



**SPECIAL PROVISIONS  
FOR  
SANITARY SEWER REHABILITATION USING CURED-IN-PLACE PIPE**

**Black Hawk County  
HDP-8155(775)--71-07**

**Effective Date  
July 16, 2024**

**THE STANDARD SPECIFICATIONS, SERIES 2023, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.**

**232006.01 DESCRIPTION.**

**A. Scope.**

1. It is the intent of this specification to provide for the reconstruction of pipelines and conduits by the installation of a cured-in-place pipe (CIPP) consisting of a thermosetting resin-impregnated flexible felt tube coated on one side with an impermeable plastic which is inverted into the original conduit by the use of a hydrostatic head or pressurized air. No pull-in method is allowed. Curing is accomplished by circulating hot water or controlled steam throughout the length of the inverted tube to cure the resin into a hard, impermeable pipe with the plastic coating on the internal surface of the CIPP. The final product shall extend the entire length of the original pipe segment providing a continuous, tight-fitting and joint-less CIPP.
2. Included items of work: All aspects of the installations shall be in accordance with the manufacturer's recommendation and per the specifications herein. Where conflicts occur, this specification shall govern. Work includes:
  - a. Written and verbal public notifications coordinating service outages.
  - b. Cleaning and removal of debris by hydrocleaning sewer pipe to be lined.
  - c. Bypass pumping.
  - d. Inspection of pipeline by recorded closed circuit television (CCTV).
  - e. CIPP liner installation:
    - 1) Finish cured thickness 6MM for pipe 8 inches or greater; and,
    - 2) Finish cured thickness 5MM for 6 inch pipe.
  - f. CIPP liner cutting and sealing in manhole inverts.
  - g. Identification and reinstatement of service connections including dye testing if necessary.
  - h. Second cleaning and inspection of new liner by recorded CCTV.
  - i. Clean-up.
  - j. Field quality control and final acceptance testing.
  - k. Repair of defective or deficient work.

3. Other Items of Work: Same as Article SP-232006.01, A, 2, except items will be paid for as separate bid items. See contract documents for specifications unless noted otherwise:
  - a. Coordinating traffic control with city, residents, and businesses.
  - b. Heavy cleaning of sewer pipe not thoroughly prepared by incidental cleaning.
  - c. Protruding service cuts.
  - d. Point repairs by trench and/or trenchless methods.
  - e. Sanitary sewer service grouting.
  - f. CIPP lining service reconnection.

**B. Submittals.**

The following items shall be submitted:

1. Submit technical data sheets on each product used, including chemical and physical properties and applicable ASTM test results verifying product meets specifications and is suitable for its intended use. Submit data on each tube and container of resin used.
2. SDS for all products used.
3. Manufacturer's installation recommendations.
4. Bypass plan layout.
5. Qualifications:
  - a. Submit documentation that manufacturer has a minimum of 1,000,000 linear feet or 4000 manhole to manhole line sections of successful CIPP wastewater collection system installations in the U.S.
  - b. Submit documentation that manufacturer of the inversion liner must operate under a quality management system that is third party certified to ISO 9001:2000 or other internationally recognized organization standards. Proof of certification shall be required for approval.
  - c. Submit third part test results for the liner and resin meet all applicable ASTM standards. See Article SP-232006.02 for more information.
  - d. Submit documentation that Contractor has successfully installed at least 500,000 linear feet of CIPP in wastewater collection systems. Document shall list dates, locations of work, diameters and lengths of CIPP liner installed, and reference contact information for each project listed.
  - e. Submit documentation that Contractor's superintendent designated for this project must have had at least 5 years of continuous active experience in the commercial installation of CIPP. Documentation shall be in the form of a resume of work experience detailing scope of work (linear footage and CIPP diameters), location of work, and reference contact information for each project listed.

**C. Field Quality Control and Final Acceptance Testing.**

1. Unless otherwise noted, submit two copies of reports to the Engineer 48 hours after test completion.
2. Field quality control and final acceptance testing and retesting shall be performed by an independent third party company (unless otherwise noted) at the expense of the Contractor. Contractor shall make all appropriate repairs at Contractor's expense.
3. Hydraulic capacity shall be tested by Contractor as directed by the Engineer using a pipe mandrel. Lined pipe with a general round appearance on CCTV will not be mandrel tested – few, if any, segments will require testing. Mandrel testing shall be completed by the Contractor at the option of the Engineer as an incidental item. Mandrel testing shall be documented by recorded CCTV which is also incidental. Mandrel testing will be used to

determine areas where the CIPP liner is cured out-of-round or has deflected into pipe because it did not have resin saturation. Contractor should be careful to test and document areas of host pipe out of round prior to the lining process. Contractor shall repair all areas failing a mandrel testing showing the new CIPP liner defecting or out of round.

4. Field samples for CIPP testing shall be prepared by the Contractor. Testing shall be completed once for every 3500 linear feet of liner placed with one test minimum for each size used (except for quantities less than 500 feet). Pipe physical properties will be tested by a third party in accordance with ASTM F 1216, Section 8, using either method proposed. The flexural properties must meet or exceed the values listed in Article SP-232006.02.
5. Wall thickness of samples shall be determined by third party in a manner consistent with 8.1.2 of ASTM D 5813. Frequency as per 1.4-E. The minimum wall thickness at any point shall not be less than 87.5% of the specified design thickness.
6. The water-tightness of the liner shall be gauged by the Contractor while the liner is curing under a positive head or through review of recorded CCTV. No infiltration of groundwater should be observed.
7. Contractor shall verify location and quality of cut for each reinstated service connection using a radial view (pan & tilt) TV camera. All service entrances should be accounted for and be unobstructed.
8. Contractor shall submit liner wet out report. Multiple installations may be listed separately on one report.
9. Contractor shall submit water or steam cure log that samples every 15 minutes. Multiple installations may be listed separately on one report.

**D. Delivery, Storage, and Handling.**

Deliver materials to site and store according to manufacturer's recommendations. Handle materials in a manner to protect from damage during delivery and application.

**E. Environmental Conditions.**

Site environmental conditions (time, temperate, humidity, atmospheric conditions, precipitation, etc.) should be noted when installing CIPP liner. Liner should be installed in those environmental conditions deemed acceptable by the manufacturer.

**232006.02 MATERIALS.**

**A. General.**

This specification references ASTM F 1216 (Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube), ASTM D 5813 (Cured-in-Place Thermosetting Resin Sewer Pipe) and ASTM D 790 (Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics) which are made a part hereof by such reference and shall be the latest edition and revision thereof.

**B. Liner Tube**

1. The tube shall consist of one or more layers of absorbent, flexible needled felt or equivalent non-woven material and meet the requirements of ASTM F 1216, Section 5. The tube shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe, and stretch to fit irregular shaped pipe sections.
2. The wet-out tube shall have a uniform thickness that when compressed at installation pressures will meet or exceed the listed minimum thicknesses.

3. The tube shall be manufactured to a size that when installed will tightly fit the internal circumference and length of the original pipe. In the event that under-sized pipe is present, the liner tube shall be manufactured so that overlap folds or wrinkles do not occur. Allowances shall be made for circumferential stretching during inversion.
4. The outside layer of the tube (before wet-out) shall be coated with an impermeable polyurethane, polyethylene, or polypropylene coating. This coating shall be an impermeable, flexible membrane that will contain the resin and facilitate monitoring of resin saturation during the resin impregnation (wet-out) process. This coating shall form the inner layer of the finished pipe and is required for enhancement of corrosion resistance, flow, and abrasion properties.
5. The tube shall be homogenous across the entire wall thickness containing no intermediate or encapsulated layers of any material. Additionally, no material shall be included in the tube that may cause delamination in the cured liner, and no dry or unsaturated layers shall be evident.
6. The wall color of the interior liner surface after installation shall be a light reflective color so that a clear detailed inspection with closed-circuit television equipment may be conducted. The hue of the color shall be dark enough to distinguish a contrast between the fully resin saturated felt fabric and resin lean or dry areas.
7. The outside of the tube shall be marked for distance at regular intervals not to exceed 10 feet. Such markings shall include the Manufacturer's name or identifying symbol.
8. The minimum length shall be that deemed necessary by the Contractor to effectively span the distance between manhole sections of the segment to be lined unless otherwise specified. The Contractor is solely responsible for field verification of all pipe diameters and lengths prior to fabrication, wet-out and installation.

**C. Resin.**

The resin system shall be a corrosion resistant polyester, vinyl ester, or epoxy and catalyst system including all required catalysts and initiators, that when properly cured with the tube composite meets the requirements of ASTM F 1216, the physical properties herein, and those which are to be utilized in the design of the CIPP for this project. The resin shall produce a CIPP which will comply with the structural and chemical resistance requirements of this specification.

**D. Waterstop.**

An approved hydrophilic waterstop.

**E. CIPP Product.**

1. The CIPP liner shall not bond to the original pipe wall.
2. The layers of the cured CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or the probe or knife blade moves freely between the layers. If separation of the layers occurs during field sample testing, new samples will be required to be obtained from the installed pipe. Any reoccurrence may cause rejection of the work.
3. All layers of cured CIPP must be fully impregnated with liquid thermosetting resin as per the manufacturer's recommendations.
4. The cured pipe material (CIPP) shall conform to the structural properties, as listed below.

Cured Liner	Standard	Results
Flexural Stress	ASTM D 790	4500 psi
Modulus of Elasticity	ASTM D 790	400,000 psi

### 232006.03 CONSTRUCTION.

#### A. Responsibilities Prior to Lining.

1. **Traffic Control** - All manholes are accessible in City right of way. The Contractor is responsible to coordinate disruptions to traffic and traffic control. The Contractor shall give 48 hour notice to residents affected by traffic disruptions as coordinated with the City. Notification shall be via door hangers or other approved method. Traffic control is paid for as a separate bid item.
2. **Sewer Interruptions** - The Contractor shall make every effort to maintain sewer service usage throughout the duration of the project. In the event that a connection will be out of service, the longest period of no service shall be 8 hours. A public notification program shall be implemented, and shall as a minimum, require the Contractor to be responsible for contacting each home or business connected to the sanitary sewer and informing them of the work to be conducted, and when the sewer will be off-line. Coordinating sewer interruptions with the city, residence, and business owners is incidental. The Contractor shall also provide the following:
  - a. Written notice to be delivered to each home or business two days prior to the beginning of work being conducted on the section, and a local telephone number of the Contractor they can call to discuss the project or any potential problems.
  - b. Personal contact with each business to ensure the lining can be done and keep the business open.
  - c. Personal contact with any home or business, which cannot be reconnected within the time stated in the written notice.
3. **Water** - All water needed from City fire hydrants shall be lined up with the City, including meters. Water will be provided to the Contractor by the City, as long as the Contractor is not wasteful with the water.
4. **Cleaning of Sewer Lines** - The Contractor, when required, shall remove all internal debris out of the sewer line that will interfere with the installation of CIPP. Debris includes mineral scale, roots, sludge, soil, sand, rocks, grease, clay, brick, and pavement removed using three passes with 3000 PSI hydrocleaning equipment. Work is incidental. Heavy cleaning will be paid for as a separate bid item of work if necessary. The Contractor is responsible for removal and off-site disposition of all sewer debris collected during cleaning operations. Any hazardous waste material encountered during this project will be considered as a changed condition.

Debris from pipe cleaning activities may be disposed at the Waterloo WWTP Monday through Friday between the hours of 8 a.m. to 2 p.m. Register with the operator of the WWTP prior to disposal.
5. **Bypassing Sewage** - The Contractor, when required, shall provide for the flow of sewage around the section or sections of pipe designated for repair. Plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system shall make the bypass. The pump(s) and bypass line(s) shall be of adequate capacity to accommodate the sewage flow. Additional spare pumps must be onsite to handle all necessary bypass flows should those bypass pump(s) in use fail. Bypass pumping and the submitted plan is incidental.
6. **Inspection of Pipelines** - Inspection of pipelines shall be performed by experienced personnel trained in locating breaks, line obstructions, and service connections using recorded CCTV

inspection techniques. Sizes of lines should be verified. The pipeline interior shall be carefully inspected to determine the location of any structural failures and conditions that may prevent proper installation of CIPP. Said locations shall be noted and submitted to the Engineer for review. A movie and suitable written report for each line section shall be produced for later reference by the Owner. The movie format shall be agreed upon with the Engineer. Inspection of pipelines is incidental.

7. Line Obstructions - It shall be the responsibility of the Contractor to clear the line of intruding services or collapsed pipe prior to lining. Verify location of intruding services and structural failures with Engineer prior to proceeding. If pre-installation inspection reveals such an obstruction, the Contractor will be paid to remove obstruction. Work includes 1) protruding service cut, and; 2) point repair. Such work shall be approved in writing by the Engineer prior to the commencement of the work and shall be considered as a separate pay item.
8. The Contractor shall be responsible for confirming the locations of all branch service lateral connections before beginning the installation of the CIPP. See drawings for bid item description.

**B. Installation.**

CIPP installation shall be in accordance with ASTM F 1216, Section 7, with the following modifications:

1. Resin Impregnation - The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the potential loss of resin during installation through cracks and irregularities in the original pipe wall, as applicable. A vacuum impregnation process shall be used in conjunction with a roller system to achieve a uniform distribution of the resin throughout the tube.
2. Tube insertion - The wet out tube shall be inverted into the pipeline using inversion as defined within relevant ASTM standards previously stipulated. The tube should be inverted through an existing manhole or approved access point and fully extend to the next designated manhole or termination point.
3. Temperature gauges shall be placed between the tube and the host pipe's invert position to monitor the temperatures during the cure cycle.
4. Using Circulated Heated Water - After inversion is completed, suitable heat source and water re-circulation equipment are required to circulate heated water throughout the pipe. The equipment should be capable of delivering hot water throughout the section to uniformly raise the water temperature above the temperature required to affect a cure of the resin. The heat source should be fitted with suitable monitors to gauge the temperature of the incoming and outgoing water supply. Another such gauge should be placed between the impregnated tube and the pipe invert at both ends to determine the temperatures during cure.

Water temperature in the line during the cure period should be as recommended by the resin manufacturer.

Initial cure will occur during temperature heat-up and is completed when exposed portions of the new pipe appear to be hard and sound and the remote temperature sensor indicates that the temperature is of a magnitude to realize an exothermic or cure in the resin.

Initial cure is reached, the temperature should be raised to the post-cure temperature recommended by the resin manufacturer. The post-cure temperature should be held for a period as recommended by the resin manufacturer, during which time the re-circulation of the water and cycling of the boiler to maintain temperature continues. The curing of the CIPP

must take into account the existing pipe material, the resin system, and ground conditions (temperature, moisture level, and thermal conductivity of soil).

Before the curing begins, the pressure required to hold the flexible tube tight against the existing conduit shall be provided by the tube manufacturer. Once the cure has started and dimpling for laterals is completed, the required pressure shall be maintained until the cure has been completed. If required by the owner, a continuous log of pressure during cure shall be maintained.

**Cool-Down - Using Cool Water After Heated Water Cure.** The new pipe should be cooled to a temperature below 100°F before relieving the static head or air pressure in the inversion standpipe. Cool-down may be accomplished by the introduction of cool water into the inversion standpipe water being drained from a small hole made in the downstream end. Care should be taken in the release of head so that a vacuum will not be developed that could damage the newly installed pipe.

5. **Using Steam -** After inversion is completed, suitable steam-generating equipment is required to distribute steam throughout the pipe. The equipment should be capable of delivering steam throughout the section to uniformly raise the temperature within the pipe above the temperature required to affect a cure of the resin. The temperature in the line during the cure period should be as recommended by the resin manufacturer.

The steam-generating equipment should be fitted with a suitable monitor to gauge the temperature of the outgoing steam. The temperature of the resin being cured should be monitored by placing a gauge between the impregnated tube and the existing pipe at the termination end to determine the temperature during cure.

Initial cure will occur during temperature heat-up and is completed when exposed portions of the new pipe appear to be hard and sound and the remote temperature sensor indicates that the temperature is of a magnitude to realize an exotherm or cure in the resin. After initial cure is reached, the temperature should be raised to post-cure temperatures recommended by the resin manufacturer. The post-cure temperature should be held for a period as recommended by the resin manufacturer, during which time the distribution and control of steam to maintain the temperature continues. The curing of the CIPP must take into account the existing pipe material, the resin system, and ground conditions (temperature, moisture level, and thermal conductivity of soil).

**Cool Down - Using Cool Water After Steam Cure.** The new pipe should be cooled to a temperature below 113°F before relieving the internal pressure within the section. Cool-down may be accomplished by the introduction of cool water into the section to replace the mixture of air and steam being drained from a small hole made in the downstream end. Care should be taken in the release of the air pressure so that a vacuum will not be developed that could damage the newly installed pipe.

6. The finished lining shall be continuous over the entire length of an insertion run and be free of visual defects such as foreign inclusions, dry spots, pinholes, lifts, major wrinkles, and delamination. The lining shall be impervious and free of any leakage from the pipe to the surrounding ground or from the ground to the inside of the lined pipe. If leaks, defects, or deficiencies are found, the Contractor shall make repairs at the Contractor's expense.

#### **C. Cutting Liner Ends.**

After liner has been fully cured (temperature reaches ground temperature), the end of the liner shall be neatly trimmed to approximately 2 inches from the end of the host pipe and have no jagged edges. Work is incidental.

**D. Sealing Liner to Host Pipe.**

Install Greenstreak Hydrotite or approved equal between cut back CIPP liner and host pipe for each segment of CIPP installed. If a watertight seal is not achieved using Hydrotite, seal line with an approved chemical grout. Work is incidental.

**E. Service Reconnection.**

It is the intent of these specifications that branch connections to buildings be re-opened without excavation, utilizing a remotely controlled cutting device, monitored and recorded by a CCTV. Coordinate with property owners and the city to access buildings as necessary to complete the work. Dye testing is incidental. Cut openings shall be brushed leaving no jagged edges. Flow lines shall be flush and flow properly with a minimum of 95% of the existing service being opened. Coupons removed from the line shall be collected and available to the Engineer. Cut shall be directly over service laterals to be reconnected. The Contractor shall certify a minimum of two complete functional cutters plus key spare components are on the job site before each CIPP liner installation. Unless otherwise directed by the Engineer, only active sanitary services will be reinstated. Reconnections made to abandoned sewer or clear water (sump, roof, footing, yard) drains will not be paid and will be repaired at the expense of the Contractor. The Contractor will be responsible for all costs and liability associated with said repair work.

**F. Responsibilities After Lining.**

1. Cleaning - Line shall be cleaned prior to second recorded CCTV inspection to remove accumulated debris after CIPP liner installation. Work is incidental.
2. Televising – Post televising shall be done within 1 week of cleaning. Lines with sags or bellies shall have flow blocked to allow recorded CCTV to observe the full circumference of the newly lined pipe. Each reinstated service shall be viewed to prove that it was correctly reconnected. Work is incidental.
3. Reporting - The unedited digital documentation of the pre-lining and post lining inspections shall be indexed for each pipe segment separately, shall be of high quality, and be provided to the Engineer within 10 working days of the liner installation. This documentation will be reviewed by the Engineer to provide the acceptance of the installed liner. Final inspection movies and accompanying reports shall be submitted to the Engineer for review after all repairs are made. The movie format shall be agreed upon with the Engineer. Work is incidental.
4. Clean-up - Upon CIPP liner acceptance, the Contractor shall restore the project area affected by CIPP lining operations. Work to repair and/or rehabilitate private facilities will not be reimbursed. Work is incidental.

**232006.04 METHOD OF MEASUREMENT.**

Each type and size of CIPP liner will be measured in linear feet along the centerline of the pipe lining from center of manhole to center manhole. Linear footage will be rounded to the nearest foot.

**232006.05 BASIS OF PAYMENT.**

Payment will be at the unit price for each linear foot of CIPP liner installed rounded to the nearest foot.