

UV CIPP  
Specification

***StreamLiner*** UV

Designed for municipal engineers and project managers for the inclusion of all ultra violet light cured fiberglass lining products within a CIPP specification

## **Project**

The Contractor shall rehabilitate the structurally and/or functionally deteriorated sanitary sewer and/or storm water pipelines using the trenchless method of cured-in-place pipe (CIPP) by ultraviolet light cure in accordance with these Specifications.

The CIPP material shall consist of a resin-impregnated fiberglass material tube ("Liner") which when cured shall extend the full length of the original pipe and provide a structurally sound, smooth, jointless and watertight pipe.

## **Reference Specifications, Codes, and Standards**

The following documents form a part of this specification to the extent stated herein.

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 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 the Pull in and inflate and Curing of a Resin-Impregnated Tube.

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.

ASTM D790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

ASTM D2122 Standard 1 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

ASTM D3567 Standard Practice for Determining Dimensions of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings

ASTM D5813 Standard Specification for Cured-in Place Thermosetting Resin Sewer Pipe

## **Contractor Qualifications**

The Contractor shall demonstrate that a minimum of 50,000 ft, has been successfully performed by the Contractor's job Superintendent, who shall be assigned full time to this Project. The proposed CIPP Rehabilitation process shall be proven technology, which is defined as a minimum of 100,000 linear feet of successful sanitary sewer and/or storm water collection system installations in the U.S., documented to the satisfaction of the Owner.

## **Contractor Submittals**

A. The Contractor shall submit, prior to the installation or use of any lining materials or equipment, certified test results from the manufacturers which indicate that all materials conform to the applicable requirements.

B. Chemical resistance submittals – The Contractor shall submit test results of the resin proposed that meet the chemical resistance requirements of ASTM F2019, Section 5.2.6. The chemical resistance tests will be completed in accordance with Test Method D543.

C. CIPP Field Samples –Field sampling procedure shall be in accordance with ASTM 2019 and in accordance with ASTM D5813.

D. MSDS Sheets – The Contractor shall submit Material Safety Data Sheets for all resins, and other additives such as accelerants, colorants, and lubricants utilized in the pipe liner/lining process.

E. Manufacturer Protocols - The Contractor shall submit manufacturer information that describes the materials, curing speeds, curing installation processes, installation pressures, temperature limitations, and recommended post curing documentation.

F. Residential Informational Handout - The Contractor shall submit an informational hand out that describes the materials, processes, installation, pressures, temperature limitations, and odors associated with the lining process that shall be provided at the request of concerned residents.

## **Materials**

Neither the CIPP product, nor its installation, shall cause adverse effects to any of the City 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 City and identify any by products produced as a result of the operations, shall test and monitor the levels, and shall comply with any and all local waste discharge requirements.

### ***Product Storage and Handling***

All materials shall be accompanied by test reports certifying that the material conforms to the ASTM standards listed herein. Materials shall be shipped, stored, and handled in a manner consistent with written recommendations of the manufacturer. All damaged materials rejected by the Engineer shall be promptly removed from the project site at the Contractor's expense and disposed of in accordance with current applicable regulations.

### ***Liner***

The fiberglass within the Liner shall be non corrosion (E-CR Glass) material and shall be free from tears, holes, cuts, foreign materials and other surface defects. Its glass fibers must extend in a longitudinal direction to insure no longitudinal stretching during the pull-in process.

1. The Liner shall be constructed to withstand installation pressures as required by Manufacturer's recommendations.
2. The Liner shall be manufactured to a size that when installed will tightly fit the internal circumference and the length of the original pipe. The tube be able to stretch to fit irregular pipe sections and negotiate bends of up to 20 degrees and shall have sufficient strength to bridge missing pipe sections, with the use of a canvas sleeve if necessary.
3. Interior and exterior plastics shall be styrene resistant to protect and contain the resin used in the Liner.
4. The exterior plastic shall be ultra violet light resistant and translucent to allow visual inspection of the impregnation of the resin within the glass fibers.
5. 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 CCTV inspection may be made.
6. The nominal Liner wall thickness shall be constructed to the nearest 0.5mm increment

### ***Resin***

The resin used to impregnate the Liner shall produce a cured liner pipe resistant to shrinkage, corrosion, abrasion and shall have a proven resistance to municipal wastewater.

1. The resin shall be a chemically resistant UV cured isophthalic polyester resin or vinyl ester resin (as determined by the Engineer). When cured the resin/Liner system shall meet the structural and chemical resistance requirements of ASTM F2019.

### **CIPP Structural Requirements**

1. The thickness of each Liner installed shall be determined using calculation methods that are consistent with applicable ASTMs. The Contractor shall submit stamped and signed designs prior to the installation of any Liner. The designs shall include a step by step calculation that shows all equations, defines all variables, lists all assumptions, and clearly indicates all values used for the design.
2. The design engineer shall set the long term (50 year extrapolated) Creep Retention Factor at 50% of the initial design flexural modulus as determined by ASTM D790 test method.
3. The cured in place pipe material (CIPP) shall conform to the structural properties as listed below.

#### **MINIMUM PHYSICAL PROPERTIES**

Wall Thickness: ASTM D2122 per ASTM F2019  
Flexural Modulus of Elasticity ASTM D-790  
(short term): 725,000 psi

Flexural Strength ASTM D-790: 6,500 psi

4. The required structural CIPP wall thickness shall be based as a minimum on the physical properties indicated above, the Design Equations in the appendix of ASTM F1216, and the following design parameters:

Design Safety Factor 2.0  
Creep Retention Factor 60% (UV fiberglass liners typically tests at >65%)  
Ovality 2%  
Modulus of passive soil reaction \_\_\_\_\_ psi  
Groundwater Depth Assume at surface \_\_\_\_\_  
Soil Depth (above the crown) See Plan Set \_\_\_\_\_  
Poisson's ratio of 0.3  
Live Load H-20 (Highway Loading)  
Soil Load  
\_\_\_\_\_ lb/cu. Ft.  
Pipe Condition Fully Deteriorated  
Minimum service life 50 years

## Construction Requirements

### *Preparatory Work*

1. The Contractor shall verify the lengths of pipe to be relined and the inside diameters
2. The fabric tube shall be fully impregnated with resin (wet-out). The impregnation equipment shall contain devices to secure a proper distribution of the resin. Following the impregnation, the fabric tube shall be exposed to a resin thickening procedure. Certification documentation concerning date, type of resin (manufacturer, trade name and lot number), resin calculation, and volume of resin used shall be attached to the impregnated fabric tube.

### **Pipe Liner Installation**

The CIPP Liner shall be installed in the host pipe per the manufacturer's specifications as submitted in these Specifications.

CIPP installation shall be in accordance with applicable ASTM F2019, Section 6.4, and the following:

1. Final Cleaning and Inspection -- The existing host pipe shall be cleaned just prior to insertion of the Liner. A maximum of **one hour** may elapse between this final cleaning/flushing pass and the insertion of the Liner. After the cleaning is complete, a recorded video inspection shall be made to verify the cleanliness of the line, shall be available to the Engineer upon request.
2. Liner protection – Prior to inserting the Liner, a plastic sheet 10 mil thick will be pulled into the host pipe to protect the Liner from damage as the Liner is pulled in.

3. Liner Insertion – The Liner shall be pulled-in through an existing manhole or approved access point and fully extend to the next designated manhole or termination point. The pulling speed shall not exceed 15 ft/min. Care shall be exercised not to damage the tube during the pulling phase.

4. Liner Inflation – The Liner shall then be inflated with air with sufficient pressure to hold the Liner tight to the host pipe wall.

5. Liner Inspection – The Contractor will video record the Liner prior to commencement of the curing process, and make the recording available to the Engineer upon request.

### **Curing for Ultraviolet Light**

CIPP curing shall be in accordance with applicable ASTM F2019, Section 6.6 and 6.7, with the following modifications:

1. The ultraviolet curing lamps shall operate in a sufficient frequency range to insure the curing of the resin.

2. A camera must be located on the ultraviolet light assembly to enable the video inspection of the Liner and to insure that the Liner has been properly inflated and any liner problems can be identified before curing begins.

3. The Contractor will submit a documented record of time, rate of travel of the ultraviolet light assembly, and internal temperatures and pressures during the curing process to the Engineer upon request.

### **Finished Pipe Liner**

1. The cured Liner shall be continuous over the entire length of an installation run and be free of material defects. 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, strength, capacity, or future maintenance of the installed Liner, shall be repaired at the Contractor's expense, in a manner approved by the Engineer.

3. Both ends of the cured Liner shall be cut flush at the inlet and outlet points in the manhole, and sealed with an epoxy or resin mixture compatible with the Liner/resin system, providing a watertight seal. Sealing material and installation method shall be submitted and approved by the Engineer prior to start of construction. Hydraulic cements and quick-set cement products are not acceptable.

### **Internal Reinstatement of Side Sewers**

After the Liner has been properly cured, the Contractor shall internally reinstate the existing side sewer laterals. Internal reinstatement of laterals shall be performed by a qualified individual with experience in successful internal lateral cuttings. The cutting device shall produce a neat, clean and smooth opening of at least 95% of the existing side sewer lateral circumference.

## **Lateral Seals**

Because there is negligible shrinkage of UV fiberglass liners after curing, and because the liners are of such strength that roots are not able to affect them, no lateral seals are required to be made except when there is damage to the lateral itself. Only those laterals identified by the Engineer as defective and needing seals will be sealed by the contractor.

## **Final Acceptance**

1. The Contractor shall perform a CCTV inspection in accordance with ASTM F2019, section 7.3 after installation of the CIPP Liner and reconnection of the active side sewer laterals. The quality of the post-installation CCTV inspection shall be held to the same standards as the pre-installation CCTV inspection.

2. The Contractor shall submit to the Engineer, for acceptance and approval, two (2) copies of unedited post-installation CD/DVDs and associated curing reports for each sewer main segment within 10 working days of the Liner installation. No more than one sewer main segment shall be included on a post-installation Inspection CD/DVD or curing report.

## **Sampling and Laboratory Testing**

The physical properties of the installed CIPP Liner shall meet the minimum physical properties per Section \_\_\_\_ above, verified through field sampling and laboratory testing.

Per Section 8 of ASTM F1216 and ASTM F1743, the Contractor shall obtain samples from all actual installed CIPP Liners. All samples shall be labeled with the following:

Date of installation

Main segment number

## **Warranty**

The Contractor shall provide the City a non pro-rated, full labor and materials warranty to be in force and effect for a period of one (1) years from the date of physical completion of the project. The warranty shall cause the Contractor to repair or replace the Liner should failures or damage result from faulty material or installation.

Extended warranties shall be considered for portions of the project that have not met the requirements of the contract or are defective or have been repaired.

## **END OF SECTION**