not be more than 180° F.
3. The resin shall be a general purpose thermosetting polyester, vinyl ester, or epoxy resin and catalyst system that provides the cured physical strengths and properties specified herein. The resin shall not contain fillers, except those required for viscosity control or fire retarding.
4. The resin used to impregnate the tube shall produce a cured tube which shall be resistant to abrasion from solids, grit, and sand in wastewater. The resin shall have proven resistance to the municipal wastewater environment.
5. The resin/liner system shall conform to ASTM D 5813 and ASTM F 1216.

D. Expanding Hydrophilic Rubber End Joint Seal

1. The rubber end joint seal shall be an extended hydrophilic rubber compounded from chloroprene (Neoprene) rubber and hydrophilic resin, which expands on contact with water.
2. The rubber joint seal shall be bonded with adhesive on one face to hold it in place during assembly.

3. On contact with water, the rubber shall swell a minimum of 8 times its original volume, if necessary, and mold itself to completely fill any gaps and exert pressure evenly to ensure the seal. High compression or bolt up forces shall not be necessary to effect a complete and watertight seal.

E. Chemical Grout

1. The chemical grout shall be a hydrophilic liquid that is water reactive and will change from a free-flowing liquid to a water impermeable elastomeric solid upon injection to stop excessive infiltration at the point where the CIPP liner enters the manholes. A reaction (curing) which produces a chemically stable and non-biodegradable, tough, flexible gel. The chemical grout shall be a urethane liquid in uncured form suitable for pumping with a moderate viscosity and variable gelling and curing times. The polyurethane chemical grout shall be Scotch-Seal 5610 by 3M, Avanti Av-254, or approved equal.
2. Acceptable urethane base gel chemical sealing materials shall meet or exceed the following requirements:
 - a. The liquid shall have a solids content of 80% and a specific gravity of 1.04 to 1.11.
 - b. The liquid shall have a viscosity of 300 to 1,000 centipoise at 70° F.
 - c. The water used to react to the pre-polymer should have a pH of 5 to 9.
 - d. Gel times shall be in accordance with the manufacturer's recommendations.
 - e. The grout shall have the ability to increase viscosity, density, gel strength and resistance to shrinkage by the use of additives in the reaction water.
3. A reinforcing agent shall be added to the reaction water at the manufacturer's suggested rate. This agent is intended to increase the polyurethane gel's resistance to wet/dry cycles, freeze/thaw cycles, and solid movement stresses. The reinforcing agent shall be appropriate for the specific grout product that is to be used.
4. Additional chemical grout additives such as catalysts or accelerators as needed to make the grout function properly shall be as manufactured by 3M, Avanti, or approved equal and shall be used in a manner approved by the manufacturer.

2.5 ACCESSORIES (NOT USED)

2.6 SOURCE QUALITY CONTROL

- A. The outside reach of CIPP liner tube shall be labeled by the liner manufacturer with the location of the liner manufacturer, the name of the project, the liner thickness, the liner diameter, the liner length, and the location where it is to be installed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions are acceptable and ready to receive work.
- B. Examine and verify the sewer system is not surcharged prior to the start of work.

C. Examination of service laterals on main sewer lines to be CIPP lined.

1. All lines scheduled for CIPP Installation under this Contract shall include CCTV inspection of all later service connections, excluding later service connections replaced under this contract, and shall include CIPP lining of all non-PVC lateral service connections.
2. Contractor shall inspect all service laterals via pre-CCTV inspection and determine which service laterals are abandoned and are not to be reinstated for service or lined.
3. A service connection shall be considered abandoned under the following conditions:
 - a. The connection does not connect to any building or surface drains.
 - b. The connection has been capped or otherwise purposefully blocked.
4. In the event that the status of a connection is inconclusive, the Contractor shall introduce dye from a sanitary or drain fixture and witness the travel path of the dye using both the lateral and mainline cameras.
5. In the event that a service connection is identified as being cross-connected, the Engineer shall be notified immediately, and the location of the cross-connection shall be determined using dye testing and shall then be clearly marked and labeled on the surface using paint.
6. The Contractor shall indicate the location of the service connections as follows:
 - a. In the event no inspection chamber or cleanout is present at property line, the Contractor shall, by using a sonde/locator, clearly mark by staked hub (in grassed areas) or by PK nail (in roadways or concreted areas) and paint, where the service connection crosses at the property line.
 - b. In the event a junction is present on the service connection, the location of the junction(s) shall be clearly marked and labeled on the surface with paint. All branches of the service connection shall be inspected, if possible, up to the property line.
7. In the event a collapse or blockage is present preventing further movement of the camera, or that may otherwise prevent use of trenchless rehabilitation equipment, the location of such shall be clearly marked and labeled on the surface with paint

3.2 PREPARATION

- A. Contractor shall provide Sewer Flow Control, as specified in Section 330130.03, Sewer Flow Control prior to the start of CIPP Lining of Sewer for the duration of the liner installation and curing periods.
- B. Contractor shall submit a Traffic Control Plan to the approving authority (DPW, DOTD, etc.) for review and approval prior to the closing of any streets. The approved traffic control plan shall be fully executed prior to the performance of CIPP Lining.
- C. The Contractor shall provide adequate sewer line cleaning as specified in Section 330130.13, Cleaning of Sewers prior to the start of CIPP Lining.
 1. It shall be the responsibility of the Contractor to remove all internal debris such as solids and roots and clean the existing sewer line prior to installation of the liner

2. Upon written approval from the Engineer the Contractor may receive payment for Obstruction Removal per each item removed as specified in Section 330130.13 Cleaning of Sewers.
- D. The Contractor shall perform a Pre-Rehabilitation CCTV inspection in accordance with Section 330130.16, CCTV Inspection of Sewers to record sewer line defects requiring repair prior to the installation of the CIPP Liner as well as to note the location, station and orientation, and size of all active sewer service laterals to be reinstated.
1. Any sewer pipeline defects noted during the CCTV inspection that require repair prior to the installation of the CIPP Liner shall be approved by the Engineer and/or Owner and performed in accordance with Section 310130.73, Rehabilitation of Sewers.
 2. The Contractor shall clear the line of obstructions such as solids, protruding gaskets, dropped joints, protruding service connections or collapsed pipe that will prevent the insertion of the liner, as noted during pre-rehabilitation CCTV inspection. If inspection reveals an obstruction that cannot be removed by conventional sewer cleaning equipment in accordance with Section 330130.13, Cleaning of Sewers, the Contractor, upon approval from the Engineer, shall make a point repair to uncover and remove or repair the obstruction in accordance with Section 310130.73, Rehabilitation of Sewers prior to lining.
 3. CCTV inspection of service connections must be from inside the main line sewer up into the lateral. Inspection from cleanouts, excavations, or other access points is not permitted, unless prior approval is obtained from the Engineer. All lateral inspections shall extend from the mainline to the property line, or until the camera is unable to proceed further
 4. Service connection inspections shall be recorded on the same DVD as the mainline recording.
 5. A service connection shall be considered abandoned only if the connection has been capped or otherwise purposefully blocked. Connections not connecting to any building or surface drains shall not be assumed abandoned without confirmation from the Owner.
 6. In the event that the status of a connection is inconclusive, the Contractor shall introduce dye from a sanitary or drain fixture and witness the travel path of the dye using both the lateral and mainline cameras.
 7. In the event that a service connection is identified as being cross-connected, the Engineer shall be notified immediately, and the location of the cross-connection shall be determined using dye testing and shall then be clearly marked and labeled on the surface using paint.
 8. The Contractor shall indicate the location of the service connections as follows:
 - a. In the event no inspection chamber or cleanout is present at property line, the Contractor shall, by using a sonde/locator, clearly mark by staked hub (in grassed areas) or by PK nail (in roadways or concreted areas) and paint, where the service connection crosses at the property line.
 - b. In the event a junction is present on the service connection, the location of the junction(s) shall be clearly marked and labeled on the surface with paint. All branches of the service connection shall be inspected, if possible, up to the property line.

- c. In the event a collapse or blockage is present preventing further movement of the camera, or that may otherwise prevent use of trenchless rehabilitation equipment, the location of such shall be clearly marked and labeled on the surface with paint.
- E. The Contractor shall obtain and setup temporary water, if required, in accordance with Section 015136, Temporary Water.
- F. The Contractor shall position his equipment and layout the site so as to not obstruct any fire hydrants or otherwise prevent its use in case of a fire in the area served by the hydrant.
- G. The Contractor shall carry out his/her operations in accordance with all OSHA and manufacturer's safety requirements. Particular attention is drawn to those safety requirements involving the entering of confined spaces.
- H. The Contractor shall take field measurements to verify the existing pipe diameter, ovality and length prior to manufacturing liners. The manufacturer shall incorporate these measurements into the manufacturing process of the liner. The outside of the flexible tube shall be marked along its full length at regular intervals not to exceed five (5) feet.
- I. If the invert of a sewer is eroded more than 2 inches, it shall be filled with grout to match the surrounding pipe surface.
- J. The Contractor shall trim protruding laterals so the service connection is flush to within ¼ inch of the internal pipe wall. Lateral cutting shall be documented by internal inspection methods.
 - 1. The Contractor shall ensure that the host pipe is not damaged during lateral trimming operations and document each location subjected to lateral trimming in the (CCTV) inspection.
 - 2. Protruding service connections that cannot be trimmed shall be replaced with approval of the Engineer and/or Owner in accordance with Section 310130.73, Rehabilitation of Sewers prior to lining.

3.3 CURED IN PLACE PIPE LINER INSTALLATION

- A. Installation shall be accomplished by inversion or winched-in-place methods and cured in place by ambient temperature or circulating hot water or steam to produce a hard, jointless, impermeable pipe repair.
- B. Installation procedures shall be in accordance with the latest versions of ASTM F 1216 - Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube or ASTM F 1743 - Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP), and the manufacturer's recommendations.
- C. The Contractor shall designate a location where the reconstruction tube will be vacuum impregnated prior to installation. The Contractor shall allow the Engineer to inspect the materials and "wet out" procedure. Sufficient excess resin shall be used in accordance with

the latest version ASTM F 1216. A roller system shall be used to uniformly distribute the resin throughout the tube.

- D. Before installation begins, the tube manufacturer shall provide the minimum pressure required to hold the tube tight against the existing conduit, and the maximum allowable pressure so as not to damage the tube. Once the installation has started the pressure shall be maintained between the minimum and maximum pressures until the installation has been completed.
- E. The Contractor shall install a Hydrophilic Rubber End Seal at each pipe end prior to installing the uncured CIPP lining. The Engineer will require verification that the hydrophilic seals are being properly installed.
- F. 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 soil). The post-cure temperature should be held for a period as recommended by the resin manufacturer, during which time the recirculation of the water and cycling of the head source to maintain the temperature continues.
- G. The bond between all CIPP layers shall be strong and uniform. All layers, after cure, shall be completely saturated with resin.
- H. The CIPP shall be cooled to a temperature below 100 degrees F before relieving the hydrostatic head. Care should be taken in release of the static head so that a vacuum will not be developed that could damage the newly installed liner.
- I. Where practicable, liners can be installed in continuous runs through manholes where there are two or more continuous sewer segments requiring lining, especially to connect several short segments with continuous lining.
- J. The temperature of water discharged to the sewer system from processing liners shall not exceed 125 degrees F maximum, or the level allowed by State or local standards if less than 125 degrees F.
- K. Cut and trim the new lining at each manhole wall. Seal the lining to the manhole wall with a sealant material.
- L. The Contractor shall furnish on-site on a continuous basis one (1) additional operational robotic cutter assembly train and key spare components as a "stand-by" unit in the event of primary equipment breakdowns.

3.4 POST CIPP LINING INSTALLATION

- A. After installation of the liner in a full segment pipe, a minimum of one (1) inch of the liner material shall be left to protrude from the wall of the entrance and the exit manhole.
- B. The Contractor shall install a joint seal at all manhole inlet and outlet connections to seal the area where the line enters or leaves each manhole. The Contractor shall use chemical grout to dress up around the end of the liner. This space may be sealed with a mechanical seal, chemical seal, or combination of both. The method used shall be as approved by the Engineer.

- C. The upstream and downstream manholes shall be inspected and any holes or voids in the manhole wall immediately surrounding the new liner shall be sealed with a hydrophilic rubber joint seal and chemical grout as specified herein. The Engineer shall approve the seal.
- D. Where liners of any type are installed in two or more continuous manhole segments, the liner invert through the trough of intermediate manholes shall be left intact. Final finishing of the installation in those intermediate manholes shall require removal of the top of the exposed liner and neat trimming of the liner edge where it touches the lip of the manhole bench.
- E. Portions of any piece of liner material removed during installation shall be available for inspection and retention by the Engineer. Any unrestrained samples shall not be used for testing purposes.

3.5 REINSTATEMENT OF SEWER SERVICE LATERALS

- A. The Contractor shall reinstate openings for all drop assemblies after lining the mainline sewer.
- B. The Contractor shall reinstate all sewer service laterals except for those shown on the plans as “Abandoned”. Services that are abandoned, but reinstated, shall be plugged in a manner acceptable to the Engineer and at no additional expense to the Owner.
- C. The Contractor must keep prepare and maintain an Excel spreadsheet listing of all services that have been reinstated. The listing shall be organized by line segment ID and provide the distance and clock position for each service reinstatement.
- D. Service connections shall be reinstated without excavation, utilizing a remotely controlled cutting device monitored by a CCTV camera.
- E. After the liner has been installed, in the event that the Contractor chooses to temporarily reinstate service lines, all active existing services may be temporarily reinstated by punching through the liner from the interior of the pipeline. Temporary reinstatements shall allow normal flow from the service line into the mainline.
- F. Final reinstatement of all active services within a rehabilitated line segment shall be performed internally using a robotic cutter within 48 hours of curing and buffed to a minimum of 95% of the original service opening size. The finished opening shall contain no jagged edges.
- G. All coupons shall be recovered at the downstream manhole and removed.

3.6 CURED IN PLACE PIPE LINER INSTALLATION – SEWER LATERAL

A. Lateral Liner Tube

- 1. The exterior of the lateral liner tube shall be laminated with an impermeable, translucent flexible membrane. Longitudinal seams in the tube shall be stitched and thermally sealed. The lateral tube will be continuous in length. The lateral tube will be capable of conforming to offset joints, bends, bells, disfigured pipe sections and pipe diameter transitions.

B. Mainline Connection

1. The main tube and lateral tube shall form a one-piece assembly by stitching the lateral tube to the mainsheet aperture. The connecting end of the lateral tube shall be shaped to match the aperture and curvature of the main tube. The lateral tube and main tube shall be sealed by use of a flexible UV cured adhesive/sealant. The main/lateral tube assembly shall take the shape of a “TEE” or “WYE” with corresponding dimensions such as a curved circle or a curved elliptical opening in the pipefitting. Submittals for the liner assembly must include the manufacturer’s assembly methods and test protocol for the main/lateral liner assembly to be certified as airtight prior to resin saturation. Each liner assembly must include this test data and be certified by the manufacturer to be airtight prior to resin saturation.

C. Plugging

1. The upstream side of the cleanout shall be plugged during insertion and curing of the liner assembly ensuring no flows enter the pipe and no air, steam or odors will enter the building. When required, the main pipe flows will be by-passed. The pumping system shall be sized for 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.

D. Line Obstructions

1. The existing lateral pipe 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.

E. Resin Impregnation

1. The liner assembly is encapsulated within the translucent bladder (liner/bladder assembly), the entire liner including the flat sheet shall be saturated with the resin system (wet-out) under controlled vacuum 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.

F. Liner Insertion

1. The lateral tube and inversion bladder shall be inserted into the launching hose. The main bladder and flat textile sheet (main liner tube) shall be wrapped around a “T” launching device, formed into a tube and secured by use of rubber bands. A seamless molded flange shaped gasket shall be attached to the main liner tube by use of stainless steel snaps. The flanged gasket shall be inserted into the lateral pipe at the main/lateral juncture so that the brim of the flanged gasket is firmly seated against the mainline pipe liner. An O-ring end seal shall be positioned 6-inches from the terminating end of the lateral liner tube. The launching device is inserted into the pipe and pulled to the point of repair. The pull is complete when the lateral tube is exactly aligned with the lateral

pipe connection. The lateral tube is completely protected during the pull. The mainline liner is supported on a rigid “T” launcher that is elevated above the pipe invert through the use of a rotating skid system. The liner assembly shall not be contaminated or diluted by exposure to dirt or debris during the pull.

G. Bladder

1. The main bladder shall be inflated causing the main sheet to unwrap and expand; pressing the main tube firmly into contact with the main pipe and embedding the flange shaped gasket between the main tube and the main pipe at the lateral opening. The lateral tube is inverted through the main tube aperture by the action of the lateral bladder extending into the lateral pipe to a termination point that shall be no less than 2-feet from the exterior cleanout. The bladder assembly shall extend beyond each end of the liner, so the liner remains open-ended and no cutting shall be required

H. Curing

1. After the liner has been fully deployed into the lateral pipe, pressure is maintained pressing the liner firmly against the inner pipe wall until the liner is 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 a uniform raise the temperature above the temperature required to cure the resin. The curing of the CIPP shall 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. The manufacturer’s recommended cure schedule shall be submitted and followed

I. CIPP Processing

1. Curing shall be done without pressure interruption with air or a mixture of air and steam for the proper duration of time per the resin manufacturer’s recommendations. The curing process is complete when the temperature of the CIPP reaches 100 degrees Fahrenheit or less.

- J. The finished CIPP shall be a homogenous CIPP liner assembly located within a lateral service pipe for a specific length, and extending into the main pipe to renew 16-inches of the main pipe at the main/lateral service connection. The CIPP shall be smooth with minimal wrinkling and shall increase flow rate. The CIPP shall be free of dry spots, lifts, and delamination. The CIPP shall include a textile taper at each end providing a smooth transition to the host mainline liner for accommodating video equipment and maintaining proper flow in the mainline. The finished product shall provide a verifiable non-leaking connection between the mainline liner and the CIP-Lateral liner.

3.7 MAINTENANCE (NOT USED)

3.8 FIELD QUALITY CONTROL

A. Testing

1. After complete curing of the CIPP liner and during cooling, the Contractor shall test the liner in accordance with Section 330505, Sewer Utilities Testing.
2. After completing lining and service reinstatement, every liner shall be CCTV inspected in accordance with Section 330130.16, CCTV Inspection of Sewers.
3. Segments not fully conforming to these Specifications must be immediately brought to the Engineer's attention.
4. The Contractor shall furnish a written proposed method of correction within 24 hours for approval by the Engineer.

B. Inspection

1. The Board will have a certified independent testing lab analyze finished liner samples taken from the restrained sample located at the manhole invert. The Contractor shall furnish samples directly to the Construction Manager within 2 days after installation.
 - a. A minimum of one (1) sample shall be taken from every four (4) segments installed. The restrained samples shall be a minimum of one (1) foot in length. The Contractor shall place a sample mold aligned with and the same size as the existing sewer in such a manner as to allow the installation of the liner material through the restraining sample mold. This sample mold shall be made of SDR 35 PVC, C900 PVC or a Construction Manager approved equal.
 - b. The resin-impregnated tube shall be installed and cured through this restraining mold in order to obtain a liner sample representative of the actual liner physical characteristics. All samples shall be labeled with the project number, date of installation, pertinent manhole numbers, nominal thickness, flow direction, and location of installation. The Contractor and Construction Manager shall acknowledge receipt and transfer of all samples.
 - c. Tests in accordance with the latest versions of the ASTM standards for flexural strength, flexural modulus and wall thickness will be conducted by the independent testing lab.
 - d. A sample will be provided by the Contractor to the Construction Manager for all CIPP installation over 18" inches in diameter to be tested in accordance with ASTM standards.
2. CCTV inspection of service connections must be from inside the main line sewer up into the lateral. Inspection from cleanouts, excavations, or other access points is not permitted, unless prior approval is obtained from the Engineer. All lateral inspections shall extend from the mainline to the property line, or until the camera is unable to proceed further
3. Service connection inspections shall be recorded on the same video as the mainline recording (where possible). A written report of the condition of each service connection shall include:
 - a. Identification and approximate location of any pipe defects.
 - b. Approximate location and description of inflow/infiltration and root intrusion.
 - c. The type and condition of the lateral connection.
 - d. Whether the lateral is in active use or abandoned.

C. Acceptance of Work

1. The finished CIPP liner shall be fully rounded and free from visible defects, including but not limited to damage, deflection, holes, delamination, ridges, cracks, uncured resin, foreign inclusions or other objectionable defects as determined by the Construction Manager.
2. There shall be no visible infiltration through the liner, or around the liner at manhole or service line connections. The Contractor shall be required to repair any visible leaks in a manner approved by the Construction Manager.
3. The Contractor shall refrain from removing the sewer flow bypass pumping system until both the Construction Manager and Owner have formally notified the Contractor that the work and finished product is accepted.
4. Correction of failed CIPP or CIPP deemed defective from post-installation inspection or test reports for structural values, thickness, etc., shall be repaired at no extra cost to the Owner. Method of repair, which may require field or workshop demonstration, shall be approved by the Owner.

D. Non-Conforming Work

1. If either the thickness, flexural strength, or flexural modulus of elasticity of the installed CIPP liner are less than 80% of the approved design values, the product is considered unacceptable. A method of repair or replacement shall be submitted for review and approval by the Construction Manager. All work required to remedy non-conforming work shall be at no additional expense to the Owner.
2. For all instances, as described in this Subsection, other than thickness, flexural strength, and flexural modulus of elasticity, where the CIPP liner is deemed unacceptable, the Contractor shall submit a method of repair or replacement for review and approval by the Construction Manager. All work required to remedy non-conforming work shall be at no additional expense to the Owner.
3. Where post-installation thickness measurements and/or physical property testing is performed, payment for installed cured-in-place pipe shall be made in accordance with the following:
 - a. If the thickness, flexural strength, or flexural modulus of elasticity of the installed CIPP are 90% or greater than the approved design values, full payment shall be made accordingly.
 - b. If the thickness, flexural strength, or flexural modulus of elasticity of the installed CIPP are between 90% and 80% of the approved design values, with all at least 80% of the approved design values, payment shall be based on:
 - i. Adjusted Unit Price = Unit Price Bid x Value Factor, where:
 - Value Factor = [* thickness + * flexural strength + * flexural modulus of elasticity] / 3.

◇ * Insert actual measured or tested result expressed as a percentage of specified value. Maximum allowable percentage is 100%.

4. If a defect repair is required after the liner has cured, a short segment tube shall be used to splice across the defect repair. The overlap on each defect shall be twice the diameter, or 12 inches, whichever is greater.

3.9 PROTECTION

- A. The Contractor shall take necessary precautions to protect sewer line segments and manholes from damage that may be imposed by the improper installation of the CIPP Liner.

3.10 CLEAN UP AND REMOVAL

- A. Upon completion of the CIPP Lining, the Contractor shall fully clean and restore the site.
- B. Sewer Flow Control shall be removed and sewer flow shall be normalized in accordance with Section 330130.03, Sewer Flow Control.

END OF SECTION 330130