

## SPECIFICATIONS FOR PREMIER-PIPE GREEN CIPP SYSTEM

### 1. General Statement:

This specification is for the Cured in Place Pipe process (CIPP) of pipe rehabilitation using a needle woven polyester felt tube polyester glass reinforced tube and **a styrene free (NO HAZARDOUS AIR POLLUTANTS) resin system thereby reducing the impact on the environment.**

### 2. Referenced Standards, Specifications:

All referenced American Society for Testing and Materials (ASTM) standards and practices shall be the current version.

ASTM F1216 - Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin Impregnated Tube

ASTM F1743 - Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)

ASTM D790 - Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials

ASTM D2990 - Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics

ASTM D543 - Test Method for Resistance of Plastics to Chemical Reagents

If the specification and ASTM Standards disagree, the specification shall be considered as governing.

### 3. Contractor Qualifications:

3.1 The Contractor shall have a minimum of five (5) years experience in the installation of Cured- in-Place-Pipe products.

3.2 Within the previous five (5) years, the Contractor shall have successfully completed at least ten (10) projects of 800 linear feet or greater and at least 50,000 linear feet in total using similar rehabilitation technique.

3.3 The Contractor shall provide the name of the Owners of such projects and contact information upon request.

### 4. Submittals:

The following submittals are required:

4.1. Traffic Control/Staging Area plan consisting of a drawing of the surrounding area, the excavation locations, the pipe staging areas, and all devices used as traffic control.

4.2. The Rehabilitation technique to be used

4.2.1 Proposed materials of construction

4.2.2 Manufacturer's technical literature

4.2.3 Installation instructions

4.2.4 Test methods

4.2.5 Certifications for liner materials, resins, tube, cure method, etc.

4.3 All design calculations for the CIPP including liner thickness for the parameters specified in Section xxx.

4.4 Testing results from previous installations of the product proposed for this project.

4.5 Videos of the pipe being rehabilitation both prior to installation and post-installation

4.6 Installer qualifications

## 5. Materials

All materials shall be commercially available products from manufacturers acceptable to the Owner.

### 5.1 Tube Materials

5.1.1. Felt Tube: The tube material shall meet the requirements of ASTM F-1216 ( current version)

**5.1.2** The tube shall have a uniform thickness that when compressed at installation pressures will equal the specified tube thickness.

5.1.3 The Tube shall be sewn to a size that when installed will tightly fit the internal circumference and length of the original pipe. Allowance should be made for circumferential stretching during inversion. Overlapped layers of felt in longitudinal seams that cause lumps in the final product shall not be utilized. And or glass reinforced .

5.1.4 The outside layer of the tube (before wet out) shall be plastic coated with a translucent flexible material that clearly allows inspection of the resin impregnation (wet out) procedure. The plastic coating shall not delaminate after curing the Premier-Pipe CIPP.

5.1.5 The tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers. No material shall be included in the tube that may cause delamination in the cured Premier-Pipe CIPP.

5.1.6 The wall color of the interior pipe surface of the Premier-Pipe CIPP after installation shall be a light reflective color so that a clear detail examination with closed circuit television inspection equipment may be made..

5.1.7 Seams in the Tube shall be stronger than the non-seamed material.

5.1.8 The outside of the Tube shall be marked for distance at regular intervals along its entire length, not to exceed 5 ft. Such markings shall include the Manufacturers name or identifying symbol. The tubes must be manufactured in the USA.

### 5.2 Resin Materials

5.2.1 A corrosion resistant non-styrenated resin system shall be used, that, when properly cured within the tube composite, meets the requirements of ASTM F1216 and ASTM F1743, 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 the structural and chemical resistance requirements of this specification.

### 5.3 Product Storage and Handling

5.3.1. If the flexible tube is impregnated with resin at the wet out facility, it shall be transported, installed, and cured before expiration of the shelf life as defined by the manufacturer or CIPP process licensor.

5.3.2. Resin impregnated tube shall be stored and transported under refrigerated and/or ultraviolet light-free conditions as required by and according to manufacturer recommendations. Any liner damage in shipment shall be replaced as directed by the Engineer. Any liner showing a split or tear or has been mishandled shall be marked as rejected and removed at once from the work.

5.3.3. The tube shall be handled to avoid cuts, tears, or abrasions and in a manner to minimize deleterious stretching during all phases of the delivery and installation process. Special care shall be taken to roller convey, pull, lift, or pressurize the tubes to limit stretching and other potential deleterious effects as recommended by the manufacturer.

5.3.4. Any tubes removed from the host pipe prior to completing inversion and cure according to manufacturer or CIPP process licensor recommendations may be rejected for reuse at the sole discretion of the OWNER.

## 6. Cured-in-Place-Pipe Product Requirements

Unless otherwise specified, the Contractor shall furnish a CIPP system that provides cured physical strengths specified herein.

### 6.1 Design.

6.1.1 Detailed design calculations for all external loading conditions shall be submitted for review and approval. The CIPP shall be designed as per ASTM F1216, Appendix X1.3.1 for the Fully Deteriorated Pressure Pipe condition. These detailed calculations shall provide the input data as well as the actual calculations for Equations X1.1, X1.3, and X1.4 of Appendix X1. of the latest edition of ASTM F1216. The design submittal shall also clearly identify the physical properties used for design.

#### 6.1.2 Design requirements:

6.1.2.1 The Liner shall be designed in accordance with ASTM F1216 and the following requirements:

6.1.2.2 Ground water shall be actual depth or at least 5 feet below grade.

6.1.2.3 Soil density is equal to or greater than 120 pounds per cubic feet

6.1.2.4 Ovality shall be 2% unless video inspections indicate otherwise.

6.1.2.5 Live load shall be actual or a minimum of HS-20.

6.1.2.6 All pipes shall be considered fully deteriorated for design unless owner decides otherwise.

6.1.2.7 All calculations shall be submitted to the ENGINEER, for his information and be signed and sealed by a Professional Engineer in the State of the project location...

6.1.2.8 The net inside diameter of the reconstructed lined sewer shall be as large and smooth as possible to maintain the lined pipe's final capacity as close as possible to its original capacity.

6.1.3 The Contractor shall be fully responsible for the design of the CIPP (liner) and shall save and hold harmless the Owner and Engineer from any and all costs or damages directly or indirectly related to the structural design of the CIPP.

6.1.4 Prior to design and ordering of the liner, the internal dimensions of the existing sewer mains shall be verified to insure that the lining utilized will be of appropriate dimension.

## 6.2 Properties;

The physical properties used in the design submittal shall be clearly identified. These physical properties shall be the basis for the acceptance of submittals of field samples and the acceptance of the final product. At a minimum, the pipe lining shall have the following physical properties:

Property	Test Method	Value (psi)
Initial Flexural Modulus of Elasticity	ASTM D790	250,000
Initial Flexural Strength	ASTM D790	4500

\*Value is for design conditions @ 75°F (25°C)

6.3 Retention Factor - The retention factor for the design shall be a default value of 50% or a factor calculated from ASTM D2990 testing data.

## 7. Construction/Installation

### 7.1 General Requirements

7.1.1 All materials shall be installed in accordance with manufacturer's written instructions and recommendations.

7.1.2 All work shall be completed by workmen skilled in their trade.

## 7.2 Installation Responsibilities

7.2.1 It shall be the responsibility of the Contractor to field locate and designate all access points open and accessible for the work based on the contract drawings. The Contractor shall arrange for access to water hydrants for cleaning, inversion, and other work related items requiring water.

7.2.2 Bypassing Sewage –The contractor shall provide all sewage bypass required for the proper installation of liner.

## 7.3 PREPARATION

### 7.3.1 Cleaning and Inspection:

7.3.1.1 Cleaning of Pipeline – All internal debris shall be removed from the original pipeline. Pipeline shall be cleaned with hydraulically powered equipment, high velocity jet cleaners, or mechanically powered equipment (see NASSCO Recommended Specifications for Sewer Collection System Rehabilitation) as required for the CIPP lining operation.

7.3.1.2 Inspection of Pipelines – Inspection of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles, and service connections by closed-circuit television. The interior of the pipeline shall be carefully inspected to determine the location of any conditions that may prevent proper installation of the proposed pipe lining operation, such as protruding areas of, collapsed or crushed pipe, and reductions in the cross-sectional area. These conditions shall be noted and brought to the Engineer's attention immediately. The pre-installation video (copy) shall be turned over to the Engineer prior to pipe lining.

7.3.1.3 Line Obstructions – The original pipeline shall be clear of obstructions such as solids, dropped joints, protruding areas, crushed or collapsed pipe, and reductions in the cross-sectional area that will prevent the insertion of the liner system. If pre-installation inspection reveals an obstruction such as a dropped joint, or a collapse that will prevent the lining installation process, and that cannot be removed by conventional sewer cleaning or pipe or root cutting equipment, then the Contractor may be required to 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.

7.3.1.4 Excavations- All excavated materials are the property of the Owner unless otherwise stated in the Contract Plans or Specifications. In the event that excavated material is found to be 'contaminated', the owner shall assist in finding a suitable 'dump' site or remediation for the material. The Owner shall pay all costs associated with this activity. Proper trenching techniques and safety procedures shall be followed for all excavations.

7.3.1.5 Existing Dimensions: After cleaning, the Contractor shall measure the I.D. of the existing pipe at the two (2) locations. Prior to ordering of the liner, verify the internal dimensions of the existing sewer mains to insure that the lining utilized will be of appropriate dimension.

## 7.4 CIPP INSTALLATION

7.4.1 CIPP installation shall be by the pulled in place method or inversion by use of hydrostatic head or air pressure, followed by steam or hot water curing. CIPP installation shall be in accordance with ASTM F1216, Section 7, or ASTM F1743, Section 6, with the following modifications:

7.4.2 If the liner is pulled into place, a pre-liner tube shall be inserted to protect the resin from any wash out caused by dragging

### 7.4.3 Resin Impregnation

7.4.3.1 Resin Quantity The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the loss of resin through cracks and irregularities in the original pipe wall. A vacuum impregnation process or resin bath shall be used.

7.4.3.2 Vacuum impregnation process: To insure thorough resin saturation throughout the length of the felt tube, the point of vacuum shall be no further than 25 feet from the point of initial resin introduction.

7.4.3.2 After vacuum in the tube is established, a vacuum point shall be no further than 75 feet from the leading edge of the resin. The leading edge of the resin slug shall be as near to perpendicular as possible. A roller system shall be used to uniformly distribute the resin throughout the tube. If the Installer uses an alternate method of resin impregnation, the method must produce the same results. Any alternate resin impregnation method must be approved.

7.4.4 Temperature gauges shall be placed inside the existing pipe at the invert level of each end to monitor the temperatures during the cure cycle.

7.4.5 Curing shall be accomplished by utilizing hot water or steam under pressure in accordance with the manufacturer's recommended cure schedule.

## 8. Quality Assurance/Quality Control

### 8.1 Testing

8.1.1 CIPP samples shall be prepared and physical properties tested in accordance with ASTM F1216 or ASTM F1743, Section 8. The flexural properties must meet or exceed the values listed in Table 1 of the applicable ASTM and the values used for design.

8.1.2 Thickness of samples shall be determined as described in paragraph 8.1.6 of ASTM F1743. The minimum wall thickness at any point shall not be less than 87½% of the design thickness as calculated in Section 2.04, Structural Requirements.

## 8.2 Inspection

8.2.1 Visual inspection of the CIPP shall be in accordance with ASTM F1743, section 8.6. Two (2) sets of post installation videos labeled and audio keyed to the contract drawings and associated logs shall be submitted to the Owner **within 24 hours of the inspection.**

## 9. CLEAN-UP

9.1 Upon acceptance of the installation work, the Contractor shall restore the project area affected by the operations to a condition at least equal to that existing prior to the work in accordance with the Site Restoration section of this specification.

## 10. Warranty

10.1 The finished liner shall be warranted against defects in material and installation for a period of 1 year from the date of completion of the installation. The Contractor shall be responsible to repair all installation defects, for the one year warranty period. The Contractor shall be responsible to cover all costs, including materials and labor, associated with these repairs.