

- 1. Group “B” – Chemical Grouting:** Testing and chemical grouting of pipe, root removal, cleanout installation, bypass pumping and TV surveying.
- 2. Group “D” – Cured-in-Place Sectionals and Lateral Lining:** Cured-in-place lateral lining, sectional lining of mains and mainline/lateral connection. Television survey on service lateral pipes using special camera systems and associated cleanout installation and bypass pumping. Lateral camera surveys must have pan and tilt capabilities, associated work such as cleaning and preparation, cleanout installation, bypass pumping, traffic control and TV survey.
- 3. Group “E” – Cured-in-place Lining:** Cured-in-place pipe lining for gravity mains and laterals and associated work such as cleaning and preparation, lateral reinstatement, cleanout installation, bypass pumping, traffic control and TV survey. Cured-in-place lateral lining, sectional lining of mains, and mainline/laterals connection interface seal installation. Television survey on service lateral pipes using special camera systems and associated cleanout installation and bypass pumping.
- 4. Group “F” – Fold-and-Form Lining:** Fold-in-form pipelining for gravity mains, and associated work such as cleaning and preparation, lateral reinstatements, cleanout installation, bypass pumping, traffic control and TV survey. Television survey on service lateral pipes using special camera systems and associated cleanout installation and bypass pumping.

Measurement and Payment

1. Group “B” – Chemical Grouting Payment Items

a. Items B1 to B3 – Testing and sealing sewer joints

(1) These items of work will be measured and paid for at the unit price per each joint of pipe tested and sealed as delineated by the pipe size brackets named in the Schedule of Price Bid. Each unit price bid shall include all work including, but not limited to, setups, flow isolation, testing, sealing, maintenance, transportation, traffic control, labor, work, materials, reporting and documentation, or any other costs associated with pipe joint testing and sealing.

b. Item B5 – Chemical grout for sealing sewer joints

(1) This item of work will be measured and paid for at the unit price per gallon of grout used to seal sewer joint regardless of pipe size. The price shall include all setups, maintenance,

transportation, traffic control, labor, work, materials, or any other costs associated with chemical grouting of sewer joints. Chemical grout for sealing sewer laterals or lateral connections will not be paid for by this item

c. Items B7 to B7 – Chemical root removal in sewer lines

(1) This item of work will be measured and paid for at the unit price per linear foot for each sewer size bracket named in the Schedule of Price Bid. Measurement of lines shall be made based on the horizontal projection of the centerline of the pipe between manholes, measured to the nearest foot from inside wall of manhole to inside wall of manhole, not including the manhole chamber, in the pipe which root removal/treatment was performed.

(2) Each unit price bid for root removal and chemical root treatment in sewer lines shall include cleaning; all mechanical methods of root removal specified or not; all herbicides or chemical treatment specified or not and/or all equipment, materials and labor which shall be used to provide an open sewer (no blockages or constrictions due to roots or vegetation) to an acceptable condition and ready for any and all repairs.

(3) The OWNER may authorize root removal as a separate pay item when root intrusion is sufficiently heavy to prevent the completion of inspection or following completion of successful cleaning and inspection. Root removal not authorized in writing by the OWNER shall be considered part of the cleaning operation and shall not be considered a separate pay item.

(4) Sewer line or manhole cleaning is not a separate bid item. The prices for all cleaning of sewers and manholes; verification of adequate cleaning by pulling double squeegees; hoses; nozzles; water; labor; materials and/or any other work required to clean the sewers to a degree acceptable for television inspection and subsequent repairs shall be included in the bid item in which the rehabilitation occurs.

d. Items B8 to B10 – Grout/Sealing Lateral Connection 4&6-inch Laterals with Chemical Grout

(1) This item of work will be measured and paid for at the unit price per each lateral connection sealed. The price bid shall include all setups, maintenance, transportation, traffic control, labor, work, materials, or any other costs associated with chemical grouting of the lateral joints. Measurement shall be made based on the horizontal projection of the centerline of the pipe between sewer main and property line. Chemical grout will not be paid for separately and shall be included in the unit price bid for this item.

2. Group “D” – Sectional Liners and Lateral Liners Payment Items

a. Items D1 to D6 – Install cured-in-place sectional pipe liners

(1) Items D1, D3, and D5 will be measured and paid at the unit price per each cured-in-place sectional pipe liner installed up to 6 feet, as delineated by the pipe size brackets named in the Schedule of Price Bid. Each unit price bid shall provide full compensation for all work including, but not limited to, furnishing, and installing section of liner; pipe cleaning; television inspections; all labor, materials and equipment specified or not which will provide a complete and acceptable liner installation, in accordance with the technical specifications.

(2) Items D2, D4, and D6 will be paid for in addition to the price paid under corresponding Items D1, D3, or D5 as applicable, at the unit price bid per linear foot of liner installed beyond 6 feet and up to 9 feet. This item will be full compensation for all additional costs associated with work of installing sectional liner beyond 6 feet. Any sectional liner extending beyond 9 feet and up to 12 feet shall be paid for as two single liners under Items D1, D3, or D5, in accordance with the technical specifications.

(3) Payment for bypass pumping, if required (other than because of damage caused by the CONTRACTOR), will be paid for under a separate item.

b. Item D7 – Reinstate laterals and grout annular space

(1) This item of work will be measured and paid at the unit price per each lateral reinstated and shall include, but not be limited to, blocking or plugging incoming line; removal, transportation and disposal of material generated by cleaning and preparation; television surveys, furnishing the equipment necessary to internally cut out the liner to at least 95 percent of the circumference of the lateral, cutting out the coupon; wire-brushing the cut to remove jagged edges; recovering all waste material from the sewer; service pipe cleaning; sealing the lateral connection to the liner including the first joint of the lateral connection; grouting the annular space using 3’ minimum lateral bladder; performing all repairs required due to damage caused by the CONTRACTOR, and all appurtenant and miscellaneous items and work, in accordance with the technical specifications.

(2) If the CONTRACTOR damages the host pipe during lateral reinstatement, the CONTRACTOR shall repair the host pipe to the satisfaction of the OWNER at no additional cost.

(3) If grouting of the annular space at the reinstated lateral results in residual grout in greater than 50 percent the circumference of the lateral, such grout shall be removed at no additional cost.

c. Items D8 to D12 – Full Circle Lateral Repairs Liner (FCLRL), in various-sized main with 4-inch to 6-inch laterals

- (1) This item of work will be measured and paid for at the unit price per each as delineated by the pipe size and depth brackets named in the Bid Form, and shall include up to 15 feet of lateral. Each unit price bid shall include, but not be limited to, all necessary or required labor, equipment, tools, and materials for traffic control, sewer pipe cleaning and preparation of the existing sewer, including blocking or plugging incoming lines; removal, transportation and disposal of material generated by cleaning and preparation; television surveys; pipe liner; cleaning; testing; cleanup; documentation and reporting; and all labor, materials and equipment required to provide a complete and acceptable liner installation, in accordance with the technical specifications.
- (2) This item of work will be measured and paid for at the unit price per linear foot of sewer laterals lined beyond 15 feet of lateral, in addition to the corresponding item with Bid Form units of "EA". This item will be full compensation for all additional costs associated with work of installing liner beyond 15 feet.
- (3) Payment for bypass pumping, if required (other than because of damage caused by the CONTRACTOR) will be paid for under a separate item.

d. Items D13 to D16 – Install CIP liner in 4-inch to 6-inch laterals, various depths.

- (1) This item of work will be measured and paid for at the unit price per each and shall include up to 15 feet of lateral. Each unit price bid shall include, but not be limited to, all necessary or required labor, equipment, tools, and materials for traffic control, sewer pipe cleaning and preparation of the existing sewer, including blocking or plugging incoming lines; removal, transportation and disposal of material generated by cleaning and preparation; television surveys; pipe liner; cleaning; testing; cleanup; documentation and reporting; and all labor, materials and equipment required to provide a complete and acceptable liner installation, in accordance with the technical specifications.
- (2) This item of work will be measured and paid for at the unit price per linear foot of sewer laterals lined beyond 15 feet of lateral, in addition to the corresponding item with Bid Form units of "EA". This item will be full compensation for all additional costs associated with work of installing liner beyond 15 feet.
- (3) Payment for bypass pumping, if required (other than because of damage caused by the CONTRACTOR) will be paid under a separate item.

e. Items D17 to D18 – Install Full-Circle CIP mainline/lateral connection interface seal (minimum 3') in 6-inch to 21-inch main with 4-inch to 6-inch laterals, all depths.

- (1) This item will be paid at the unit price per each and shall include furnishing all labor, equipment, and materials needed to install a mainline/lateral connection interface seal that extends a minimum of 3-feet into the lateral. Each unit price bid shall include, but not be limited to, all necessary or required labor, equipment, tools, and materials for traffic control, sewer pipe cleaning and preparation of the existing sewer, including blocking or plugging

incoming lines; removal, transportation and disposal of material generated by cleaning and preparation; television surveys; pipe liner; recovering all waste material from the sewer; testing; cleanup; performing all repairs required due to damage caused by the CONTRACTOR; documentation and reporting; and all labor, materials and equipment required to provide a complete and acceptable liner installation, in accordance with the technical specifications.

Coating removal / Surface preparation will be required when an interface seal is installed over an existing Full-Circle CIP liner, and will be separately compensated using the applicable pay item.

f. Items D19 to D20 – Install Full-Circle CIP mainline/lateral connection interface seal 6-in to 21-inch main, 4-inch & 6-inch lateral pipe, up to 6-inch of lateral piping, all depths.

(1) This item will be paid at the unit price per each and shall include furnishing all labor, equipment, and materials needed to install a mainline/lateral connection interface seal that extends a minimum of 6-inches into the lateral. Each unit price bid shall include, but not be limited to, all necessary or required labor, equipment, tools, and materials for traffic control, sewer pipe cleaning and preparation of the existing sewer, including blocking or plugging incoming lines; removal, transportation and disposal of material generated by cleaning and preparation; television surveys; pipe liner; recovering all waste material from the sewer; testing; cleanup; performing all repairs required due to damage caused by the CONTRACTOR; documentation and reporting; and all labor, materials and equipment required to provide a complete and acceptable liner installation, in accordance with the technical specifications.

(2) Coating removal / Surface preparation will be required when an interface seal is installed over an existing CIP liner, and will be separately compensated using the applicable pay item.

g. Item D21 – Transitional liner (6-inch to 4-inch)

(1) This item of work will be measured and paid for at the unit price per each, as defined in the Bid Form. Payment of the unit price per each will provide complete compensation for furnishing materials and all labor, tools, equipment and incidentals, to provide as directed by the OWNER, a transitional liner (6-inch to 4-inch), as part of a T-liner or lateral liner, complete in place. Payment for this item, when authorized by the OWNER, shall be in addition to a T-liner or lateral liner, in accordance with the technical specifications

h. Item D22 – Coating Removal

(1) This item of work will be measured and paid for at the unit price per each, as defined in the Bid Form. Payment of the unit price per each will provide complete compensation for furnishing materials and all labor, tools, equipment and incidentals, to remove the coatings in mainline cured-in-place liners prior to the installation of a mainline/lateral connection interface

seal. Payment for this item, when authorized by the OWNER, shall be in addition to a mainline/lateral connection interface seal, in accordance with the technical specifications.

i. Item D23 – Televis service lateral and locate from mainline (up to 30 feet)

(1) This item of work will be measured and paid at the unit price per each of lateral televised. Payment of the unit price per each will provide for complete compensation for furnishing all labor, equipment, tools, and materials for preparatory cleaning and televising of sanitary sewer service laterals, including all incidentals such as traffic control and sewer plugging, in accordance with the technical specifications.

j. Item D24 – Televis service lateral and locate from mainline (beyond 30 feet)

(1) This item of work will be measured and paid for at the unit price per foot of sewer laterals televised in addition to Item D1. Payment of the unit price for each will provide for complete compensation for furnishing all labor, equipment, tools and materials, preparatory cleaning, and televising service lateral including all incidentals such as traffic control and sewer plugging, in accordance with the technical specifications.

k. Item D25 – Televis lateral from cleanout (up to 30 feet)

(1) This item of work will be measured and paid at the unit price per each of lateral televised. Payment of the unit price per each will provide for complete compensation for furnishing all labor, equipment, tools, and materials for preparatory cleaning and televising sanitary sewer service laterals, including all incidentals such as traffic control and sewer plugging, in accordance with the technical specifications.

l. Item D26 – Televis lateral from cleanout (beyond 30 feet)

(1) This item of work will be measured and paid for at the unit price per foot of sewer laterals televised in addition to Item D4. Payment of the unit price for each will provide for complete compensation for furnishing all labor, equipment, tools and materials, preparatory cleaning and televising service lateral including all incidentals such as traffic control and sewer plugging, in accordance with the technical specifications.

m. Items D27 - Lateral grouting (if required in preparation for FCLRL, lateral liner, or mainline/lateral connection interface seal installation)

(1) This item of work will be measured and paid at the unit price per each lateral grouting performed, with the advance concurrence of the OWNER, in association with the performance

of a FCLRL, lateral liner, or mainline/lateral connection interface seal installation. Payment of the unit price per each will provide complete compensation for furnishing materials and all labor, tools and equipment and incidentals, to chemically grout leaking laterals prior to the installation of a FCLRL, lateral liner, or mainline/lateral connection interface seal, complete in place. Payment for this item, when authorized by the OWNER, shall be in addition to a FCLRL, lateral liner, or mainline/lateral connection interface seal, in accordance with the technical specifications.

Item D28 – Lateral testing

This item of work will be measured and paid at the unit price per each lateral tested (10% of installed liners). Payment of the unit price per each will provide complete compensation for furnishing materials and all labor, tools and equipment and incidentals, to test laterals that have been lined. Payment for this item, when authorized by the OWNER, shall be in addition to a FCLRL, lateral liner, or mainline/lateral connection interface seal. There will be no payment for laterals that fail the test, in accordance with the technical specifications.

3. Group “E” Cured-in-Place Pipe (CIPP) Lining Pay Items

a. Items E1 to E8 – Install CIPP liner in gravity mains.

(1) This work will be measured and paid at the unit price per linear foot of liner as delineated by the pipe size and depth brackets named in the Bid Proposal. Measurement shall be made based on the horizontal projection of the centerline of the permanently installed liner between manholes, including the laying length of fittings along the run, measured to the nearest foot from the inside wall of manhole to inside wall of manhole for each section lined. Each unit price bid shall include, but not be limited to, all necessary or required resident notification, traffic control, sewer pipe cleaning and preparation of the existing sewer, including blocking or plugging incoming lines; removal, transportation and disposal of material generated by cleaning and preparation; pre- and post-lining television surveys; chemical joint sealing if necessary; pipe lining; the cost of obtaining a water meter from the OWNER; cleaning; sample collection; grouting to eliminate infiltration at service connections and liner ends; cleanup; documentation and reporting; and all labor, materials and equipment required to provide a complete and acceptable liner installation, in accordance with the technical specifications.

(2) Where post-installation thickness measurements and/or physical property testing is performed, payment for installed liner will be made as itemized below:

(a) Full payment – If thickness, flexural strength, and flexural modulus of elasticity of installed liner are all 95 percent or more of specified values, full payment will be made accordingly.

(b) Adjusted payment for 90 to 94 percent of specified values –If thickness, flexural strength, or flexural modulus of elasticity of installed liner are between 90 and 95 percent of

specified values, payment will be made based on an Adjusted Unit Price, which shall equal the Unit Price bid, multiplied by a Value Factor calculated as follows:

- 1) Value Factor = * thickness x * flexural strength x * flexural modulus of elasticity'.

* Insert actual measured or test result expressed as a fraction of the specified value.

Maximum allowable is 1.

- 3) Payment for bypass pumping and service lateral connections, if required (other than because of damage caused by the CONTRACTOR) will be paid for under a separate item.

4. Group "F" – Fold and Form Lining Payment Items

a. Items F1 to F4 – Install liner

- (1) This work will be measured and paid at the unit price per linear foot of liner as delineated by the pipe size named in the Bid Proposal. Measurement shall be made based on the horizontal projection of the centerline of the permanently installed liner between manholes, including the laying length of fittings along the run, measured to the nearest foot from the inside wall of manhole to inside wall of manhole for each section lined. Each unit price bid shall include, but not be limited to, all necessary or required resident notification, traffic control, sewer pipe cleaning and preparation of the existing sewer, including blocking or plugging incoming lines; removal, transportation and disposal of material generated by cleaning and preparation; pre- and post-lining television surveys; chemical joint sealing if necessary; pipe lining; the cost of obtaining a water meter from the OWNER; cleaning; sample collection; grouting to eliminate infiltration at service connections and liner ends; cleanup; documentation and reporting; and all labor, materials and equipment required to provide a complete and acceptable liner installation, in accordance with the technical specifications.

- (2) Payment for bypass pumping and service lateral connections, if required (other than because of damage caused by the CONTRACTOR) will be paid for under a separate item.

b. Item F5 – Reinstate laterals and grout annular space

- (1) This item of work will be measured and paid at the unit price per each lateral reinstated and shall include, but not be limited to, blocking or plugging incoming line, removal, transportation and disposal of material generated by cleaning and preparation; television surveys, furnishing the equipment necessary to internally cut out the liner to at least 95 percent of the circumference of the lateral, cutting out the coupon; wire-brushing the cut to remove jagged edges; recovering all waste material from the sewer; service pipe cleaning; sealing the lateral connection to the liner including the first joint of the lateral connection; grouting the annular space using 3' minimum lateral bladder; performing all repairs required due to damage caused by the CONTRACTOR, and all appurtenant and miscellaneous items and work, in accordance with the technical specifications.

- (2) If the CONTRACTOR damages the host pipe during lateral reinstatement, the CONTRACTOR shall repair the host pipe to the satisfaction of the OWNER at no additional cost.
- (3) If grouting of the annular space at the reinstated lateral results in residual grout in greater than 50 percent the circumference of the lateral, such grout shall be removed at no additional cost.

5. Items in Common

a. Sewer main cleaning and TV inspection

- (1) This item will be paid for at the unit price bid per foot of sewer cleaned and televised for inspection only, when a sewer repair is not performed due to change of field conditions, or as directed by the OWNER. The unit price shall provide full compensation for all work required to perform television inspection of sanitary sewer including, but not limited to, furnishing all labor, equipment and material for cleaning, flow isolation, TV inspection, and all incidentals related to sewer inspection. The products shall be acceptable to the OWNER or otherwise the CONTRACTOR shall re-televiser the sewer line to the satisfaction of the OWNER. Sewer main cleaning shall include drop connections, in accordance with the technical specifications.
- (2) Cleaning and TV inspection performed to prepare for a repair or to document a completed repair are not considered separate pay items. Costs for such cleaning and TV inspection shall be included in the contract unit cost for each particular repair.

b. Sewer lateral cleaning and TV inspection

- (1) This item will be paid for at the unit price bid per foot of sewer lateral cleaned and televised for inspection only, when a sewer repair is not performed due to change of field conditions, or as directed by the OWNER. The unit price shall provide full compensation for all work required to perform television inspection of sanitary sewer service laterals including, but not limited to, furnishing all labor, equipment, tools and material for cleaning, flow isolation, TV inspection, and all incidentals related to sewer inspection. The products shall be acceptable to the OWNER or otherwise the CONTRACTOR shall re-televiser the sewer line to the satisfaction of the OWNER, in accordance with the technical specifications.
- (2) Cleaning and TV inspection performed to prepare for a repair or to document a completed repair are not considered separate pay items. Costs for such cleaning and TV inspection shall be included in the contract unit cost for each particular repair.

c. Mechanical root or grease removal

- (1) Removal of grease or roots involving the use of special equipment will be considered special cleaning and will be measured and paid per linear foot additionally to cleaning, depending on the pipeline diameter and the type of cleaning, as shown on the Schedule of

Prices. The unit price shall provide full compensation for all work required to perform such cleaning including, but not limited to, furnishing all labor, equipment and material for cleaning, flow isolation, pre- and post-cleaning TV inspection, traffic control, and all incidentals. The products shall be acceptable to the OWNER or otherwise the CONTRACTOR shall re-clean and re-televiser the sewer line to the satisfaction of the OWNER, in accordance with the technical specifications.

(2) Special cleaning not authorized in writing by the OWNER shall be considered part of the cleaning operation and shall not be considered a separate pay item.

(3) Sewer line or manhole cleaning is not a separate bid item. The prices for all cleaning of sewers and manholes; verification of adequate cleaning by pulling double squeegees; hoses; nozzles; water; labor; materials and/or any other work required to clean the sewers to a degree acceptable for television inspection and subsequent repairs shall be included in the bid item in which the rehabilitation occurs.

d. Mechanical tuberculation/concrete removal

(1) Removal of tuberculation in cast iron pipe, or concrete in pipe, involving the use of special equipment will be considered special cleaning and will be measured and paid per linear foot additionally to cleaning, depending on the pipeline diameter and the type of cleaning, as shown on the Schedule of Prices. The unit price shall provide full compensation for all work required to perform such cleaning including, but not limited to, furnishing all labor, equipment and material for cleaning, flow isolation, pre- and post-cleaning TV inspection, traffic control, and all incidentals. The products shall be acceptable to the OWNER or otherwise the CONTRACTOR shall re-clean and re-televiser the sewer line to the satisfaction of the OWNER, in accordance with the technical specifications.

(2) Special cleaning not authorized in writing by the OWNER shall be considered part of the cleaning operation and shall not be considered a separate pay item.

(3) Sewer line or manhole cleaning is not a separate bid item. The prices for all cleaning of sewers and manholes; verification of adequate cleaning by pulling double squeegees; hoses; nozzles; water; labor; materials and/or any other work required to clean the sewers to a degree acceptable for television inspection and subsequent repairs shall be included in the bid item in which the rehabilitation occurs.

e. Protruding service connection removal by internal means

(1) The OWNER may request that the CONTRACTOR remove protruding service connections, typically to allow completion of inspection or as a prelude to lining. The CONTRACTOR shall use non-destructive robotic techniques. The use of equipment that may damage the existing service connection will not be allowed. The CONTRACTOR shall not perform this work prior to receiving written authorization from the OWNER, in accordance with the technical specifications.

- (2) Measurement shall be per protruding service connection removed.
- 3) Payment shall be at the unit price bid, per each protruding service connection removed, provided in the Bid Proposal and shall include full compensation for accessing the site, wastewater flow control, performing the protruding service connection removal, and all else incidental thereto for which separate payment is not provided under other items in the Bid Proposal.

f. Bypass pumping

- (1) These items shall provide full compensation for bypass pumping operations required for sewer and manhole repair work. The CONTRACTOR shall attempt to perform the sewer work without bypass pumping. However, if, in the opinion of the OWNER bypass pumping is necessary, it will be identified as a payment item. The pay item is a charge per day for all bypass pumping operations during a specific sewer repair, including services, regardless of the number of pumps required. Bypass Pumping shall be bid on the basis of sewer size, which is bypassed, in accordance with the technical specifications.

g. Installation in rear-yard easement

- (1) Payment shall be at the unit price bid, per easement repair performed, provided in the Bid Proposal and shall include full compensation for all additional labor, materials, equipment and incidentals required to perform work away from vehicular traveled ways, if so requested by the OWNER, in association with any other work under this contract. This item will be paid in addition to the price paid under the corresponding work item, and will only be paid when the area where work must necessarily be performed is in the easement area and presents restrictions to vehicular access from roads, alleys, driveways, or other features suitable for access by the installation vehicles. This item shall be full compensation for all additional costs associated with working in an easement area.
- (2) When the CONTRACTOR judges that this item is applicable, the CONTRACTOR shall obtain the OWNER's concurrence on such judgment in advance of performing the work.

END OF SECTION

PART 1 - GENERAL**1.1 SCOPE OF WORK**

- A. The work specified in this section consists of providing for the reconstruction of a particular mainline section and the adjacent lateral sewer pipe without excavation while providing a structural one-piece leak free connection at the interface of the mainline and lateral pipelines.

1.2 GENERAL

- A. The reconstruction will be accomplished using a non-woven fabric tube of particular length and a thermoset resin with physical and chemical properties appropriate for the application. The lateral tube within a translucent inversion bladder is vacuum impregnated with the resin then placed inside a protective carrying device. The mainline liner that is physically attached to the lateral tube is affixed around a rigid launching device. The launching device and protective carrying device are winched into the existing sewer. When the launching device is properly positioned at the lateral connection, the mainline liner is inflated and the resin saturated tube is inverted up through the lateral pipe, using air or water pressure, by the action of the inversion bladder. Once the tube/resin composite is cured, the inversion bladder and launching/carrying devices are removed. The cured-in-place mainline/lateral connection repair system shall be "T-Liner" or approved equal.

1.3 QUALIFICATIONS

- A. The Qualifications of the CONTRACTOR shall be submitted with submittal. These Qualifications shall include detailed descriptions of the following:
 - 1. The CONTRACTOR shall sign and date the information provided and certify, that to the extent of his knowledge, the information is true and accurate, and that the supervisory personnel submitted will be directly involved with and used on this project. Substitutions of personnel will not be allowed without written authorization of the OWNER.
 - 2. Specialty technicians shall be certified by the proposed product manufacturer and/or its authorized representative. Certifications shall be submitted to the OWNER.

PART 2 - PRODUCTS**2.1 GENERAL**

- A. The finished liner shall be fabricated from material as specified in this section which when cured will be resistant to the corrosive effects of the raw sewage and hydrogen sulfide.
- B. The liner shall be fabricated to a size that when installed will neatly fit the internal circumference of the conduit to be repaired as specified by the OWNER.

- C. The liner shall be one piece and will consist of a lateral portion and the mainline portion with one or more layers of flexible needled felt or an equivalent non-woven material. The liner will be continuous in length and the wall thickness shall be uniform. No overlapping sections shall be allowed in the circumference or the length of the lateral liner. The tube will be capable of conforming to offset joints, bells, and disfigured pipe sections. The mainline liner will be flat with one end overlapping the second end and sized accordingly to create a circular lining equal to the diameter of the mainline pipe. The resin will be polyester or vinyl ester or epoxy, with proper catalysts as designed for the specific application. The cured-in-place pipe shall provide a smooth bore interior. Both the lateral pipe and the main connection shall have a design report documenting the design criteria, fully deteriorated pipe section for the lateral and partially deteriorated for the main (if the main has already been lined), relative to the hydrostatic pressures, depth of soil cover, and type of soil. The mainline sectional liner shall be a full-circle 16-inch long CIPP liner integrally manufactured to the lateral liner providing a seamless connection between the mainline pipe liner and the lateral liner. Installation will be accomplished remotely using air or water for inversion and curing. The cured pipe repair system shall be watertight and shall conform to the existing pipe and eliminate any leakage or connection to the outside of the host pipe/service.
- D. The liner shall meet or exceed ASTM F2561-06.
- E. The composite of the materials above will, upon installation inside the host pipe, exceed the minimum test standards specified by the American Society for Testing Methods.

Physical Characteristics	Test Procedure	Minimum Value
Flexural Strength	ASTM D790	4,500 psi
Flexural Modulus	ASTM D790	250,000 psi
Long Term Modulus	Reduction for Creep	50%

Design Considerations	Criteria	
Tube Design	ASTM F 1216	Appendix X1
Hydrostatic Buckling	ASTM F 1216	Appendix X1

The CIPP design for the lateral tube and mainline connection shall assume no bonding to the original host pipe.

2.2 LINER DESIGN

- A. The minimum required structural CIPP wall thickness shall be based on the physical properties described above and in accordance with the design equations in the appendix of ASTM F 1216, and the following design parameters

Design Safety Factor	2.0
Retention Factor for Long-Term Flexural Modulus to be used in Design	50 %
Ovality*	2 %
Groundwater Depth = Pipe Depth (above invert)*	ft.
Soil Depth (above crown)*	ft.
Soil Modulus	700 psi
Soil Density	120 pcf
Live Load	One H20 passing truck
Design Condition (lateral pipe)	Fully deteriorated
Design Condition (main pipe) Lined Main Pipe	Partially deteriorated
Design Condition (main pipe) Unlined Main	Fully deteriorated

PART 3 - EXECUTION

3.1 CLEANING SEWER LINES

- A. Prior to any lining of a pipe, it shall be the responsibility of the CONTRACTOR to remove internal deposits or roots from the pipeline. Both mainline and lateral line shall be cleaned.
- B. Television survey shall be performed. Both main line and lateral line shall be televised under separate pay items utilizing a pan and tilt camera for both mains and laterals.
- C. The interior of the pipeline shall be carefully surveyed to determine the locations and extent of any structural failures. The location of any conditions which may prevent proper installation of lining materials into the pipelines shall be noted so that these conditions can be corrected. A video and suitable log format shall be kept, and a copy turned over to the OWNER.

3.2 FLOW BYPASSING

- A. The CONTRACTOR, when required, shall provide for the transfer of flow, through or around section or sections of pipe that are to be repaired. The proposed bypassing system shall be acceptable in advance by the OWNER. The acceptance of the bypassing system in advance by the OWNER shall in no way relieve the CONTRACTOR of his responsibility and/or public liability.

3.3 LINE OBSTRUCTIONS

A. It shall be the responsibility of the CONTRACTOR to clear the line of obstruction. If survey reveals an obstruction that cannot be removed by conventional cleaning equipment, the CONTRACTOR shall make a point repair excavation. Such excavation shall be approved in writing by the OWNER prior to the commencement of the work.

3.5 LINER INSTALLATION

A. The tube is inspected for tears and frayed sections. The tube, in good condition, will be vacuum impregnated with the thermostat resin. The resin will be introduced into the tube creating a slug of resin at the beginning of the tube. A calibration roller will assist the resin slug to move throughout the tube. All air in the tube shall be removed by vacuum allowing the resin to thoroughly impregnate the tube. All resin shall be contained to ensure no public property or persons are exposed to the liquid resin. The mainline liner will be saturated upon a wet-out platform. The resin impregnated sample (wick) shall be retained by the installer to provide verification of the curing process taking place in the host pipe.

B. The saturated tube along with the inversion bladder will be inserted into the carrying device. The mainline liner is affixed on the launching device. Both the launching and carrying device is pulled into the pipe using a cable winch. The pull is complete when the open port of the launching device is aligned with the interface of the service connection and mainline pipe. The resin saturated lateral tube is completely protected during the pull. No resin shall be lost by contact with manhole walls or the pipe during the pull. The resin saturated mainline liner is supported upon the rigid launcher that is elevated above the pipe invert by means of rotating skid system. The mainline liner should not be contaminated or diluted by exposure to dirt, debris, or water during the pull.

C. The installer shall document the placement of the liner by internal video inspection with the camera being inserted from the lateral pipe down to the mainline pipe.

D. The mainline liner is expanded against the mainline pipe and lateral tube is inverted out of the launcher/carrying device by controlled air or water pressure. The installer shall be capable of viewing the lateral liner contacting the lateral pipe from the beginning to the end of the repair. The mainline liner and the lateral tube are held tightly in place against the wall of the host pipe by controlled pressure until the cure is complete.

E. When the curing process is complete, the pressure will be released. The inversion bladder and launching device shall be removed from the host pipe with the winch. No barriers, coatings, or any material other than the cured tube/resin composite, specifically designed for desirable physical and chemical resistance properties, should ever be left in the host pipe. Any materials used in the installation other than the cured tube/resin composite are to be removed from the pipe by the installer.

3.6 ACCEPTANCE AND TESTING

A. The finished liner shall be continuous over the entire length of the installation. The liner shall be free from visual defects, damage, deflection, holes, delamination, uncured resin, and the like. There shall be no visible infiltration through the liner or from behind the liner.

B. Verification of a non-leaking lateral liner and service connection shall require an air test in accordance with the following specifications. Testing shall be performed at the OWNER'S discretion but at a frequency not to exceed one test for every ten liners installed.

The cost for the test shall be included in the liner installation cost, and no separate payment shall be made.

1. A camera shall be inserted into the lateral pipe via a clean-out upstream of the upper most portion of the cured in-place lateral liner. The camera is then moved through the lateral pipe until it becomes positioned at the lateral/main connection. The camera is utilized to assist in positioning and placing a pair of plugs in the mainline on either side of the lateral opening. A test device with a minimum of a ten-inch clear separation shall be centered on the lateral opening and spanning the lined connection.
2. Next, an air test plug shall be introduced into the lateral pipe. The test plug will be placed inside of the cured in-place lateral liner at its upper most portion. The test plug shall be inflated and sealed against the cured in-place lateral liner at the upstream end of the liner.
3. The testing devices within the mainline are then inflated and sealed across the service connection.
4. Air-pressure not less than 4 PSI shall be introduced through the test plug. The void area between the three plugs shall be pressurized at 4 PSI, held for 2 minutes and during this time the pressure shall not drop below 3.0 PSI.
5. If an installed cured in-place lateral liner fails the specified air test, the following corrective measures shall be taken.
 - a. The cured in-place lateral liner shall be re-inspected by use of a closed-circuit television camera in attempt to identify the defect.
 - b. Any repairs made shall consist of materials that are structural and meet or exceed the same criteria as the cured in-place lateral liner is required to meet in a domestic sewer collection system. Such materials shall have a minimum life expectancy of 50 years in accordance with ASTM F-1216 (most recent standard) Appendix X1 Design Considerations and Appendix X2 Chemical-Resistance Test.
 - c. Once the defect has been corrected, the renewed lateral pipe shall be re-tested in accordance with the air test procedure as described above.
 - d. Any corrective measures shall be performed at the CONTRACTOR's expense.
6. If any of the air tests fail, the OWNER at its option may require the CONTRACTOR to test an additional lateral at no additional charge to the OWNER. If a second air test shall fail, the OWNER at its option may require the CONTRACTOR to test additional or all of the installed cured in-place lateral linings at no additional charge to the OWNER.

3.7 CLEANUP

A. After the liner installation has been completed and accepted, the CONTRACTOR shall clean up the entire project area and return the ground cover to grade. All excess material and debris not incorporated into the permanent installation shall be disposed of by the CONTRACTOR.

END OF SECTION

