***ADD THE FOLLOWING SECTION TO DIVISION II – CONSTRUCTION DETAILS***

SECTION 690 – CURED-IN-PLACE REHABILITATION OF EXISTING SEWERS

**DESCRIPTION**

**690.01.01 GENERAL**

A. This work consists of the installation of cured-in-place pipe (CIPP) in existing sewers or CIPP sectional liners for spot repairs (CIPPSL), CIPP end and connection sealing including all labor, materials, and equipment necessary to complete the work where indicated on the Plans.

B. When cured, the sectional liner shall taper flat at the ends and produce the thinnest wall possible to mitigate flow constriction, and be capable of supporting overlapping liners for future sewer rehabilitation.

C. CIPP installation will take place prior to all manhole coating work. Lined-through manholes shall be opened prior to manhole coating work.

D. Service connections are defined as the interface of the lateral with the sewer main. Service connection sealing is not intended to be a lateral liner. No lateral work is included in the portion of the Work for CIPP.

E. Incidental work to remove and replace manhole cones, risers, frame and cover, and concrete collars necessary for the installation of the CIPP will be considered as part of the CIPP work. Refer to Section 630 “Sanitary Sewers” for manhole requirements.

F. Steam cure methods shall not be allowed.

**690.01.02 STANDARDS**

A. This section contains references to the following standards, latest editions. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements affording the greatest protection to the Owner shall apply, as determined by the Engineer.

Reference Title

|  |  |
| --- | --- |
| AASHTO HS20 | Vehicle Loading Standard |
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| ASTM D543 | Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents |
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| ASTM D638 | Standard Test Method for Tensile Properties of Plastics |
|  |  |
| ASTM D790 | Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials |
| ASTM D2990 | Standard Test Method for Tensile, Compressive, Flexural Creep and Creep-Rupture Of Plastics |
|  |  |
| ASTM D5813 | Standard Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems |
|  |  |
| ASTM F1216 | Rehabilitation of Existing Pipelines and Conduits by Inversion and Curing of a Resin Impregnated Tube |
|  |  |
| ASTM F1743 | Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Thermosetting Resin Pipe |
|  |  |
| ASTM F2019 | Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP) |

**690.01.03 SUBMITTALS**

A. The submittals designated shall be provided as specified in Section 100, “General Project Requirements”.

B. Submit certification showing the Contractor is currently licensed by the appropriate licensor to perform CIPP installation. Certification shall be given to the Engineer before any materials are ordered.

C. Submit shop drawings detailing short and long-term properties (providing all supporting test data) of all component materials and composite materials, and recommendations for material storage and temperature control, CIPP handling, insertion, curing, trimming and finishing, and QA/QC procedures. The Contractor shall calculate and submit to the Engineer for review after field verification of sizes and prior to ordering any material from the manufacturer the required minimum thickness for the CIPP to be installed in each pipe reach based on the internal inspection data and the CIPP manufacturer’s specifications..

D. Submittals shall also include the following:

1. CIPP end and connection sealing materials and methods to be used to reinstate connecting sewers. Method, procedure, or information to provide either an adhesive, water-tight seal to the sewer or a water-tight mechanical seal between the cured sectional liner and sewer pipe wall which will not prohibit the installation of future, structural liners, sewer cleaning equipment, and video inspection equipment.
2. Detailed method for addressing CIPP sampling requirements including location and size of each sample, method of removal, and method of liner repair and procedure for testing CIPPSL.
3. Video Inspection reports as specified below.
4. Manufacturer’s recommended installation procedures, including resin manufacturer’s heating requirements.
5. Contractor shall submit 10,000-hour third party, 50-year Flexural Creep Modulus test data.
   1. Test shall be in accordance with ASTM D-2990 at 10,000 hours or equal test as approved by the Engineer.
   2. If approved 10,000 hour tests are not available, Contractor shall use a minimum 50% reduction (50% retention) of Flexural Modulus of Elasticity (per ASTM F 1216) for all formula calculations.
6. Certification stating CIPP tube has been manufactured in accordance with ASTM F1216 and resin is suitable for its intended use. Not applicable for CIPPSL
7. Test report of CIPP sample(s) and recent test results for CIPPSL.
8. A safety plan in accordance with Section 107, “Legal Relations and Responsibility to the Public” for all hazardous chemicals used or expected to be on-site including resin, catalyst, cleaners and repair agents.
9. A sampling plan that demonstrates pollutants are not being discharged into the sanitary sewer system.
10. Technical procedure or information regarding the control and mitigation of shrinkage and wrinkling during installation and cure of sectional liner.
11. Current certification by manufacturer to install the sectional liner. Certification shall indicate the Contractor has been licensed or certified by the manufacturer for a minimum of two(2) years.
12. Copy of previous physical properties tests for the sectional liner.
13. Copy of chemical resistance test for the sectional liner.
14. In accordance with ASTM D2990 any proposed products currently in a long term testing process shall submit current results based on 50 percent through the test duration.
15. The Contractor’s written 2-year warranties.

**MATERIALS**

**690.02.01 GENERAL**

A. The Contractor shall be responsible for control of all material and process variables to provide a finish CIPP possessing the minimum properties specified in ASTM F1216, and required herein.

B. The Contractor shall verify all measurements and dimensions prior to manufacturing the CIPP liner.

C. The outside of each CIPP liner tube shall be labeled by the liner manufacturer with the location of the liner manufacturer, the name of the project, the liner thickness, the liner diameter, the liner length, and the location where it is to be installed. The sectional liners shall not be marked by the manufacturer.

**690.02.02 DESIGN CRITERIA**

A. The liner or sectional liner shall be designed in accordance with the procedures of ASTM F1216 and/or F1743. All material properties used in design calculations shall be long-term (time-corrected) values. Alternative procedures for CIPPSL design are acceptable if they address values or properties not accounted for in F1216 or F1743 and render a structural solution as further required and stated herein.

B. The following parameters shall be assumed for the liner design for bid purposes:

1. Modulus of soil reaction, E’ = 700 psi
2. Groundwater depth equal 10 feet above top of pipe.
3. Unit weight of soil = 120 pcf
4. Live load using an AASHTO HS20 vehicle loading
5. The CIPP shall be designed for fully deteriorated conditions
6. Safety factor of 2.0
7. Ovality factor of 4 percent
8. CIPPSL design shall be based on physical property strengths represented within the sample test report.

C. The design for the CIPP shall recognize any non-uniform cross section and the liner bifurcation present at the spring line of the concrete pipe. Accounting for this condition by the use of an ovality reduction factor alone is unacceptable.

**690.02.03 COMPONENT CIPP PROPERTIES**

A. CIPP Fabric Tubing:

1. The fabric tube shall be free from tears, holes, cuts, foreign materials and other surface defects.
2. The fabric tube material shall be designed for use in gravity sanitary sewers and shall be in strict conformance with all applicable sections of ASTM F1216, F2019 or a seamless version of F2019.
3. The tube should be fabricated to a size that, when installed, will tightly fit the internal circumference and length of the original sewer pipe.
4. Allowance should be made for circumferential stretching during the installation and shrinkage of resin during curing and aging.

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

1. The liner material shall be fabricated from an ECR fiberglass laminate designed for use in gravity sewers.

2. The liner shall be fabricated or neatly cut to fit the internal circumference of the sewer. When cutting the material to fit, the laminate shall overlap a minimum of 2-inches and cure monolithically per manufacturer’s recommendations.

C. Resins:

1. The resin used shall be compatible with the CIPP system used, and designed for use in gravity sewers.
2. The resin shall be a general purpose, unsaturated polyester and catalyst system compatible with the CIPP system that provides the cured physical strengths and properties specified herein.
3. Resins shall be tinted for adequate visibility suitable for internal inspection and provide positive indication of adequate liner wet-out.
4. The sectional liner shall use either a polyester resin, vinyl ester resin, or epoxy resin. The watertight seal shall either be an adhesive epoxy compound or mechanical seal.

**690.02.04 CURED CIPP PROPERTIES**

A. The physical properties of the cured CIPP or CIPPSL shall have minimum initial test values as defined in Table 1 of ASTM F1216 or ASTM F1743 and supplemented below for polyester resin. Properties for the polyester or any other enhanced resins shall be substantiated with third party test data.

1. Flexural strength: 4,500 psi per ASTM D790 or 6,500 psi sectional liner
2. Flexural modulus: 300,000 psi per ASTM D790 or 725,000 psi for section liner
3. 50-year flexural creep modulus: 150,000 psi per ASTM D2990
4. Tensile strength: 9,000 psi per ASTM D638 for sectional liner

**690.02.05 DIMENSIONS OF CIPP**

A. The Contractor shall make allowances in determining the felt tube length and circumference for stretch during installation and shrinkage during curing and aging.

1. The minimum length shall be that which continuously spans the distance from the center of the inlet manhole to the center of the outlet manhole or 2- to 4-feet for a CIPPSL based on the specifics of the repair and pipe diameter.
2. The Contractor shall verify the lengths in the field before the liner tube is cut and impregnated, except CIPPSL.
3. Individual installation runs may include one or more manhole-to-manhole sections, except CIPPSL as authorized by the Engineer.

B. The existing sewer lines may be larger than their nominal size due to corrosion of the concrete pipe. It is the Contractor’s responsibility to measure the actual inside diameter at different locations of the sewer to determine the appropriate size of CIPP liner to use.

**690.02.06 WALL THICKNESS**

A. The wall thickness of the felt tube shall be ordered to the next standard 1.5 mm incremental thickness above the minimum calculated design thickness. Unless otherwise specified to provide for excess resin migration, the gap thickness of the wetting out equipment shall be sized to allow an excess of 5 percent resin to pass during impregnation.

B. The nominal CIPP thickness shall be at least the calculated design thickness, per ASTM F1216, except where fabric layers overlap, in which case it may be in excess of this value.

C. At locations of voids in the existing pipe to be lined, the nominal wall thickness shall be increased to provide the minimum design thickness taking into consideration stretch and expansion of the liner into the void area. Void locations shall be accurately determined during video inspection.

**690.02.07 CHEMICAL RESISTANCE**

A. The cured pipe shall be resistant to a variety of chemical effluents as described in ASTM D543.

1. Testing for chemical resistance may be performed on the sample of the finished product prior to this contract, provided a certified affidavit, signed by an officer of the company, is submitted stating the resin the tests apply to and the resin submitted for this project are the same.
2. Finished and cured CIPP liner properties shall perform as specified.
3. Previous test data will not be acceptable.

B. Chemical resistance test results shall be provided in accordance with Test Method D543 on samples of the cured liner material that are the same as that proposed for installation.

* + - 1. Exposure should be for a minimum of one month at 73.4 degrees F.
      2. During this period, the CIPP test specimens should lose no more than 20 percent of their initial flexural strength and flexural modulus when tested in accordance with Section 8 of ASTM F1216, when subjected to the following solutions:

|  |  |
| --- | --- |
| Chemical Solution | Concentration, percent |
| Tap Water (pH 6-9) | 100 |
| Nitric Acid | 5 |
| Phosphoric Acid | 10 |
| Sulfuric Acid | 10 |
| Gasoline | 100 |
| Vegetable Oil | 100 |
| Detergent | 0.1 |
| Soap | 0.1 |

C. The Contractor shall be responsible for all costs associated with the chemical resistance tests.

D. Proof of meeting the requirements for the design specified shall be provided to the Engineer for approval at least 7 days prior to ordering any material.

**690.02.08 CIPP END AND CONNECTION SEAL**

1. CIPP End Seal: Use epoxy sealant compatible with liner for end seal. Coat all concrete or vitrified clay surfaces.
2. Connection Seal: Use epoxy sealant or lateral connection sealing system that is compatible with CIPP liner system for the connection seal.
3. Sectional Liners: Use an adhesive epoxy compound or mechanical seal to provide a watertight seal

**690.02.09 ALLOWED CIPP AND END CONNECTION SEAL MANUFACTURERS**

A. The following manufacturers of CIPP will be allowed:

1. Inliner Technologies
2. Insituform Technologies, Inc.
3. Applied Felts
4. Pipenology
5. COSMIC CIPPSL or Quick Seal
6. Or equal.

B. The following manufacturers of CIPP end and connection sealing will be allowed:

1. Neopoxy
2. COSMIC A/B Epoxy Paste (UV Cure sectional liners)
3. Or equal.

C. The following lateral connection sealing system manufacturers are allowed:

1. Top Hat
2. Or equal.

**CONSTRUCTION**

**690.03.01 STORAGE AND DELIVERY**

A. The Contractor shall be responsible for the delivery, storage and handling of all materials for CIPP and end and connection sealing material in accordance with the written requirements of the manufacturer.

B. Contractor shall exercise adequate care during transportation, handling and installation to ensure the CIPP material is not torn, cut, or otherwise damaged. If any part or parts of the CIPP material becomes torn, cut or otherwise damaged before or during insertion, it shall be repaired or replaced in accordance with the manufacturer’s recommendations and approval by the Engineer before proceeding.

**690.03.02 PREPARATORY PROCEDURES**

A. Sewer Bypassing and Dewatering. The Contractor shall meet the requirements for bypassing and flow diversion in Section 695 “Diversion of Sewage Flows”.

B. Water Lines for CIPP Work: Water lines used for installation of CIPP shall meet the same requirements as bypass pipes under Section 695 “Diversion of Sewage Flow”.

C. Sewer Cleaning. Prior to CIPP tube or CIPPSL installation, the Contractor shall clean the existing sewer in accordance with Section 692 “Sewer Pipe and Structure Cleaning”. The Contractor shall clear the existing sewer of obstructions such as solids or collapsed pipe or intrusions that will prevent or hinder CIPP liner installation.

D. Internal Inspection:

1. The interior of the sewer shall be carefully inspected in accordance with Section 693 “Internal Inspection of Sewer and Storm Drain Facilities”, to determine the location of conditions that may prevent proper installation of CIPP.
2. Contractor shall furnish television inspection report material to the Engineer within 1 week of inspection.

E. Odor Control:

1. At each location within the project, prior to diversion of flows, the Contractor shall initiate the odor control measures submitted and approved in Section 695 “Diversion of Sewage Flows”.

F. Host Pipe Repair:

1. Prior to insertion of the liner, the Contractor shall take any remediation actions necessary to prepare the host pipe for insertion of the liner.
2. This will include removal of obstructions, intrusions, or smoothing of surfaces in order to ensure a proper fit and full expansion of the liner to the host pipe.
3. Host pipe preparation recommendations shall be made by the contractor after reviewing the video inspection.
4. This work shall be included in the price for the CIPP liner Pay Item(s).

G. Structural Defect Repair:

1. Sections of the existing host pipe which have shifted, dropped, or severely deteriorated (greater than 2” loss of diameter), shall be ground down, grouted, or otherwise repaired to provide a smooth continuous surface which will not reduce the cross-sectional area of the interior of the relined pipe or reduce wall thickness to less than the minimum specified thickness.
2. Recommendations for the structural defect repair method shall be made by the Contractor after reviewing the video inspection.

**690.03.03 TRIMMING INTRUDING LATERALS**

A. Contractor shall trim intruding lateral so that the service connection is flush with the internal pipe wall. Lateral cutting shall be documented by internal inspection methods.

B. Contractor shall ensure that existing pipe is not damaged during cutting operations.

**690.03.04 INSTALLATION CIPP TUBE**

A. The Contractor shall designate the location where the CIPP tube will be impregnated with resin (“wet-out”). Locations shall be subject to approval by the Engineer. The Contractor shall allow the Engineer to inspect the materials and “wet-out” procedure.

B. If the “wet-out” location is not at project site, the impregnated CIPP tube shall be transported to site under controlled environmental conditions.

1. Transport vehicles shall include a tamper resistant, sealed temperature recording device which records the temperature of the liner at all times after leaving the wet-out site.
2. The Contractor shall decide when to transport the resin impregnated CIPP tube and when to commence installation depending on prevailing weather conditions, so as to not jeopardize the installation or be detrimental to the long term performance of the CIPP.

C. The liner will be installed by the inversion tube method.

D. The resin-impregnated tube shall be lowered into the insertion pit through an inversion tube and reducer if needed.

1. The CIPP liner shall be installed through existing manholes.
2. There shall be no separate payment for additional or enhanced access to facilitate the Contractor’s CIPP liner installation process.

E. For CIPP liner thicknesses greater than 0.75 inch, or where the existing pipe, soil and groundwater combination is likely to provide a significant heat sink, affecting the temperature gradient across the CIPP liner material, the temperature of the exotherm shall be monitored by remote temperature sensors placed at the interface of the existing pipe and the CIPP.

1. A minimum of two temperature sensors shall be installed, one at either end of the length being lined.
2. The curing process shall not be terminated until the temperature sensor readings indicated that a satisfactory cure has been completed.
3. Any extended cure times shall not adversely affect the properties of the CIPP lining material.
4. The water shall be evacuated from the pipe at a controlled rate to prevent negative pressure in the pipe and negative impacts to downstream facilities.

F. The curing process shall follow a step cure or similar approach recommended by the manufacturer and approved by the Engineer, and shall be held at the top step for an adequate length of time to ensure that the design physical properties are attained.

* 1. Circulation water shall cool down to at least 100 degrees F for 1 hour before releasing the hydrostatic head.
  2. The rate of temperature rise and fall during heating and cooling shall not exceed 2 degrees F per minute.
  3. The circulation water shall be filtered through a carbon filter treatment system, approved by the Engineer, prior to release into the sanitary sewer system.
  4. The Contractor shall provide a sampling plan to the Engineer that demonstrates pollutants are not being discharged into the sanitary sewer system.

G. Reinstatement of service laterals:

1. After the curing is complete, existing service connections shall be reinstated.
2. Reinstate service laterals using only remote internal methods (prior to CIPP acceptance).
3. Where the CIPP liner does not create dimples at the service connections or in other ways indicate the locations, the exact location shall be determined from the internal inspection data. It shall be the Contractor’s responsibility to accurately locate and reinstate all service connections after the CIPP installation and curing has been completed. All service connections shall be reinstated to a minimum of 95% of the original opening, matching the invert of the lateral.

H. The Contractor shall seal the end points of the liner so that no leakage of fluids may infiltrate between the liner and the existing pipe.

I. The Contractor shall apply either epoxy sealant or lateral connection sealing system (after CIPP acceptance) to completely seal area around opening of the liner and the connection. The installation of the connection seal shall not, in any way, damage or adversely affect the CIPP in any way. If damage to the CIPP liner does occur, the Contractor shall repair or replace the area at no additional cost to the Owner. Contractor shall trim loose or hanging/intruding pipe connection seals to be flush with the internal pipe wall. The Contractor shall not fold the hanging/intruding material.

J The Contractor shall inspect the CIPP after installation as required in 690.03.07.

**690.03.05 INSTALLATION SECTIONAL LINER**

A. The material shall be factory-impregnated with resin (wet-out) by the material manufacturer and shall be packed suitable for transport to the field for installation. The resin shall be in a state to resist wash off during transport/installation and shall be capable of being installed during wet and/or live flow conditions.

B. The resin impregnated tube shall be folded/wrapped per manufacturer’s instructions and loaded on a pressure apparatus for transport and installation.

C. The pressure apparatus, either attached to a robotic device or pulled in by winch, shall be positioned with a television camera to the location of the defect. The pressure apparatus shall include a bladder which shall inflate in the sewer, effectively seating the repair against the sewer pipe wall.

D. Air pressure, supplied to the pressure apparatus through an air hose, shall be used to expand the resin impregnated sectional liner against the sewer pipe wall.

E. The pressure shall be adjusted per manufacturer’s requirements to hold the laminate against the sewer pipe wall. Care shall be taken during the installation to not over-stress the tube.

F. After pull in is completed, recommended pressure is maintained on the impregnated tube for the duration of the curing process.

G. The Liner shall be cured in place by the manufacturer’s suggested resin technology, using either a polyester resin, vinyl ester resin, or epoxy-resin with a watertight seal comprised of either an adhesive epoxy compound or rubberized seal.

H. Curing method shall be compatible with resin selected. The initial cure shall be deemed complete when the liner has been exposed to UV light, heat source, or held in place for the time period specified by the manufacturer.

I. The Contractor shall cool (if heat cured) the hardened liner before relieving the pressure in the pressure apparatus. Care shall be taken to maintain proper pressure throughout the cure and cool-down period.

J. The finished liner shall be free of dry spots, lifts, and delamination. The repair shall not inhibit the closed circuit television post video inspection of the sewer. Any frayed ends of the liner shall be removed prior to acceptance.

H. Contractor shall maintain a visible, written log of all activities in accordance with manufacturer’s recommendations and shall include time of insertion, bladder pressure and requirements, required cure time, actual cure time, and cool-down duration.

**690.03.06 FINISHED PRODUCT**

A. The finished CIPP shall be continuous over the entire length of a manhole to manhole section of pipe, except for sectional liner point repairs.

B. Defects such as foreign inclusions, dry spots, pinholes, delamination, lifts, seam separation, lateral overcuts, and wrinkling beyond the specification allowances, determined by the Engineer as affecting the integrity or strength of the CIPP, or as adversely affecting the hydraulic capacity of the pipe, shall be repaired or replaced at the Contractor’s expense. Method of repair shall be proposed by the Contractor and submitted to the Engineer for review and approval.

C. Wrinkles in the finished CIPP which cause a backwater of one (1) inch or more or a reduction in cross sectional area of 5% of the diameter are unacceptable and shall be removed or repaired by the Contractor at no additional cost to the Owner.

1. If a void between the wrinkle and the pipe exists, the Contractor shall repair or replace that section of the pipe at no additional cost to the Owner.
2. Methods of repair shall be proposed by the Contractor and submitted to the Engineer for review and approval.

D. Separations of liner seams in the finished liner pipe are unacceptable and shall be removed or repaired by the Contractor at no additional cost to the Owner.

1. If a separation of a liner seam exists, the Contractor shall repair or replace that section of the pipe at no additional cost to the Owner.
2. Methods of repair shall be proposed by the Contractor and submitted to the Engineer for approval.

E. Wrinkles in the finished CIPP that reduce the structural integrity of the CIPP are unacceptable and shall be removed or repaired by the Contractor at no additional cost to the Owner.

1. If a void between the wrinkle and the pipe exists, the Contractor shall repair or replace that section of the pipe at no additional cost to the Owner.
2. Methods of repair shall be proposed by the Contractor and submitted to the Engineer for review and approval.

**690.03.07 CIPP LINER SAMPLING AND TESTING**

A. Contractor shall prepare a sample of the installed CIPP liner for subsequent testing of its physical properties.

1. Sampling shall be performed for each separate installation of CIPP on one (1) test per batch-order of sectional liner. As an example – one sample from each pipeline reach where the liner is installed shall be provided.
2. The Owner reserves the right to take five (5) random core samples of the installed CIPP liner at no additional cost in accordance with the procedures in ASTM D5813, as is applicable. The method of repair will be as recommended by the Manufacturer.
3. The minimum wall thickness shall be determined at a minimum of three locations on a cut section of the CIPP lining using a method of measurement accurate to the nearest 0.005 inch or one (1) test per batch order of sectional liner not taken from actual live installation. The acceptable measured wall thickness shall not be less than 5%, or greater than 10%, of the minimum design thickness.
4. The sample shall be prepared using the flat plate sampling method in accordance with the procedures in ASTM F1216.
5. The flat plate sample shall be large enough to provide five sample specimens each for short term flexural (bending) properties, as per ASTM D790. The sample will be clamped in a mold and placed in the downtube during the curing of the CIPP tube.
6. The sample shall be removed after all the water is removed from the cured pipe tube. The samples shall be identified by: Date, Project Name, Size, Thickness, Location, Resin and Catalyst. The cured sample shall be tested by an independent testing laboratory as recommended by the CIPP liner manufacturer and approved by the Engineer for the short term flexural (bending) properties and tensile properties, per ASTM D790 and ASTM D638, respectively. The sample shall be double bagged and sealed.
7. The Contractor shall provide liner test results for long-term properties in accordance with ASTM D2990.
8. The Contractor shall be responsible for any deviation from the specified physical properties and those evaluated through testing. Failure to meet the specified physical properties shall result in the CIPP liner being considered defective work and shall be rejected.
9. The Contractor shall be responsible for all costs associated with the testing of the liner physical properties.

**690.03.08 ACCEPTANCE**

A. Before the removal of the diversion of sewage flow, internal inspection of the CIPP-lined or sectional lined pipe, after all liner end and connection sealing is completed, as specified in Section 693 “Internal Inspection of Sewer and Storm Drain Facilities” will be reviewed by the Engineer for pipe lining acceptance.

**690.03.09 CLEANUP**

A. Following inspection, the Contractor shall clean up the entire project area. All excess material and debris, not incorporated into the permanent installation, shall be disposed off site by the Contractor at a site approved by the Engineer.

**METHOD OF MEASUREMENT**

**690.04.01 MEASUREMENT**

The quantity of XX-INCH CURED-IN-PLACE PIPE LINER will be measured per linear foot, measured from the end of pipe or inside face of structures or actual length installed if lined through the manholes.

The quantity of [FILL IN ITEM DESCRIPTION] will be measured per [UNIT].

No direct measurement shall be made for CIPP end and connection sealing, host pipe repair, structural repair, or lateral repair [ADD ANY INCIDENTALS SPECIFIC TO THIS PROJECT HERE].

**BASIS OF PAYMENT**

**690.05.01 PAYMENT**

The accepted quantity of [XX-INCH DIAMETER CURED-IN-PLACE PIPE LINER] shall be paid for at the contract unit price per linear foot of CIPP liner installed and shall include all materials, equipment and labor required including, but not limited to, design and installation of the liner and end/connection sealing; sewer cleaning; video inspection before and after pipe lining operations; CIPP end and connection sealing; any repair of the existing pipe necessary to ensure proper installation of the lining (including repair of damage during cleaning); removal and replacement of manhole cone, riser, frame/cover, and concrete collar; removal and restoration of pavement; plantmix bituminous surface; tack and prime coat; traffic striping, pavement markings, and curb markings; pavement markers; sampling; testing; clean up and all other items necessary to complete the work as shown on the Plans, as specified herein and as directed by the Engineer. Payments will be based on the liner installed, tested and approved. Partial payments for liner material delivered but not yet installed will not be made. No payment will be made for liner installations deemed deficient by the Engineer.

The accepted quantity of [FILL IN ITEM DESCRIPTION] will be paid for at the contract unit price of [UNIT] and shall include all materials, equipment and labor required including, but not limited to, [FILL IN] and all other items necessary to complete the work as shown on the Plans, as specified herein and as directed by the Engineer.

Unless otherwise provided in the Special Provisions, no payment will be made for [FILL IN ITEM DESCRIPTION] as such. The cost thereof shall be considered as included in the price bid for construction or installation of the items to which [FILL IN ITEM DESCRIPTION] is required.

Payment will be made under:

|  |  |  |
| --- | --- | --- |
| **ITEM NO.** | **ITEM DESCRIPTION** | **UOM** |
| 690.XXXX | XX-INCH CURED-IN-PLACE PIPE LINER | LF |

**END OF SECTION 690**