

SECTION 02533

SANITARY SEWER LINE REHABILITATION

PART 1 - Description

- A. The scope of work to be performed shall be to furnish necessary labor, materials, equipment, and appurtenant work to rehabilitate designated sections of sanitary sewer mains in the City of Lakeland, Tennessee in accordance with this special provision and the contract documents. Specifically, the applicable standards and materials to rehabilitate gravity wastewater pipelines by cleaning, remotely investigating, and inserting a continuously extruded, folded, PVC pipeliner or a resin impregnated flexible tube into an existing gravity pipeline (host pipe) and then thermoforming the pipeliner to conform to the shape of the host pipe are enumerated here. This specification covers work, materials and equipment required for protecting and/or rehabilitating existing sanitary sewer mains with liners anchored to the interior wall to eliminate infiltration, provide corrosion protection, repair voids, and enhance structural integrity. Procedures for surface preparation, cleaning, application, and testing are described herein.
- B. It is the intent of the specifications and drawings to provide an installation complete and functional in all respects. The Contractor will be responsible for this result. The omission of an express reference to work necessary or incidental to a complete installation shall not be construed as releasing the Contractor from providing such work at the contract price bid.
- C. This Special Provision shall supplement, amend, and where in conflict therewith, supersede those conflicts in Section 02530 of the Technical Specification.

PART 2 - Materials

- A. Sanitary sewer pipe used to implement point repairs to the existing PVC mains shall be PVC SDR 26 in conformance with ASTM D-3034 for eight (8) inches, twelve (12) inches, and fifteen (15) inches in diameter as modified by the contract documents. Appurtenant items such as couplings used to reconnect to the existing main and “control density backfill” to prevent connection movement shall conform to the applicable provision of Section 02530. All materials incorporated into the project shall be new.
- B. Cement used to grout manhole inverts or other uses shall be Type I in conformance with ASTM C150. The minimum twenty-eight (28) day compressive strength for concrete be four thousand (4,000) pounds per square inch.
- C. This specification references the following American Society For Testing and Materials (ASTM) standards, which are made a part hereof by such reference and shall be the latest applicable edition and revision thereof:

ASTM D-256 Standard Test Methods for Determining the Pendulum Impact Resistance of Notched Specimens of Plastics

ASTM D-638 Standard Test Method for Tensile Properties of Plastics

ASTM D-790 Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics

ASTM D-1784 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

ASTM D-2444 Standard Test Method for Impact Strength

ASTM D-2122 Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

ASTM D-2152 Standard Test Method for Extrusion Quality using Acetone Immersion

ASTM F-1057 Standard Test Method for Extrusion Quality using Heat Reversion

ASTM F-1871 Standard Specification for Folded/Formatted Poly (Vinyl Chloride) Pipe Type A for Existing Sewer and Conduit Rehabilitation

- D. Cured in Place Pipe installations shall meet the requirements of ASTM F1216, the specific requirements and conditions of the liner manufacturer. Only one method of liner installation shall be performed on the project. The minimum uniform wall thickness of the liner material shall be 0.229 inches for Cured in Place Pipe installations. The materials shall meet the following criteria:

Flexural Stress (ASTM D-790)	4,500 psi
Modulus of Elasticity (ASTM D-790)	400,000 psi
Tensile Strength (Gravity Sewer ASTM D-638)	2,500 psi

- E. The PVC pipeliner will be manufactured from unused PVC compound, containing no fillers, and meet or exceed the following minimum physical properties:

COMBUSTIBILITY	Self-Extinguishing
FLEXURAL MODULUS	ASTM D-790 145,000 PSI @ 73F
FLEXURAL STRENGTH	ASTM D-790 4,100 PSI @ 73F
IZOD IMPACT	ASTM D-256 15 FT-LB/IN
CHEMICAL RESISTANCE	ASTM D-1784 (suitable for use under general sanitary sewer conditions)

- F. The PVC pipeliner shall be designed to meet the following installed performance requirements:

1. The pipeliner shall be capable of expanding a full pipe size larger than the nominal diameter (i.e.: 8" to 10") without splitting or rupturing.

2. After being expanded, the installed pipeliner will match the configuration of the host pipe, with a concave dimple typically appearing at each service connection.
 3. The pipeliner shall be capable of negotiating pipeline bends in the host pipe without splitting, rupturing or wrinkling of the pipeliner material.
 4. The pipeliner shall be dimensionally stable immediately after cool-down, so as to permit immediate service connection reinstatement.
 5. The pipeliner shall have an ASTM D-1784 impact resistance cell classification of no less than five (5), to resist splitting during remote controlled service connection reinstatement.
 6. Processing of the pipeliner shall cause no degradation of the pipeliner physical properties.
- G. The pipeliner shall be marked at maximum five (5) foot intervals indicating ASTM D-1784 cell classification, manufacturer, and size (diameter and SDR). Each production lot will be uniquely coded.
- H. The pipeliner outside diameter will be manufactured substantially smaller than the inside diameter of the host pipe. The pipeliner shall be manufactured with sufficient excess wall thickness to allow the pipeliner to meet or exceed the DR requirements after being expanded. The Standard Dimension Ratio (SDR) of the pipeliner will be 32.5 with a DR range of 30 to 37.
- I. The PVC pipeliner will be continuously extruded at the factory to the minimum length required to effectively span the distance between manholes, in accordance with actual distances which shall be field verified by the Contractor prior to manufacturing.
- J. The PVC liner shall be Ultraliner PVC Alloy pipeliner, manufactured by Ultraliner, Inc., or AM-Liner II or approved equal. Alternate materials must be approved not less than 7 days prior to bid date.
- K. Each production lot of pipeliner will be inspected and tested at the time of manufacture for defects in accordance with STM D-2444, ASTM D-2122, and ASTM D-2152. All pipeliners shall be homogeneous, uniform in color, free of cracks, holes, foreign material, blisters and deleterious faults. All pipeliners shall conform with the specified dimensions. Material design properties shall be confirmed in accordance with ASTM D-790.
- L. **WARRANTY:** A written warranty shall be provided by the manufacturer warranting the materials against all defects for a period of one year from the date of substantial completion. This warranty shall be in addition to the general warranty required of the Contractor in the General Conditions.
- M. The following items shall be submitted to the Engineer prior to initiating liner work and shall include technical data sheets on each product used, including ASTM test results indicating the product conforms to and is suitable for its intended use per these specifications. Additional information to be supplied shall include Material Safety Data Sheets (MSDS) for

each product used, project specific guidelines and recommendations, qualifications of applicator, and design details for any additional ancillary systems and equipment to be used in site and surface preparation, application and testing. The liner material must be applied by a Certified Applicator of the liner manufacturer. A copy of this certification shall be supplied to the Engineer prior to the commencement of the lining portion of the project. All work for and in connection with the installation of the lining in the structure and the field sealing, shall be done in strict conformity with the applicable specifications and the instructions and recommendations of the lining manufacturer. Other applicators may be available to perform the work.

PART 3 - Execution

- A. Before installation of the PVC liner work begins, the Contractor shall clean and clear the main of obstructions such as solids, roots, and other materials which would prevent proper installation of the liner. Internal debris such as sludge, dirt, sand, rocks, grease, and other solid or semi-solid material shall be cleaned out of the main with hydraulic equipment, high velocity jet cleaners, or mechanical equipment. Refuse from this operation shall be accumulated and removed from the system at the downstream manhole and be hauled to the waste water treatment plant no less than once a day. Accumulations of the debris on the surface or transfer of the refuse to downstream portions of the sewage collection system shall not be permitted. Sanitary sewer mains contaminated with debris from the Contractor's upstream operations shall be cleaned and cleared of debris by the Contractor at the Contractor's sole expense to the satisfaction of the Owner and the Engineer, or the Owner may, with its own, or other hired forces, clean the contaminated sections and withhold such monies from the next partial payment due the Contractor for work completed on the project. Precautions shall be taken to ensure that sewer lines are not damaged during the cleaning operations or that flooding to public or private property results. The contractor shall bear the sole expense of damage to public or private property.
- B. Where indicated on the plans or directed by the Engineer or discovered in the field during the scrutinization processes described below, the Contractor shall route protruding services flush with the wall of the sewer main. The routing shall be accomplished by mechanical means which shall not damage the main. Thirteen protruding services have been identified at various locations throughout the project.
- C. Where indicated on the plans or directed by the Engineer, the Contractor shall abandon existing manholes in place. The Contractor shall line through the manhole with the liner, fill the manhole with control density backfill, remove the ring and cover, and restore the surface to the condition of the surrounding existing conditions. No manholes are contemplated for abandonment in place on this project.
- D. The Contractor shall scrutinize the mains to determine breaks, obstacles, and service connections by remote mechanical processes. A DVD and log of the inspection shall be processed by the Contractor and two (2) copies shall be submitted to the Engineer for delivery to the Owner. A reconnaissance survey has been performed by the Owner to aid in allocating resources for this project. The logs of this survey are available for inspection at the office of the Engineer with the prior consent of the Engineer. Copies may be checked out

and returned within a short period of time. However, since the Owner does not possess the specialized equipment available to the Contractor, the results of these surveys are not complete or all encompassing but were made solely for the design of the project and may not represent the condition of the mains. Consequently, the Contractor shall remotely inspect and record his findings for the contemplation of the Owner and the Engineer prior to proceeding with the installation of the liner or performing point repairs. The labor, materials, equipment, and ancillary items required to clean the line and provide the video inspections items shall be considered subsidiary to other contract work items and separate measure or payment shall not be made.

- E. If the inspection reveals obstructions such as protruding service connections, displaced joints, broken or missing pipes, or a pipe collapse which cannot be cleared with internal methods and will prevent the proper installation of the liner, then the Contractor shall excavate the distressed location in conformance with these contract documents, make a point repair of the main utilizing SDR 26 D-3034 sewer pipe, the appropriate Fernco, or equal, couplings, necessary PVC wyes, and PVC SDR 26 service pipe of the appropriate size, and backfill and compact the excavation in conformance with Section 02530. Point repairs shall be a short term activity which shall be initiated and completed in one working day. Base shall be restored to allow vehicular access and the surfacing restored promptly. The Contractor shall provide excavation and suitable backfill as required to install the system. At each end of the point repair, the coupling shall be encased in “control density backfill” which shall be allowed to solidify and cure prior to backfill to prevent joint movement. This will include removing any unsuitable backfill material from the site. The work shall be approved by the Owner’s representative prior to initiating it.
- F. Temporary plugs at the ends of existing sewer mains in existing manholes shall be required to effectively handle existing effluent flows. The contractor shall be responsible for providing the means to divert existing flows around the work site from manhole to manhole to allow the construction of the improvements to be performed in dry conditions. The Contractor shall be responsible for cleansing required or treatments necessary to install the PVC liner. The labor, materials, equipment, and ancillary items required to provide these temporary plugs, pumps, or other items shall be considered subsidiary to other contract work items and separate measurement or payment shall not be made.
- G. Sanitary sewer services shall be maintained throughout the rehabilitation process. Portable toilets shall be supplied and maintained by the Contractor for the users to ensure continuous service is available if required by the Owner. The Contractor shall contact and maintain communications with the users of the sanitary sewer mains undergoing rehabilitation. Written notice shall be supplied to each user describing the work schedule, a Contractor contact for the user along with a phone number for the contact, and the effects of the work the user may be expected to experience. On the day the main is lined the user shall be contacted and advised of the specifics required of the user such as running clean water through the house service to confirm the active lateral and the length of time no effluent shall be permitted from the facility. Communications with users, written notices to users, and coordination of the user’s requirements including providing necessary temporary sanitary facilities by the Contractor shall be considered incidental to the pipelining work and shall not be paid for separately but shall be considered merged with the unit cost bid to line the pipe.

Installation of the liner shall not commence until the substrate has properly cured in accordance with these specifications and the liner manufacturer's written recommendations.

- H. The entrance to the host pipe shall be covered so as to provide a smooth surface to prevent damage to the pipeliner. The insertion end of the pipeliner shall be sealed to inhibit fluids and solids from entering the pipeliner. The liner shall be slowly fed into entry manhole from the supply reel, while simultaneously pulling the pipeliner at the exit manhole, to minimize tension on the pipeliner. Maintain two-way communication between personnel at entry and exit manholes to coordinate the rate of pipeliner supply and pulling operations. A power winch and a steel cable connected to the pulling head may be used as recommended by the manufacturer to advance the pipeliner.
- I. Process the pipeliner in accordance with the manufacturer's instructions for heating and expanding the pipeliner. Upon completion of processing, the pipeliner shall fit tightly against the inside wall of the host pipe, be locked into the joints of the host pipe, and have distinct dimples at the locations of existing service connections to the host pipe. Temperature and pressure gauges shall be used at the insertion and termination manholes to monitor internal conditions during pipeliner processing and molding. **DO NOT ALLOW PRESSURE TO EXCEED 12 PSI, AS DAMAGE MAY OCCUR TO HOST PIPE.**
- J. The live service connections shall be reinstated using remote controlled methods as approved by the manufacturer or as otherwise approved by the Engineer. After creating a hole in the pipeliner, polish the edges of the resulting hole to remove sharp edges and to improve flow conditions from the service lateral into the lined sewer main.
- K. A watertight seal at the insertion and termination points in the manholes shall be provided in accordance with the manufacturer's recommendations. Neatly cut off the pipeliner to a minimum of 3" to 4" from the manhole wall. Provide a mortar/concrete bench adjacent to the pipeliner segment within the manhole to support the pipeliner sidewalls and to provide for smooth merging of flows from other pipelines.
- L. The Contractor shall perform an internal video inspection of the completed pipeliner and the restored service connections. The camera shall have an accurate footage counter which shall display on the monitor the exact distance of the camera from the center line of the starting manhole. A final visual inspection shall be made by the Contractor and manufacturer's representative. Any deficiencies in the finished coating shall be marked and repaired according to the procedures set forth herein by the Contractor. Two (2) copies of the final video inspection on DVD prepared and processed by the Contractor shall be supplied to the Engineer for delivery to the Owner. Defects detected with the aid of the final video process shall promptly be rectified to the satisfaction of the Engineer by the Contractor.

END OF SECTION