

SECTION **XXXXXX**

REHABILITATION OF SEWERS BY CURED-IN-PLACE PIPE (CIPP) METHODS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cleaning and flushing existing sanitary/storm sewers.
2. Television inspection of existing sewers.
3. Inserting liner into existing sewers.
4. Television inspection of post-construction, rehabilitated sewers.

1.2 REFERENCES

A. ASTM International:

1. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum ^[1]_[SEP] Impact Resistance Notched Specimens of Plastics.
2. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
3. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced ^[1]_[SEP] and Reinforced Plastics and Electrical Insulating Materials.
4. ASTM D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis ^[1]_[SEP] for Thermoplastic Pipe Materials.
5. ASTM F1216 – Rehabilitation of pipelines by the inversion and curing of a resin- ^[1]_[SEP] impregnated tube.
6. ASTM F1743 – Rehabilitation of pipelines by pulled-in-place

- installation of a [L]
[SEP]cured-in-place thermosetting resin pipe.
7. ASTM F2019 – Rehabilitation of existing pipelines and conduits by the pull in [L]
[SEP]place installation of glass reinforced plastic (GRP) cured-in-place thermosetting resin pipe.

1.3 DESIGN REQUIREMENTS

- A. Design lining material to have sufficient structural strength to support loads, live loads and groundwater load imposed assuming existing pipe cannot share loading or contribute to structural integrity of liner.
- B. Design lining material to support reasonable anticipated settlement and movement in aerial and elevated pipe segments without jeopardizing the structural integrity or uniformity of the liner.
- C. Design liner to least possible thickness, but in no instance shall the **finished thickness** be less than 4.5mm for 6” pipe and no less than 6 mm for 8” and larger pipe, to minimize decreasing of inside pipe diameter.
- D. Design liner material to provide jointless and continuous structurally sound construction able to withstand imposed static, dynamic and hydrostatic loads on long term basis.
- E. Identify design provisions for shrinkage control to prevent future misalignment of service reconnections. [L]
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1.4 PERFORMANCE REQUIREMENTS

- A. Perform relining and internally reestablish service connections (if applicable) without need for excavation while minimizing disruptions to adjacent occupied buildings and traffic

1.5 SUBMITTALS

- A. Shop Drawings: Indicate liner dimensional information for

each pipe size to be relined.

- B. Product Data: Submit manufacturer's information on liner material, curing chemicals, and lubricants.
- C. Samples: Submit sample of liner material in uncured and cured state.
- D. Design Data: Submit two copies of liner thickness and design calculations
- E. Test Reports: Submit reports certifying liner material meets ASTM testing standards listed in this section.
- F. Manufacturer's Installation Instructions:^[1]1. Submit detailed description of liner placement and curing procedures for piping. 2. Include description of procedures for internally reestablishing service ^[2]connections.^[3]3. Submit manufacturer's requirements for receiving, handling, and storage of ^[4]materials.
- G. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.6 CLOSEOUT SUBMITTALS

- A. Section 01700 - Execution Requirements.
- B. Project Record Documents: Record actual locations of each service connection (if applicable).

1.7 QUALIFICATIONS AND PRE-APPROVAL

Manufacturers and installers have been pre-approved for this project, and others will be considered. To be considered as an equal, manufacturers and installers must be formally approved by addendum, prior to bid. All pre-approval requests must be submitted at least 10-days prior to bid. The engineer will have sole discretion in determining whether a manufacturer or installer is to be approved on

this project, based upon documentation submitted as required below and communication with references.

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum five years documented experience. Manufacturer shall provide evidence of a minimum of 500,000 linear feet of documented successful installations in sanitary sewer systems and a minimum of 2,000 documented, successful manhole-to-manhole line sections in sanitary or storm sewer systems. Of this experience, qualifications must indicate the successful completion of a minimum of 100,000 linear feet of documented successful installations in sanitary or storm sewer systems with pipe diameters 12” and larger.

Pre-Approved Manufacturers:

- I. Applied Felts

- II. Liner Product, LLC

- B. Installer: Installer shall have a minimum of 150,000 linear feet of documented successful installations of full main cured-in-place pipe. Installer shall own/operate their own Wet-Out facility, open to inspection by the engineer/owner at any time.

Pre-Approved Installers:

- I. Gulf Coast Underground, LLC

- II. Spiniello Companies

Installers seeking pre-approval shall submit the following information 10 days prior to bid:

- 1. References for all cured-in-place pipe installations completed within the last 24 months. For each

reference, include at a minimum the Project Name, Location, Length of Segments Lined, Diameter of Segments Lined, Dollar Value of Contract, Customer's Name and Contact Information.

2. A list of all equipment available for CIPP Installations.

3. Installer's written installation procedures and safety plan.

4. A signed affidavit by the owner of the installation company stating that all of the information furnished is complete and correct.

1.8 PRE-INSTALLATION MEETINGS

A. Convene minimum one week prior to commencing work of this section to review pre- rehabilitation video.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Receive, store, and protect liner materials.

1.10 FIELD MEASUREMENTS

A. Verify field measurements of pipes prior to design, fabrication, and delivering of liner material.

1.11 COORDINATION

- A. Section 01300 - Administrative Requirements.
- B. Coordinate work with users connected to system.
- C. Notify home owners and businesses at least twenty-four hours in advance of expected disruption of sanitary service.
- D. Limit disruption of service to individual properties to no later than

same day on which product is installed.

- E. Provide and maintain temporary facilities including piping and pumps to meet requirements.
- F. Owner will supply water for the work described within this section at no charge. Water must be metered and connection provided with suitable backflow protection. Contractor must provide transmission to site. Coordinate the use of the nearest feasible fire hydrant with the Owner.

PART 2 PRODUCTS

2.1 CURED-IN-PLACE (CIPP) LINER

A. Pre-Approved Manufacturers: Other products will be considered, but must be pre-approved. Pre-approval requests must be made a minimum of 10-days prior to bid (See section 1.7)

B. Materials:

1. Tube consisting of one or more layers of absorbent non-woven felt fabric or glass ^{[[i]]}~~SEP~~ reinforced plastic. It shall not be possible to separate the tube layers. The application of the resin to the felt tubing or fiberglass layers shall be conducted under factory conditions and the materials shall be fully protected against UV Light degradation, excessive heat and contamination at all times.
2. Furnish product material in accordance with ASTM F1216, ASTM F1743 and ASTM F2019.
3. Liner effective length to match length of piping to be lined as determined by the Contractor to effectively carry out the rehabilitation and extend into the adjoining manhole structures. The Contractor shall be responsible for field verifying all liner lengths prior to liner fabrication. Each liner shall contain an end section which shall be bonded to each end of the host pipe to prevent leakage from the liner

and host pipe.

4. Furnish wet-out tube with uniform thickness that when compressed at installation pressures will meet or exceed design thickness.

5. Furnish tube of sufficient size to provide tight fit to existing pipe. Allowances shall be made for longitudinal and circumferential expansion. All dimensions shall be verified by the Contractor prior to fabrication.

6. Furnish resin system consisting of corrosion resistant polyester, vinyl ester, or epoxy. Recycled resins will not be allowed.

7. Chemical and Physical Testing: Test samples in accordance with ASTM D790. Comply with minimum property values shown below with applicable ASTM requirements.

Property	ASTM Method	Test Value
Flexural Modulus	D790	250,000 psi
Flexural Strength	D790	4,500 psi
Longitudinal Flexural Modulus	D2990	150,000 psi

8. Liner Thickness: All liner thickness calculations shall be submitted in accordance with provisions made in this Specification. The thickness design shall be in accordance with ASTM D2412 and F1216. Calculations shall be based on fully deteriorated gravity pipe values. Liner thickness calculations shall comply with, at a minimum, the following design constraints and the following considerations shall be made:

a. Minimum Factor of Safety = $2.0^{\text{[SEP]}}$

- b. Service Temperature = 33 to 150 degrees F
- c. Groundwater Elevation = At Surface^[L]_{SEP}
- d. Minimum Liner Finished Thickness = 4.5mm for 6” pipe and 6 mm for 8” and larger
- e. Maximum Long Term Deflection = 5%^[L]_{SEP}
- f. Long term flexural modulus shall be estimated as one-half of the lowest short term flexural modulus dictated by ASTM^[L]_{SEP}
- g. Liner thickness shall be the maximum of that dictated by bending, deflection, buckling, and stiffness calculations.
- h. Soil Characteristics
 1. Unit Weight = 120 pcf^[L]_{SEP}
 2. Modulus of Elasticity = 1,000 psi
 3. Coefficient of Friction = 0.130r

2.2 SOURCE QUALITY CONTROL

A. Inspect each lot of liner for defects. Verify liner is homogeneous throughout, uniform in color, free of cracks, holes, foreign materials, blisters or deleterious faults.

B. Marking:

1. For testing purposes, mark each production lot with identical marking number.

2. Mark liner at 5' intervals or less with coded number identifying manufacturer, ^[L]_{SEP}size, material, date and shift when liner was manufactured.

3. At end of production shift, change marking code to indicate where new ^[L]_{SEP}production shift started.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify location of piping to be relined.

3.2 CLEANING AND FLUSHING

- A. Clean existing sewer pipes of debris, sedimentation and mineral deposits with high velocity cleaner, bucket and scraper, root saws, rolling or balling units. All cleaning and flushing must be in accordance with liner manufacturer's requirements. Any protruding taps, roots, and any and all other obstructions not removed during the pre-installation television inspection shall be removed and surfaces cleaned as required by the lining manufacturer to avoid liner puncture.

3.3 INITIAL VIDEO INSPECTION AND REPAIR

- A. Conduct closed-circuit video inspection
- B. Determine condition of existing piping, degree of offset of joints, crushed walls, and obstructions.
- C. Determine and document in writing sizes and locations of service entrances and service connections.
- D. Clear obstructions, service piping protrusions, roots, and other materials from existing pipe to ensure inserted pipe liner contacts only existing pipe wall. [SEP]

3.4 BYPASSING SEWAGE

- A. Set up bypassing pump system to isolate each section of piping if required.

3.5 POINT REPAIRS

- A. When and where indicated by the video inspection, point repairs shall be completed, as necessary, in order to enable lining. All point repairs shall be approved by the Engineer prior to construction.

- B. Point repairs shall be completed if required
- C. Point repairs completed to correct pre-existing conditions shall be paid for at the unit bid price as detailed.

3.6 INSTALLATION – CURED-IN-PLACE PIPE (CIPP) LINER FOR MAINLINE

- A. Install liner in accordance with ASTM F1216, ASTM F1743, ASTM 2019 and manufacturer's instructions.
- B. Pull or invert liner through existing pipe through access points or using existing manholes. Take care not to damage deformed pipe during installation. Use appropriate sleeves and rollers to protect liner.
- C. Liner Curing:
 - 1. Use steam or circulated hot water to cure liner. Ensure temperatures inside liner pipe are sufficient to effect resin curing and are within manufacturers instructions. Monitor temperature for entire curing period.
- D. Cool-down:
 - 1. Cool cured pipe in accordance with manufacturer's recommendations.
- E. Finish:
 - 1. Install finished lining continuous over entire length of piping free of visual ^{SEP}defects including foreign inclusions, pinholes and delamination. Confirm lining is impervious and free of leakage from pipe to surrounding ground or from ground to inside lined pipe.
 - 2. Repair defects affecting integrity or strength of lining.

3.7 FIELD QUALITY CONTROL

- A. When liner fails to meet installation requirements, remove failed

liner and install new liner.

B. Conduct closed-circuit video inspection of completed rehabilitation work.

C. No infiltration of groundwater is permitted. No visual defects including foreign inclusions, dry spots, pinholes, cracks or delamination are allowed.

D. Confirm service connections are complete and are unobstructed.

E. Submit summary report of final inspection with copy of video documentation.

3.8 CLEANING

A. Remove debris resulting from work and unused materials from site and legally dispose.

END OF SECTION