

ADDENDUM No. 01

Issued: March 4, 2024

Orchard Drive Sanitary Lining

City of Northville

OHM Job No.: 0152-24-0010

The following changes, additions, and/or clarifications to the Contract Documents shall be incorporated in the Contract Documents. This addendum will be included in its entirety in the final, executed version of the Contract Book.

The Bidder shall acknowledge receipt of this addendum on Bid Form Page 1 of their submitted offer.

The following items comprise this Addendum:

Addendum No. 2 – 1 page

33 01 30 Cured In Place Pipe Lining – 8 pages

33 01 30 CURED IN PLACE PIPE LINING

1. Replace Section 3.01.G.4 with the following:

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 two (2) 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.

QUESTIONS AND ANSWERS

1. Q. The Maintenance and Guarantee Bond is shown as for two years, while the CIPP specification calls for a one year warranty. Which controls?

A. The Maintenance and Guarantee Bond controls.

End of Addendum No. 02

SECTION 33 01 30 – CURED-IN-PLACE PIPE (CIPP) LINING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

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

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

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

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

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 (CIPP).

ASTM D543 Standard Practices 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 D2122 Standard 1 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

ASTM D5813 Standard Specification for Cured-in Place Thermosetting Resin Sewer Piping Systems.

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

1.04 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 collection system installations in the U.S., documented to the satisfaction of the Owner.

1.05 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 CIPP shall meet the chemical resistance requirements of ASTM F1216, Appendix X2. CIPP samples for testing shall consist of a tube and resin system similar to the materials that were used for actual construction.
- C. CIPP Field Samples - Field sampling procedure shall be in accordance with ASTM F1216 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 handout 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.

PART 2 - PRODUCTS

2.01 MATERIALS

1. 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.

2.02 PRODUCT STORAGE AND HANDLING

1. 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.

2.03 LINER

The liner shall be free from tears, holes, cuts, foreign materials and other surface defects.

The sewn liner shall consist of one or more layers of absorbent non-woven felt fabric and meet the requirements of ASTM F1216 or ASTM F1743, Section 5.1.

1. The liner shall be constructed to withstand installation pressures as required by Manufacturer's recommendations and have sufficient strength to bridge missing pipe, negotiate bends, and stretch to fit irregular pipe sections.
2. The liner shall have a uniform thickness so that it will meet or exceed the design thickness when compressed at installation pressures. The nominal liner wall thickness shall be constructed to the nearest 0.5mm increment.

3. The liner shall be manufactured to a size that when installed will tightly fit the internal circumference and the 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 allowed. Seams in the liner shall be stronger than the non-seamed felt. The liner shall 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.
4. The outside layer of the tube (before wet out) shall be coated with an impermeable, flexible membrane that will contain the resin and facilitate monitoring of resin saturation during the resin impregnation (wet out) procedure.
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 tube shall be homogeneous across the entire wall thickness and shall contain no intermediate or encapsulated elastomeric layers. No material shall be included in the tube that may cause delamination in the cured CIPP. No dry or unsaturated layers shall be evident.
7. The outside of the tube shall be marked for distance at regular intervals along its entire length, not to exceed 25 ft. Such markings shall include the manufacturer's name or identifying symbol. The tubes must be manufactured in the USA.

2.04 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. The resin shall be either of the following:

1. A general purpose, unsaturated, styrene based, thermoset resin and catalyst system or an epoxy resin and hardener, or a thermoset polyurethane that is compatible with the inversion process being used. The resin shall meet the requirements of ASTM F1216 and must be able to cure in the presence of water with the initiation temperature for cure being less than 180° F (82.2° C). The resin shall produce CIPP which will comply with the structural and chemical resistance requirements of this specification.

2.05 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.

Table CIPP-1

Cast-In-Place Pipe

Property	Test Method	Minimum Value
Flexural Strength	ASTM D790	4,500 psi
Flexural Modulus of Elasticity	ASTM D790	250,000 psi
Tensile Strength (Gravity Pipe)	ASTM D638	2,500 psi
Tensile Strength (Pressure Pipe)	ASTM D638	3,000 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 50%
Ovality 2%
Soil Depth (above the crown) Varies
Poisson's ratio of 0.3
Live Load H-20 (Highway Loading)
Soil Load 135 lb/cu. Ft.
Pipe Condition Fully Deteriorated
Minimum service life 50 years

PART 3 - EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. Preparatory Work

1. The Contractor shall verify the lengths of pipe to be relined and the inside diameters
2. Sewer Cleaning
 1. Prior to lining work, the Contractor shall clean the existing sewer including flushing, debris removal, root cutting, deposit cutting, and grinding protruding break-in service connections.
 2. The sewers shall be cleaned by using a high pressure water cleaning machine. A high pressure hose with a jet nozzle shall be introduced into the sewer so that a spray shall scour and clean the sewer line without applying internal pressure and damaging the pipe. The hose shall be self-propelled by a minimum water pressure of 1,000 psi. The jet nozzle hose, upon withdrawal, will scour the pipe, flushing light materials down the line and depositing heavy materials in the downstream manhole for removal. All debris shall be completely removed from the sewer and disposed of by the Contractor at his expense.
3.
 1. The Contractor shall furnish suitable power machinery which shall be used to remove tree roots, and deposits remaining after jet cleaning.
 4. 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.

B. 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 F1216, Section 7, 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.

C. Curing by Heated Water or Steam

Installation of CIPP shall be in accordance with the current versions of ASTM F1216 section 7 or ASTM F1743 section 6 with the following modifications:

1. Resin Impregnation

The tube should be vacuum-impregnated with resin (wet-out) under controlled conditions. The volume of resin used shall be sufficient to fill all voids in the tube material at nominal thickness and diameter. The volume shall be adjusted by adding 5-10% excess resin to allow for the change in resin volume due to polymerization and to allow for any migration of resin into the cracks and joints in the original pipe. The quantities of the liquid thermosetting materials shall be per manufacturer's standards to provide the wall thickness specified. 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.

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 Contractor uses an alternate method of resin impregnation, the method must produce the same results. Any alternate resin impregnation method must be proven.

2. Tube Inversion

The wet out tube shall be positioned in the pipeline using either inversion or a mechanical pull-in method. Inversion may be accomplished by using hydrostatic head or by air pressure. If pulled into place, a power winch should be utilized and care should be exercised not to damage the tube as a result of pull-in friction. The tube should be inverted or pulled-in through an existing manhole or approved access point and fully extend to the next designated manhole or termination point.

The hydrostatic head or air pressure should be adjusted to cause the impregnated tube to invert from the point of inversion to the point of termination. The hydrostatic head or air pressure should turn the tube inside out and hold the tube tight to the wall while producing dimples at lateral connections. Care shall be taken to avoid overstressing the fabric. The tube manufacturer shall provide information on the maximum allowable

tensile stress for the tube. This information shall also indicate what the minimum required pressure is to hold the tube tight against the existing sewer or main as well as what the maximum allowable pressure is so as not to damage the tube. Once the inversion has started the pressure shall be maintained between the minimum and maximum pressures until the inversion has been completed. If the pressure range is not maintained, the tube shall be removed from the sewer.

3. Lubricant

A lubricant may be used to reduce friction during inversion. The lubricant shall be a nontoxic, oil-based product that has no detrimental effect on the tube and does not support bacteria growth or affect the general characteristics of the fluid to be transported.

4. Curing

Prior to the start of the inversion process, the Contractor shall furnish information to the Owner which outlines the resin manufacturer's recommended cure temperatures.

After inversion has been completed, the inversion water shall be uniformly raised above the temperature required to affect a cure of the resin as recommended by the manufacturer. The inversion water shall be recirculated by means of a pump throughout the tube and temperature monitors shall be placed on the ingoing and outgoing lines to determine that the correct temperature is maintained. Additionally, a temperature gauge shall be installed between the tube and the pipe invert at the termination point to determine temperatures during cure.

The recommended temperature shall be held for the length of time recommended by the resin manufacturer. Initial cure occurs during heat up and is indicated when the exposed portions of the tube appear to be hard and sound and the remote temperature sensor(s) indicate that the temperature is of a magnitude to realize an exotherm or cure in the resin. The temperature should then be raised to post cure temperatures and held for the duration recommended by the resin manufacturer.

For quality control during the CIPP lining operation, the Contractor shall utilize remote temperature sensing devices placed between the host pipe and the liner to continuously monitor the liner cure incrementally every 18 inches or less to verify that an exothermic reaction has occurred and that a full cure has taken place along the full length of the CIPP liner. Measuring temperatures at the liner endpoints only will not be permitted. The cure information must be taken from the bottom third of the pipe liner. Cure parameter information shall be provided by the resin manufacturer.

Pressure shall be maintained as per the manufacturer's recommendations to hold the flexible tube tight against the existing sewer or main. This pressure shall be maintained until the cure has been completed. The contractor shall provide a continuous log of the designated temperatures and pressures during the time of the cure.

Initial cure shall be deemed to be completed when the remote sensing devices reflect that the cure temperature, as recommended by the resin/catalyst system manufacturer, have been achieved. The cure period shall be of a duration recommended by the resin manufacturer, as modified for site-specific conditions, during which time the recirculation of the water and cycling of the heat exchanger to maintain the temperature in the liner continues.

5. Cool Down

The new liner pipe shall be cooled down to a temperature below 100° F for the heated water curing method (113° F for the steam curing method) before relieving the internal pressure. Cool down may be accomplished by introducing cool water into the section as the water and/or steam is drained off through a small hole in the downstream end. Care must be taken to avoid causing a vacuum that could damage the newly installed pipe.

D. 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/or end section, and be 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.

E. 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.

No service shall be interrupted for more than 12 hours unless otherwise approved by the Engineer.

F. Final Acceptance

1. The Contractor shall perform a CCTV inspection in accordance with ASTM F1216, section 8.7 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 preinstallation CCTV inspection.
2. The Contractor shall submit to the Engineer, for acceptance and approval, two (2) copies of unedited post-installation flash drives and associated curing reports for each sanitary sewer main segment within 10 working days of the Liner installation. No more than one sanitary sewer main segment shall be included on a post-installation Inspection CD/DVD/flash drive or curing report.

G. Sampling and Laboratory Testing

1. The physical properties of the installed CIPP Liner shall meet the minimum physical properties per Section 2.05, verified through field sampling and laboratory testing.

2. All materials testing shall be performed at the Contractor's expense by an independent third party laboratory. All tests shall be in accordance with applicable ASTM test methods to confirm compliance with the requirements specified in these contract documents. If properties tested do not meet the physical and thickness design requirements as required by the contract, the CIPP liner shall be repaired or replaced by the Contractor. The City reserves the right to provide independent testing at their own expense to confirm results.
3. 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

4. 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 two (2) 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.
5. 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 33 01 30