

SECTION XXXXXX
Reconstruction of Sanitary Sewers by
Cured-in-Place Pipe (CIPP)

1.00 PART 1 -- GENERAL

1.01 SCOPE

- A. It is the intent of this specification to provide for the reconstruction of existing sewer lines by forming a new pipe within an existing deteriorated pipe, which has generally maintained its original shape. The cured-in-place-pipe (CIPP) shall provide flow capacity equal to or greater than 100% of the original pipe's flow capacity when new. The process is defined as the reconstruction of sewer lines by installation of a thermosetting resin impregnated flexible felt fiber tube, coated on one side with a thermoplastic, which is installed into the existing sewer line utilizing a water column. Curing is accomplished by circulating hot water throughout the length of the inverted tube to cure the thermosetting resin into a hard impermeable pipe with the thermoplastic coating on the inside surface of the new pipe. The pipe shall extend the full length of the original pipe and shall provide a structurally sound, joint-less, close fitting, and corrosion resistant cured-in-place pipe.

1.02 PRE-QUALIFICATION OF PRODUCTS AND INSTALLERS

- A. The Owner will only approve experienced installers utilizing proven Commercially Acceptable sewer rehabilitation products. In order to be considered Commercially Acceptable, the Product and Installer must demonstrate compliance with the following requirements.
- B. Bid proposals must be labeled clearly on the outside of the bid envelope, defining the product(s) and installer being proposed. Only bids using pre-approved products and installers will be opened and read. Bids submitted on products or from installers that have not been pre-approved will be returned unopened.
- C. The following products and installers are classified Commercially Acceptable and are approved for use on this project:
1. Suncoast Liner; Suncoast Infrastructure, Inc.
 2. Inliner Technologies; Reynolds Inliner, LLC
- D. Documentation for other products and installers seeking pre-approved status must be submitted to the Engineer no less than two (2) weeks prior to bid date to ensure adequate consideration.
- E. Pre-approval of products and installers shall be classified as Commercially Acceptable. To be considered Commercially Acceptable, the product and the installer must demonstrate full compliance with the requirements outlined

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below. Only products and installers deemed Commercially Acceptable will be allowed to bid as specified.

1. For a Product to be considered Commercially Acceptable, the product must be manufactured in a facility with a quality management program which is certified to ISO 9001:2000 standards. Proof of third party certification shall be required for approval. In addition, a minimum of 300,000 linear feet or 1000 line sections of successful wastewater collection system installations in the U.S. using the Product must be documented to assure commercial viability. Also, the Product shall have been in service within the wastewater collection system of the Owner (or some other city, town, or county within the United States of America) for a minimum of four (4) years.
2. For an Installer to be considered as Commercially Acceptable, the Installer must satisfy all insurance, financial, and bonding requirements of the Owner, and must have had at least four (4) years active experience in the commercial installation of the product. In addition the Installer must have successfully installed at least 300,000 feet of the product in the wastewater collection systems. These installations must have had a combined minimum total of 1000 successful internally reinstated lateral connections.

2.00 PART 2 -- MATERIALS

2.01 RESIN

- A. The resin used shall be high-grade corrosion resistant polyester, vinyl ester or epoxy resin specifically designed for the cured-in-place pipe (CIPP) being installed. Only PREMIUM, NON-RECYCLED resin shall be used.
- B. The resin vendor must be able to confirm that the grade of resin used has been extensively tested for corrosion resistance and has met the minimum requirements of ASTM F1216, latest revision.
- C. The contractor shall designate a wet-out facility and shall provide wet-out liner tubes from the designated facility only. Multiple facilities may not be used to supply wet-out liner tubes.
- D. The Engineer at his discretion shall have the right to inspect the designated wet-out facility and randomly draw samples of the resin used to wet-out the CIPP used under this contract.

2.02 TUBE

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- A. The CIPP liner shall be a polyester, vinylester or epoxy vacuum impregnated flexible woven or non-woven tube. The tube shall be inverted into position by the means of hydrostatic head. The tube, once installed, shall be cured to form a hard impermeable pipe, by circulating hot water through the entire length of the tube. When cured, the liner shall extend over the designated length of the existing sewer in a continuous, tight fitting and watertight pipe-within-a-pipe.
- B. The minimum length shall be that deemed necessary by the engineer to effectively span the pipelining distance of the necessary repair unless otherwise specified. The line lengths shall be verified in the field before impregnation of the tube with resin.
- C. The outside of the tube, before installation, shall have an impermeable thermoplastic coating. This coating will form the inner layer of the finished pipe and is required for enhancement of corrosion, flow and abrasion properties.

2.03 GENERAL REQUIREMENTS OF CIPP

- A. The finished pipe must be such that when the thermosetting resin cures, the total wall thickness will be a homogeneous and monolithic felt and resin composite matrix that will be chemically resistant to withstand internal exposure to domestic sewerage. When cured the CIPP must form a mechanical bond with the conduit.

2.04 REFERENCE SPECIFICATIONS

- A. Installation and material tests of cured-in-place-pipe (CIPP) must meet the minimum requirements demonstrated in the following ASTM standards:

ASTM F-1216	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
ASTM D-638	Test Method for Tensile Properties of Plastics
	Tensile Strength 3,000 psi
ASTM D-790	Test Method of Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
	Flexural Strength 4,500 psi
	Flexural Modulus 250,000 psi

- B. Independent material tests for compliance with this specification shall be made according to the applicable ASTM standards. A certificate of compliance shall be provided upon request for all materials furnished under this specification.

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2.05 PIPE DESIGN

- A. The cured-in-place-pipe shall be designed to a minimum wall thickness based on the individual project parameters and the condition of the existing conduit. Prior to installation of the liner, design calculations in accordance with ASTM-F1216 shall be submitted to determine the minimum thickness of the liner to be installed. The pipe design shall have sufficient strength to support all dead loads, live loads and groundwater loads imposed.

- B. The contractor shall submit his price proposal based on the appropriate length, size, and existing pipe parameters designated in the Bid Item or Bid Proposal Section. The deterioration of sewers is an ongoing process. Should pre-construction inspections reveal the sewers to be in substantially different conditions than those in the design considerations, the contractor shall request such changes in reconstruction liner thickness, supporting such requests with design data. The deviation, if approved, shall be reflected by the appropriate addition or reduction in the unit cost for that size as agreed to by the engineer.

3.00 PART 3 -- EXECUTION

3.01 ACCESS TO MANHOLES AND ACCESS POINTS

- A. It shall be the responsibility of the Owner to locate and designate all manhole access points open and accessible for the work, and provide rights of access to these points. If a street must be closed to traffic due to the orientation of the sewer, the Owner shall institute the actions necessary to do this for the mutually agreed time period. The Owner shall also provide free access to water hydrants for cleaning, inversion and other work items requiring water.

3.02 CLEANING AND PRE-TV INSPECTION

- A. Sewers shall be cleaned of all debris, roots and other materials that would block proper inversion of the cured-in-place-pipe. Utilizing high-pressure jet cleaning equipment, several passes are completed to assure all debris is removed from the pipe. If roots are present, root cutters or mechanical brushes are attached to the jet nozzle and are sent through the line to remove all root intrusions. The owner shall provide a site for disposal of materials removed from the lines at no cost to the contractor.

- B. Sewers shall be CCTV inspected providing, both a video recording and log, which identifies all service connections and openings. Utilizing a color video inspection system with data recording capabilities, the entire pipe sections shall be recorded on VHS tape.

- C. It shall be the responsibility of the Contractor to clear the line of obstructions such as solids and roots that will prevent the insertion of the CIPP. If pre-

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installation inspection reveals an obstruction such as a protruding service connection, dropped joint, or a collapse that will prevent the inversion process, that was not evident on the pre-bid video and it cannot be removed by conventional sewer cleaning equipment, then the Contractor shall make a point repair excavation to uncover and remove or repair the obstruction. Such excavation shall be approved in writing by the Owner's representative prior to the commencement of the work and shall be considered as a separate pay item.

- D. All active lateral connections shall be identified and measured. A 360° Pan-and-Tilt view camera shall be used to inspect the pipe traveling upstream. At each connection the operator will stop and turn the camera lens toward the lateral, thereby inspecting the first 8 to 12 inches of the connection. If there is still a doubt as to whether or not the connection is live, additional "dye and flush" tests shall be performed. It will be the responsibility of the Owner's representatives to review this process live or review the video tapes to verify and approve which laterals are to be reinstated. All laterals will be directly measured from the back wall (opposing wall) of the basis manhole, typically the downstream manhole.

3.03 BYPASS OF FLOW

- A. The Contractor shall bypass the sewerage around the sections of sewer to be lined. The bypass shall be made by plugging an existing upstream manhole if necessary and pumping the sewerage into the downstream manhole or adjacent system. The typical pump and bypass lines shall not be greater than 4" pump and pipe. Any bypass need requiring pump or pipe greater than 4" shall be paid for as a separate pay item.

3.04 RESIN IMPREGNATED OF CIPP TUBE

- A. The Contractor shall designate a location where the tube shall be impregnated or "wet out" with resin, using distribution rollers and a "single-source" vacuum to thoroughly saturate the tube's felt fiber prior to installation. The impregnated tube shall be free of pinholes, resin voids and other defects. If the cured-in-place-pipe is impregnated at the manufacturing plant, it shall be delivered to the job site in a refrigerated truck and remain refrigerated prior to the installation to prevent premature curing.

3.05 INSTALLATION OF CIPP TUBE

- A. The impregnated tube shall be inverted through an existing manhole or other approved access until it has fully traversed the designated line length and the inversion face breaches the target manhole or termination point.

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- B. Thermocouples shall be placed at the top, and if possible, the bottom interface of both ends of the liner and, if possible, at all intermediate manholes for monitoring the temperatures during the cure cycle.
- C. The cure cycle and cool down will be dictated with consideration of the actual field conditions and shall be per the manufacturer's recommendations. The curing temperatures shall be monitored at the boiler truck's water inlet and outlet lines. The temperature reading from the truck shall be compared to the thermocouples to ensure that sufficient heat is being supplied to the system.
- D. Once the pipe has reached exotherm, cool water shall be slowly introduced into the rehabilitated pipe. The water temperature shall be cooled inside of the pipe to below 100 degrees F. The cool down process will also be affected by actual field conditions, and may have to be modified in cases of severe weather conditions or below normal ground temperatures.
- E. Termination of the cured-in-place-pipe at the manhole is completed by trimming the inverted pipe end back within approximately 2 inches of the outlet connection.

3.06 TESTING

- A. Leakage testing shall be conducted by monitoring the water level in the down tube during the processing and cool down cycles prior to the reinstatement of laterals and shall be performed under the supervision of the Owner's representative or inspector. The Contractor shall furnish all equipment and personnel necessary to conduct the test.

3.07 INTERNAL RECONNECTION OF LATERALS

- A. Lateral connections shall be reinstated robotically whereby a camera and robotic cutter are put into the newly rehabilitated line. Each lateral is identified by a dimple in the cured-in-place pipe or through pre-installation measurements. Initially, each lateral shall be relieved by cutting a 2 to 3 inch hole to ensure that no services will be interrupted and there will be minimal risk of backed up lines. Once this is accomplished, each lateral shall be fully reopened to 90% percent of its original size.

3.08 FINAL INSPECTION

- A. Upon completion of installation, sewers shall be CCTV inspected, providing both a video recording and log which identifies all service connections and openings. The entire pipe sections rehabilitated shall be recorded on VHS tape and presented to the Owner.

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4.00 PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Installation of Cured-in-Place Pipe, when listed on the Proposal, shall be measured as the horizontal distance from the center of the entry manhole to the furthest extent of the cured-in-place pipe installed. Measurements shall be made to the nearest foot.
- B. Reinstatement of Services, when listed on the Proposal, shall be measured per each for each service reinstated.

4.02 PAYMENT

- A. Payment for Installation of Cured-in-Place Pipe shall be made per LF.
- B. Payment for Service Reinstatement shall be made per EA.