

## **SPECIFICATIONS FOR PREMIER-PIPE USA CURED-IN-PLACE-PIPE LINER ULTRAVIOLET LIGHT CURED CIPP**

### 1. General Statement:

This specification is for the Cured in Place Pipe process (CIPP) of pipe rehabilitation using a glass fiber reinforced felt tube and resin system, cured by Ultraviolet light system (UV).

### 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 F2019 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Resin Pipe (CIPP)

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

ASTM D578 - Standard Specification Glass Fiber Strands

ASTM D638 - Standard Test Method for Tensile Properties of Plastics

### 2. Contractor Qualifications:

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

2.2 Within the previous five (5) years, the Contractor shall have successfully completed at least 10,000 linear feet in total using the selected rehabilitation technique.

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

### 3. Submittals:

The following submittals are required:

3.1. 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.

3.2. The Rehabilitation technique to be used

3.2.1 Proposed materials of construction

3.2.2 Manufacturer's technical literature

3.2.3 Installation instructions

3.2.4 Test methods

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

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

3.4 Third party testing results from previous installations of the product proposed for this project.

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

3.6 Installer qualifications

#### 4. Materials

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

##### 4.1 Tube Materials:

4.1.1 The Liner shall be constructed to withstand installation pressures as required by the Manufacturer's recommendations.

4.1.2 Glass fiber material shall be of chemically resistant EC-R Glass.

4.1.3 The Liner wall thickness shall be manufactured to the nearest 1mm increment.

4.1.4 The Liner should be manufactured to expand sufficiently but not greater than 10% achieving a tight fit against the host pipe. The liner should have sufficient strength to bridge missing pipe sections or with the use a fabric restraint sleeve.

4.1.5 Inner and outer foil shall be used to protect and contain the resin and shall be styrene resistant.

4.1.6 The glass fiber liner shall be cured with UV light sources at a constant inner pressure.

##### 4.2 Resin Materials

4.2.1 All Resin must be able to cure by Ultraviolet light

4.2.2 A corrosion resistant vinyl ester resin system may 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 a CIPP which will comply with the structural and chemical resistance requirements of this specification.

4.2.3 A corrosion resistant polyester resin system may 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. Light system:

5.1 When inserting the curing equipment in the liner, care should be taken to not damage the inner film material.

5.2 Approved UV light systems shall have the ability to record specific parameters during the curing process to ensure the liner is properly cured.

**5.3 The recording parameters will include:**

- Project name
- Line section
- Date and time
- Curing speed
- Light source working & wattage
- Inner air pressure
- Inner temperatures
- Length of liner

**INITIAL MINIMUM PHYSICAL PROPERTIES**

- Flexural Modulus (minimum) 725,000 psi
- Flexural Strength (minimum) 6,500 psi
- Tensile Strength (minimum) 9,000 psi

**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

6.1.2.7 All calculations shall be submitted to the ENGINEER, in duplicate, 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	725,000
Initial Flexural Strength	ASTM D790	6500

\*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, CCTV inspected and recorded ensuring the host pipe is free of debris and stable enough to line.

## 7.4 CIPP INSTALLATION

**7.4.1 Gliding Foil** – A continuous heavy gauge (10mm) plastic sheet shall be pulled into place the entire length of host pipe, covering 1/3 – 1/2 the diameter of lower portion of the host pipe, protecting liner during the pull in process.

**7.4.2 Liner Installation** – Liner shall be securely attached to winch and pulled into place taking care not to exceed pulling forces as stated in manufacturer’s installation protocol.

**7.4.3 Liner Inflation** – Liner shall be inflated per manufactures inflation process. Once inflated to working pressures the liner shall fit tightly against the host pipe.

**7.4.4. Pre-Curing Inspection** – Once working inflation pressures are reached the liner shall be inspected by integrated CCTV on light assembly checking for proper fit and expansion of the liner.

## 7.5 Curing Process

**7.5.1 Curing Speeds** – Initial curing speeds will start off at a sufficient speed to ensure the first 15’ of liner is cured properly, ramping up to working speed to properly cure the remainder of liner per manufacturer’s protocol. The same process will be adhered to during the last 15’ of liner.

**7.5.2 Integrated camera** – The integrated CCTV camera on the light assembly will inspect post curing operations, fit of liner and any problems that may occur during the curing process.

## 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. Product Storage and Handling

9.1. 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.

9.2 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.

9.3 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.

9.4. 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.

## 10. CLEAN-UP

10.1 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.

## 11. Warranty

11.1 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.