

SECTION 24

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CURED-IN-PLACE PIPE (CIPP) INSTALLATION

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SECTION 24

CURED-IN-PLACE PIPE (CIPP) INSTALLATION

1. GENERAL:

- A. These Specifications include the minimum requirements for the rehabilitation of sanitary sewer pipelines by the installation of Cured-In-Place Pipe (CIPP) within the existing, deteriorated pipe as shown on the PLANS and specified in these SPECIFICATIONS.
- B. The rehabilitation of pipelines shall be done by the installation of a resin-impregnated flexible tube which, when cured, shall be continuous and tight-fitting throughout the entire length of the original pipe. The CIPP shall extend the full length of the original pipe and provide a structurally sound, joint-less and water-tight new pipe within a pipe. The Contractor is responsible for the proper, accurate and complete installation of the CIPP using the system selected by the Contractor.
- C. Neither the CIPP system, nor its installation, shall cause adverse effects to any of the City's 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 installation operations, test and monitor the levels, and comply with any and all local waste discharge requirements. The Contractor shall cleanup, restore existing surface conditions and structures, and repair any of the CIPP system determined to be defective. The Contractor shall conduct installation operations and schedule cleanup in a manner to cause the least possible obstruction and inconvenience to traffic, pedestrians, businesses, and property owners or tenants.
- D. The prices submitted by the Contractor, shall include all costs of labor, equipment and materials for the various bid items necessary for furnishing and installing, complete in place, CIPP in accordance with these specifications. All items of work not specifically mentioned herein which are required, by the Contractor, to make the product perform as intended and deliver the final product as specified herein shall be included in the respective lump sum and unit prices bid in the Bid Proposal.

1.1 DESCRIPTION OF WORK AND PRODUCT DELIVERY

- A. These Specifications cover all the work necessary to furnish and install the CIPP. The Contractor shall provide all materials, labor, equipment, and services necessary for traffic control, bypass pumping and/or diversion of sewage flows,

cleaning and television inspection of sewers to be lined, liner installation, reconnection of service connections, all quality controls, final television inspection, testing of lined pipe system and warranty work, all as specified herein.

- B. The CIPP shall be continuous and joint-less from manhole to manhole or access point to access point and shall be free of all defects that will affect the long term life and operation of the pipe.
- C. The CIPP shall fit sufficiently tight within the existing pipe so as to not leak at the manholes, at the service connections or through the wall of the installed pipe. If leakage occurs at the manholes or the service connections the Contractor shall seal these areas to stop all leakage using material compatible with the CIPP as directed by the City at the price bid therefore in the Bid Proposal. If leakage occurs through the wall of the pipe the liner shall be repaired or removed as recommended by the CIPP manufacturer. Final approval of the liner installation will be based on a leak tight pipe.
- D. All existing and confirmed active service connections and any other service laterals to be reinstated as directed by the City shall be re-opened robotically or by hand in the case of man-entry size piping, to their original shape and to 90% of their original capacity. All over-cut service connections will be properly repaired to meet the requirements of these specifications.
- E. Testing and warranty inspections shall be executed by the City. Any defects found shall be repaired or replaced by the Contractor.

1.2 PERFORMANCE WORK STATEMENT (PWS) SUBMITTAL

- A. The Contractor shall submit, to the City, a Performance Work Statement (PWS) at the pre-construction meeting, which clearly defines the CIPP product delivery in conformance with the requirements of these contract documents. Unless otherwise directed by the City, the PWS shall at a minimum contain the following:
 - 1. Clearly indicate that the CIPP will conform to the project requirements as outlined in the Description of Work and as delineated in these specifications.
 - 2. Where the scope of work is specifically delineated in the contract documents, a detailed installation plan describing all preparation work, cleaning operations, pre-CCTV inspections, by-pass pumping, traffic control, installation procedure, method of curing, service reconnection, quality control, testing to be performed, final CCTV inspection, warranties furnished and all else necessary and appropriate for a complete CIPP liner installation. A detailed installation schedule shall be prepared, submitted and conform to the requirements of the contract.
 - 3. Contractor's description of the proposed CIPP lining technology, including a detailed plan for identifying all active service connections maintaining service,

during mainline installation, to each home connected to the section of pipe being lined, including temporary service if required by the contract.

4. A description of the CIPP materials to be furnished for the project. Materials shall be fully detailed in the submittals and conform to these specifications and/or shall conform to the pre-approved product submission.
5. A detailed public notification plan shall be prepared and submitted including detailed staged notification to residences affected by the CIPP installation.

1.3 PRODUCT SUBMITTALS

- A. The manufacturer's recommended cure method - for each diameter and thickness of CIPP liner to be installed. The PWS shall contain a detailed curing procedure detailing the curing medium and the method of application.
- B. Manufactures detailed description of the recommended material installation/application process including mixing, additives, set time, cure time (return to service) and all equipment required for quality product delivery. (PWS)
- C. Technical data sheet describing each rehabilitation component to be applied/installed, stating the expected longevity of the component in a wastewater environment. Data shall be based on independent third party tests. (PWS)
- D. By-pass Pumping Plan if applicable to the SYSTEM's being installed. (PWS)
- E. Traffic Control Plan, if applicable to the SYSTEM's being installed.
- F. For each manhole rehabilitation, a complete and accurate record of all SYSTEM's installed/applied shall be prepared by the Contractor. The record shall include identifying manhole number, location, quantities of rehabilitation components installed.
- G. Compensation for all work required for the submittal of product data shall be included in the Mobilization Item contained in the Bid Proposal.

1.4 SAFETY

- A. The Contractor shall conform to all work safety requirements of pertinent regulatory agencies, and shall secure the site for the working conditions in compliance with the same. The Contractor shall erect such signs and other devices as are necessary for the safety of the work site.
- B. The Contractor shall perform all of the work in accordance with applicable OSHA standards. Emphasis shall be placed upon the requirements for entering confined spaces and with the equipment being utilized for pipe renewal.

1.5 CIPP REPAIR/REPLACEMENT

- A. Occasionally installations will result in the need to repair or replace a defective CIPP. The Contractor shall outline specific repair or replacement procedures for potential defects that may occur in the installed CIPP. Repair/replacement procedures shall be as recommended by the CIPP system manufacturer and shall be submitted as part of the PWS.
- B. Defects in the installed CIPP that will not affect the operation and long term life of the product shall be identified and defined.
- C. Repairable defects that may occur in the installed CIPP shall be specifically defined by the Contractor based on manufacturer's recommendations, including a detailed step-by-step repair procedure, resulting in a finished product meeting the requirements of these specifications.

1.6 WARRANTY

- A. The materials used for the project shall be certified by the manufacturer for the specified purpose. The Contractor shall warrant the liner material and installation for a period of one (1) year. During the Contractor warranty period, any defect which may materially affect the integrity, strength, function and/or operation of the pipe, shall be repaired at the Contractor's expense in accordance with procedures included in Section 1.5 CIPP REPAIR/REPLACEMENT and as recommended by the manufacturer.
- B. On any work completed by the Contractor that is defective and/or has been repaired, the Contractor shall warrant this work for one (1) year in addition to the warrantee required by the contract.
- C. After a pipe section has been lined and for a period of time up to one (1) year following completion of the project, The City may inspect all or portions of the lined system. The specific locations will be selected at random by the City and will include all sizes of CIPP from this project. If it is found that any of the CIPP has developed abnormalities since the time of "Post Construction Television Inspection", the abnormalities shall be repaired and/or replaced as defined in Section 1.5 CIPP REPAIR/REPLACEMENT and as recommended by the manufacturer. If, after inspection of a portion of the lined system under contract, problems are found, the City may televise all the CIPP installed on the contract. All verified defects shall be repaired and/or replaced by the Contractor and shall be performed in accordance with Section 1.5 CIPP REPAIR/REPLACEMENT and per original specifications, all at no additional cost to the City.

2. PRODUCTS:

2.1 FABRIC TUBE

- A. The fabric tube shall consist of one or more layers of absorbant non-woven felt fabric, felt/fiberglass or fiberglass and meet the requirements of STM F1216, ASTM F 1743, ASTM D 5813 & ASTM F 2019. The fabric tube shall be capable of absorbing and carrying resins, constructed to withstand installation pressures and curing temperatures and have sufficient strength to bridge missing pipe segments, and stretch to fit irregular pipe sections. The contractor shall submit certified information from the felt manufacturer on the nominal void volume in the felt fabric that will be filled with resin.
- B. The wet-out fabric tube shall have a uniform thickness and excess resin distribution that when compressed at installation pressures will meet or exceed the design thickness after cure.
- C. The fabric tube shall be manufactured to a size and length that when installed will tightly fit the internal circumference, meeting applicable ASTM standards or better, of the original pipe. Allowance shall be made for the circumferential stretching during installation. The tube shall be properly sized to the diameter of the existing pipe and the length to be rehabilitated and be able to stretch to fit irregular pipe sections and negotiate bends. The Contractor shall determine the minimum tube length necessary to effectively span the designated run between manholes. The Contractor shall verify the lengths in the field prior to ordering and prior to impregnation of the tube with resin, to ensure that the tube will have sufficient length to extend the entire length of the run. The Contractor shall also measure the inside diameter of the existing pipelines in the field prior to ordering liner so that the liner can be installed in a tight-fitted condition.
- D. The minimum length of the fabric tube shall be that deemed necessary by the installer to effectively span the distance form the starting manhole to the terminating manhole or accesspoint, plus that amount required to run-in and run-out for the installation process.

3. INSTALLATION:

3.1 CONSTRUCTION REQUIREMENTS

- A. Preperation, cleaning, inspection, sewage by-passing and public notification. The Contractor shall clean the interior of the existing host pipe prior to installation of the CIPP liner. All debris and obstructions, that will effect the installation and the final CIPP product delivery to the City, shall be removed and disposed of.

- B. The CIPP Liner shall be constructed of materials and methods, that when installed, shall provide a jointless and continuous structurally sound CIPP able to withstand all imposed static, and dynamic loads on a long-term basis.
- C. The Contractor may, under the direction of the City, utilize any of the existing manholes in the project area as installation access points. If a street must be closed to traffic because of the location of the sewer, the Contractor shall furnish a detailed traffic control plan and all labor and equipment necessary. The plan shall be in conformance with the local agency having jurisdiction over traffic control.
- D. Cleaning of Pipe Lines
 - 1. The Contractor shall remove all internal debris from the pipe line that will interfere with the installation and the final product delivery of the CIPP as required in these specifications. Solid debris and deposits shall be removed from the system and disposed of properly by the Contractor. Moving material from manhole section to manhole section shall not be allowed. As applicable the Contractor shall either plug or install a flow by-pass pumping system to properly clean the pipelines. Precaution shall be taken, by the Contractor in the use of cleaning equipment to avoid damage to the existing pipe. The repair of any damage, caused by the cleaning equipment, shall be the responsibility of the Contractor. The City will designate a site for the disposal of all debris removed, from the City's sewer system, as a direct result of the cleaning operation. Unless otherwise specified by the City, the Contractor shall dispose of all debris at no charge.
- E. By-Passing Existing Sewage Flows
 - 1. The Contractor shall provide for the flow of existing mainline and service connection effluent around the section or sections of pipe designated for CIPP installation. With most small diameter pipelines, particularly on terminal sewers, plugging will be adequate but must be monitored on a regular basis to prevent backup of sewage into adjacent homes. Service connection effluent may be plugged only after proper notification to the affected residence and may not remain plugged overnight. Installation of the liner shall not begin until the Contractor has installed the required plugs or a sewage by-pass system and all pumping facilities have been installed and tested under full operating conditions including the by-pass of mainline and side sewer flows. Once the lining process has begun, existing sewage flows shall be maintained, until the resin/felt tube composite is fully cured, cooled down, fully televised and the CIPP ends finished. The Contractor shall coordinate sewer by-pass and flow interruptions with the City at least fourteen (14) days in advance and with the property owners and businesses at least one (1) business day in advance. The pump and by-pass lines shall be of adequate capacity and size to handle peak flows. The Contractor shall submit a detail of the by-pass plan and design to the City before proceeding with any CIPP installation.

Compensation for by-pass pumping and all associated plans and approvals shall be included in the Mobilization Item contained in the Bid Proposal.

- F. Contractor shall perform post-cleaning video of the pipelines. Only PACP certified personnel trained in locating breaks, obstacles and service connections by closed circuit television shall perform the inspection. The Contractor shall provide the City a copy of the pre-cleaning and post-cleaning video and suitable log, and/or in digital format for review prior to installation of the CIPP and for later reference by the City.
- G. The Contractor shall be responsible for confirming the locations of all branch service connections prior to installing and curing the CIPP. If required in the contract documents, each connection will be dye tested to determine whether or not the connection is live or abandoned. The cost for dye testing of existing service connections shall be compensated at the unit price bid in the Bid Proposal for Dye Testing of Existing Service Connections. In the event the status of a service connection cannot be adequately defined, the City will make the final decision, prior to installation and curing of the liner, as to the status. Typically only service connections deemed “active” shall be reopened by the Contractor.
- H. The Contractor shall be allowed to use water from an owner-approved fire hydrant in the project vicinity. Use of an approved double check backflow assembly shall be required. Contractor shall provide their own approved assembly.

3.2 INSTALLATION OF LINER

- A. The CIPP liner shall be installed and cured in the host pipe per the manufacturer’s specifications as described and submitted in the PWS.
- B. CIPP installation shall be in accordance with the applicable ASTM standards with the following modification:
 - 1. The wet-out tube shall be positioned in the pipeline using the method specified by the manufacturer. Care should be exercised not to damage the tube as a result of installation. The tube should be pulled-in or inverted through an existing manhole or approved access point and fully extend to the next designated manhole or termination point.
- C. Prior to installation and as recommended by the manufacturer remote temperature gauges or sensors shall be placed inside the host pipe to monitor the temperatures during the cure cycle. Liner and/or host pipe interface temperature shall be monitored and logged during curing of the liner.
- D. Curing shall be accomplished by utilizing the appropriate medium in accordance with the manufacturer’s recommended cure schedule. The curing source or in and output temperatures shall be monitored and logged during the cure cycles if

applicable. The manufacturer's recommended cure method and schedule shall be used for each line segment installed, and the liner wall thickness and the existing ground conditions with regard to temperature, moisture level, and thermal conductivity of the soil, per ASTM as applicable, shall be taken into account by the Contractor.

- E. For heat cure liners, if any temperature sensor or multiple sensors do not reach the temperature as specified by the manufacturer to achieve proper curing or cooling, the installer can make necessary adjustments to comply with the manufacturer's recommendations. The system computer should have an output report that specifically identifies each installed sensor station in the length of pipe, indicates the maximum temperature achieved and the sustained temperature time. Each sensor should record both the maximum temperature and the minimum cool down temperature and comply with the manufacturer's recommendations. For UV cured liners, all light train sensor readings, recorded by the tamper proof computer, shall provide output documenting the cure along the entire length of the installed liner. The cure procedure shall be in accordance with the manufacturer's recommendation as included in the PWS submission by the Contractor.

3.3 COOL DOWN

- A. The Contractor shall cool the CIPP in accordance with the approved CIPP manufacturer's recommendations as described and outlined in the PWS.
- B. Temperatures and curing data shall be monitored and recorded, by the Contractor, throughout the installation process to ensure that each phase of the process is achieved as approved in accordance with the CIPP system manufacturer's recommendations.

3.4 FINISH

- A. The installed CIPP shall be continuous over the entire length of a sewer line section and be free from visual defects such as foreign inclusions, dry spots, pinholes, major wrinkles, and de-lamination. The CIPP shall be impervious and free of any leakage from the pipe to the surrounding ground or from the ground to inside the lined pipe.
- B. Any defect, which will or could affect the structural integrity or strength of the linings, shall be repaired at the Contractor's expense, in accordance with the procedures submitted under Section 1.5 CIPP REPAIR/REPLACEMENT.
- C. The beginning and end of the CIPP shall be sealed to the existing host pipe. The sealing material shall be compatible with the pipe end and shall provide a watertight seal.

- D. If the wall of the CIPP leaks, it shall be repaired or removed and replaced with a watertight pipe as recommended by the manufacturer of the CIPP system.
- E. Compensation shall be at the actual length of CIPP installed. The length shall be measured from center of manhole to center of manhole. The unit price per linear foot installed shall include all materials, labor, equipment, and supplies necessary for the complete CIPP linear installation. Compensation for service connection sealing and pipe sealing at the manhole/wall interface, shall be at the unit price bid therefore in the Bid Proposal.

3.5 MANHOLE CONNECTIONS AND RECONNECTIONS OF EXISTING SERVICES

- A. Existing services shall be internally or externally reconnected unless indicated otherwise in the contract documents.
- B. Reconections of existing services shall be made after the CIPP has been installed, fully cured, and cooled down. It is the Contractor's responsibility to make sure that all active service connections are reconnected.
- C. A CCTV camera and remote cutting tool shall be used for internal reconections. The machined opening shall be at least 90 percent of the service connection opening and the bottom of both openings must match. The opening shall not be more than 100 percent of the service opening. The edges of the opening shall not have pipe fragments or liner fragments, which may obstruct flow or snag debris. In all cases the invert of the sewer connection shall be cut flush with the invert entering the mainline.
- D. In the event that service reinstatements result in openings that are greater than 100 percent of the service connection opening, the Contractor shall install a CIPP type repair, sufficiently in size to completely cover the over-cut service connection. No additional compensation will be paid for the repair of the over-cut service connections.
- E. Coupons of pipe material resulting from service tap cutting shall be collected at the next manhole downstream of the pipe rehabilitation operations prior to leaving the site. Coupons may not be allowed to pass through the system.

3.6 FINAL ACCEPTANCE

- A. All CIPP sample testing and repairs to the install CIPP as applicable, shall be completed, before final acceptance, meeting the requirements of these specifications and documented in written form.

- B. The Contractor shall perform a detailed closed-circuit television inspection in accordance with ASTM standards, in the presence of the City after installation of the CIPP Liner and reconnection of the side sewers. A radial view (pan and Tilt) TV camera shall be used. The finished liner shall be continuous over the entire length of the installation and shall be free of significant visual defects, damage, deflection, holes, leaks, and other defects. Unedited digital documentation of the inspection shall be provided to the City within ten (10) working days of the liner installation. The data shall note the inspection date, location of all reconnected side sewers, debris, as well as any other defects in the liner, including, but not limited to, gouges, cracks, bumps, or bulges. If post installation inspection documentation is not submitted within ten (10) working days of the liner installation, the City may at its discretion suspend any further installation of CIPP until the post-installation documentation is submitted. As a result of this suspension, no additional working days will be added to the contract, nor will any adjustment be made for increase in cost. Immediately prior to conducting the closed circuit television inspection, the Contractor shall thoroughly clean the newly installed liner removing all debris and build-up that may have accumulated, at no additional cost to the City.
- C. By-pass pumping or plugging from the upstream manhole shall be utilized to minimize sewage from entering the line during the inspection. In the case of bellies in the line, the pipe shall be cleared of any standing water to provide continuous visibility during the inspection.
- D. Where leakage is observed through the wall of the pipe, the Contractor shall institute additional testing including but not limited to air testing, localized testing, and any other testing that will verify that the leakage rate of the installed CIPP does not exceed acceptable tolerances specified in the contract.

3.7 BID ITEM DESCRIPTIONS

- A. CIPP Lining Install - Per Linear Foot - Includes all labor, equipment, and materials for the complete installation of a CIPP.
- B. Dye Testing Existing Service Connections - Per Each - Includes dye testing and documentation of existing service connections on each pipe length to be lined.
- C. Service Connection Sealing - Per Each - Includes reconnecting existing live sewer services connections to the installed CIPP and sealing the interface between the installed CIPP and the host pipe at the location of the service connection. The City shall review and verify those connections that are not live and will be left unopened.
- D. Manhole/Wall Interface Sealing - Per Each - Includes sealing the interface between the installed CIPP and the manhole wall.

E. Mobilization - Lump Sum - Includes all PWS submittals, product submittals, safety plan, as-built drawings, testing samples, pre- and post-CCTV inspection documentation, mobilization/demobilization of labor, equipment, and materials to the project site. Limited to five percent (5%) of the total amount bid for the project.

END OF SECTION