CHAPTER 16.2
CURED-IN-PLACE PIPE LINING (CIPP) FOR SERVICE LATERALS

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PART 1 - GENERAL

1.1 SCOPE

A. Work under this section consists of furnishing all materials, labor, and equipment required for the installation of cured-in-place pipe (CIPP) in 4" and 6" service laterals.

1.2 RELATED DOCUMENTS

A. CHARLOTTE WATER Water and Sewer Design and Construction Standards and Standard Details.

1.3 DEFINITIONS AND ABBREVIATIONS

A. See Sections iii and iv of the CHARLOTTE WATER Water and Sewer Design and Construction Standards for common abbreviations and definitions.

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

A. The minimum installed, cured liner thickness shall be derived from traditionally accepted pipe formulas for various loading parameters and modes of failure and shall be as recommended by the liner manufacturer for the specific installation conditions included. The minimum installed thickness shall be 3 mm for 4" laterals and 4 mm for 6" laterals.

B. The cured liner shall have the following minimum structural properties:

Flexural Strength of 4,500 psi in accordance with ASTM D 790
Flexural Modulus of 250,000 psi in accordance with ASTM D 790
Tensile Strength of 3,000 psi in accordance with ASTM D 638

C. Contractor shall submit thickness calculations, design parameters, etc. to support the proposed installation.

1.5 SUBMITTALS

A. Submit a contractor statement of qualifications which identifies key personnel and their specific experience with lining service laterals and recent projects listing the total quantity of laterals lined. Work and personnel experience listed must reference projects that used process method and materials proposed. Include project names, references/contacts and phone numbers.

B. Submit product data for the fabric tube, resin, catalysts, etc. to demonstrate conformance to the specifications.

C. Submit manufacturer material certifications for the fabric tube and resin that state conformance to the specifications. The felt tube manufacturer shall provide in their certification a statement identifying how many years they have produced the felt tube. Material certifications shall be current and must reference the project.

D. Submit manufacturers' shipping, storage and handling recommendations for all components of the CIPP system.

E. Submit CIPP wet-out information to include how the wet-out must be performed, including specifics on saturating the felt tube, temperature issues, mixing of the resin system, and all else pertinent to the wet-out process.

F. Installation procedures and curing schedules shall be submitted.

G. Submit a sample CIPP installation report. The report shall include items such as service lateral location between manhole numbers, house address served by the lateral being lined, location, project number, date, time, length lined, resin system, ambient temperature, curing time, and liner thickness.

H. With each shipment of CIPP delivered to the jobsite, submit certifications that the CIPP lining was manufactured in accordance with these specifications and the appropriate ASTM standards.

I. Submit a plan for bypassing sewage around the work area and facilities where sewage flows must be interrupted to complete the work. The plan shall be reviewed by Engineer and shall be acknowledged as acceptable before any work is started. The bypass pumping plan, and requirements for bypass pumping, shall be in accordance with Chapters 11 and 17 of CHARLOTTE WATER's Water and Sewer Design and Construction Standards.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be shipped, stored, and handled in a manner consistent with written recommendations of the CIPP system manufacturer to avoid damage. Damage includes, but is not limited to, gouging, abrasion, flattening, cutting, puncturing, premature curing, or ultra-violet (UV) degradation. The CIPP shall be maintained at a proper temperature prior to installation to prevent premature curing. All damaged materials shall be promptly removed from the project site at Contractor's expense.

1.7 QUALIFICATIONS

A. The manufacturer of the CIPP lateral lining system must have a minimum of 5 years experience and at least 50,000 successful laterals installed. Contractor performing the service lateral CIPP installation shall be fully qualified, experienced and equipped to complete this work expeditiously and in a satisfactory manner and shall be certified and/or licensed as an installer by the CIPP manufacturer. Contractor must have at least 20,000 successful CIPP service lateral installations and have a minimum of 5 years experience utilizing the products and installation method intended for use on this project. The Contractor's superintendent should have successfully lined at least 2,000 laterals using a CIPP lateral lining system. Submit a detailed list of references to include the number of laterals lined with contact names and phone numbers to document compliance with these qualifications.

1.8 ENVIRONMENTAL REQUIREMENTS

A. 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.

1.9 PROJECT ACCESS

A. Contractor shall utilize existing road rights-of-way and sanitary sewer easements to perform the work unless notified otherwise. Contractor shall coordinate with and meet the requirements of North Carolina Department of Transportation, Charlotte Department of Transportation, or any other agency or municipality that may be impacted by the work.

B. The Contractor is required to obtain a written agreement from private property owners granting them permission to perform work on private property. Copies of any and all agreements between the Contractor and private property owners granting temporary access by the Contractor for work on private property shall be submitted to CHARLOTTE WATER.

1.10 WARRANTY

A. The materials used shall be certified by the manufacturer for the specified purpose. The manufacturer shall warrant the liner to be free from defects in raw materials for two (2) years from the date of final acceptance by Owner. Contractor shall warrant the liner installation for a period of two (2) years.

1.11 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Contractor shall ensure that the products and work comply with the current version of the following American Society for Testing and Materials (ASTM) standards:

1. ASTM D638 - Standard Test Method for Tensile Properties of Plastics
2. ASTM D790 - Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
3. ASTM D2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
4. ASTM D5813 - Standard Specification for Cured-in-Place Thermosetting Resin Sewer Pipe
5. ASTM F1216 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
6. ASTM F1743 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)

PART 2 - PRODUCTS

2.1 CURED-IN-PLACE-PIPE LINING FOR LATERALS

A. Cured-In-Place-Pipe (CIPP) lining for laterals shall be BLD “Service Connection Seal + Lateral” Full Wrap Style Connection Seal by BLD Services, LLC or approved equal. Any “equal” product shall be of similar nature and have similar properties and characteristics as the BLD system.

B. The liner shall be fabricated to a size that when installed will neatly fit the internal circumference of the service lateral specified by Owner. Allowance shall be made for circumferential stretching during insertion. The liner shall be a one piece joint-less polyester felt tube that will create a watertight seal at the mainline connection.

C. The CIPP lateral lining system shall be installed from the main sewer and inserted up into the service lateral pipe by an approved inversion/insertion method without the need for a cleanout. The CIPP lateral lining system must be capable of lining up to fifty (50) feet of lateral from the main without a cleanout.

D. The CIPP lateral lining system must provide a watertight seal at the mainline and a structural repair of the lateral over the specified length. Contractor shall verify the lengths in the field before impregnation of the resin. The required length of liner shall be verified in the field by Contractor prior to fabrication of the liner.

E. When cured, the CIPP shall form a continuous, tight-fitting, hard, impermeable liner which is resistant to any chemicals normally found in domestic sewage. The liner shall be chemically resistant to trace amounts of gasoline and other oil products commonly found in municipal sewerage and soils adjacent to the sewer pipe to be lined.

F. The CIPP shall be fabricated to a size that will tightly fit the service lateral being rehabilitated after being installed and cured. The liner shall be capable of fitting into irregularly shaped pipe sections and through bends and dips within the service lateral. Allowance for longitudinal and circumferential expansion shall be taken into account when sizing and installing the liner. All dimensions shall be verified in the field by Contractor prior to fabrication of the liner. Field measurements shall be used to ensure maximum closure between the new liner and the existing sewer pipe. The liner shall be a one piece joint-less polyester felt tube that will create a watertight seal at the mainline connection. Any leakage found shall be eliminated by Contractor at no additional cost to Owner.

G. The felt tube shall be impregnated with the specified resin and catalyst system. This impregnation is termed “wet-out”. All wet-out shall be performed on site using a vacuum impregnation system.

2.2 GROUTING OF SERVICE LATERAL CONNECTIONS

A. Service laterals that are actively leaking may need to be grouted to stop the leak prior to installing the CIPP lateral lining system. The CIPP lateral lining system shall be capable of lining over active leaks and properly sealing and curing in this situation. Grouting is only intended for use when the active leaks are too significant to line over. Contractor shall identify those laterals that need to be grouted prior to CIPP and submit the list and reasons for grouting to Engineer for review and approval. Engineer must approve grouting of laterals prior to the work or payment will not be made for the lateral grouting. In some cases, Engineer may specify that lateral grouting be performed as a stand-alone rehabilitation technique to eliminate the active infiltration.

B. All lateral grouting shall adhere to NASSCO's Standard Specification for Pressure Testing and Grouting of Sewer Pipe Joints, Laterals and Lateral Connections Using the Packer Method with Solution Grouts, latest version. The grout shall be Avanti AV-100, AV-118 or approved equal. Contractor shall make recommendations for alternate grouts as applicable for the specific installation and application being performed.

C. The lateral grouting shall be accomplished using a grout packer unit that travels down the main sewer to the defective service lateral (guided into place by a CCTV camera), pressurizes against the pipe wall and pumps grout at the lateral connection to completely seal the active leak. The main packer unit shall include a lateral packer/bladder that is inverted into the lateral from the mainline assembly a minimum of two (2) feet and inflated against the lateral pipe wall to completely isolate the lateral.

D. Once in place, Contractor shall pressure inject grout though the lateral packer into the annular space between the lateral grouting plug and the lateral pipe. The pressure injection of grout shall continue until all voids are completely sealed and the grout has properly gelled (per the grout manufacturer's recommendations and requirements).

E. Once the grouting is completed, Contractor shall air-test the lateral connection using the packer unit to confirm the lateral connection is completely sealed. The air-test pressure shall be 0.5 psi per foot of pipe depth plus 2 psi with a not-to-exceed pressure of 10 psi per NASSCO standards. If the lateral cannot hold this pressure, the lateral shall be re-grouted, and then re-tested. Once the lateral passes the air test, Contractor shall deflate and remove the packer unit and TV inspect the lateral connection to document that the active leaks have been completely stopped. If a CIPP lateral liner is to be installed after grouting, Contractor can eliminate the air-testing of the lateral connection and just provide the TV inspection.

F. Contractor shall document all lateral air-testing and grouting on approved installation forms. The forms and final TV inspection shall be submitted to Engineer within 30 calendar days of installation.

PART 3 - EXECUTION

3.1 INSTALLATION OF SERVICE LATERALS

A. All service laterals shall be installed AFTER installation and completion of CIPP for main line sewers.

B. Contractor shall thoroughly clean and televise each lateral specified to be inspected and/or lined, including the removal of all roots, grease, debris, silt, etc. Refer to Chapter 16, Sewer Cleaning and Television Inspection, for general cleaning and TV requirements including format and data submittal requirements. All work shall be in accordance with Chapter 16, Sewer Cleaning and Television Inspection, as applicable.

   All cleaning and TV inspections shall be performed from the main sewer. The cleaning equipment and CCTV inspections shall be performed by launching the cleaning heads and camera from the main sewer up into the lateral to the edge of the sewer and/or road R/W. The main TV camera shall record video as it travels down the main sewer to the lateral location to provide Engineer with a current view of the sewer and other lateral connections. The cleaning operations shall fully clean the service lateral and remove all debris, roots, grease, etc from the lateral to facilitate the CIPP installation. The service lateral TV inspections shall extend to the existing cleanout (if one exists). If a cleanout does not exist, Contractor shall locate the lateral at the edge of the road and/or sewer R/W using a sonde on the TV camera and install a stake over the lateral where a cleanout should be installed (at the edge of the road R/W and/or property line). Installation of cleanouts may be required at direction of the Owner/Engineer. It shall be the responsibility of Contractor to verify, prior to installation, that all internal debris has been removed from the sewer line.

C. Contractor shall carefully inspect the interior of the service lateral to determine the location of any conditions which may prevent proper installation of the lateral liner into the pipelines, and it shall be noted so that these conditions can be corrected. Digital files in MPEG-4 Video file format with the H.264 Codec recording with embedded meta-data is required for submittal to the Engineer. Each submittal to the Engineer will include the ITpipes software database file within the approved structure along with the MPEG-4 video files. Inspection logs shall be included and in pdf file format. Acceptable formats for submittal include USB flash drives, external hard drive, or via a pre-approved (by CHARLOTTE WATER) file sharing website. Each submittal to the Engineer shall include a transmittal that lists the file names and all sewer segments and video files included with the submittal. See Chapter 16, Sewer Cleaning and Television Inspection for additional requirements.

D. Line Obstructions – If inspection reveals an obstruction that cannot be removed by conventional sewer cleaning equipment, as in solids, dropped joints or collapsed pipe then Contractor shall inform Engineer and Engineer will determine whether to repair the service lateral or remove the service lateral from the scope.

E. Contractor shall fully open and brush the existing lateral connections to the existing mainline CIPP as necessary to facilitate the installation of the lateral lining system.

F. Care shall be taken in shipping, handling and laying to avoid damaging the CIPP. Any CIPP damaged in shipment shall be replaced as directed by Engineer. Any CIPP showing a split or tear or has been mishandled shall be marked as rejected and removed from the jobsite at once.

G. Contractor shall continuously notify the public of the work being performed. Owner will define the specific notification requirements, and Contractor shall meet all of those requirements. At a minimum, Contractor shall distribute door hangers to each property owner affected by the work seventy-two (72) hours prior to performing any work. Contractor shall submit a sample door hanger to Engineer and Owner for review. The door hangers shall include the specific work to be performed, start time and estimated completion time for the work being conducted, impacts to the property owner, contact names and local phone numbers for the Contractor's project manager, superintendent, and the Engineer's on-site representative.

H. Contractor shall perform and provide all necessary traffic control measures to complete the work. Warning signs, barricades and flagmen must be provided in accordance with the NCDOT Transportation's "Manual on Uniform Traffic Control Devices" at all times and places necessary. No roads shall be closed for construction activities. At least one (1) lane of traffic will be safely maintained at all times when construction is in progress. Access to businesses and residences along the roads shall be maintained at all times. All lanes will be open when work is suspended for one (1) hour or longer.

Contractor shall provide all appropriate signing and barricades and shall provide flag persons at all times and places necessary. Traffic control will be strictly enforced in order to provide fire and police protection to the area and access to driveways while construction is in progress. Occupants must be notified a minimum of two (2) hours in advance of private drive closings. Closure time will be limited to a maximum of 2 hours. Where businesses have only one (1) means of access, the Contractor shall provide an alternative means of access or perform work during hours when the business is closed.

Contractor shall submit to Engineer a detailed traffic control plan for performing all phases of the Work within one (1) week prior to performing the Work in residential roads and three (3) weeks prior to working in major thoroughfares. The traffic control plan shall be specific to each road and each sewer and manhole. The traffic control plan shall be modified as necessary in the field to accommodate unforeseen traffic control issues and problems and safety concerns. No work shall begin until the traffic control plan is reviewed and approved by the Engineer, Owner, NCDOT and/or Town.

I. Water for use in the installation of service laterals will be available from approved fire hydrants owned and operated by CHARLOTTE WATER only. Use of fire hydrants other than those approved by CHARLOTTE WATER will not be allowed. The Contractor shall meet all Owner requirements for connecting to fire

hydrants and **will be charged** for water usage. Prior to connection to, and use of any hydrant, the Contractor must apply for and successfully obtain a temporary fire hydrant use permit (Vehicle Mounted "Tanker Truck" Permit). All instructions and requirements for obtaining the permit are listed under the **Fire Hydrant Program for Temporary Service** section of CHARLOTTE WATER's website. The Contractor is responsible for meeting all requirements whether listed herein or not.

The Contractor shall submit to the Engineer, a copy of the approved permit number for each vehicle prior to connection to, and use of, any fire hydrant.

The Contractor shall be well versed in the proper operation of valves and hydrants and will be responsible for any damage caused by improper operation or usage of hydrants. All cure water must be discharged to the wastewater collection system.

J. Contractor shall bypass pump sewage flows around the lining work while it is being performed. Contractor is responsible for handling and accommodating all existing wastewater flows during the work. Prior to performing the work, Contractor shall submit, for approval by Engineer, a detailed plan of the method Contractor proposes in order to maintain the existing flow during construction. The plan must include a provision for handling the existing peak flow by pumping. The peak flow shall be considered the existing pipe flowing full, which is highly possible during rain events. When pumping is used, an identical standby pump(s) shall be on site in the event of failure of the primary pump(s). Flows in the lateral specified for lining will not require bypass pumping. Contractor shall coordinate with the homeowner/business in advance of all work to ensure the lateral will be inactive at the time of the CIPP installation. All bypass pumping work shall be performed as specified in Chapters 11 and 17 of CHARLOTTE WATER's Water and Sewer Design and Construction Standards.

   If, at any time during construction, effluent from the existing sewer is not fully contained by the bypass system, gravity service will be restored, and work shall be suspended until the problem is resolved to the satisfaction of Engineer. This includes wastewater flow into trenches during excavation work. Sewer system overflows will not be tolerated. All fines imposed on Owner associated with overflows caused by the Contractor's work shall be paid by Contractor.

K. Contractor shall furnish and install the CIPP lateral lining in the specified laterals and to the required/specified length. The installation of the CIPP shall be in complete accordance with the manufacturer's specifications and applicable provisions of ASTM F1216 or ASTM F1743 except as modified herein.

L. Contractor shall designate a location where the liner will be vacuum impregnated prior to installation. Contractor shall allow Engineer and/or Owner to inspect the materials and "wet-out" procedure. A catalyst system compatible with the resin and liner shall be used.

M. The wet-out liner shall be loaded inside a pressure apparatus above ground and utilizing a hydrophilic sealant (or equivalent) on the backside of the connection to enhance a watertight seal. Also, a two-part 100% solid epoxy (reference ASTM

C-881) shall be applied to the lateral brim interface to insure adhesion against the host pipe. The pressure apparatus, with an end attached to a robotic device, shall be winched through the mainline pipe to the service connection. The robotic device, together with a television camera, will be used to position the pressure apparatus' inversion elbow at the service connection opening. Air pressure, supplied to the pressure apparatus through an inversion hose, shall be used to invert the wet-out liner through the lateral pipe to the R/W location and/or cleanout location. The inversion head will be adjusted to be of sufficient pressure to cause the impregnated liner to invert completely in the lateral pipe and hold the tube tight to the pipe wall. Care shall be taken during the curing process so as not to overstress the tube.

N. Curing – All curing shall be accomplished through ambient cure means. An accelerated ambient-temperature curing resin system shall be utilized to expedite curing as recommended by the CIPP system manufacturer. Initial cure shall be deemed to be completed when inspection of the exposed portions of the CIPP appears to be hard and sound. The cure period shall be of a duration recommended by the resin manufacturer, as modified for the installation process. Contractor shall cool the hardened CIPP to a temperature of approximately 100 degrees F before relieving the pressure from the pressure apparatus. Care shall be taken to maintain proper pressure throughout the cure and cool-down periods. No flow shall pass through the lateral until the initial cure is achieved.

O. Installation reports shall be generated for each service lateral lined. The reports shall document installation, including manhole numbers and service lateral location, street names/sewer location, project number, date, time, temperature, curing time, liner thickness, etc. A sample report shall be submitted to Engineer for approval prior to installing any lining.

P. Finish – The finished CIPP shall provide a watertight connection seal at the mainline and extend continuous over the entire length of the service lateral and be free of dry spots, lifts, ribs, bumps, delaminations, etc., and there shall be no leakage of groundwater around, through or under the CIPP. This continuous one piece structural pipe-within-a-pipe shall not inhibit the closed circuit television post video inspection of the mainline or service lateral pipes. Any liner that does not meet these Specifications shall be repaired by Contractor as agreed to by Engineer at the Contractor's expense.

Q. Testing: For every twenty (20) laterals, one (1) flat plate sample shall be taken and sent to a third party test laboratory for confirmation of short term flexural modulus and strength properties in accordance with ASTM F1216. The test results shall meet or exceed the values used in the design of the CIPP lateral liner.

R. The Contractor shall select the independent testing laboratory and shall pay the laboratory for all tests. All testing shall be performed by an independent, accredited, certified and experienced (minimum 5 years of experience) testing laboratory as chosen by the Contractor. The Contractor shall submit the name and location of the testing laboratory for approval by CHARLOTTE WATER and/or the Engineer. The submittal shall include the laboratory's experience testing CIPP samples, the laboratory's accreditation/certification to perform CIPP

testing from a recognized accreditation body, and a certified statement from the laboratory that they are independent from and not associated with the Contractor in any way.

S. After the lateral liner is fully cured, Contractor shall TV the finished lateral liner from the main sewer to the termination point, and shall submit one (1) copy of the final video inspections to Engineer for review and acceptance. The post-rehab TV inspections shall be submitted prior to final acceptance.

T. During the warranty period, any defects which will affect the integrity or strength of the CIPP liner shall be repaired at the Contractor's expense in a manner mutually agreed upon by Owner and Contractor.

END OF SECTION

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