

The purpose of this ADDENDUM NO. 2 dated January 22, 2021, is to distribute information in response to questions received from proposers, as well as other revisions to the solicitation documents. **All other specifications, terms and conditions of this solicitation not expressly amended by the responses in this ADDENDUM remain as originally stated. Please include the attached Addendum Acknowledgement Form in your firm's technical proposal.**

1. **RFP Revisions:**

- 1.1 On page 5, modify the first sentence of Section 1.5 as follows, "*The Project is to be completed within ~~twelve (12)~~ fourteen (14) months from the date of the Notice to Proceed issued by the University.*"
- 1.2 Pre-Proposal Sign-in Sheet: The sign-in sheet for the Pre-Proposal meeting has been revised to include additional attendee information. The revised sheet has been provided as an attachment to this addendum.

2. **Technical Specification Revisions:**

- 2.1 Delete Specification Section 33 11 14 – Cured In Place Piping (CIPP) in its entirety and replace with the attached Specification Section 33 11 14 – Cured In Place Pipe Rehabilitation of Water Main Piping (CIPP).

It is expressly noted that the attached Specification is a 95% CD Submission. Firms are responsible to review the 100% CDs and may not rely upon this 95% Submission in their Price Proposal.

3. **Questions from Proposers:**

- 3.1 Question: What is the operating pressure of the water mains?

UMBC Response: The existing pressure fluctuates throughout the campus due to elevation. Per Paragraph 2.1.E. of the attached specification Section 33 11 14 – Cured In Place Pipe Rehabilitation of Water Main Piping (CIPP), the design pressure for the new liner system is 130 psi.

- 3.2 Question: What is the associated test pressure for the CIPP lined water mains?

UMBC Response: Per Paragraph 3.11.A.1. of the attached specification Section 33 11 14 – Cured In Place Pipe Rehabilitation of Water Main Piping (CIPP), the test pressure is the working pressure plus 50 psi.

- 3.3 Question: There is mention of lateral lining scope that references non-pressure rated CIPP materials in the specifications, however, there are no non-pressure lateral pipelines to be lined shown on the plans. Please clarify.

UMBC Response: Lateral lining is not in the scope of work. The product is required to have a history of use on pressurized service laterals as written in Paragraph 1.5.K. of the attached specification Section 33 11 14 – Cured In Place Pipe Rehabilitation of Water Main Piping (CIPP).

- 3.4 Question: Are there potable service lines present that may not be shown on the plans?

UMBC Response: No. All potable water service lines to be relined are shown on the plans.

3.5 Question: What is the required pressure rating for the Lateral-Mainline Interface Seal per section 33 11 14-3.7.A?

UMBC Response: Lateral-mainline seals shall be rated for the same pressure as the main.

3.6 Question: Is the experience requirement per 33 11 14-1.3.F include only pressure rated lateral-mainline interface services? Or gravity applications as well?

UMBC Response: The experience requirement pertains to pressurized systems. Refer to Paragraph 1.5 of the attached specification Section 33 11 14 – Cured In Place Pipe Rehabilitation of Water Main Piping (CIPP) for revised experience requirements.

3.7 Question: Section 33 11 14-1.3.E requires 3,500 LF of lateral installations however there are seems to be no lateral service line lining scope in the plans. Please clarify.

UMBC Response: While there are no service laterals in the scope of work, the product is required to have a history of use on pressurized service laterals. Refer to Paragraph 1.5.K. of the attached specification Section 33 11 14 – Cured In Place Pipe Rehabilitation of Water Main Piping (CIPP) for revised requirements.

3.8 Question: Section 33 11 14-1.3.F requires 1000 lateral-mainline interface installations but is this for gravity or pressure applications?

UMBC Response: The interface requirement has been removed from the specification section. Refer to Paragraph 1.5. of the attached specification Section 33 11 14 – Cured In Place Pipe Rehabilitation of Water Main Piping (CIPP) for revised requirements.

4. **Acknowledgement of Addendum Form:** The attached Acknowledgement of Receipt of Addendum form is to be completed/signed and included with the Technical Proposal.

END OF ADDENDUM #2 DATED 1/22/21

Attachments:

- Acknowledgement of Receipt of Addendum
- Revised Pre-proposal Meeting Sign-in Sheet
- Section 33 11 14 – Cured In Place Pipe Rehabilitation of Water Main Piping (CIPP) dated December 18, 2020

This Addendum #2 on RFP #BC-21210-C and its attachments are posted on UMBC's ebid Board at <http://procurement.umbc.edu/bid-board/>

RFP NO.: BC-21210-C

RFP FOR: UMBC UTILITIES UPGRADES PHASE II

TECHNICAL PROPOSAL DUE DATE: Friday, January 29, 2021 on or before 4:00 pm.

NAME OF PROPOSER: _____

ACKNOWLEDGEMENT OF RECEIPT OF ADDENDA

The undersigned, hereby acknowledges the receipt of the following addenda:

Addendum No. 1 dated January 7, 2021

Addendum No. 2 dated January 22, 2021

Addendum No. _____ dated _____

Addendum No. _____ dated _____

Addendum No. _____ dated _____

Addendum No. _____ dated _____

Signature _____

Printed Name _____

Title _____

Date _____

Revised Pre-Proposal WebEx Attendees

UMBC: Elizabeth Moss: emoss@umbc.edu, Tom Argasinski – UMBC Facilities, Craig Goodwin – UMBC Facilities, Larry Hennessey – UMBC Facilities

UMB: Mike Dougherty – UMB Facilities

RMF – John Williamson

1. Joe Corson, CIANBRO, jcorson@cianbro.com
2. Lewis Kimball, Kimball Construction, lkimball@kimballcc.com
3. Mark Lucas, Michels Pipe Services, mlucas@michels.us
4. Lee Adolph, Kiewit, Lee.Adolph@kiewit.com
5. Alex Fraser, Kiewit, Alexander.Fraser@kiewit.com
6. Stephen Chesko, Whiting-Turner, Stephen.chesko@whiting-turner.com
7. Mike Thompson, Meadville Land Service, miket@meadvillelandservice.com
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9. Terrell Maroney, J. Fletcher Creamer & Son, Terrell.Maroney@jfcson.us
10. Bill Stinson, PipeWay Energy Construction, bstinson@pipewayenergy.com
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12. Tara Sacks, Glenelg Construction, tara.glenelg@gmail.com
13. Chris Hulse, Insituform Technologies, chulse@aegion.com
14. Jimmy Dick, Environmental Quality Resources, jdick@eqrllc.com

SECTION 33 11 14 – CURED IN PLACE PIPE REHABILITATION OF WATER MAIN PIPING (CIPP)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Section includes requirements for structural rehabilitation of water mains and laterals by Cured in Place Pipe (CIPP) lining.

1.2 DEFINITIONS

- A. Mainline: Water main.
- B. Lateral: Service pipe from mainline.
- C. Lateral-Mainline Interface: Lateral connection to mainline.
- D. Lateral-Mainline Interface Seal: Watertight seal between lateral and mainline.
- E. Re-instate Lateral-Mainline Interface: Cutting open or trimming opening in mainline liner to allow flow from main to lateral.

1.3 REFERENCES

- A. ASTM D638 – Standard Test Method for Tensile Properties of Plastics.
- B. ASTM D790 – Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- C. ASTM F1216 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
- D. ASTM F1743 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP).
- E. AWWA M28 – Rehabilitation of Water Mains.
- F. NSF/ANSI Standard 61 – Drinking Water System Components.
- G. 29 CFR 1910.146 – Permit Required Confined Spaces

1.4 SUBMITTALS

- A. Submit material specifications, certified material test results in accordance with ASTM F1216 and F1743, Material Safety Data Sheets, and shop drawings for all materials and equipment furnished under this Section.
 - 1. Shop drawings shall include design calculations, soil impacts, design live and dead loads, and liner thickness. Design calculations shall be sealed by a Professional Engineer licensed in the State of Maryland.
 - 2. Material test results shall list the physical properties and chemical resistance of the liner.
- B. Submit manufacturer's recommended procedures for handling, storing, repairing, and installing materials selected.
- C. Submit samples of Owner notifications.
- D. Submit certification from NSF that the proposed CIPP lining system meets the requirements of NSF/ANSI Standard 61.
- E. Submit a detailed description of the installation procedures that will be used. The description shall include at a minimum:
 - 1. Segment-specific liner inversion and curing methods.
 - 2. Segment-specific access pit size and size of working area, including proposed maintenance of traffic plan.
 - 3. Information on whether the liner will be wetted on-site or off-site.
 - 4. Wet-out quality control program (if on-site).
 - 5. Cool-down procedures.
 - 6. Main line-lateral interface reinstatement procedures.
 - 7. Pressure testing procedures.
- F. Submit a contingency plan that includes methods and equipment to be used in the event that liner defects are encountered, or the lining process is unsuccessful, and a description of back-up equipment available to the installation crew for removal/repair of the unsuccessful lining, such as air compressors, lateral reinstatement cutters, etc.
- G. Submit a project-specific Health and Safety Plan. Maintain a copy onsite for duration of the project.
 - 1. Address dangers associated with rehabilitation work (i.e. working with large boiler trucks).
 - 2. Identify Health and Safety officer (i.e. crew chief).
 - 3. Designated Health and Safety officer:
 - a. Responsible for providing health and safety oversight of personnel participating on project team.
 - b. Perform and document routine work area inspections, conduct safety meetings, and provide safety orientations for team members.

- c. Have in easily accessible place following contact information;
 - 1) Emergency and non-emergency number.
 - 2) Contractor's health and safety representative name and number.
 - 3) Occupational health clinic number(s).
 - 4. Submit for review the following;
 - a. List of critical rehabilitation equipment, including boiler truck equipment, to be inspected on daily basis.
 - b. Recently completed (previous month) monthly maintenance log.
 - c. Annual third-party certified inspection for boiler truck(s) to be used on project.
 - d. Certification of training for boiler truck operator.
 - H. Submit pre-lining, post-lining, and post-reinstatement videos and typed television logs for each lining segment onto a USB media device.
 - I. Submit references for at least 5 similar CIPP pressurized potable water lining projects within the last 5 years.
 - J. Submit results of liner tests described in PART 3 - EXECUTION.
 - K. Submit curing logs after complete installation of each CIPP liner segment.
 - 1. Heat cured liners.
 - a. Record temperature (degrees Fahrenheit) and pressure (psi) readings per unit of time collected during liner installation and curing.
 - 2. UV cured liners.
 - a. Record the curing speed (feet per minute), light source (number of lamps, intensity and wattage), inner air pressure (psi), and curing temperatures (degrees Fahrenheit) per unit time over length of liner.
 - L. Submit copies of CIPP liner order sheets for record.
- 1.5 QUALITY ASSURANCE
- A. All work shall comply with the requirements of this Section and with manufacturer's standards for rehabilitation of water mains using cured-in-place pipe (CIPP) lining method proposed by the Contractor, approved by the Engineer, and installed by the CIPP lining manufacturer or its approved installer.
 - B. The CIPP lining system shall be certified by NSF to be in accordance with NSF/ANSI Standard 61 and shall be listed on the NSF website accordingly.

- C. The manufacturer shall have at least 5 years of experience in the manufacture of the CIPP lining system being provided for this project.
 - D. The installer shall have at least 5 years of experience in the installation of CIPP lining system being provided for this project.
 - E. The installer's supervisory personnel shall have at least 5 years of experience in providing the required services and shall be present at the site during all CIPP lining work.
 - F. The installer shall have completed at last 5 CIPP lining projects of similar size and project conditions. Provide the Engineer with a list of these projects, including the location and a contact person for each.
 - G. If the installer elects to wet-out the CIPP liner on-site, the Contractor shall employ a Quality Control Program to ensure proper distribution of the resin throughout the liner. Both the Owner and the Engineer shall be notified one week in advance of commencing this work.
 - H. The lining installer's personnel shall have completed a 10-hour construction and safety training, confined space entry training, and other training as appropriate for the work to be performed. Confined space entry training shall be in accordance with the requirements and protocol as specified in 29 CFR 1910.146, Permit Required Confined Spaces, and ASTM D4276-84.
 - I. The lining installer's personnel shall be certified by liner manufacturer successfully completed training in handling, insertion, trimming, reinstatement of laterals and finishing pipe liner.
 - J. Internally inspect host pipe prior to lining and post-lining.
 - K. Commercially Proven Mainline and Lateral Products:
 - 1. Minimum 50,000 linear feet main-line and 3,500 linear feet laterals successfully installed and documented in the United States and Internationally.
 - 2. Translate International installations into English to Owner's approval.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Protect, store, and handle materials during transportation and delivery, while stored on-site, and during installation following manufacturer's recommendations.
 - B. Continuously monitor liner materials during transport and storage with temperature recorder and data storage. Material exposed to temperatures outside of manufacturer's limits shall be rejected.
 - C. Material found to be defective or damaged due to manufacture or shipment shall not be used.
 - 1. Replacement of defective or damaged material will be at no additional cost to Owner.

1.7 WARRANTY

- A. Make all necessary repairs and replacements to remedy defects, breaks or failures of the Work occurring within one year following the date of acceptance of the Work.
- B. During the warranty period, any defects that might affect the integrity or strength of the liner shall be immediately repaired or replaced at the Contractor's expense, pursuant to the manufacturer's recommendations, and to the satisfaction of the Owner and Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. The CIPP liner shall be a flexible lining tube consisting of two concentric, tubular, felt or woven polyester jackets with a watertight polymeric membrane bonded to the interior surface of the interior jacket. The polymeric inner membrane shall be designed to ensure water tightness.
- B. The CIPP liner thickness for each segment shall be designed to adequately resist the full internal pressure and all external pressures and conditions (e.g. deflection, ring bending, buckling, and minimum stiffness). The liner shall be long enough to carry out the insertion process, effectively span the segment distance, and allow for sealing of the liner at end points. The Contractor shall verify the lengths in the field before cutting the liner to length.
- C. When fully cured, the CIPP liner shall act as a structurally independent Class IV liner as detailed in AWWA M28, able to withstand all imposed static, dynamic and hydrostatic loads, independent of the load-bearing capacity of the host pipe.
- D. The fully-cured CIPP liner shall conform to the minimum structural standards as follows:
 - 1. Tensile Strength per ASTM D638 – 3,000 psi
 - 2. Flexural Strength per ASTM D790 – 4,500 psi
 - 3. Flexural Modulus per ASTM D790 – 250,000 psi
- E. The following design parameters shall be used in the design of CIPP liners in addition to the manufacturer's standards and ASTM F1216 or ASTM F1743 requirements:

1. Host Pipe Conditions:	Fully Deteriorated
2. Ovality of Pipe Circumferences:	1% (minimum)
3. Factor of Safety:	2 (minimum)
4. Long-Term Flexural Strength:	50% of initial (minimum)
5. Long-Term Flexural Modulus:	50% of initial (minimum)
6. Creep Reduction Factor:	50% (maximum)
7. Modulus of Soil Reaction:	700 psi (minimum)
8. Live Load:	AASHTO HS20-44
9. Soil Load:	120 pcf (minimum)

- 10. Depth of Cover: Depth of Pipe at Each Liner Location
- 11. Internal Pressure: 130 psi
- 12. Service Life: 50 years (minimum)
- 13. Assume groundwater is present at existing surface grade at each liner location.

- F. Prior to installation, the manufacturer of the CIPP liner shall submit stamped design calculations for wall thickness of each segment to the Engineer for approval.
- G. The liner shall have a uniform thickness that when compressed at installation pressures will meet or exceed the design thickness.
- H. Sewing of liner pieces together to form the desired length for a particular segment shall be prohibited.
- I. Prior to installation, the CIPP liner shall be impregnated and saturated with a thermosetting or UV-setting epoxy resin.
- J. The CIPP liner shall be resistant to chemical attack (specifically elevated chlorine levels) that may occur during initial cleaning and future repairs.

2.2 EQUIPMENT

- A. The Contractor shall provide suitable temperature and pressure gauges in accordance with the manufacturer's standards and specifications. Puller unit/winch cable shall be equipped with manufacturer recommended tension gauge and shall be smooth running and variable speed. The cutting device shall be a remote monitored device for use inside the lined pipe.
- B. The Contractor shall prepare and inspect all necessary tools and any spare parts that are required for equipment that suffer frequent breakdowns and shall ensure that said tools and spare parts are available at the site. The Contractor shall also prepare and make operable all necessary communication equipment for the field crew.

2.3 ACCEPTABLE CIPP LINER PRODUCTS, MANUFACTURERS, AND INSTALLERS

- A. A. All CIPP liners shall be manufactured as part of a single, complete CIPP lining system specifically designed for rehabilitating potable water mains. CIPP liners and lining systems shall be one of the following:
 - 1. Aqua Pipe by Sanexen
 - 2. Nordpipe by Sekisui SPR
 - 3. InsituMain by Insituform
- B. The CIPP lining system installer shall be either the manufacturer of the CIPP liner or a licensed installer of one of the approved CIPP lining systems.

2.4 MECHANICAL JOINT RESTRAINTS

- A. Split Serrated Ring Harness with gripping inserts to provide axial restraint to push-on joints.
 - 1. Meets ANSI/AWWA C151/A21.51 and ANSI/AWWA C150/A21.50.
 - 2. Ductile iron conforming to ASTM A536.
 - 3. Electrostatically applied and heat cured epoxy coating.
 - 4. EBAA 1500TD or approved equal.

- B. Split Ring Restraint for existing mechanical Fittings
 - 1. Ductile iron conforming to ASTM A536.
 - 2. Electrostatically applied and heat cured epoxy coating.
 - 3. EBAA 1100SD or approved equal.

PART 3 - EXECUTION

3.1 SCHEDULING THE WORK

- A. Prepare a sequence of work plan identifying each segment of the work and which buildings/facilities will have domestic water service interrupted. The plan shall include graphics indicating the work area and affected buildings/facilities, as well as anticipated duration of service outages. Graphically show how the potable water system will be isolated and opened to perform the work. Submit the sequence of work plan to the Owner at least two weeks prior to the proposed start of work. Work shall not begin until the sequence of work plan has been approved. The Owner will operate all existing potable water valves and hydrants in order to prepare the potable water system for the work.

- B. Notify the Owner as soon as it becomes apparent that the lining work, including lateral reinstatement, cannot be not performed within the schedule indicated in the sequence of work plan. Provide an updated sequence of work plan with revised time of completion.

3.2 WATER FOR CONSTRUCTION PURPOSES

- A. Water will be made available to the Contractor from nearby hydrants for pipeline cleaning and installation of the liner.

- B. Operation of hydrants shall only be performed by Owner's personnel.

- C. Contractor shall provide backflow preventers approved by the Owner when water is drawn from the Owner's hydrants.

3.3 TEMPORARY WATER SERVICE

- A. The Contractor shall install, maintain, and protect a temporary water bypass system as shown on the Drawings, in accordance with Section 33 11 13.
- B. The temporary water bypass system shall be disinfected in accordance with Section 33 11 13.

3.4 PREPARATION OF ACCESS PITS FOR CIPP LINING

- A. The Contractor shall excavate CIPP lining access pits at the locations and dimensions indicated on the Drawings.
- B. The Contractor shall excavate and remove the minimum length of existing potable water main required for the liner insertion and receiving operation as per manufacturer's recommendations and as approved by the Engineer.

3.5 ISOLATING AND CUTTING THE WATER MAIN

- A. New sleeves, couplings, pipe, valves, fittings and other materials required for the repair of cut-ins shall be at the work site before the water main is taken out of service and cut.
- B. Coordinate with the Owner to shut off service to the main pipeline using existing valves and ensure the water main is de-energized prior to cutting into the pipe.
- C. Restrain all live connections to the main pipeline with a mechanical restraint prior to cutting into the pipe to prevent leakage and movement of pipelines and valves.
- D. If a restrainer assembly is not a viable option for restraining a live connection, the Contractor shall provide an alternative restraining system subject to Engineer's approval.
- E. Do not cut into the pipe until it has been completely isolated and restrained as necessary.
- F. Cut into the pipeline for the purpose of draining and isolating the pipe and obtaining access for the cleaning, inspection and lining operation.
 - 1. If existing valves do not provide an adequate seal, the Contractor shall cut in and restrain new valves at locations determined by the Engineer. Coordinate the shutdown of adjacent valves with the Owner to de-energize the section of pipe prior to cutting in and restraining new gate valves.
- G. All openings shall be of the proper size for insertion and operation of the cleaning apparatus, and for the drainage of the pipeline and removal of materials scraped out during the cleaning operation.
- H. The existing main shall be cut square using an approved cutting equipment, leaving no split or fractured ends. All cut faces of the existing main shall be chamfered on the inside surface to a suitable profile to prevent damage to the liner during and after the insertion.

- I. At all times when the cleaning and lining work is not in progress, the cut openings in the pipe shall be closed by temporary watertight plugs or by other means approved by the Engineer. If water is in the trench when work is resumed, the plug shall not be removed until the risk of water entering the pipe has been eliminated.

3.6 CLOSED-CIRCUIT TELEVISION (CCTV) INSPECTION

- A. The Contractor shall thoroughly examine the route of the existing water main after cutting of the main, including a pipeline location survey with equipment for locating any changes in direction, valves, bends, intrusions, and other fittings that may impede the insertion and/or proper inflation of the CIPP liner.
- B. The Contractor shall perform CCTV inspections on each segment of the rehabilitated water main at the following times during construction:
 1. After cleaning.
 2. After lining.
 3. After reinstating service laterals.
- C. The Contractor shall submit videos and written logs in accordance with Paragraph 1.3 of this Section.

3.7 CLEANING

- A. The interior surfaces of all pipe segments to be lined shall be cleaned to the satisfaction of the Engineer. All rust, scale, tuberculation, chemical or other deposits, loose or deteriorated remains of any original coatings, and other foreign materials from the inside of the pipe shall be removed so as to produce a smooth metal surface finish that will allow the CIPP liner to adhere (bond) to the existing host pipe. The Contractor shall pass the approved cleaning equipment through each pipe segment as many times as necessary to remove all foreign matter, rust, dirt, and debris from the pipe surfaces. During pipe cleaning operations, take precautions in the use of equipment to prevent damage to public and private property.
- B. Cleaning Equipment
 1. High-Velocity Jet (Hydrocleaning) Equipment
 - a. All high-velocity pipe cleaning equipment shall be constructed for ease and safety of operation.
 - b. The equipment shall have a selection of two or more high-velocity nozzles.
 - c. The nozzles shall be capable of producing a scouring action from 15 to 45 degrees in all size lines designated to be cleaned.
 - d. Equipment shall also include a high-velocity gun for washing and scouring structure walls and floors. The gun shall be capable of producing flows from a fine spray to a solid stream.

- e. The equipment shall carry its own water tank, auxiliary engines, pumps, and hydraulically driven hose reel.

2. Mechanically Powered Equipment

- a. Mechanically powered equipment includes winches, chain knockers, metal scrapers and squeegees appropriate for cleaning cast iron and ductile iron water mains.
- b. Machines shall be belt-operated or shall have an overload device.
- c. Machines with direct drive that could cause damage to the pipe are not permitted.

3. Vacuum-Operated Equipment

- C. Clean each water main section to be lined using a hydraulically propelled, high-velocity jet, or mechanically powered equipment such as a chain knocker. Any other proposed cleaning equipment shall not be used unless approved by the Owner and Engineer.
- D. When hydraulically propelled cleaning tools or flows which retard the flow in the pipe are used, take precautions to ensure that the water pressure created does not cause damage or flooding of public or private property. When possible, use the flow in the pipe to provide the necessary pressure for hydraulic cleaning devices. When additional water from hydrants is necessary, conserve water and do not use unnecessarily.
- E. The Contractor shall collect and dispose of all cleaning waste off-site in a manner as approved by the governing Local or State agencies. Cleaning waste includes all wastewater, dirt, rocks, sand, roots, and other materials within the structures and piping to be cleaned. Cleaning waste shall not be discharged into sewer manholes or catch basins.

3.8 PLUGGING SERVICE LATERALS

- A. Prior to installation of the CIPP liner, the Contractor shall locate all existing water service laterals and main line tees to be plugged. The Contractor shall plug the service laterals and tees as recommended by the lining manufacturer and as approved by the Engineer.
- B. The plugs shall prevent any accumulation of resin inside the service lateral and shall prevent any water infiltration from a service lateral's leaking shut-off valve. Furthermore, special plugs shall be inserted so as to make visible any non-penetrating service connections in the lined pipe and allow the operators to locate non-penetrating service connections after they have been covered by the CIPP liner.

3.9 ABANDONING EXISTING VALVES

- A. The Contractor shall abandon existing valves as shown on the Drawings prior to lining. Abandoned valves shall be set to the full open position such that the CIPP liner can be installed through the abandoned valve.
- B. The Contractor shall remove abandoned valve boxes as shown on the Drawings.

3.10 LINING

- A. The CIPP liner installation shall comply with ASTM F1216 (inversion method) or ASTM F1743 (pulling method). Installation, reformation, and processing shall cause no degradation of the liner physical properties.
- B. Field verify all proposed liner lengths prior to construction.
- C. Ensure that the correct liner is installed in each water main segment being rehabilitated.
- D. During the lining procedure, isolate the water main section at the appropriate access pit by using a plug. Take special precautions so as to prevent flooding and damage to public or private property.
- E. The liner insertion shall be done according to the manufacturer's recommended installation procedures. Make field measurements as needed to ensure correct fit of liner.
- F. After liner insertion is complete, cure the liner according to the manufacturer's recommended water, steam, or UV light curing procedures using heat and pressure. The liner shall be expanded until pressed tightly against the existing (host) pipe with a concave dimple appearing at each service lateral.
- G. The liner shall expand to prevent any annular gap between the host pipe and the liner and shall completely adhere to the host pipe without splitting or rupturing.
- H. Cool the CIPP liner to a temperature below 100 degrees Fahrenheit before releasing the static pressure. The cool down procedure may include the introduction of cool water into the inversion standpipe to replace water being drained from a small hole in the liner made at the downstream end.
- I. Temperature or "thermocouple" logs shall be collected at the upstream and downstream access pits during the curing process to document that proper temperature and cure times have been achieved.
- J. The finished pipe shall be continuous (jointless) over the entire length of a lining segment and be as free as commercially practicable from visual defects such as foreign inclusion, fry spots, pinholes, delamination, and wrinkles.
- K. If the liner fails to form correctly (e.g., a section of liner does not fully cure, a liner lift, etc.) remove the failed liner and replace it with a new liner.

- L. After the liner has formed, the ends of the liner shall be cut away neatly at both ends to provide a smooth transition between lined and unlined pipe.
- M. If, for any reason, the new pipe fails to make a tight seal, apply a seal at the joint. The seal shall consist of a resin mixture compatible with the pipe and shall be as recommended by the manufacturer. Other types of seals may be considered and shall be submitted to the Owner and Engineer for consideration. Seals shall be approved by the Owner and Engineer prior to use.
- N. Do not reopen capped or inactive water service connections. Confirm the locations of all capped or inactive service laterals during the pre-lining television inspections and confirm with the Owner which laterals are to be abandoned, and which are to be reinstated.
- O. Reconnect the existing active water service laterals only after the manufacturer's minimum recommended curing time has elapsed and the pipe pressure and leakage tests have been performed for each lined segment in accordance with Paragraph 3.11 of this Section. Reconnect the existing service laterals in accordance with Paragraph 3.12 of this Section.

3.11 INSPECTION AND TESTING

A. Pressure and Leakage Testing

- 1. Perform hydrostatic pressure and leakage tests for each lined segment in accordance with ASTM F1216 or ASTM F1743 and submit pressure and leakage testing reports for each lined segment.
 - a. Perform the pressure and leakage tests at twice the known working pressure or at the working pressure plus 50 psi, whichever is less, for a minimum of 1 hour.
 - b. The leakage shall not exceed 20 gallons per inch of internal pipe diameter per mile per day, providing that all air has been removed from the line prior to testing and the CIPP has cooled to ambient temperature.

B. Liner Material Testing

- 1. Collect and prepare CIPP liner samples for each water main segment being rehabilitated for testing. Measure wall thickness of liner samples.
 - a. For liner samples less than 18 inches in diameter or equivalent, collect a restrained pipe sample by placing a section of PVC pipe at the end of the lined segment and inverting or pulling the liner through the section of PVC pipe. Select PVC pipe to match the inside diameter of the water main lined as closely as possible.
 - b. For liner samples greater than 18 inches in diameter or equivalent, prepare plate samples from the same tube and resin as the liner being installed at the time of wet-out. Cure the plate samples for the same duration and under the same conditions as the liner being installed.

2. An independent testing laboratory shall test the CIPP liner samples for tensile and flexural properties as well as chemical resistance in accordance with ASTM F1216 or ASTM F1743. Submit results and testing reports directly to the Engineer and Owner.

3.12 REINSTATING SERVICE LATERALS

- A. Upon successful installation of the liner and associated testing, the Contractor shall reinstate all active water service laterals without excavation from the interior of the CIPP liner using a remote-controlled cutting device. The Contractor shall use a CCTV system to monitor all cutting operations. All reinstated service laterals shall be satisfactorily opened to the size of the original opening and to the depth required to completely open the water service lateral to the Owner's buildings/facilities.
- B. Service openings shall be flush with the liner and shall be brushed to produce a smooth finish free from any burrs.
- C. If service laterals cannot be fully reopened within a lined segment due to work-day time constraints, the Contractor may be allowed to open each active service lateral connection to a minimum of 75% of the full pipe diameter before the end of the work day, upon approval of the Owner. These service laterals must be opened to the size of the original opening no later than the end of the next working day.
- D. Water tightness at the service laterals shall be achieved by the adherence of the liner to the existing pipe.
- E. Modifying the existing service by removing the protruding end and/or installing anything into the lateral that will remain as a permanent restriction or reduce the interior diameter of the existing service lateral is prohibited.
- F. If an active water service cannot be reinstated with a remote-controlled cutting device in accordance with this Section, the Contractor shall di and replace the water service lateral at no extra cost to the Owner.

3.13 PIPELINE AND HYDRANT ASSEMBLY

- A. After final testing and inspection of each CIPP liner segment is completed, the Contractor shall replace sections of the existing pipeline (e.g., pipe, fittings, valves, side connections, hydrants, etc.) as shown on the Drawings and in accordance with Section 33 11 13.
- B. The necessary end pieces shall be installed so as to make proper connection to the cut and lined existing water main pipe. No internal mechanical end seals shall be used to seal the extremities of the liner.
- C. All cut-ins shall be repaired using appropriate couplings in accordance with Section 33 11 13. Solid sleeve mechanical joint repair couplings shall be used wherever possible (i.e., when pipes

being joined are of equal diameter). Transition type cast iron sleeve couplings shall be used when the outer diameters of pipe being joined differ.

3.14 DISINFECTION

- A. Once all pipe work is completed to the satisfaction of the Engineer, the Contractor shall perform, as required, chlorine disinfection of newly installed liner in accordance with Section 33 11 13.

3.15 REACTIVATION OF WATER MAIN

- A. A. Reactivation of the rehabilitated water main shall be done in accordance with Section 33 11 13.
- B. The Contractor shall decommission the temporary water bypass system and shall restore all affected water services after the rehabilitated water main has been successfully tested and placed back into service.

3.16 CLEAN-UP

- A. Upon acceptance of the installation work and testing, restore the project area affected by the operations to pre-construction conditions.

END OF SECTION 33 11 14