

**UTILITIES COMMISSION
CITY OF NEW SMYRNA BEACH, FLORIDA**

ITB# 01-18
SANITARY SEWER REHABILITATION – SYSTEMS 1, 2 & 10

SECTION 02740 – CURED-IN-PLACE PIPE (CIPP) SPECIFICATION

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PART 1 – GENERAL

A. DESCRIPTION OF WORK

- 1) This specification covers all work necessary to furnish and install CIPP to rehabilitate sanitary sewer pipe. The Contractor shall provide all labor, materials and equipment necessary, including but not limited to, pipe cleaning, pipe preparation, root removal, removal & disposal of material(s) generated from pipe cleaning/preparation/root removal, manhole connections, pre-lining video (after pipe is cleaned/prepped), reinstatement of all existing lateral connections, sealing all manhole wall and lateral reinstatement connections, post-lining video (after lining and lateral reinstatements), testing and clean-up.
- 2) The Contractor shall provide necessary maintenance of traffic and by-pass pumping per the Contract Bid Tabulation.
- 3) The Contractor shall provide necessary warranty and documentation of required experience per the Contract Bid Submittal Requirements and as specified herein.
- 4) The **COMMISSION** requires all Customers to be notified a minimum of 5 calendar days of any anticipated flow interruptions. It is the Contractor's responsibility to make said Customer notifications.
- 5) The CIPP shall be continuous, jointless and structurally sound liner from manhole to manhole. All existing and confirmed lateral connections shall be internally reinstated/re-opened. The Contractor will be responsible for sealing all manhole wall and lateral reinstatement connections.
- 6) The **COMMISSION** will pay for installed materials only per the Contract Bid Tabulation Bid Item Unit Cost.
- 7) All work shall adhere to Occupational Health and Safety Administration (OSHA) standards, current edition.
- 8) Maintenance of Traffic shall adhere to FDOT Design Standards, Index 600, current edition.

B. REFERENCE SPECIFICATIONS AND STANDARDS

- 1) This specification references the following American Society for Testing and Materials (ASTM) Standard Specifications, American Water Works Association (AWWA) Specifications and their reference standards, which are made a part hereof by such reference and shall be the latest edition and revision thereof. All work shall comply with the reference standards unless specifically stated otherwise in this Specification.
 - ASTM D5813 - Standard Specification for Cured-in-Place Thermosetting Resin Sewer Pipe

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- ASTM F1216 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
- ASTM F1743 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-In-Place Installation of Cured-In-Place Thermosetting Resin Pipe
- ASTM D543 - Standard and Practice for Evaluating the Resistance of Plastics to Chemical Reagents
- ASTM D638 - Standard Test Method for Tensile Properties of Plastics
- ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- ASTM D792 - Standard Test Methods for Density and Specific Gravity of Plastics by displacement
- ASTM F2019-03 - 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)
- ASTM D2122-98(2004) - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
- ASTM D2990 - Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics

C. PERFORMANCE WORK STATEMENT (PWS)

- 1) The Contractor shall submit, to the **COMMISSION**, a Performance Work Statement (PWS) at the pre-construction meeting, which clearly defines the CIPP product delivery in conformance with the requirements of these contract documents. Unless otherwise directed by the **COMMISSION**, the PWS shall at a minimum contain the following:
 - a. Clearly indicate that the CIPP will conform to the project requirements as outlined in the Description of Work and as delineated in these specifications.
 - b. Where the scope of work is specifically delineated in the contract documents, a detailed installation plan describing all preparation work, cleaning operations, pre-video inspections, by-pass pumping, maintenance of traffic, installation procedure, method of curing, lateral reinstatement, quality control, testing to be performed, final video inspection, warranties furnished and all else necessary and appropriate for a complete CIPP liner installation. A detailed installation schedule shall be prepared, submitted and conform to the requirements of this contract.
 - c. Contractor's description of the proposed CIPP lining technology, including a detailed plan for identifying all existing lateral connections and maintaining all Customer sewer service during CIPP installation.

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- d. A description of the CIPP materials to be furnished for the project. Materials shall be fully detailed in the submittals and conform to these specifications and/or shall conform to the pre-approved product submission.
- e. The name and experience of each lead individual performing work on this Contract shall be submitted with the PWS.
- f. Engineering design calculations, in accordance with the Appendix of ASTM F1216, for each length of liner to be installed including the thickness of each proposed CIPP. It will be acceptable for the Contractor to submit a design for the most severe line condition and apply that design to all of the line sections. These calculations shall be performed and certified by a, qualified, Professional Engineer. All calculations shall include data that conforms to the requirements of these specifications or has been pre-approved by the **COMMISSION**.
- g. Proposed manufacturers technology data shall be submitted for all CIPP products and all associated technologies to be furnished.
- h. A detailed description of the Contractor's proposed procedures for removal of roots/blockages in the pipe that may be encountered during the cleaning process.
- i. A detailed public notification plan shall be prepared and submitted including detailed staged notification to Customers affected by the CIPP installation.

PART 2 – PRODUCTS

A. MATERIALS

- 1) The CIPP System must meet the chemical resistance requirements of these contract documents. All materials, shipped to the project site, shall be accompanied by test reports certifying that the material conforms to the ASTM standards listed herein. Materials shall be shipped, stored, and handled accordance with the CIPP manufacturer's recommendations to avoid damage. Damage includes, but is not limited to, gouging, abrasion, flattening, cutting, puncturing, or ultra-violet (UV) degradation. On site storage locations, shall be approved by the **COMMISSION**. All damaged materials shall be promptly removed from the project site at the Contractor's expense and disposed of in accordance with all current applicable agency regulations.

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B. FABRIC TUBE

- 1) The fabric tube shall consist of one or more layers of absorbent non-woven felt fabric, felt/fiberglass or fiberglass and meet the requirements of ASTM F1216, ASTM F1743, ASTM D5813 & ASTM F2019.
- 2) The fabric tube shall be capable of absorbing and carrying resins, constructed to withstand installation pressures and curing temperatures and have sufficient strength to bridge missing pipe segments, and stretch to fit irregular pipe sections. The Contractor shall submit certified information from the felt manufacturer on the nominal void volume in the felt fabric that will be filled with resin.
- 3) The wet-out fabric tube shall have a uniform thickness and excess resin distribution that when compressed at installation pressures will meet or exceed the design thickness after cure.
- 4) The fabric tube shall be manufactured to a size and length that when installed will tightly fit the internal circumference, meeting applicable ASTM standards or better, of the original pipe. Allowance shall be made for circumferential stretching during installation. The tube shall be properly sized to the diameter of the existing pipe and the length to be rehabilitated and be able to stretch to fit irregular pipe sections and negotiate bends. The Contractor shall determine the minimum tube length necessary to effectively span the designated run between manholes. The Contractor shall verify the lengths in the field prior to ordering and prior to impregnation of the tube with resin, to ensure that the tube will have sufficient length to extend the entire length of the run. The Contractor shall also measure the inside diameter of the existing pipe in the field prior to ordering liner so that the liner can be installed in a tight-fitted condition.
- 5) The outside and/or inside layer of the fabric tube (before inversion/pull-in, as applicable) shall be coated with an impermeable, flexible membrane that will contain the resin and facilitate, if applicable, vacuum impregnation and monitoring of the resin saturation during the resin impregnation (wet-out) procedure.
- 6) No material shall be included in the fabric tube that may cause de-lamination in the cured CIPP. No dry or unsaturated layers shall be acceptable upon visual inspection as evident by color contrast between the felt fabric and the activated resin containing a colorant.
- 7) The wall color of the interior pipe surface of CIPP after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made. The hue of the color shall be dark enough to distinguish a contrast between the fully resin saturated felt fabric and dry or resin lean areas.
- 8) Seams in the fabric tube, if applicable, shall meet the requirements of ASTM D5813.

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- 9) The outside of the fabric tube shall be marked every 5 feet with the name of the CIPP manufacturer, manufacturing lot and production footage.
- 10) The minimum length of the fabric tube shall be that deemed necessary by the installer to effectively span the distance from the starting manhole to the terminating manhole or access point, plus that amount required to run-in and run-out for the installation process.
- 11) The nominal fabric tube wall thickness shall be constructed, as a minimum, to the nearest 0.5 mm increment, rounded up from the design thickness for that section of installed CIPP. Wall thickness transitions, in 0.5 mm increments or greater as appropriate, may be fabricated into the fabric tube between installation entrance and exit access points. The quantity of resin used in the impregnation shall be sufficient to fill all of the felt voids for the nominal felt thickness.

C. RESIN

- 1) The resin shall be a corrosion resistant polyester or vinyl ester resin and catalyst system that when properly cured within the tube composite meets the requirements of ASTM F1216, ASTM F1743 or F2019, the physical properties herein, and those, which are to be utilized in the design of the CIPP for this project. The resin shall produce CIPP which will comply with or exceed the structural and chemical resistance requirements of this specification.

D. STRUCTURAL REQUIREMENTS

- 1) The physical properties and characteristics of the finished liner will vary considerably, depending on the types and mixing proportions of the materials used, and the degree of cure executed. It shall be the responsibility of the Contractor to control these variables and to provide a CIPP system which meets or exceeds the minimum properties specified herein:
 - a. The CIPP shall be designed as per ASTM standards. The CIPP design shall assume no bonding to the original pipe wall.
 - b. The design engineer shall set the long term (50 year extrapolated) Creep Retention Factor at 33% of the initial design flexural modulus as determined by ASTM D790 test method. This value shall be used unless the Contractor submits long term test data (ASTM D2990) to substantiate a higher retention factor.

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- c. The CIPP material shall, at a minimum, meet or exceed the structural properties, as listed below.

MINIMUM PHYSICAL PROPERTIES

Property	Test Method	Cured Composite Per ASTM F1216	Cured Composite Per Design
Flexural Modulus of Elasticity (Short Term)	ASTM D790	250,000 psi	Contractor Value
Flexural Strength (Short Term)	ASTM D790	4,500 psi	Contractor Value

- 2) The required structural CIPP wall thickness shall be based, as a minimum, on the physical properties of the cured composite and per the design of the Professional Engineer and in accordance with the Design Equations contained in the appendix of the ASTM standards, and the following design parameters:
- Design Safety Factor - 2.0 (1.5 for pipes 36” or larger)
 - Creep Retention Factor - 33%
 - Ovality - 2% or as measured by field inspection
 - Constrained Soil Modulus Per AASHTO LRFD Section 12 and AWWA Manual M45
 - Groundwater Depth - As specified or indicated on the Plans
 - Soil Depth (above the crown) - As specified or indicated on the Plans
 - Live Load - Highway, railroad or airport as applicable
 - Soil Load (assumed) - 120 lb/cu. Ft.
 - Minimum service life - 50 years
- 3) The Contractor shall submit, prior to installation of the lining materials, certification of compliance with these specifications and/or the requirements of the pre-approved CIPP system. Certified material test results shall be included that confirm that all materials conform to these specification and/or the pre-approved system. Materials not complying with these requirements will be rejected.

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E. PRODUCT SUBMITTALS

- 1) The Contractor shall submit the following information:
 - Manufacturer’s certification that the materials to be used meet the referenced standards and these specifications.
 - License or certificate verifying Manufacturer’s/Licensors’ approval of the installer.
 - Proposed equipment and procedures for accomplishing the work.
 - Tube wet-out & cure method including:
 - A complete description of the proposed wet-out procedure for the proposed technology.
 - The Manufacturer’s recommended cure method for each diameter and thickness of CIPP liner to be installed. The PWS shall contain a detailed curing procedure detailing the curing medium and the method of application.
 - Design calculations for wall thickness designs to be completed by an Engineer proficient in the pipe design.

PART 3 – CONSTRUCTION

A. PREPARATION AND CLEANING

- 1) Contractor shall perform pre-video inspection of the pipe to be lined. The Contractor shall provide the **COMMISSION** a copy of the video in digital format for review and approval.
- 2) The pre-video shall be after the pipe is cleaned.
- 3) The Contractor is responsible to clear the pipe of obstructions that will interfere with the installation and long-term performance of the CIPP.
- 4) If the pre-video inspection reveals an obstruction, misalignment, broken or collapsed section or sag that was not identified as part of the original scope of work and will prohibit proper installation of the CIPP, the Contractor may be directed by the **COMMISSION** to correct the problem(s) prior to lining by utilizing open cut repair methods. The Contractor shall be compensated for this work under a Contract Bid Alternate Bid Item.
- 5) The Contractor shall be responsible for confirming the locations of all lateral connections prior to installing and curing the CIPP.
- 6) In the event the status of a lateral connection cannot be adequately defined, the **COMMISSION** will make the final decision, prior to installation and curing of the liner, as to the status.

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- 7) The Contractor may, under the direction of the **COMMISSION**, utilize any of the existing manholes in the project area as installation access points. If a road closure or detour is required due to the location of the gravity sanitary sewer, Contractor must obtain permission from the City of New Smyrna Beach.
- 8) The Contractor shall remove all internal debris from the pipe that will interfere with the installation and the final product delivery of the CIPP as required in these specifications. Solid debris and deposits shall be removed from the system and disposed of properly by the Contractor. The Contractor shall dispose of all debris at no additional charge to the **COMMISSION**. Moving material from manhole section to manhole section shall not be allowed. As applicable, the Contractor shall either plug or install a by-pass pumping system to properly clean the pipe. Precaution shall be taken by the Contractor in the use of cleaning equipment to avoid damage to the existing pipe. The repair of any damage, caused by the cleaning equipment, shall be the responsibility of the Contractor.
- 9) The Contractor is responsible for construction water. The **COMMISSION** can supply the Contractor with a Temporary Construction Water Meter (with proper backflow prevention) provided an account is applied and paid for by the Contractor with the **COMMISSION**'s Billing Department.

B. BY-PASS PUMPING

- 1) See Specification 02730.

C. INSTALLATION OF LINER

- 1) Neither the CIPP system, nor its installation, shall cause adverse effects to any of the **COMMISSION**'s processes or facilities. The use of the product shall not result in the formation or production of any detrimental compounds or by-products at the wastewater treatment plant. The Contractor shall notify the **COMMISSION** and identify any by-products produced as a result of the installation operations, test and monitor the levels, and comply with any and all local waste discharge requirements.
- 2) The CIPP liner shall be installed and fully cured prior to installation of a Manhole Liner.
- 3) The Contractor shall clean-up, restore existing surface conditions and structures, and repair any of the CIPP system determined to be defective. The Contractor shall conduct installation operations and schedule clean-up in a manner to cause the least possible obstruction and inconvenience to Customers, traffic, pedestrians, businesses, etc.

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- 4) The CIPP liner shall be installed and cured in the host pipe accordance with the CIPP manufacturer's recommendations as described and submitted in the PWS.
- 5) The CIPP liner shall be constructed of materials and methods, that when installed, shall provide a continuous, jointless and structurally sound liner from manhole to manhole able to withstand all imposed static and/or dynamic loads, and free of all defects that will affect the long term life and operation of the pipe.
- 6) CIPP installation shall be in accordance with the applicable ASTM standards with the following modification:
 - a. The wet-out tube shall be positioned in the pipe using the method specified by the manufacturer. Care should be exercised not to damage the tube as a result of installation. 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.
- 7) Prior to installation and in accordance with the CIPP manufacturer's recommendations remote temperature gauges or sensors shall be placed inside the host pipe to monitor the temperatures during the cure cycle. Liner and/or host pipe interface temperature shall be monitored and logged during curing of the liner.
- 8) Curing shall be accomplished by utilizing the appropriate medium in accordance with the CIPP manufacturer's recommended cure schedule. The curing source or in and output temperatures shall be monitored and logged during the cure cycles. The CIPP manufacturer's recommended cure schedule shall be used for each line segment installed, and the liner wall thickness and the existing ground conditions with regard to temperature, moisture level, and thermal conductivity of soil, per ASTM as applicable, shall be taken into account by the Contractor.
- 9) The CIPP liner shall not be installed through a manhole. Each liner shall begin and end at a manhole.

D. COOL DOWN

- 1) The Contractor shall cool the liner in accordance with the CIPP manufacturer's recommendations as described and outlined in the PWS.
- 2) Temperatures and curing data shall be monitored and recorded, by the Contractor, throughout the installation process to ensure that each phase of the process is achieved as approved in accordance with the CIPP manufacturer's recommendations.

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E. FINISH

- 1) The installed CIPP shall be continuous over the entire length of a pipe section and be free from visual defects such as foreign inclusions, dry spots, pinholes, major wrinkles and de-lamination. The lining shall be impervious and free of any leakage from the pipe to the surrounding ground or from the ground to inside the lined pipe.
- 2) Any defect, which will or could affect the structural integrity or strength of the linings, shall be repaired at the Contractor's expense, in accordance with the procedures submitted under Part 3, G. CIPP Repair/Replacement.
- 3) The beginning and end of the CIPP shall be sealed to the existing host pipe. The sealing material shall be compatible with the pipe end and shall provide a watertight seal.
- 4) If any of the lateral connection leak water between the host pipe and the installed liner, the connection at the host pipe interface shall be sealed to provide a water tight seal.
- 3) If the wall of the CIPP leaks, it shall be repaired or removed and replaced with a watertight liner in accordance with the CIPP manufacturer's recommendations.

F. MANHOLE AND LATERAL CONNECTIONS

- 1) A seal, consisting of a resin mixture or hydrophilic seal compatible with the installed CIPP shall be applied at manhole walls and at lateral connections in accordance with the CIPP manufacturer's recommendations.
- 2) The maximum a lateral can be plugged is 8 hours. Lateral connections may not remain plugged overnight.
- 3) Laterals shall be internally reinstated unless indicated otherwise in the contract documents.
- 4) Lateral reinstatement shall be made after the CIPP has been installed, fully cured, and cooled down. It is the Contractor's responsibility to make sure that all lateral connections are reinstated.
- 5) All existing and confirmed lateral connections shall be internally reinstated/re-opened to their original shape and capacity (minimum 95%) using a CCTV camera and remote cutting tool. Lateral connections shall not be cut more than 100% of the original shape or capacity.
- 6) In the event that lateral reinstatements result in openings that are greater than 100% of the original opening, the Contractor shall install a CIPP type repair, sufficiently in size, to repair the over-cut lateral opening, at no additional charge to the **COMMISSION**.

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- 7) The edges of the opening shall not have pipe fragments or liner fragments, which may obstruct flow or snag debris. All over-cut lateral connections will be properly repaired to meet the requirements of these specifications.
- 8) Pipe coupons resulting from lateral reinstatements shall be collected at the downstream manhole prior to leaving the site. At no time shall coupons be left in the gravity sanitary sewer system.

G. CIPP REPAIR/REPLACEMENT

- 1) Occasionally installation of will result in the need to repair or replace a defective CIPP. The Contractor shall outline specific repair or replacement procedures for potential defects that may occur in the installed CIPP. Repair/replacement procedures shall be accordance with the CIPP manufacturer's recommendations and shall be submitted as part of the PWS.
- 2) Defects in the installed CIPP that will not affect the operation and long term life of the product shall be identified and defined.
- 3) Repairable defects that may occur in the installed CIPP shall be specifically defined by the Contractor based on manufacturer's recommendations, including a detailed step-by-step repair procedure, resulting in a finished product meeting the requirements of these contract specifications.
- 4) Un-repairable defects that may occur to the CIPP shall be clearly defined by the Contractor based on the manufacturer's recommendations, including a recommended procedure for the removal and replacement of the CIPP.

PART 4 – FINAL COMPLETION

A. TESTING

- 1) The Contractor shall have an independent testing lab analyze finished liner regarding the ASTM standards for Tensile Properties, Flexural Modulus, Chemical Resistance and wall thickness (or as specified by the **COMMISSION**). Samples shall be taken from manhole cutoffs and lateral coupons.
- 2) A minimum of 1 sample shall be taken of the first segment installed at each location specified in the Contract Bid Documents.
- 3) A minimum of 2 samples shall be taken for each 2,500 linear feet of liner installed or for each manufacturing lot.
- 4) The laboratory results shall identify the test sample location as referenced to the nearest manhole and station.

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- 5) If properties tested do not meet minimum requirements, the liner shall be repaired or replaced by the Contractor, at no cost to the **COMMISSION**.
- 6) The installed liner thickness shall be measured for each line section installed. If the liner thickness does not meet these specifications then the liner shall be repaired or removed by the Contractor at no cost to the **COMMISSION**. The liner thickness shall have tolerance of minus 5% plus 10%. The Contractor may use industry proven, non-destructive methods for confirming the thickness of the installed liner.
- 7) The Contractor shall furnish removable sizing sleeves, when possible, to collect liner samples, which accurately replicate the hose pipe diameter.
- 8) All liner testing and repairs to the installed CIPP shall be completed before Final Completion and Final Payment to the Contractor.

B. INSPECTIONS

- 1) Contractor shall perform a post-video inspection of the lined pipe. The Contractor shall provide the **COMMISSION** a copy of the video in digital format for review and approval.
- 2) Immediately prior to conducting the post-video, the Contractor shall thoroughly clean the newly installed liner removing all debris and buildup that may have accumulated.
- 3) The post-video shall be after the installation of the CIPP and all laterals are reinstated.
- 4) The post-video will visual inspect the finished liner as follows:
 - a. Shall be continuous over the entire length of the installation and shall be free of significant visual defects, damage, deflection, holes, leaks and other defects.
 - a. Shall maintain the overall hydraulic capacity of the original pipe diameter. In those cases where full capacity cannot be achieved after liner installation, the Contractor shall submit a request to waive this requirement, together with the reasons for the waiver request. Calculated capacities may be derived using a commonly accepted roughness coefficient for the existing pipe material taking into consideration its age and condition.
- 2) The post-video shall be submitted to the **COMMISSION** within ten (10) working days of the liner installation. The data shall note the inspection date, location of all reconnected side sewers, debris, as well as any other defects in the liner, including, but not limited to, gouges, cracks, bumps, or bulges.

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- 3) If post installation inspection documentation is not submitted within Ten (10) working days of the liner installation, the **COMMISSION** may at its discretion suspend any further installation of CIPP until the post-installation documentation is submitted. As a result of this suspension, no additional working days will be added to the contract, nor will any adjustment be made for increase in cost.
- 4) Bypass pumping or plugging from the upstream manhole shall be utilized to minimize sewer from entering the pipe during the post-video inspection. In the case of bellies in the line, the pipe shall be cleared of any standing water to provide continuous visibility during the inspection.
- 5) Where leakage is observed through the wall of the pipe, the Contractor shall institute additional testing including but not limited to air testing, localized testing and any other testing that will verify the leak-proof integrity of the installed liner to the satisfaction of the **COMMISSION**.

C. AS-BUILTS

- 1) As-Built drawings/reports and pre & post inspection videos shall be submitted to the **COMMISSION** for review and approval for Final Completion contract date. As-Built drawings will include the identification of the work completed by the Contractor and shall be prepared on one set of Contract Drawings provide to the Contractor at the onset of the project.
- 2) As-Built drawings shall be kept on the project site at all times, shall include all necessary information as outlined in the PWS or as agreed to by the **COMMISSION** and the Contractor at the start of the Contract and shall be updated as the work is being completed, and shall be clearly legible.

D. WARRANTY

- 1) The Contractor shall provide necessary warranty and documentation of required experience per the Contract Bid Submittal Requirements and as specified herein.
- 2) The CIPP manufacturer shall warrant the liner to be free from defects in raw materials for a minimum of one (1) year, or as specified in the Contract Bid Submittal Requirements, from the date of installation and Final Completion by the **COMMISSION**.
- 3) The Contractor shall warrant the CIPP installation for a minimum of one (1) year, or as specified in the Contract Bid Submittal Requirements, from the date of installation and Final Completion by the **COMMISSION**.

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- 4) During the CIPP manufacturer and Contractor warranty period, any defect found that may materially affect the integrity, strength, function and/or operation of the pipe shall be repaired at the Contractor's expense in accordance with procedures included in Part 3, G. CIPP Repair/Replacement at no cost to the **COMMISSION**.
- 5) The **COMMISSION** may inspect all or portions of the lined pipe during the warranty period and if found that any of the liners have developed abnormalities since the time of Final Completion, the abnormalities shall be repaired and/or replaced as defined in Part 3, G. CIPP Repair/Replacement at no cost to the **COMMISSION**.

END OF SECTION