



Formerly P.C. Simonton & Associates, Inc.

Addendum No. Two

Date: July 30, 2021

Project: Pembroke Sewer Rehabilitation, MES No. 2017-89

Engineer: M.E. Sack Engineering
Hinesville, Georgia

The original plans, specifications, and bid documents are amended to include the following:

Bid Items:

- Replace the previous Bid Items, P-2, with the enclosed Bid Items. Note lines have been added for CCTV inspection and Traffic Control.

Specifications:

- Replace the previous Sections 01150 and 09905 with the enclosed of the same.

Plans:

- Replace the previous Sheet C-100 with the enclosed of the same.

Clarifications:

- Replace the previous Clarification #7 from Addendum One with the answer below:

7. Will the Owner provide a location for debris disposal of material removed from the sanitary sewers during cleaning?

Temporary storage will NOT be provided. Decant liquids into system; grit and solids shall be permanently disposed of by the contractor at an acceptable landfill.

- Answers to questions following the mandatory pre-bid meeting are as follows:

1. Will contractors be allowed to work concurrently across multiple phases/areas?

We prefer maintaining one work area to completion but will consider multiple areas in review of the work plan/schedule. Primary concern would be impacts to citizens, but quick completion is important as well.

2. *Will the Owner/Engineer verify the quantity of service laterals in Basin #2 and Basin #3 for CIPP lateral re-connection to the main via internal cutting?*

Service laterals can be located on the CCTV survey; however, not all the lines have been inspected with video. The bid item list has been revised to include CCTV inspection in order to determine locations of service laterals.

3. *Will the Owner/Engineer provide copies of existing CCTV files for pipe segments proposed for rehabilitation?*

A link to the existing CCTV files has been posted on our website at <http://www.mesack.com/category/bidding/>. This file includes a document with a manhole number correlation; the manhole numbers on the survey are different from the manhole numbers on the plan set.

4. *Due to the proximity of the area near the coast and standing water, does the engineer anticipate a large amount of infiltration in the sewer lines where steam curing would not be an acceptable practice? Typically, in high water table areas steam curing cannot be achieved, and water curing will have to be done which increases cost in labor and curing time.*

The area has a high ground water table and I&I, which is the catalyst of the project.

5. *Will the owner allow Lay flat pipe for bypass methods?*

This is means and methods; proper bypass and no spills are our major concern. All environmental impacts are the contractor's responsibility.

6. *Does the cleaning of the lines require disinfectant?*

Yes. Specification 02660 identifies Chlorine as the disinfectant.

7. *Per the Drawings, Page C100, Basin 3, "Sewer Lines – Line with CIPP" notes (2) MH BS-36 – MH B3-41. One is 188' and the other is 236'. Please advise on the correct MH Length to use, or the other MH number.*

Manhole numbers have been corrected.

8. *Will the Engineer verify the manhole repairs consist of lining walls, bench, inverts, handholds, joints, and seals? And that no ring and cover adjustments are required?*

Ring and cover adjustments are not anticipated as a part of this project.

9. *Per the Pre-Bid meeting GDOT stated traffic control would be strictly enforced on all working areas, including side streets with low traffic volume and would expect flaggers at each location. Will the Owner/Engineer verify this is a requirement for the project to include flaggers on all and low volume traffic areas/side streets? This is not a standard procedure outside of standard signs and cones.*

In the event a lane is shut down, flagmen will be required. On GDOT right-of-way, GDOT traffic control is required. On local streets, utility work ahead signs, cones, and barrels are appropriate unless closing a lane, as mentioned.

10. *If traffic control is a requirement throughout for this project will the Owner/Engineer add a line item to the bid form for traffic control or note where to include the traffic control cost?*

The bid item list has been revised to include traffic control.

11. *Will the Owner/Engineer verify that there is not a dump site provided by the Owner and that the debris will need to be dumped at an offsite landfill?*

See amended Clarification #7 above.

12. *What is the intended minimum Flexural Stress for CIPP? (Pg 235, 2.03.E)?*

Please see revised Section 09905.

13. *At the pre-bid meeting, disposal of solid materials obtained from cleaning operations was discussed. Have any clarifications been made on where contractors could dispose of solids? Would the City/owner assist contractors for this scope of work? Or would disposal of solids be the responsibility of the contractor?*

See amended Clarification #7 above.

-END-



BID ITEMS

Item No.	Estimated Quantity	Units	Description	Unit Price	Total Price
A. <u>Basin 2 Sewer</u>					
1	5,309	LF	CCTV Inspection to determine lateral locations		
2	7,553	LF	Cleaning of 8" Gravity Sewer Lines		
3	12	LF	8" Gravity Sewer Removal and Replacement		
4	145	VF	Manhole Repair and Lining		
5	7,553	LF	8" CIPP on Sewer Lines		
6	7	EA	Sewer Tap Repair and Replacement		
7	1	LS	Stabilization		
8	1	LS	Traffic Control		
9	1	LS	Mobilization (5%)		
Sub-Total					
B. <u>Basin 3 Sewer</u>					
1	11,000	LF	CCTV Inspection to determine lateral locations		
2	13,954	LF	Cleaning of 8" Gravity Sewer Lines		
3	354	LF	8" Gravity Sewer Removal and Replacement		
4	120	VF	Manhole Repair and Lining		
5	13,954	LF	8" CIPP on Sewer Lines		
6	10	EA	Sewer Tap Repair and Replacement		
7	1	LS	Stabilization		
8	1	LS	Traffic Control		
9	1	LS	Mobilization (5%)		
10	30	LF	4" Sewer Lateral		
Sub-Total					
Total Bid					

SECTION 01150
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 QUANTITIES

- A. Quantities: Quantities listed in the Proposal are approximate only and are intended to serve as a guide in comparing bids and may be increased or decreased without invalidating the unit price bid.
- B. Payment: Contractor shall be paid for actual in place quantities as determined by the Engineer field measurements.
- C. Discrepancies: In case of discrepancies between the figures shown in the unit prices and totals, the unit prices shall apply, and the totals shall be corrected to agree with the unit price.

PART 2 - MEASUREMENT AND PAYMENT

2.01 CLOSED CIRCUIT TELEVISION (CCTV) INSPECTION TO DETERMINE LATERAL CONNECTIONS

- A. Measurement: This item of work will be considered complete when all gravity sewer lines were inspected, and the final report is delivered to the city.
- B. Payment: Payment for the CCTV inspection will be made at the unit price bid per linear foot. Unit price bid shall include all aspects of the project including access to the sewer, deliverables, and reinserting manhole cover when complete.

2.02 CLEANING OF GRAVITY SEWER LINES

- A. Measurement: This item of work will be considered complete when all cleaning and disinfection of the 21,507 linear feet of 8" gravity sewer is accomplished and lining can commence.
- B. Payment: Payment for the cleaning of the gravity sewer will be made at the unit price bid per linear foot. Unit price bid shall include all aspects of the project including access to the sewer, clearing of any trees, undergrowth, or brush that may be necessary to access the sewer line, supplying all-terrain vehicles if required, clear bare surface, removal of cleaning debris, and dumping off-site, cleaning of manholes and reinserting manhole cover when complete.

2.03 GRAVITY SEWERS REMOVAL AND REPLACEMENT

- A. Measurement: Measurement shall be made on the basis of each linear foot of gravity sewer line removed and replaced at the elevation and location designated on the construction plans.
- B. Payment: Payment for gravity sewers will be made at the unit price bid per complete removal and replacement. Unit price bid shall include furnishing all labor, materials, and equipment necessary to complete the removal of old pipe and

installation of the sewer including, but not limited to, trenching, bedding, PVC, or ductile iron sewer pipe, shoring and sheeting, dewatering, testing, backfill, trench compaction, complete surface restoration, and temporary bypass to maintain uninterrupted service.

2.04 MANHOLE REPAIR AND LINING

- A. Measurement: Measurement shall be made on the basis of each vertical foot of manhole repair and coated with liner on manholes designated on the construction plans.
- B. Payment: Payment for manhole repair and coating with liner will be made at the unit price bid per vertical foot. Unit price bid shall include furnishing all labor, materials, and equipment necessary to complete the lining of manholes, including, but not limited to seals, bottoms, walls, handholds, joints, and coating with liner for complete manhole restoration.

2.05 CIPP ON SEWER LINE

- A. Measurement: Measurement shall be made on the basis of each linear foot of sewer line coated with Cast In-Place Pipe (CIPP) on lines designated on the construction plans.
- B. Payment: Payment for sewer line coated with CIPP technique will be made at the unit price bid per linear foot. Unit price bid shall include furnishing all labor, materials, and equipment necessary to complete the lining, including, but not limited to, setting up a sewer bypass system, if necessary, sewer vacuum, open and reinstate sewer service lateral connections that were covered by the pipe lining, removal of the bypass system, and conduct quality control inspections with video for a complete sewer line restoration.

2.06 SEWER TAP REPAIR AND REPLACEMENT

- A. Measurement: Measurement will be made on the basis of each completed repair or replacement.
- B. Payment: Payment will be made on the basis of the unit price stated in the bid. The unit price bid shall include all materials, equipment, and labor necessary to complete the task. The task shall include, but is not limited to, locating the laterals, excavation, connection to the main line including any fittings or clean outs required using insertion tee or approved equal, temporary bypass, complete backfill and compactions and complete surface restoration.

2.07 STABILIZATION

- A. Measurement: Measurement shall be made on the basis of the completed item in accordance with the construction plans and bid items.

- B. Payment: Payment will be made in accordance with the price stated in the bid. The unit price shall include, but is not limited to, grassing, mulching, watering, and fertilization necessary to establish permanent grass cover and temporary mulch cover on all disturbed areas in accordance with plans and specifications. Work shall include, but not be limited to, furnishing all materials, fertilizer, soil samples, mulch, grass seed, raking, leveling, watering, maintenance, and final surface restoration. Final payment will not occur until permanent grass is established.

2.08 TRAFFIC CONTROL

- A. Measurement: Measurement shall be made on the basis of the percentage complete of the lump sum bid in accordance with the construction plans and bid items.
- B. Payment: Payment shall be made on the basis of the percentage complete of the lump sum price stated in the bid as determined by the project engineer. The lump sum shall include furnishing all labor, materials, and equipment necessary to complete the task. The task shall include, but is not limited to, the placing, moving, and maintenance of all signage, barricades, cones, barrels, flagging, flag men, and guide vehicles throughout the construction process to safely reroute traffic from existing traffic patterns. Traffic control shall be done in a manner to safely warn, reroute, and lead vehicles to their destination. Additional signage will be required if the engineer deems that the traffic control in place does not fully meet the required intent of the task. Changing of existing traffic patterns shall be communicated with the engineer no less than 48 hours prior to.

2.09 MOBILIZATION

- A. Payment: Payment will be made for the price as stated in the Contract once the Contractor has established his construction yard, and met the requirements established in the Contract Documents. Mobilization will be recognized complete once the Contractor has provided a construction schedule and moved his equipment and a substantial amount of material to the job site. Construction must be underway and progressing. Payment for mobilization will be limited to a maximum amount not to exceed 5% of the bid price.

2.10 SEWER LATERAL

- A. Measurement: Measurement shall be made on the basis of each linear foot of sewer lateral at the elevation and location designated on the construction plans.
- B. Payment for sewer lateral will be made at the unit price bid per complete lateral reconnection. Unit price bid shall include furnishing all labor, materials, and equipment necessary to complete the removal of old pipe and reconnection of the lateral including, but not limited to, trenching, digging, PVC or ductile iron pipe, shoring and sheeting, dewatering, testing, backfill, trench compaction, complete surface restoration, and temporary bypass to maintain uninterrupted service.

SECTION 09905
CURED-IN-PLACE PIPE (CIPP)

PART 1 - GENERAL

1.01 INTENT

- A. It is the intent of this specification to provide for the reconstruction of pipelines and conduits by the installation of a resin-impregnated flexible tube, which is tightly formed to the original conduit. The resin is cured using either hot water under hydrostatic pressure or steam pressure within the tube. The Cured-In-Place Pipe (CIPP) will be continuous and tight fitting.

1.02 REFERENCED DOCUMENTS

- A. ASTM F1216 (Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube).
- B. ASTM F1743 (Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)).
- C. ASTM D5813 (Cured-in-Place Thermosetting Resin Sewer Pipe).
- D. ASTM D790 (Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials), and D2990 (Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics). In case of conflicting requirements between this specification and these referenced documents, this specification will govern..

1.03 PRODUCT, MANUFACTURER/INSTALLER QUALIFICATION REQUIREMENTS

- A. Products are intended to have a 50-year design life, and in order to minimize the Owner's risk, only proven products with substantial successful long-term track records will be approved. All trenchless rehabilitation products and installers must be pre-approved prior to the formal opening of proposals.
- B. Products and Installers seeking approval must meet all of the following criteria to be deemed Commercially Acceptable:
 - 1. For a Product to be considered Commercially Proven, a minimum of 1,000,000 linear feet or 4,000 manhole-to-manhole line sections of successful wastewater collection system installations in the U.S. must be documented to the satisfaction of the Owner to assure commercial viability
 - 2. For an Installer to be considered as Commercially Proven, the Installer must satisfy all insurance, financial, and bonding requirements of the Owner, and must have had at least 5 (five) years active experience in the commercial installation. In addition, the Installer must have successfully installed at least

50,000 feet of the product bid in wastewater collection systems. Acceptable documentation of these minimum installations must be submitted to the Owner.

3. Sewer rehabilitation products submitted for approval must provide third party test results supporting the structural performance (short-term and long-term) of the product and such data shall be satisfactory to the Owner. Test samples shall be prepared so as to simulate installation methods and trauma of the product. No product will be approved without independent third party testing verification.
4. Both the rehabilitation manufacturing and installation processes shall operate under a quality management system which is third-party certified to ISO 9000 or other recognized organization standards. Proof of certification shall be required for approval.
5. Proposals must be labeled clearly on the outside of the proposal envelope, listing the product name and installer being proposed. Only proposals using pre-approved products and installers will be opened and read. Proposals submitted on products and/or from installers that have not been pre-approved will be returned unopened.
6. Documentation for products and installers seeking pre-approved status must be submitted no less than two weeks prior to proposal due date to allow time for adequate consideration. The Owner will advise of acceptance or rejection a minimum of three days prior to the due date. All required submittals must be satisfactory to the Owner.

PART 2 – MATERIALS

2.01 TUBE

- A. Tube - The sewn Tube shall consist of one or more layers of absorbent non-woven felt fabric and meet the requirements of ASTM F1216, Section 5.1 or ASTM F1743, Section 5.2.1 The tube shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe, and stretch to fit irregular pipe sections.
- B. The wet out Tube shall have a relatively uniform thickness that when compressed at installation pressures will equal or exceed the calculated minimum design thickness.
- C. The Tube shall be manufactured to a size that when installed will tightly fit the internal circumference and length of the original pipe. Allowance should be made for circumferential stretching during inversion. Overlapped layers of felt in longitudinal seams that cause lumps in the final product shall not be utilized.
- D. The outside layer of the Tube shall be coated with an impermeable, flexible membrane that will contain the resin and all the resin impregnation (wet out) procedure to be monitored.

- E. The Tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers. No material shall be included in the Tube that may cause delamination in the cured CIPP. No dry or unsaturated layers shall be evident.
- F. The wall color of the interior pipe surface of CIPP after installation shall be a relatively light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.
- G. Seams in the Tube shall be stronger than the non-seamed felt material.
- H. The Tube shall be marked for distance at regular intervals along its entire length, not to exceed 5 ft. Such markings shall include the Manufacturers name or identifying symbol. The tubes must be manufactured in the USA.

2.02 RESIN

- A. The resin system shall be a corrosion resistant polyester, vinyl ester, or epoxy system including all required catalysts, initiators or hardeners that when cured within the tube create a composite that satisfies the requirements of ASTM F1216 and ASTM F1743, the physical properties herein, and those which are to be utilized in the design of the CIPP for this project.
- B. The resin shall produce a CIPP that will comply with the structural and chemical resistance requirements of this specification.

2.03 STRUCTURAL REQUIREMENTS

- A. The CIPP shall be designed as per ASTM F1216. The CIPP design shall assume no bonding to the original pipe wall.
- B. The Contractor must have performed long-term testing for flexural creep of the CIPP pipe material installed by his Company. Such testing results are to be used to determine the long-term, time dependent flexural modulus to be utilized in the product design. This is a performance test of the materials (Tube and Resin) and general workmanship of the installation and curing. A percentage of the instantaneous flexural modulus value (as measured by ASTM D790 testing) will be used in design calculations for external buckling. The percentage, or the long-term creep retention value utilized, will be verified by this testing. Retention values exceeding 50% of the short-term test results shall not be applied unless substantiated by qualified third party test data to the Owner's satisfaction. The materials utilized for the contracted project shall be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus used in the CIPP design.

- C. The Enhancement Factor 'K' to be used in 'Partially Deteriorated' Design conditions shall be assigned a value of 7. Application of Enhancement (K) Factors in excess of 7 shall be substantiated through independent test data to the satisfaction of the Owner.
- D. 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 the layers separate during field sample testing, new samples will be required to be obtained from the installed pipe. Any reoccurrence may cause rejection of the work.
- E. The cured pipe material (CIPP) shall conform to the structural properties, as listed below.

MINIMUM CIPP PHYSICAL PROPERTIES

<u>Property</u>	<u>Test Method</u>	<u>Cured Polyester Composite</u>	
		<u>min. per ASTM F1216</u>	<u>Enhanced Resin</u>
Modulus of Elasticity	ASTM D790	250,000 psi	400,000 psi
Flexural Stress	ASTM D790	4,500 psi	4,500 psi

- F. The required structural CIPP wall thickness shall be based as a minimum, on the physical properties listed above and in accordance with the Design Considerations of ASTM F1216.
- G. Refer to the attached dimension ratio table for specific pipe section requirements, based on the pipe condition, depth, ovality, etc. as computed for the conditions shown, using ASTM F1216 design equations.
- H. Any layers of the tube that are not saturated with resin prior to insertion into the existing pipe shall not be included in the structural CIPP wall thickness computation.

2.04 TESTING REQUIREMENTS

- A. Chemical Resistance - The CIPP shall meet the chemical resistance requirements of ASTM F1216. CIPP samples for testing shall be of tube and resin system similar to that proposed for actual construction. It is required that CIPP samples with and without plastic coating meet these chemical-testing requirements.
- B. Hydraulic Capacity - Overall, the hydraulic cross-section shall be maintained as large as possible. The CIPP shall have a minimum of the full flow capacity of the original pipe before rehabilitation. Calculated capacities may be derived using a commonly accepted roughness coefficient for the existing pipe material taking into consideration its age and condition.

- C. CIPP Field Samples - When requested by the Owner, the Contractor shall submit test results from field installations in the USA of the same resin system and tube materials as proposed for the actual installation. These test results must verify that the CIPP physical properties specified in Section 2.03 (E) have been achieved in previous field applications. Samples for this project shall be made and tested as described in Section 3.05 (A).

2.05 INSTALLATION RESPONSIBILITIES FOR INCIDENTAL ITEMS

- A. It shall be the responsibility of the Owner to locate and designate all manhole access points open and accessible for the work, and provide rights-of-access to these locations. If a street must be closed to traffic because of the orientation of the sewer, the Owner shall institute the actions necessary to provide access during this for the mutually agreed time period. The Owner shall also provide free access to water hydrants for cleaning, installation and other process related work items requiring water.
- B. 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. The Owner shall also provide a dumpsite for all debris removed from the sewers during the cleaning operation. This site will be at or near the sewage treatment facility to which the debris would have arrived in absence of the cleaning operation.
- C. 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. The Owner shall require a detail of the bypass plan to be submitted.
- D. Inspection of Pipelines - Inspection of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles and service connections using close circuit television (CCTV) inspection techniques. The pipeline interior shall be carefully inspected to determine the location of any conditions that may prevent proper installation of CIPP. These shall be noted and corrected. A videotape and suitable written log for each line section shall be produced for later reference by the Owner.
- E. Line Obstructions - It shall be the responsibility of the Contractor to clear the line of obstructions such as solids and roots that will prevent the insertion of CIPP. If pre-installation inspection reveals an obstruction such as a protruding service connection, dropped joint, or a collapse that will prevent the installation process, that was not evident on the pre-bid video and it cannot be removed by conventional sewer cleaning equipment, then the Contractor shall make a point repair excavation to uncover and remove or repair the obstruction. Such excavation shall be approved

in writing by the Owner's representative prior to the commencement of the work and shall be considered as a separate pay item.

- F. Public Notification - 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. The Contractor shall also provide the following:
 - 1. Written notice to be delivered to each home or business the day 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.
 - 2. Personal contact with any home or business, which cannot be reconnected within the time stated in the written notice.
- G. The Contractor shall be responsible for confirming the locations of all branch service connections prior to installing the CIPP.

PART 3 – EXECUTION

3.01 CIPP INSTALLATION - CIPP installation shall be in accordance with ASTM F1216, Section 7, or ASTM F1743, Section 6, with the following modifications.

3.02 RESIN IMPREGNATION

- A. 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 loss of resin during installation through cracks and irregularities in the original pipe wall.
- B. If a vacuum impregnation process is used, the point of vacuum shall be no further than 25-feet from the point of initial resin introduction. After vacuum in the tube is established, a vacuum point shall be no further than 75-feet from the leading edge of the resin.
- C. The leading edge of the resin slug shall be as near to perpendicular to the longitudinal axis of the tube as possible.
- D. A roller system shall be used to uniformly distribute the resin throughout the tube.
- E. If the Installer uses an alternate method of resin impregnation, the method must produce the equivalent results. Any alternate resin impregnation method must be documented to the Owner's satisfaction that the saturation of the CIPP is sufficient.

3.03 TUBE INSTALLATION

- A. Tube Insertion – The wet-out tube shall be positioned in the pipeline using either inversion or a pull-in method. If pulled into place, a power winch should be utilized and care should be exercised not to damage the tube as a result of pull-in friction. The tube should be pulled-in or inverted through an existing manhole or approved access point and fully extend to the next designated manhole or termination point.
- B. Temperature gauges shall be placed between the tube and the host pipe's invert position to monitor the temperatures during the cure cycle.
- C. Curing shall be accomplished by utilizing hot water under hydrostatic pressure or steam pressure in accordance with the manufacturer's recommended cure schedule.

3.04 REINSTATEMENT OF BRANCH CONNECTIONS

- A. It is the intent of these specifications that branch connections to buildings be re-opened without excavation, utilizing a remotely controlled cutting device, monitored by a CCTV. The Contractor shall certify a minimum of two complete functional cutters plus key spare components are on the job site before each installation or are in the immediate area of the jobsite and can be quickly obtained. Unless otherwise directed by the Owner or his authorized representative, all laterals will be reinstated. No additional payment will be made for excavations for the purpose of reopening connections and the Contractor will be responsible for all costs and liability associated with such excavation and restoration work.

3.05 INSPECTION

- A. CIPP samples shall be prepared and physical properties tested in accordance with ASTM F1216 or ASTM F1743, Section 8, using either method proposed. The flexural properties must meet or exceed the values listed in Table 1 of the applicable ASTM.
- B. Wall thickness of samples shall be determined as described in paragraph 8.1.6 of ASTM F1743. The minimum wall thickness at any point shall not be less than 87½% of the minimum design wall thickness as calculated in paragraph 2.03 (F) of this document.
- C. Visual inspection of the CIPP shall be in accordance with ASTM F1743, Section 8.6.

3.06 CLEAN-UP

- A. Upon acceptance of the installation work and testing, the Contractor shall restore the project area affected by the operations to a condition at least equal to that existing prior to the work.

CIPP WALL THICKNESS

FULLY DETERIORATED DESIGN (FD)

		Required DR (D / t)			
		Ei = 250,000 psi		Ei = 400,000 psi	
		Groundwater Depth			
Ovality	Range of Depth to invert (feet)	50% Depth	Full Depth	50% Depth	Full Depth
2 % *	4 - 8	49	43	58	51
	8 - 12	49	43	58	51
	12 - 16	44	39	52	46
	16 - 20	40	36	47	41
	20 - 24	37	33	44	38
5 %	4 - 8	41	37	48	43
	8 - 12	41	36	48	43
	12 - 16	37	33	44	38
	16 - 20	34	30	40	35
	20 - 24	31	27	37	32
8 %	4 - 8	35	31	40	36
	8 - 12	35	30	41	36
	12 - 16	31	27	37	32
	16 - 20	28	25	33	29
	20 - 24	26	23	31	27

FD wall thickness considers groundwater, soil and live loads upon the CIPP pipe. The table assumes two heights of groundwater, 120-lbs/cu. ft. of soil density and an AASHTO H20 highway load. The table represents CIPP pipe wall thickness for a host pipe range of 8 to 48 inches. This is a guideline only. Specific calculations should refer to ASTM F-1216, Appendix X.1.

Design Parameters:

Factor of Safety = 2.0 (typically used value)

DR = Dimension Ratio = Diameter / thickness $\Rightarrow t = D / DR$

Effective reduction of Ei-modulus to approximate effects of creep = 50 %

Soil Modulus = 1,000 psi, assumed for highway loads or depths ≥ 10 feet (all others 700 psi).

Ovality % = $100 \times (\text{Mean Dia.} - \text{Minimum Dia.}) / \text{Mean Dia.}$

* 2% ovality is typically assumed when the host pipe measurements have not been field verified.

BASIN 2

MANHOLES - COAT WITH LINER

Manhole ID	Top Elevation ft	Invert, ft	X Coordinate	Y Coordinate	Vertical Feet
MH B2-01	84.19	77.82	824721.82	775047.57	11.37
MH B2-02	84.08	75.74	824710.58	775055.64	8.34
MH B2-03	84.55	73.08	824665.91	775074.14	11.47
MH B2-04	85.08	75.00	824641.52	774752.88	10.08
MH B2-05	82.49	76.30	824630.10	774431.43	6.19
MH B2-06	85.27	77.30	824710.78	774108.26	7.97
MH B2-09	84.08	76.05	824716.81	775073.00	8.03
MH B2-10	84.58	76.60	824871.25	775065.04	7.98
MH B2-12	84.94	77.40	825043.64	775058.32	7.54
MH B2-13	84.70	77.90	825167.23	775057.13	6.80
MH B2-16	84.40	78.44	825315.00	775053.31	5.96
MH B2-17	85.76	79.32	825827.89	775080.68	6.44
MH B2-18	85.37	79.00	825069.77	775354.99	6.37
MH B2-19	87.71	80.20	825097.04	775654.48	7.51
MH B2-20	83.98	78.52	824445.70	775084.73	5.46
MH B2-21	84.78	79.10	824309.11	775103.70	5.68
MH B2-24	85.87	79.82	824310.94	775249.56	6.35
MH B2-25	85.94	79.57	824324.81	775247.60	6.37
MH B2-27	85.42	80.70	824464.22	775378.47	4.72
MH B2-28	87.48	83.96	824486.22	775627.25	3.52

SEWER TAP - REPLACE/REPAIR

Sewer Line	Initial MH	End MH	Alignment	Location ft
SL-2-08	B2-03	B2-20	DR-RUN-2-1A	1+73.40
SL-2-05	B2-04	B2-05	DR-RUN-2-1C	1+75.00
SL-2-01	B2-07	B2-08	DR-RUN-2-1C	11+15.58
SL-2-03	B2-06	B2-22	DR-RUN-2-2C	0+99.99
SL-2-03	B2-06	B2-22	DR-RUN-2-2C	1+08.74
SL-2-03	B2-06	B2-22	DR-RUN-2-2C	1+88.58
SL-2-03	B2-06	B2-22	DR-RUN-2-2C	2+96.24

SEWER LINES - LINE WITH CIPP

Sewer Line	Length	X Coordinate From	Y Coordinate From	Initial Manhole	X Coordinate To	Y Coordinate To	End Manhole	Material Type	Diameter (in)	Notes
SL-2-01	243	824791.9280	773866.9600	MH B2-07	824898.9253	773648.4174	MH B2-08	CLAY	8	ROOT REMOVAL
SL-2-02	255	824710.7858	774108.2686	MH B2-06	824791.9280	773866.9600	MH B2-07	CLAY	8	
SL-2-03	349	824710.7858	774108.2686	MH B2-06	824436.9821	773892.4999	MH B2-22	CLAY	8	REPLACE 12FT SECTION
SL-2-04	333	824630.1022	774431.4315	MH B2-05	824710.7858	774108.2686	MH B2-06	CLAY	8	
SL-2-05	322	824641.5269	774752.8806	MH B2-04	824630.1022	774431.4315	MH B2-05	CLAY	8	
SL-2-06	322	824665.9190	775074.1420	MH B2-03	824641.5269	774752.8806	MH B2-04	CLAY	8	
SL-2-07	39	824700.5800	775055.6480	MH B2-02	824665.9190	775074.1420	MH B2-03	CLAY	8	
SL-2-08	220	824665.9190	775074.1420	MH B2-03	824445.7030	775084.7300	MH B2-20	CLAY	8	MH B2-20 BURIED
SL-2-09	138	824445.7030	775055.6480	MH B2-20	824309.1170	775103.7070	MH B2-21	CLAY	8	MH B2-20 BURIED
SL-2-10	142	724309.1170	775074.1420	MH B2-21	824167.6170	775113.1360	MH B2-23	CLAY	8	
SL-2-11	149	724445.7030	775084.7300	MH B2-20	824455.4480	775233.2790	MH B2-26	CLAY	8	
SL-2-12	131	824455.4480	775103.7070	MH B2-26	824324.8190	775247.6030	MH B2-25	CLAY	8	
SL-2-13	14	824324.8190	775094.7300	MH B2-25	824310.9410	775249.5690	MH B2-24	CLAY	8	
SL-2-14	145	824455.4480	775233.2790	MH B2-26	824464.2260	775378.4700	MH B2-27	CLAY	8	
SL-2-15	250	824464.2260	775378.4700	MH B2-27	824486.2250	775627.2570	MH B2-28	CLAY	8	
SL-2-16	132	824464.2260	775378.4700	MH B2-27	824337.2342	775414.6010	MH B2-29	CLAY	8	
SL-2-17	279	824337.2342	775414.6010	MH B2-29	824287.9285	775688.9066	MH B2-30	CLAY	8	
SL-2-18	276	824297.9285	775688.9066	MH B2-30	824239.3174	775960.4343	MH B2-31	CLAY	8	
SL-2-19	24	824700.5800	775055.6480	MH B2-02	0824716.8150	775073.0040	MH B2-09	CLAY	8	
SL-2-20	457	824716.8150	775073.0040	MH B2-09	824732.4768	775529.7793	MH B2-32	CLAY	8	
SL-2-21	112	824732.4768	775529.7793	MH B2-32	824748.3200	775640.5110	MH B2-33	CLAY	8	
SL-2-22	142	824748.3200	775640.5110	MH B2-33	824757.5630	775782.1180	MH B2-34	CLAY	8	
SL-2-23	155	824716.8150	775073.0040	MH B2-09	824871.2590	775065.0440	MH B2-10	CLAY	8	
SL-2-24	142	824871.2590	775065.0440	MH B2-10	825012.8920	775059.1610	MH B2-11	CLAY	8	
SL-2-25	31	824012.8920	775059.1610	MH B2-11	825043.6480	775058.3270	MH B2-12	CLAY	8	
SL-2-26	124	825043.6480	775058.3270	MH B2-12	825167.2380	775057.1330	MH B2-13	CLAY	8	
SL-2-27	148	824167.2380	775057.1330	MH B2-13	825315.0070	775053.3150	MH B2-16	CLAY	8	
SL-2-28	308	824315.0070	775053.3150	MH B2-16	825623.0910	775058.4350	MH B2-TBD-01	CLAY	8	
SL-2-29	206	824623.0910	775058.4350	MH B2-TBD-01	825827.8906	775080.6821	MH B2-17	CLAY	8	
SL-2-30	298	825043.6480	775058.3270	MH B2-12	825069.7760	773354.9910	MH B2-18	CLAY	8	
SL-2-31	301	825069.7760	775354.9910	MH B2-18	825097.0430	775654.4860	MH B2-19	CLAY	8	
SL-2-32	202	824871.2590	775065.0440	MH B2-10	824833.2683	774866.2472	MH B2-35	CLAY	8	
SL-2-33	93	824833.2683	774866.2472	MH B2-35	824911.2668	774815.8223	MH B2-36	CLAY	8	
SL-2-34	325	824911.2668	774815.8223	MH B2-36	825105.3642	774554.7849	MH B2-37	CLAY	8	
SL-2-35	85	825167.2380	775057.1330	MH B2-13	825166.4169	774972.4182	MH B2-14	CLAY	8	
SL-2-36	301	825166.4169	774972.4182	MH B2-14	825335.0517	774722.9269	MH B2-TBD-02	CLAY	8	
SL-2-37	107	825335.0517	774722.9269	MH B2-TBD-02	825404.5827	774641.9376	MH B2-15	CLAY	8	
SL-2-38	23	824721.8820	775047.5673	MH B2-01	824700.5800	775055.6480	MH B2-02	CLAY	8	
SL-2-39	90	824741.0427	775024.6317	WW-82	824721.8820	775047.5673	MH B2-01	CLAY	8	

BASIN 3

MANHOLES - COAT WITH LINER

Manhole ID	Top Elevation ft	Invert, ft	X Coordinate	Y Coordinate	Vertical Feet
MH B3-02	89.00	76.40	822264.44	776651.72	12.6
MH B3-06	90.13	80.81	822219.10	775980.82	9.32
MH B3-19	89.75	85.67	822349.59	775127.92	4.08
MH B3-21	90.04	85.14	823361.29	775494.98	4.90
MH B3-22	88.89	76.95	822500.63	776635.65	11.94
MH B3-23	88.72	79.20	822802.62	776610.05	9.52
MH B3-28	91.15	80.40	822803.63	776944.64	10.75
MH B3-29	89.91	81.70	822808.59	777233.72	8.21
MH B3-45	86.80	76.99	822060.70	776717.94	9.91
MH B3-46	89.49	79.49	821715.66	776765.46	10.00
MH B3-49	89.16	79.82	821672.00	776850.37	9.34
MH B3-51	87.90	81.22	821363.76	776675.75	5.37
MH B3-52	88.01	82.64	821032.16	776492.08	5.91
MH B3-55	90.41	84.67	821427.63	777308.25	5.74

SEWER TAP - REPLACE/REPAIR

Sewer Line	Initial MH	End MH	Alignment	Location ft
SL-2-08	MH B3-49	MH B3-51	DR-RUN-3-1A	6+68.70
SL-2-05	MH B3-49	MH B3-51	DR-RUN-3-1A	7+87.90
SL-2-01	MH B3-49	MH B3-51	DR-RUN-3-1A	8+03.65
SL-2-03	MH B3-49	MH B3-51	DR-RUN-3-1A	9+07.20
SL-2-03	MH B3-46	MH B3-47	DR-RUN-3-2A	1+44.15
SL-2-03	MH B3-31	MH B3-34	DR-RUN-3-3B	1+30.30
SL-2-03	MH B3-22	MH B3-23	DR-RUN-3-1C	3+43.32
SL-2-03	MH B3-23	MH B3-28	DR-RUN-3-1C	8+35.02
SL-2-03	MH B3-28	MH B3-29	DR-RUN-3-1C	11+75.00
SL-2-03	MH B3-23	MH B3-29	DR-RUN-3-2C	1+67.80

SEWER LINES - LINE WITH CIPP

Sewer Line	Length	X Coordinate From	Y Coordinate From	Initial Manhole	X Coordinate To	Y Coordinate To	End Manhole	Material Type	Diameter (in)	Notes
SL-3-01	87	822188.3020	776694.6350	MH B3-01	822284.4470	776851.7210	MH B3-02	CLAY	8	
SL-3-02	335	822264.4470	776651.7210	MH B3-02	822242.7616	77317.6330	MH B3-05	CLAY	8	
SL-3-03	338	822242.7616	776317.6330	MH B3-05	822219.1072	775980.8276	MH B3-06	CLAY	8	
SL-3-04	92	822219.1072	775980.8276	MH B3-06	822211.0777	775889.4646	MH B3-10	CLAY	8	
SL-3-05	171	822211.0777	775889.4646	MH B3-07	822198.4008	775719.0447	MH B3-10	CLAY	8	
SL-3-06	399	822198.4008	775719.0447	MH B3-10	822175.3848	775320.7479	MH B3-11	CLAY	8	
SL-3-07	305	822175.3848	775320.7479	MH B3-11	822138.2123	775017.6127	MH B3-12	CLAY	8	
SL-3-08	78	822138.2123	775017.6127	MH B3-12	822191.8795	774961.0180	MH B3-13	CLAY	8	
SL-3-09	370	822211.0777	775889.4646	MH B3-07	822579.9650	775864.3725	MH B3-08	CLAY	8	
SL-3-10	92	822579.9650	775864.3725	MH B3-08	8226713.6225	775863.8725	MH B3-09	CLAY	8	
SL-3-11	251	822219.1072	775980.8276	MH B3-06	821968.8901	775993.1973	MH B3-14	CLAY	8	
SL-3-12	248	821968.8901	775993.1973	MH B3-14	821721.7115	776008.1711	MH B3-15	CLAY	8	
SL-3-13	230	821721.7115	776008.1711	MH B3-15	821491.8918	776023.3895	MH B3-16	CLAY	8	
SL-3-14	212	821491.8918	776023.3895	MH B3-16	821279.7698	776033.1736	MH B3-17	CLAY	8	
SL-3-15	237	822264.4470	776651.7210	MH B3-02	822500.6361	776635.6590	MH B3-22	CLAY	8	
SL-3-16	303	822500.6361	776635.6590	MH B3-22	822802.6290	776610.0590	MH B3-23	CLAY	8	
SL-3-17	221	822802.6290	776610.0590	MH B3-23	823023.2477	776593.1003	MH B3-24	CLAY	8	
SL-3-18	219	823023.2477	776593.1003	MH B3-24	823242.2240	776578.0610	MH B3-25	CLAY	8	
SL-3-19	127	823242.2240	776578.6010	MH B3-25	823251.7790	776451.2876	MH B3-26	CLAY	8	
SL-3-20	402	828251.7790	776451.2876	MH B3-26	823272.7425	776049.5949	MH B3-27	CLAY	8	
SL-3-21	335	822802.6290	776610.0590	MH B3-23	822803.6314	776944.6403	MH B3-28	CLAY	8	REPLACE 20FT SECTION, CLEAN TO REMOVE ENCRUSTATION
SL-3-22	289	822803.6303	776944.6403	MH B3-28	822808.5960	777233.7200	MH B3-29	CLAY	8	
SL-3-23	148	822808.5960	777233.7200	MH B3-29	822661.2785	777245.3100	MH B3-30	CLAY	8	
SL-3-24	391	822661.2785	777245.3100	MH B3-30	822700.3520	777633.9350	MH B3-31	CLAY/CAST IRON	8	REMOVE TUBERCULATION ON 122FT CAST IRON PIPE
SL-3-25	228	822700.3520	777633.9350	MH B3-31	822927.1629	777609.2541	MH B3-34	CLAY	8	
SL-3-26	225	822927.1629	777609.2541	MH B3-34	823150.1120	777582.5360	MH B3-35	CLAY	8	
SL-3-27	240	822700.3520	777633.9350	MH B3-31	822460.1700	777636.3840	MH B3-32	CLAY	8	
SL-3-28	250	822460.1700	777636.3840	MH B3-32	822210.3370	777636.5240	MH B3-33	CLAY	8	
SL-3-30	278	822700.3520	777633.9350	MH B3-31	822775.8226	777901.4120	MH B3-38	CLAY	8	
SL-3-31	259	822775.8226	777901.4120	MH B3-38	822553.6446	7780340.5046	MH B3-37	CLAY	8	
SL-3-32	205	822553.6446	778034.5046	MH B3-37	822421.8735	778191.2756	MH B3-38	CLAY	8	
SL-3-33	294	822421.8735	778191.2756	MH B3-38	822206.2486	778391.2755	MH B3-39	CLAY	8	
SL-3-34	147	822206.2486	778391.2755	MH B3-39	822095.3115	778487.6297	MH B3-40	CLAY	8	
SL-3-35	188	822095.3112	778487.6297	MH B3-40	821947.3945	778703.9629	MH B3-TBD-07	CLAY	8	