

TECHNICAL SPECIFICATIONS



INFILTRATION AND INFLOW REMOVAL PHASE 2A LATERAL REPAIRS

City of Hallandale Beach Bid # FY 2021-2022-012

CONTRACT DOCUMENTS

Prepared by:

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Document 00002

PROJECT DATA

Project Title: City of Hallandale Beach Infiltration and
Inflow Removal Phase 2A Lateral Repairs

Project Number: City Bid # FY 2021-2022-012

Project Address: Throughout the City of Hallandale Beach

Project Owner: City of Hallandale Beach, Florida
100 West Hallandale Beach Boulevard
Hallandale Beach, Florida 33004

Owner's Representative: Jeffrey Odoms
Public Works Director
City of Hallandale Beach
400 S Federal Highway
Hallandale Beach, Florida 33009
Phone: 954-457-1611
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END OF PROJECT DATA

Document 00004

LIST OF DRAWINGS

Section not used

END OF LIST OF DRAWINGS

BID SHEET

Item	Original Quantity	Unit	Unit Cost	Original Total cost
Mobilization	1	LS		
CCTV and cleaning of 4 or 6 inch lateral Up to 30 LF	220	EA		
CCTV and cleaning of 4 or 6 inch lateral per foot beyond 30 LF	1,000	LF		
Clean tubercles from service laterals 4 or 6 in up to 30 LF	100	EA		
Line service laterals 4 or 6, per foot beyond 30 LF	100	LF		
Line metallic service laterals 4 or 6 in up to 30 LF	220	EA		
Line metallic service laterals 4 or 6 in per foot beyond 30 LF	100	LF		
Lateral reinstatement cutting of defective lateral opening	500	EA		
Schedule 80 Replacement Lateral	5,000	LF		
Residential Traffic Control (MOT)		Per Day		
Grout Seal	50	EA		
Install Cleanout	300	EA		
Contingency	1	LS	\$30,000.00	\$30,000.00
TOTAL BID AMT				<input type="text"/>

SCOPE OF SERVICES

The CITY has previously conducted inflow and infiltration analysis and is currently lining mainline pipes. The quantities in the bid sheet are an estimate of the number of lateral repairs, including lining, service repairs, feet of televising and cleaning, etc. for the project. This is a unit price contract so repairs will be based on the unit prices. CONTRACTOR will endeavor to minimize the costs to the CITY, while ensuring that the appropriate repairs are made. CITY will estimate the savings resulting from this Contract as a result of the reduction of the flow.

This contract has several options:

Option 1: Where the lateral is short (under 10 ft) and shallow (under 3 ft), replace with Schedule 80 PVC to cleanout (add cleanout if not present).

Option 2: Where the lateral is longer, and deeper, line the lateral using CIPP Lateral Lining method and full circumference lateral connection.

Additional Note: All laterals that are Orangeburg must be replaced with Schedule 80 PVC.

This project is being funded through a State Revolving Loan.

There are two options for the laterals. Other alterations of the specification to qualify other bidders exclusively will not be considered. The bid will be awarded based on construction cost and contractor's minimum qualifications.

The City is desirous of resolving inflow issues on laterals at the most reasonable cost possible.

The City will accept either (BDL) or (LMK) lining systems, for bid, but will award based on price.

SPECIAL CONDITIONS

1.0 SCOPE: The scope of this project includes the following protocol:

1. Clean the designated sewer lines
2. Televise sewer lines to identify leaks, cracked pipe, broken or missing pipe, service lateral issues
3. Document each defect via photograph and location (pipe length, etc.), and submit to the City for approval by the City's project manager, with suggested action. The following and the action that will be considered:
 - a. Areas with separations or missing pipe – will be fixed with sectional material
 - b. Cracked piping - will be lined manhole to manhole and services restored
 - c. Old liner leaks – will be epoxy repaired
 - d. Service laterals leaking at the connection – will be repaired
 - e. Service laterals leaking – will be documented, address located and tabulated for later investigation
 - f. Catastrophic issues that require point repairs – document exact location for later contract
4. Make the necessary repairs as directed by the project manager in accordance with the specifications
5. Televise the repairs to verify the corrections were correctly made

Laterals will be addressed under a separate bid.

Point repairs will be addressed under a separate bid.

2.0 BIDDER QUALIFICATIONS

Bidders will meet the following qualifications: within the last 5 years in the State of Florida, 1 million feet of pipe CIPP lined, 500 service laterals reconnected, and at least 2 contracts successfully performed with value of at least \$2 million with both including at least \$1 million of CIPP lining only. Bidders will provide 5 references valued at \$500,000 or more each performed in the past 5 years in the accompanying forms.

Bidders will provide a copy of their insurance forms to verify current insurance (City does not need to be named at this time).

3.0 PROJECT DURATION

The duration of the project is 210 days.

SECTION 10001 MISCELLANEOUS ISSUES

All MHs have GPS and inspection info that will be provided to the contractor via dropbox after award

Lateral lining will be approved after.

Mobilization is for the entire job, not an individual lateral. Individual jobsite assignments are the contractor's responsibility

The city expects a portion of the laterals will not need to be lined as the leak is on the customer's side of the cleanout. Hence televising may occur, but no repair that brings 2.3—5 (both) into play. So the televising also has a separate pay item for laterals that do not need repair or lining on the City's side.

It does not matter to the city is the repair starts in the main line or the cleanout - contractor's option.

The lines have recently been lined and inspected so roots should not be an issue. If the laterals needs to be repaired and protrudes (rare), this would need to be included in the cost of the lateral repair. If the address is not on the list, the Contractor does not need to look at them. Note that page 5 of the technical specification's notes:

This contract has several options:

Option 1: Where the lateral is short (under 10 ft) and shallow (under 3 ft), replace with Schedule 80 PVC to cleanout (add cleanout if not present).

Option 2: Where the lateral is longer, and deeper, line the lateral using CIPP Lateral Lining method and full circumference lateral connection.

Additional Note: All laterals that are Orangeburg must be replaced with Schedule 80 PVC.

The winning bidder will be provided access to a dropbox of all videos

SECTION 01000 - CONTRACTOR SPECIAL CONDITIONS

1. DEMONSTRATING WORK EXPERTISE

CONTRACTOR shall demonstrate competence to perform the work. CONTRACTOR, as the bidder, shall at minimum, provide the following:

- A minimum of five public utility projects; the minimum value of work with one utility project of \$1,000,000 or greater. A minimum of one client shall have been in Florida.
- Where similar projects have been completed, including name, address, phone number and position of utility contact.
- An example of the report provided to a public utility client as a result of performing the work
- Five years of experience dealing with the specified products and examples of completed work.
- Repairing leaks for a minimum of 2,500 service laterals in place.

2. INVESTIGATION AND UTILITIES.

2.1. CONTRACTOR shall have the sole responsibility of satisfying itself concerning the nature and location of the Work and the general and local conditions, and particularly, but without limitation, with respect to the following: those affecting transportation, access, disposal, handling and storage of materials; availability and quality of labor; water and electric power; availability and condition of roads; work area; living facilities; climatic conditions and seasons; physical conditions at the work-site and the project area as a whole; topography and ground surface conditions; nature and quantity of the surface materials to be encountered; subsurface conditions; equipment and facilities needed preliminary to and during performance of the Work; and all other costs associated with such performance. The failure of CONTRACTOR to acquaint itself with any applicable conditions shall not relieve CONTRACTOR from any of its responsibilities to perform under the Contract Documents, nor shall it be considered the basis for any claim for additional time or compensation.

2.2. CONTRACTOR shall locate all existing roadways, railways, drainage facilities and utility services above, upon, or under the Project site, said roadways, railways, drainage facilities and utilities being referred to in this Sub-Section 2.2 as the "Utilities". CONTRACTOR shall contact the owners of all Utilities to determine the necessity for relocating or temporarily interrupting any Utilities during the construction of the Project. CONTRACTOR shall schedule and coordinate its Work around any such relocation or temporary service interruption. CONTRACTOR shall be responsible for properly shoring, supporting and protecting all Utilities at all times during the course of the Work.

3. BID QUANTITIES

Quantities given in the Bid Schedule, while estimated from the best information available, are approximate only. Payment for unit price items shall be based on the actual number of units

installed for the Work. Bids shall be compared on the basis of number of units stated in the Bid Schedule as set forth in the Bidding Documents. Said unit prices shall be multiplied by the bid quantities for the total Bid price. Any Bid not conforming to this requirement may be rejected. Special attention to all Bidders is called to this provision, for should conditions make it necessary or prudent to revise the unit quantities, the unit prices will be fixed for such increased or decreased quantities. Compensation for such additive or subtractive changes in the quantities shall be limited to the unit prices in the Bid.

4. PROGRESS PAYMENTS.

4.1. Prior to submitting its first monthly Application for Payment, CONTRACTOR shall submit to CITY, for their review and approval, a schedule of values based upon the Contract Price, listing the major elements of the Work and the dollar value for each element. After its approval by the CITY AND ENGINEER, this schedule of values shall be used as the basis for the CONTRACTOR's monthly Applications for Payment. This schedule shall be updated and submitted each month to the ENGINEER along with a completed and notarized copy of the Application for Payment.

4.2. Prior to submitting its first monthly Application for Payment, CONTRACTOR shall submit to CITY AND ENGINEER a complete list of all its proposed SUBCONTRACTORS and materialmen, showing the work and materials involved and the dollar amount of each proposed subcontract and purchase order. The first Application for Payment shall be submitted no earlier than thirty (30) days after the Commencement Date.

4.3. If payment is requested on the basis of materials and equipment not incorporated into the Project, but delivered and suitably stored at the site or at another location agreed to by the CITY in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice or other documentation warranting that the CITY has received the materials and equipment free and clear of all liens, charges, security interests and encumbrances, together with evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect CITY's interest therein, all of which shall be subject to the CITY's satisfaction.

5. DAILY REPORTS, AS-BUILTS AND MEETINGS.

5.1. Unless waived in writing by CITY, CONTRACTOR shall complete and submit to ENGINEER on a weekly basis a daily log of the CONTRACTOR's work for the preceding week in a format approved by the ENGINEER and CITY. The daily log shall document all activities of CONTRACTOR at the Project site including, but not limited to, the following:

5.1.1. Weather conditions showing the high and low temperatures during work hours, the amount of precipitation received on the Project site, and any other weather conditions which adversely affect the work;

5.1.2. Soil conditions which adversely affect the work;

5.1.3. The hours of operation by CONTRACTOR's and SUBCONTRACTOR's personnel;

5.1.4. The number of CONTRACTOR's and SUBCONTRACTOR's personnel present and working at the Project site, by subcontract and trade;

5.1.5. All equipment present at the Project site, description of equipment use and designation of time equipment was used (specifically indicating any down time);

5.1.6. Description of Work being performed at the Project site;

5.1.7. Any unusual or special occurrences at the Project site;

5.1.8. Materials received at the Project site;

5.1.9. A list of all visitors to the Project site; and

5.1.10. Any problems that might impact either the cost or quality of the Work or the time of performance.

The daily log shall not constitute nor take the place of any notice required to be given by CONTRACTOR to CITY or ENGINEER pursuant to the Contract Documents.

SECTION 01025 - MEASUREMENT AND PAYMENT

1. MEASUREMENT

1.1 The quantities for payment under this Contract shall be determined by actual measurement of the completed items, in place, ready for service and accepted by the CITY unless otherwise specified. The CITY or ENGINEER will witness all field measurements.

1.2 When depth of cuts are indicated in the bid items, they shall be measured vertically from the existing grade at excavation point, paved or unpaved, to the finished pipe invert.

1.3 The quantities stated in the Bid Proposal are approximate only and are intended to serve as a basis for the comparison of bids and to fix the approximate amount of the cost of the Project. The CITY does not expressly or impliedly agree that the actual amount of the work to be done in the performance of the contract will correspond with the quantities in the Bid Proposal; the amount of work to be done may be more or less than the said quantities and may be increased or decreased by the CITY as circumstances may require. The increase or decrease of any quantity shall not be regarded as grounds for an increase in the unit price or in the time allowed for the completion of the work, except as provided in the Contract Documents.

1.4 Payment items for cleaning and televising of mains will apply when sewer is cleaned and televised for inspection only, or when a sewer repair is not performed due to changed field conditions revealed by the pre-repair video inspection. Cleaning and television 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. Lateral inspection shall be performed using a camera launched from the main unless conditions within the sewer require lateral inspection from the cleanout. Reference Table 01025-1 for the television inspection requirements pertaining to each type of repair.

2 PAYMENT ITEMS

2.1 Various Items

2.1.1 Items with Bid form units of "EA" will be measured and paid at the unit price per each as delineated by the pipe size named in the Bid Form. Each unit price bid shall include, but not be limited to, all necessary or required labor, equipment, tools, and materials for traffic control, lateral pipe cleaning and preparation of the existing lateral, including blocking or plugging incoming lines; removal, transportation and disposal of material generated by cleaning and preparation; television surveys; lateral liner; testing; cleanup; documentation and reporting; and all labor, materials and equipment required to provide a complete and acceptable liner installation.

2.1.2 Items with Bid form units of "LF" will be measured and paid for at the unit price per foot. This item will be full compensation for all additional costs associated with the work. Each linear foot price bid shall include, but not be limited to, all necessary or required labor, equipment, tools, and materials for traffic control, added 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.

Reconnection of service laterals to pipe is assumed as a part of the lining pay item.

2.2 Install CIP mainline/lateral connection interface seal (minimum 3') in 8 10 or 12-inch mains with 4-inch to 6-inch laterals, all depths.

2.2.1 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 and has a minimum 16 inch full circle wrap". Each unit price bid shall include, but not be limited to, all necessary or required labor, equipment, tools, and materials for, 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.

2.3 Televis service lateral and locate from mainline (up to 30 feet)

This item of work will be compensated as a part of the liner installation.

2.4 Televis service lateral and locate from mainline (beyond 30 feet)

This item of work will be compensated as a part of the liner installation.

2.5 Televis lateral from cleanout (up to 30 feet)

This item of work will be measured and compensated as a part of the liner installation.

2.5 Televis lateral from cleanout (beyond 30 feet)

This item of work will be measured compensated as a part of the liner installation.

2.6 Lateral grouting

This item of work will be measured and paid at the unit price per each lateral grouting performed, with the advance concurrence of the CITY, in association with the performance of a 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 lateral connection, lateral liner, or mainline/lateral connection interface seal, complete in place. Payment for this item, when authorized by the CITY, shall be in addition to a lateral connection, lateral liner, or mainline/lateral connection interface seal.

2.7 Reconnect Laterals in 8 10 or 12-inch mains with 4-inch to 6-inch laterals, all depths.

2.7.1 This item will be paid at the unit price per each and shall include furnishing all labor, equipment, and materials needed to reconnect the laterals. 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.

SECTION 02751 - PREPARATORY CLEANING AND ROOT REMOVAL

1 -- GENERAL

1.1 Scope

This Section covers the preparatory cleaning of sewer lines and manholes as needed prior to the internal survey of the sewer lines by closed-circuit television. It also covers the preparatory cleaning and root removal of sewer lines and the cleaning of manholes prior to rehabilitation. The CONTRACTOR shall furnish all necessary material, labor, equipment and services required for cleaning the specific sewer lines.

1.2 General

1.2.1 Sewer Line Cleaning. The intent of sewer line cleaning is to remove foreign materials from the lines and restore the sewer to a minimum of 95% of the original carrying capacity or as required for proper seating of internal pipe joint sealing packers or performance of other specified work. It is recognized that there are some conditions such as broken pipe and major blockages that prevent cleaning from being accomplished or where additional damage would result if cleaning were attempted or continued. Should such conditions be encountered, the CONTRACTOR will not be required to clean those specific sewer sections. If, in the course of normal cleaning operations, damage does result from preexisting and unforeseen conditions such as broken pipe, the CONTRACTOR will not be held responsible.

1.2.2 Manhole Cleaning General. All concrete and masonry surfaces must be cleaned prior to repair. Grease, laitance, loose bricks, mortar, unsound concrete, and other materials must be completely removed. Water blasting (minimum 1,200 psi) utilizing proper nozzles shall be the primary method of cleaning; however, other methods such as wet or dry sandblasting, acid wash, concrete cleaners, degreasers or mechanical means may be required to properly clean the surface. Surfaces on which these methods are used shall be thoroughly rinsed, scrubbed, and neutralized to remove cleaning agents and their reactant products.

1.2.3 Cleaning and Preparation for Cementitious Liner Rehabilitation

1.2.3.1 The manhole or chamber surface shall be clean, structurally sound and free from oil, grease, loose mortar, paints, protective coatings, efflorescence, laitance and airing compounds. The conditions of the manhole or chamber may require the use of an environmentally safe degreasing compound; if so, the surface shall be thoroughly rinsed to eliminate any residue.

1.2.3.2 Place covers over invert to prevent extraneous material from entering the sewer lines.

1.2.3.3 All foreign material shall be removed from the manhole wall and bench using a high-pressure water spray (minimum 4,000 psi). Loose and protruding brick, mortar, and concrete shall be removed using a mason's hammer, chisel and/or scraper. Fill any large voids with quick setting patching material.

1.2.3.4 If the 4,000 psi high water pressure water spray is not successful in removing all grease and contaminants, then a chemical wash shall be used to clean and degrease the interior of the manhole or chamber. The entire structure shall be thoroughly water- and/or sand-blasted to remove any loose or deteriorated material. The CONTRACTOR shall clean all accumulations of debris, such as dirt and grease, loose mortar, bricks and concrete, and dispose or properly. Care shall be taken to prevent any loose material from entering outlet sewer lines by inserting a 2-inch or smaller mesh protective screen into the manhole's outlet.

1.2.3.5 Any existing manhole steps shall be removed prior to sealing (waterproofing) the structure walls and installing liners.

1.3 Hydraulic Cleaning Equipment

1.3.1 Hydraulically Propelled Equipment. The equipment used shall be of a movable dam type and be constructed in such a way that a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the sewer. The movable dam shall be equal in diameter to the pipe being cleaned and shall provide a flexible scraper around the outer periphery to insure removal of grease. If sewer cleaning balls or other equipment which cannot be collapsed is used, special precautions to prevent flooding of the sewers and public or private property shall be taken.

1.3.1.1 High-Velocity Jet (Hydrocleaning) Equipment. All high-velocity sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of two or more high-velocity nozzles. The nozzles shall be capable of producing a scouring action from 15 to 45 degrees in all size lines designated to be cleaned. Equipment shall also include a high-velocity gun for washing and scouring manhole walls and floor. The gun shall be capable of producing flows from a fine spray to a solid stream. The equipment shall carry its own water tank, auxiliary engines, pumps, and hydraulically driven hose reel.

1.3.1.2 Mechanically Powered Equipment: Bucket machines shall be in pairs with sufficient power to perform the work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive that could cause damage to the pipe will not be allowed. A power rodding machine shall be either a sectional or continuous rod type capable of holding a minimum of 750 feet of rod. The rod shall be specifically heat-treated steel. To ensure safe operation, the machine shall be fully enclosed and have an automatic safety clutch or relief valve.

3 -- EXECUTION

3.1 General

3.1.1 The designated sewer sections shall be cleaned using hydraulically propelled, high-velocity jet, or mechanically powered equipment. The equipment shall dislodge, transport and remove all sludge, mud, sand, gravel, rocks, bricks, grease, roots, sticks, and all other debris from the interior of the sewer pipe and manholes. The equipment and methods selected shall be based on the conditions of lines and manholes at the time the work commences and shall be satisfactory to the ENGINEER. If cleaning of an entire section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning again attempted. If, again, successful cleaning cannot be performed, or the equipment fails to traverse the entire manhole section, the cleaning effort shall be stopped, and sufficient inspection performed so that the ENGINEER can be notified of the reason for inability to continue. CITY And the ENGINEER, in consult with CONTRACTOR, will identify a solution.

3.1.2 Cleaning Precautions

3.1.2.1 During all cleaning and preparation operations all necessary precautions shall be taken to protect the sewer from damage. During these operations, precautions shall also be taken to insure that no damage is caused to public or private property adjacent to or served by the sewer or its branches.

3.1.2.2 Satisfactory precautions shall be taken in the use of cleaning equipment. When hydraulically propelled cleaning tools (which depend upon water pressure to provide their cleaning force) or tools which retard the flow in the sewer line are used, precautions shall be taken to insure that the water pressure created does not damage or cause flooding of public or private property being served by the sewer. When possible, the flow of sewage in the sewer shall be utilized to provide the necessary pressure for hydraulic cleaning devices. When additional water from fire hydrants is necessary to avoid delay in normal work procedures, the water shall be conserved and not used unnecessarily. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant.

3.3 Material Removal

3.3.1 All sludge, dirt, sand, rocks, grease, roots, and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. Passing material from manhole section to manhole section, which could cause line stoppages, accumulations of sand in wet wells, or damage pumping equipment, shall not be permitted.

3.3.2 Under no circumstances shall sludge or other debris removed during these operations be dumped or spilled into the streets, ditches, storm drains or other sanitary sewers. The CONTRACTOR shall remove from the site and properly dispose of all solids or semi-solids recovered during the cleaning operation. The CONTRACTOR shall obtain permits and make arrangements as required to properly dispose of solids.

3.3.3 The CONTRACTOR is advised that he shall not dispose of this material by legal or illegal dumping on private or public property, by sale to others, or any means other than those given above.

3.3.4 The CONTRACTOR shall keep his haul route and work area(s) neat and clean and reasonably free of odor, and shall bear all responsibility for the cleanup of any spill which occurs during the transport of cleaning/surface preparation by-products and the cleanup of any such

material which is authorized by or pursuant to this Contract and in accord with applicable law and regulations. The CONTRACTOR shall immediately cleanup any such spill, or waste. If the CONTRACTOR fails to cleanup such spill, or waste immediately, the CITY shall have the right to cleanup or arrange for its cleanup and may charge to the CONTRACTOR all costs, including administrative costs and overhead, incurred by the CITY in connection with such cleanup. The CITY may also charge to the CONTRACTOR any costs incurred or penalties imposed on the CITY as a result of any spill, dump or discard. Under no circumstances is this material is to be discharged into the waterways or any place other than where authorized to do so by the appropriate authority. The term "CONTRACTOR" as used in this section shall include the CONTRACTOR's SUBCONTRACTORS and other CONTRACTORS.

3.3.5 The general requirements for vehicles hauling such waste materials are as follows: Transport vehicles must be of type(s) approved for this application by the political jurisdictions involved. General requirements are that the vehicles have watertight bodies, that they be properly equipped and fitted with seals and covers to prohibit material spillage or drainage, and that they be cleaned as often as is necessary to prevent deposit of material on roadways. Vehicles must be loaded within legal weight limits and operated safely within all traffic and speed regulations.

3.3.6 The routes used by the CONTRACTOR for the conveyance of this material on a regular basis shall be subject to approval by the governing authority having jurisdiction over such routes.

3.4 DISPOSAL OF MATERIALS

All solids or semisolids resulting from the cleaning operations shall be removed from the site and disposed of by the CONTRACTOR in a legal and sanitary manner as approved by appropriate authorities, at the CONTRACTOR's cost. Copies of records of all disposal shall be furnished to the CITY, indicating disposal site, date, amount and a brief description of material disposed. All materials shall be removed from the site no less often than at the end of each workday. Under no circumstances will the CONTRACTOR be allowed to accumulate debris, etc., on the site of work beyond the stated time, except in totally enclosed containers and as acceptable to the ENGINEER.

3.5 ROOT REMOVAL

Roots shall be removed in the designated sections and manholes where root intrusion is indicated on the work order. Special attention should be exercised during the cleaning operation to assure almost complete removal of roots from the joints. Any roots which could prevent the traveling of the packer or could prevent the proper application of chemical sealants, or could prevent the proper seating and application of cured-in-place, fold-and-formed or sectional cured-in-place liners, shall be removed. Procedures may include the use of mechanical equipment such as rodding machines, bucket machines and winches using root cutters and porcupines, and equipment such as high-velocity jet cleaners. When specifically directed, chemical root treatment shall be used before the root removal operation, in accordance with Section 02762 - Chemical Root Treatment, and grouting will take place after root removal in accordance with Section 02763 - Chemical Grouting. CONTRACTOR shall capture and remove all roots from the line.

3.6 CHEMICAL ROOT TREATMENT

To aid in the removal of roots, manhole sections that have root intrusion shall be treated with an acceptable herbicide when specifically directed. The application of the herbicide to the roots shall

be done in accordance with the manufacturer's recommendations and specifications in such a manner to preclude damage to surrounding vegetation. Any damaged vegetation so designated by the ENGINEER shall be replaced by the CONTRACTOR at no additional cost to the CITY. All safety precautions as recommended by the manufacturer shall be adhered to concerning handling and application of the herbicide.

3.7 ACCEPTANCE OF CLEANING OPERATION

3.7.1 Acceptance of sewer line cleaning shall be made upon the successful completion of the television survey and shall be to the satisfaction of the ENGINEER. If television survey shows the cleaning to be unsatisfactory, the CONTRACTOR shall be required to reclean and reinspect the sewer line until the cleaning is shown to be satisfactory. In areas where television survey is not performed, the ENGINEER may require the CONTRACTOR to pull a double squeegee (with each squeegee the same diameter as the sewer) through each manhole section as evidence of adequate cleaning. If internal sealing is to follow the television survey, particular attention should be given to the adequacy of the cleaning to insure that proper seating of the sealing packer can be achieved.

3.7.2 In addition, on all those lines which have sags or dips, to an extent that the television camera lens becomes submerged for three (3) or more feet during the television inspection, the CONTRACTOR shall pull double squeegee and/or sponges through the line in order to remove the water from those dips or sags, or draft the water by means of high-velocity jet cleaners. Water removal shall be performed until the television camera lens will no longer be submerged. This requirement may be waived by the ENGINEER if the water in which the camera lens is submerged, is clear enough to allow the identification of pipe defects, cracks, holes and location of service taps.

- END OF SECTION -

SECTION 02752 - TELEVISION SURVEY

PART 1 -- GENERAL

1.1 SCOPE

1.1.1 The work consists of furnishing all labor, materials, accessories, equipment, tools, transportation, services and technical competence for performing all operations required to execute the internal closed circuit television survey to inspect the entire barrel of sewers up to 30 inches in diameter in the areas denoted on the plans and record same to DVD or thumb-drive. Drawing A identifies sections of the sewer system where excessive infiltration is occurring and denoted same on the attached drawings. CONTRACTOR will televise and provide to CITY and ENGINEER copies of all DVDs.

1.1.2 The survey shall show all defects, identify the locations, determine amount of infiltration entering the sewer system and suggest repairs for same. These repairs may be lining, point repairs or other mechanism. ENGINEER will render a decision of the appropriate repair.

1.2 GENERAL

1.2.1 After cleaning as specified in Section 02751- Preparatory Cleaning, and before and after rehabilitation operation/replacement work, the pipe sections shall be visually surveyed by means of closed-circuit television in the presence of the ENGINEER. The survey shall be performed one manhole-to-manhole section at a time and the flow in the section being surveyed shall be suitably controlled.

1.2.2 Pre- and post-construction survey video on thumb drive or DVD shall be delivered to the ENGINEER on a one-line-per CD-ROM basis, accompanied with the corresponding work order, and pre- and post-TV log, for each sewer line surveyed. The video on CD-ROM shall be direct from a live video source into a video file, format MPEG1.

1.3. DIGITAL CCTV INSPECTION

1.3.1 The CONTRACTOR shall use a color pan and tilt camera or wide-angle camera specifically designed and constructed for both sewer and manhole inspection. Each sewer to be televised shall be suitably isolated to control flow during the inspection. The CONTRACTOR shall provide a recording of the televised sewer inspection, locating each sewer service connection entering the sewer.

1.3.2 Lighting for the pan and tilt camera or wide-angle camera shall provide a clear picture of the entire periphery of the existing sewer or manhole inspected.

1.3.3 The pan and tilt camera shall pause, pan, and visually inspect all service connections, pipe ends, and maintenance or structural defects. If utilizing a camera with fisheye capabilities, pausing and panning of each lateral is not necessary during the inspection if the image clearly depicts the inside of the lateral for post processing. If a blockage cannot be removed and hampers the televising of the sewer in one direction then the CONTRACTOR shall attempt to complete the section by televising from the other manhole to complete the section, this reversal should immediately follow the initial direction. The CONTRACTOR must report the obstructions to the ENGINEER daily.

1.3.4 If the image quality is not adequate, the CONTRACTOR shall be required to repeat the survey at the CONTRACTOR's expense. The equipment utilized in 8"-12" sewers shall be specifically designed with multiple camera lenses to limit the requirement for repeated inspections in the event a camera lens becomes obscured during inspection unless prior approved in writing by ENGINEER.

1.3.5 The CONTRACTOR shall perform all pipe CCTV inspections in accordance with NASSCO's Pipeline Assessment Certification Program (PACP). CCTV inspections will be delivered entirely in electronic format. The entire survey shall be recorded in an approved electronic format submitted with electronic links between the data and the video. All television inspection reports shall be with-in +/- two (2) feet of the measured linear footage between manholes along the existing sewer centerline from the start of pipe to end of pipe. All ENGINEER and PACP required header information must be fully and accurately entered on all CCTV reports. Work not following these specifications may be rejected for payment and the CONTRACTOR may be required to re do the work.

1.3.6 The CONTRACTOR shall perform all manhole CCTV inspections in accordance with NASSCO's Manhole Assessment Certification Program (MACP). CCTV inspections will be delivered entirely in electronic format. The entire survey shall be recorded in an approved electronic format submitted with electronic links between the data and the video. All MACP Level 1 mandatory header information must be collected and fully and accurately entered on all CCTV reports including northing and easting to submeter accuracy. Work not following these specifications may be rejected for payment and the CONTRACTOR may be required to re do the work.

1.3.7 The CONTRACTOR shall provide a NASSCO certified operator on site at all times during the entire survey. If video is to be coded separately from the actual recording, both the onsite Operator and the individual performing the PACP coding shall be PACP certified. The CONTRACTOR shall provide proof of certification prior to commencement of work, prior to a change in personnel involved in data collection, and as requested by the ENGINEER

1.3.8 The importance of minimization of disturbances and requirements for traffic control is emphasized. The CONTRACTOR shall utilize equipment specifically designed to perform multiple simultaneous inspections via autonomy (allowing an operator to conduct multiple inspections at one time) from each access point unless specifically approved in writing by the ENGINEER.

1.3.9 The video camera shall include a title feature capable of showing on the tape the following information:

1. City and State
2. Date/Time
3. CONTRACTOR's Name
4. Line Size, Material, and Depth
5. Manhole Identification (both manholes)
6. On-going Footage Counter

1.4 SUBMITTALS

1.4.1 Submittals required seven (7) days prior to the Pre-construction Meeting upon request

1. Name of the project supervisor and resumes
2. Documentation of NASSCO PACP certification for all CCTV operators, database and software
3. Site Safety Plan. A complete site safety plan, specific for the project, must be submitted one week prior to the pre-construction meeting. Work will not begin until an approved site safety plan is in place
4. Sample inspection CCTV data and video or data from other approved inspection method

1.4.2 Submittals Required for the Pre-construction Meeting upon request

1. An initial schedule of work, (To be approved by the ENGINEER)
2. Management Organization: Provide an organization chart depicting the essential organizational elements and senior personnel of the proposed CONTRACTOR and the functions and interrelationships of the personnel proposed to provide technical support, project management and supervision for this project. Provide succinct resumes of the personnel proposed to provide technical support and project management for this project. The personnel designated in the management summary for essential positions shall not be changed except with the permission of ENGINEER. The ENGINEER will only approve such a change when, in its opinion, the substitute personnel have equal or greater qualifications and experience to those intended to be replaced

1.4.3 Submittals Required One Week Prior to Any Televising Work.

1. Site specific site safety plan addenda
2. Entry releases, if applicable
3. Itemization and justification to ENGINEER or representatives of any inspections to be performed not utilizing autonomous equipment to perform simultaneous inspections

1.4.4 Weekly Submittals

1. Detailed updates to the work schedule will be provided to the ENGINEER no later than 3:00 p.m. on the Friday preceding the next week's cleaning and televising work
2. Electronic logs, and / or electronic worksheets submitted seven (7) days prior to work. All field paperwork must be submitted before the CONTRACTOR's invoice will be processed for payment
3. Corrections to punch list items as required by the ENGINEER to fulfill the requirements of this specification
4. Itemization and justification for any inspections that could not be completed according to schedule in the CONTRACTOR's opinion due to inability to locate the access structure, the structure being in an inaccessible area (including paved over, buried, under water prohibited areas, etc.), inoperable due to damage or locking mechanisms, requiring specialized tools such as excavators or action outside of the intended scope of work such as legal action

1.4.5. CCTV Reports, logs, electronic reports, and worksheets must include the following information and conform to the applicable guidelines:

1. CCTV media, NASSCO PACP and MACP Certified Databases, and electronic worksheets must accompany all inspection work.
2. All ENGINEER and NASSCO PACP mandatory header information must be fully and accurately entered on all PACP CCTV reports.
3. All MACP Level 1 Mandatory header information and detail must be fully and accurately entered on all MACP CCTV reports

2 -- PRODUCTS

All inspection information and data (including video) written to digital media (CD-ROM or DVD).

3 - USE OF AUTONOMOUS PLATFORM/TRANSPORT

3.1 The contractor has the option to use autonomous platform systems (Redline). The provision of a platform capable of operating in 8-12" (200-300mm) wastewater pipelines without operator monitoring. The system must function such that an operator is capable of initiating multiple segment inspections by utilizing more than one platform for the purpose of increasing throughput without loss in data quality ("force multiplication"). To accomplish these objectives, the platform must possess sufficient onboard sensors, and artificial intelligence to traverse a pipe segment and return to the starting manhole autonomously. Other systems, such as power and tether, must be self-contained so that no special transport/vehicle or other fixed equipment is required that would prevent force multiplication. The tether must have a safety factor of 12x (break strength divided by robot weight) to facilitate safe robot self-retrieval and reduce the risk of becoming lost in a pipeline. The platform must also support one or more sensors that collect pipe information in a manner that is sufficiently dense and comprehensive to enable offline data analysis.

3.1.1. Autonomous Platform Detailed Minimum Capabilities - It is required that the platform be capable of force-multiplication, which requires conducting an inspection beneath a closed manhole without operator monitoring. The platform must be completely self-contained, including onboard computing, data storage, power, and tether. It must be pressurized and capable of operating in fully submerged conditions.

3.1.2. The platform shall be driven by dual, independently powered full-coverage tracks. It must steer itself such that it remains upright and centered in the pipeline.

3.1.3 Autonomous Platform Equipment Specifications

1. Platform Weight: 25lb (11kg) weight class
2. On-board Power: Rechargeable batteries
3. Drive: Electric motors with self-activated winch-assist
4. Steering: Independent track control with powered forward and reverse
5. Tether: On-board high-strength non-conductive, non-communicating tether for robot self-retrieval
6. Max Drawbar Pull: Laying onboard tether (versus pulling) requires minimal drawbar pull
7. Construction: Aluminum and synthetic body with rubber treads

8. Speed: 0-30 ft/min (0-9 m/min) for single robot per NASSCO requirements, equivalent to 120 ft/min (36 m/min) with four robots deployed

3.1.4 Distance Measurement - An onboard distance-reading device which uses tether length to accurately measure the location of the platform in the pipe shall be incorporated into the platform. This device shall be accurate to $\pm 1\%$ the length of the inspection and measure to a resolution of at least 4000 data points per foot (14,000 per meter). Distance data must be automatically logged with sensor data.

3.2 Transport - No special transport (i.e. vehicle) shall be required for transportation or use of the equipment. Platform and all support equipment must be of minimum weight and bulk such that they can be easily hand-carried for operator safety and usage in easement or off-road areas.

4 Spherical Video Data Collection

If using an autonomous platform vehicle, it must include spherical video capability. The purpose of Spherical Video data collection is to gather a complete view of the pipeline for off-line processing to identify features and defects. Data is obtained from dual 180° field-of-view (hemispherical) fisheye lenses, one each at the front and rear of the platform. When the data from these two lenses is combined, 360° is captured and a Spherical Video is created. The work shall include an autonomous inspection of the pipeline and the preparation of all CCTV video, digital, and written reports.

4.1 Spherical Video Camera System

4.1.1 A pair of digital cameras must capture Spherical video from dual fisheye lenses each with field-of-view of 180° or greater. This video must be stored onboard the robot in a format that allows for post-processing and “virtual” transport through the pipe in forward or reverse direction and with off-site pan-tilt-zoom capabilities.

4.1.2 “Sidescan” or other similar technology that utilizes a single lens will not be accepted as it does not offer a sufficient view of laterals entering at angles beyond the field-of-view of the single lens. Equipment that captures image data at a low frame-rate that prevents observation of flow, drippers, or other relevant movement in the pipe will also not be accepted.

4.2 Illumination the primary means of illumination should be via high-intensity LED lighting that maximizes output while being impact resistant and reducing the possibility for failure during operation relative to traditional means. The general illumination shall be such as to allow an even distribution of light around the pipeline perimeter without the loss of contrast, flare, or abnormal shadowing on the dry portion. The camera system must actively and automatically adjust light output to maximize image quality regardless of pipe size or material transitions.

4.3 Camera Data Post-Inspection Review - Imagery from any point in the pipeline must be made available for operator review via a wireless interface immediately following an inspection.

4.4 Operator Certification

- 4.4.1 CCTV experience and/or PACP coding certification is not required for data collection. Any operator shall be able to collect data utilizing this equipment with maximum one day on-site training.
- 4.4.2 Data review with certified coding must be conducted by the equipment manufacturer or authorized party utilizing a NASSCO PACP certified individual using NASSCO certified software.
- 4.4.3 Information Delivery & Viewer - Collected data shall be processed so that the information obtained is presented in a useful format. The information shall be packaged and delivered together along with access to a viewing application. This application must support multiple methods of viewing the data along with export capabilities.
- 4.4.4 Information Data Delivery - All information data shall be delivered in digital format on an appropriately sized medium (DVD, Hard Drive, etc.) to minimize the number of separate delivered components. All data should be accessible from a single Viewing Application.
- 4.4.5 Viewing Application - The viewing application shall be available via online download and automatically check for updates.
- 4.4.6 The application shall provide a list of all pipeline segments included in the project identified by manhole number or segment ID. Selecting a segment should present detailed header information as well as a distance-based chart of the observations associated with that segment. Within each selected segment, the user should be able to conduct activities such as Playback and Export.
 - 4.4.6.1 Spherical Video Playback
 - 4.4.6.1.1 The viewing application shall include the ability to load the Spherical Video of a selected segment. Controls associated with the video should allow the user to navigate *Forward* and *Reverse* as well as *Pan*, *Tilt*, and *Zoom* at desired levels. The user shall also have the option to select a distance or an observation on the distance-based chart and the Spherical video should jump to that location at the ideal Pan-Tilt-Zoom level.
 - 4.4.6.2 Distributable Data
 - 4.4.6.2.1 Information shall be made available, either via export functionality or included with the deliverable, in the form of a NASSCO PACP database or Microsoft Excel spreadsheet for import into common 3rd party applications. In addition, it shall include the capability to generate segment summary reports in PDF format that can be easily printed or distributed electronically via third party software.

4.5 Legacy Video

- 4.5.1 Spherical Video data must be able to be recorded in MPEG-2 format, if requested, inclusive of all Pan-Tilt-Zoom operations, payout, and observations as per conventional CCTV for viewing on television equipment or import into legacy systems.

5 -- EXECUTION

5.1 PRECONSTRUCTION SURVEY

5.1.1 Procedure

5.1.1.1 Prior to any repair work, the entire sewer line (from manhole to manhole) shall be televised. The camera shall be placed at the center of the manhole and videotaping shall commence prior to entering the pipe. The CONTRACTOR shall show the inside of the manhole walls and the pipe connection to the wall at both the upstream and downstream manhole.

5.1.1.2 The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case shall the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, powered rewinds and tractors or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If the camera is being pulled through the sewer line by a hydraulic cleaning unit hose the cleaning nozzle shall be located a minimum of eight (8) feet away from the camera to allow a clear, unobstructed view. Jet nozzle shall be used in front of camera while televising through a dip to draft out water. If, during the survey operation, the television camera will not pass through the entire manhole section, the CONTRACTOR shall set up his equipment so that the survey can be performed from the opposite manhole.

5.1.1.3 Whenever non-remote powered and controlled winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two manholes of the section being surveyed to insure good communications between members of the crew.

5.1.1.4 Measurement for location of defects shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Measurement meters shall be accurate to tenths of a foot over the length of the section being surveyed. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, electronic distance meter or other suitable device. Manhole numbers and linear footage shall be shown on screen during taping.

5.1.1.5 Movement of the television camera shall be temporarily halted for a minimum of ten seconds at each visible point source of infiltration and/or inflow until the leakage rate from that source is quantified. The camera shall be stopped at all service connections and the service lateral shall be inspected with the pan and tilt camera. The camera shall also be stopped at active service connections where flow is discharging. If the discharge persists, the property involved shall be checked to determine whether or not the discharge is sewage. If no flows are being discharged from the building, it shall be considered that the observed flow is infiltration/inflow.

5.1.2 Field Documentation

5.1.2.1 Television Inspection Forms (Survey Logs). Printed and electronically stored location records shall be kept by the CONTRACTOR and will clearly show the location in relation to an adjacent manhole of each infiltration point observed during survey. Upstream footage at face of manhole (0) and downstream footage at face of manhole (e.g., 250) shall be shown on the log. The television inspection forms to be utilized by the CONTRACTOR shall be those mandated by

NASSCO's (National Association of Sewer Survey Companies) PACP (Pipe Line Assessment and Certification Program). Both the Header and Details information of the form shall be entered as indicated in the PACP standards. The survey logs shall include, but not be limited to the following information:

1. Correct pipe segment/manhole numbers
2. Correct address of manhole location
3. Pipe size, length and material
4. Manhole depth (up and downstream)
5. Lift station service area number
6. CD number and index
7. Footage locations, descriptions and estimated leak rates for visible point sources of infiltration inflow
8. Footage locations and descriptions of structural defects such as obstructions, any remaining root intrusion, offset joints, cracked pipe, fractured pipe, holes, collapses, sags, protruding service connections and/or blockages in the pipe.

The terminology to be used shall follow NASSCO's PACP standards. All information will be recorded and a copy of such electronic records and a hard copy will be supplied to the ENGINEER.

5.1.2.2 Photographs. Digital photographs of the television picture of problems shall be taken by the CONTRACTOR upon request of the ENGINEER.

5.1.3 Video Recordings. The purpose of video (CD-ROM or DVD) recording shall be to supply a visual and audio record of problem areas of the lines that may be replayed. CD-ROM recording playback shall be at the same speed that it was recorded. Slow motion or stop motion playback features shall be supplied by the CONTRACTOR. Once recorded, the CD-ROM becomes property of the CITY. The CONTRACTOR shall have all CD-ROM and necessary playback equipment readily accessible for review by the ENGINEER during the Project.

The observation terminology utilized during audio narration shall be consistent with NASSCO's PACP standards. The television inspection shall be video recorded on high quality CD-W. The CD shall be clearly labeled with the lift station number and individual manhole numbers clearly listed. The CDs are to be furnished to the ENGINEER with a printed hard copy (Survey Logs) and electronic data inspection report.

Videos displaying poor video quality will be deemed unacceptable and no payments will be made until lines are re-televised and a new CD is submitted. Poor video quality refers to, but is not limited to, the following: grease or debris on the lens, camera under water, picture too dark, excessive camera speed through the line, lines improperly cleaned, poor/no audio, etc.

5.1.4 Audio. All videos shall have audio record. As a preamble, at the beginning of the CD-ROM, the CONTRACTOR shall state the following: (CONTRACTOR's Name) is performing a pre/post TV survey for Job No. 10-01 - Hallandale Beach. State the date, time, operator's name, area, upstream manhole number to downstream manhole number, pipe size and material, upstream manhole depth, and TV survey will be from up- to downstream, or down- to upstream. The CONTRACTOR shall verbally state station and position of all laterals and defects. At the end of each line, state: End of line, upstream manhole number to downstream manhole number, and total linear footage.

5.2 POST CONSTRUCTION SURVEY

5.2.1 Procedure

1. The same procedures shall be used as indicated in Section 3.1 PRECONSTRUCTION SURVEY.
2. In addition, the CONTRACTOR shall stop camera at all point repairs, sectional repairs, and reinstated laterals, and inspect entire repaired pipe section.
3. The CONTRACTOR shall invert white foreground to black as needed in the line section with light background.

5.2.2 Documentation

1. The same documentation shall be provided as indicated in Section 3.1 PRECONSTRUCTION SURVEY.

- END OF SECTION -

Section 02770

CURED-IN-PLACE PIPE LINING – Laterals – Option 1

Technical Specification

Service Connection Seal + Lateral Full Wrap and/or Brim Style Connection Seal

This specification practice describes the procedures for the reconstruction of service lateral pipelines and conduits (4 to 6-in. diameter) in 6 to 27-in. main line pipes by the installation of a resin-impregnated, flexible tube which is inverted into the existing conduit by use of air pressure. When cured, the finished pipe will be continuous and tight-fitting

Part 1 General

1.1 Summary

- a. It is the intent of this specification to provide for the structural re-construction of 4" thru 6" diameter service laterals and a water tight interface connection seals in 6-inch through 27-inch main line pipes, normally without excavation, by the installation of a one piece resin impregnated, flexible, non-woven felt liner installed into the existing lateral connection utilizing a pressure apparatus positioned in the main pipe. Curing shall be accomplished by use of ambient cure resin or other approved methods to cure the resin into a hard impermeable Cured-In-Place-Pipe (CIPP). When cured, the liner shall have a watertight connection seal at the main pipe and extend over the length of the service lateral in a structural pipe-within-a-pipe.

1.2 Qualifications of Contractor

- a. The employees of the contractor or subcontractor performing the work of this section shall be of the company installing the CIPP Lateral Lining system components. The Manufactured System must have a minimum of a five (5) year history of satisfactory performance with a minimum of 5,000 CIPP lateral installations. The contractor or subcontractor contracted to perform the work shall have a minimum of five (5) years of service continuous experience installing CIPP Lateral Lining in pipe of similar size, length and configuration as proposed in this project. In addition, the contractor or subcontractor contracted to perform the work shall have successfully installed 5,000 CIPP laterals as the Contractor of record for a given project in a wastewater collection system application. The on-site Superintendent of the lateral lining contractor or subcontractor contracted to perform the work shall have installed a minimum of 5,000 CIPP laterals of like condition for this geographic area and have a minimum of five (5) years of CIPP

industry experience. Qualified Contractors and Products must have confirmed experience with lateral rehabilitation lengths no less than those specified in this contract.

1.3 Related Sections

- a. By-pass Pumping (also included within this section)
- b. Pipe Cleaning (also included within this section)
- c. Closed Circuit Television (CCTV) Inspection (also included in this section)
- d. Cleanout Assembly Detail (included as an attachment)

1.4 References

- a. This specification references ASTM test methods which are made a part hereof by such reference and shall be the latest edition and revision thereof.
 - i. ASTM F1216 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
 - ii. ASTM F1743 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe
 - iii. ASTM D5813 – Standard Specification for Cured-in-Place Thermosetting Resin Sewer Piping Systems

1.5 Submittals

- a. Product Data
 - i. Resin
 - 1. Long term creep test data confirming the resin system's 50-year design life in accordance with ASTM D2990
 - 2. Chemical Resistance in accordance with ASTM F1216
 - 3. Certificate of Compliance in accordance with ASTM F1216
 - 4. Material Safety Data Sheets (MSDS)
 - ii. Liner
 - 1. Certificate of Compliance in accordance with ASTM 1216
 - 2. Certificate of Compliance in accordance with ASTM 1743 for pull in place tubes

- b. CIPP wall thickness design calculations in accordance with ASTM F1216. Design calculations shall include applicable designs as follows:
- i. 4" thru 6" diameter lateral liner assuming Fully Deteriorated conditions
 - ii. Main line pipe liner assuming Partially Deteriorated conditions when the main line pipe is lined
 - iii. Main line pipe liner assuming Fully Deteriorated conditions when the main line pipe is NOT lined

c. Contractor Qualifications/References

- i. The contractor or subcontractor performing the lateral lining work shall provide a list of references, including:
 - Owner Name
 - Contact Name (with phone number)
 - Contract Name
 - Start and Completion Dates
 - Quantity of Laterals Lined

Note: The CIPP Lateral Lining system used for each specific project must be provided, verifying compliance with these qualifications and each project will include the name of the Contractor's site Superintendent that completed the work. These references must satisfy the minimum requirements of:

Contractor or Subcontractor:

- A five (5) year history of satisfactory performance in the CIPP industry
- A minimum of 5,000 CIPP laterals successfully installed in the United States using the proposed CIPP Lateral Lining system
- A minimum of five (5) years continuous experience installing CIPP Lateral Lining in pipe of similar size, length and configuration as proposed in this project
- A minimum of 5,000 CIPP laterals in a wastewater collection system application
- License or Certification that the proposed installer is approved to install the proposed project

On-Site Superintendent:

- The on-site Superintendent must have installed a minimum of 5,000 CIPP laterals of like condition for this geographic area
- A minimum of five (5) years of CIPP industry experience

Part 2 Products

2.1 Materials

a. General Requirements

- i. Liner and resin will meet the requirements of ASTM F1216, F1743, and D5813
- ii. The Owner shall obtain samples of the dry weather sewage flow to be analyzed for temperature and chemical content should lateral installation(s) be in an industrial area(s) subject to possible flows other than domestic sewage. This analysis shall be supplied to the Installer for his information.

b. CIPP Lateral Materials

- i. The liner shall be fabricated to a size that when installed will neatly fit the internal circumference of the conduit specified by the Owner. Allowance shall be made for circumferential stretching during insertion. The liner shall be a joint-less polyester felt "tube" with a sewn or a semi-rigid collar at the connection to include a 3-inch "brim" or a 16-inch "full wrap" that will create a watertight seal at the main pipe interface.
- ii. The length shall be a distance to effectively span from the lateral connection at the main pipe or to the desired termination location in the service lateral pipe. For the purpose of this specification, the termination point shall be a distance within 18-inches of the intersection of a cleanout or property line. When required, an overlap method is performed with a pull-in-process installation from a cleanout or access point back to the main pipe. In either case, the lateral liner must provide a watertight seal at the main pipe and a structural repair of the lateral over the specified length. The installer shall verify the lengths in the field before impregnation of the resin.
- iii. Unless otherwise specified, this Installer shall furnish a specially designed, unsaturated, Polyester or Vinylester resin and catalyst system compatible with the cured-in-place process that provides cured physical strengths specified herein.
- iv. A hydrophilic paste shall be used at the connection of the main line and lateral to ensure material expansion into pipe cracks and voids.

Hydrophilic O-rings are permitted only to secure the main line sheet in place until cure but must have a minimum diameter of 3/8" to prevent encapsulating resin during installation.

- v. Pre-formed hydrophilic sleeves, gaskets, or "tophats" shall not be used as they inadequately fill pipe cracks and voids.
- vi. 3rd party testing must be available demonstrating the sealing capabilities for any hydrophilic material used.

c. Physical Strength

- i. The structural performance of the finished cured-in-place-pipe must be adequate to accommodate all anticipated loads throughout its design life. No cured-in-place- pipe reconstruction technology will be allowed that requires bonding to the existing pipe for any part of its structural strength. Only resin saturation using vacuum impregnation will be allowed. Transparent bladders are not permitted during wet out as they can restrict the ability to monitor thoroughness of resin saturation.
- ii. Design methods are to be derived from traditionally accepted pipe formulas for various loading parameters and modes of failure. All equations will be modified to include ovality as a design parameter. The design method shall be submitted to the Engineer for approval.
- iii. The CIPP lateral pipe shall conform to the minimum structural standards as listed below:

<u>Property</u>	<u>ASTM Standard</u>	<u>Result</u>
Flexural Stress	ASTM D790	4,500 psi
Flexural Modulus	ASTM D790	250,000 psi

2.2 Approved Manufactured Products

- a. BLD "Service Connection Seal + Lateral" of BLD Services, LLC
- b. Pre-approved equal

Part 3 Execution

3.1 Installation Preparations

- a. Access – Installation techniques must be available and used for installations where a cleanout is not present. If a cleanout already exists or is required by the Owner,

it shall be constructed of materials which provide a four-inch minimum diameter opening if the service lateral is four inches (4"). A six-inch minimum diameter opening is required if the service lateral is six inches (6"). Any cleanouts shall comply with the "Cleanout Assembly Detail" found as an attachment to this specification. Note: it is recommended that the cleanout is a double wye, double sweep Tee (or equivalent) shaped where the lateral and riser pipe joins to allow video inspection, cleaning and lining access. (Tee connections will not be permitted).

- b. Safety – The Installer shall carry out his operations in strict accordance with all applicable OSHA standards. Particular attention is drawn to those safety requirements involving entrance into confined spaces.
- c. Cleaning of Sewer Line – The intent of this specification is for cleaning of the lateral to be accomplished from the main pipe via lateral launching equipment. If the lateral cannot be cleaned using industry standard cleaning heads that can be launched from the main pipe, then a cleanout or access point will be required. The laterals shall be cleaned a sufficient length to ensure the specified length of sewer is ready for lining. It shall be the responsibility of the Installer to verify, prior to installation, that all internal debris has been removed from the sewer line. Internal debris consists of broken pipe sections, roots, loose gravel, etc. The contractor must have the capability to clean the lateral from the main line should no clean out be present.
- d. Inspection of Pipelines – It is the intent of this specification for inspection of the lateral to be accomplished from the main pipe via lateral launching equipment. If the lateral cannot be inspected using industry standard inspection equipment that can be launched from the main pipe, then a cleanout or access point will be required. Inspection of pipelines shall be performed by experienced personnel trained (PACP Certification) in locating breaks and obstacles by closed circuit television (CCTV). The interior of the pipeline shall be carefully inspected to determine the location of any conditions which may prevent proper installation of the lateral liner into the pipelines, and it shall be noted so that these conditions can be corrected. A DVD and suitable log shall be kept for later reference by the Owner. The contractor must have the capability to inspect the lateral from the main line should no clean out be present.
- e. Bypassing Sewage – The Installer, when required, shall provide for the flow of sewage around the section(s) of main pipe where the service lateral designated for lining is located. The bypass shall be made by plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system. The pump and bypass lines shall be of adequate capacity and size to

handle the flow. It is assumed that flows in the lateral specified for lining will not require bypass pumping.

- f. It is required that the service lateral be inactive during the time of installation. This is normally accomplished by turning off the homeowner's services or requesting that the homeowner relinquish using his services during the period of installation. Notification will be distributed to impacted residents 24 hours in advance of the lateral liner installation.
- g. Line Obstructions – If inspection reveals an obstruction that cannot be removed by conventional sewer cleaning equipment, as in solids, dropped joints or collapsed pipe, then the Installer 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.
- h. In case of lined main pipes, the lateral connection specified for rehabilitation shall be reinstated to 100% of its original size.

3.2 Installation of Lateral Lining

- a. The Installer shall designate a location where the liner will be vacuum impregnated prior to installation. The Installer shall allow the Owner to inspect the materials and resin saturation (wet-out) procedure. A catalyst system compatible with the resin and liner shall be used.
- b. The wet-out liner shall be loaded inside a pressure apparatus above ground, utilizing a hydrophilic sealant (or equivalent) on the backside of the connection to enhance a watertight seal. Also, a Silicate Resin or a two-part 100% solid epoxy (reference ASTM C-881) shall be applied to the lateral interface to enhance adhesion against the host pipe. The pressure apparatus, with an end attached to a robotic device, shall be winched through the main pipe to the service connection. The robotic device, together with a television camera, will be used to position the pressure apparatus' inversion elbow at the service connection opening. Air pressure, supplied to the pressure apparatus through an inversion hose, shall be used to invert the wet-out liner through the lateral pipe to the cleanout/access point or "Right of Way" point. The inversion head will be adjusted to be of sufficient pressure to cause the impregnated liner to invert completely in the lateral pipe and hold the liner tight to the pipe wall. Care shall be taken during the curing process so as not to overstress the liner.

- c. Curing – Unless otherwise approved by the engineer, an ambient-temperature curing resin system will be utilized. Steam cure of liners is not permitted due to the concern for damage to homeowner’s property.
- d. Initial cure shall be deemed to be completed when inspection of the exposed portions of the CIPP appear to be hard and sound. The cure period shall be of a duration recommended by the resin manufacturer, as modified for the installation process.
- e. Cool-down – The Installer shall cool the hardened CIPP to a temperature to approximately 100⁰ F before relieving the pressure in the pressure apparatus. Care shall be taken to maintain proper pressure throughout the cure and cool-down period.
- f. Finish – The finished CIPP shall be a watertight connection seal at the main pipe and extend continuous over the entire length of the service lateral and be free of dry spots, lifts, and delamination. This continuous one-piece structural pipe-within-a-pipe shall not inhibit the closed circuit television (CCTV) post video inspection of the main or service lateral pipes.
- g. Testing – For every 50 laterals, one flat plate sample shall be taken and sent to a 3rd party test laboratory for confirmation of short term flexural modulus and strength properties in accordance with ASTM F1216. The test results shall meet or exceed the values used in the design of the CIPP lateral liner.
- h. During the warranty period, any defects which will affect the integrity or strength of the CIPP liner shall be repaired at the Installer’s expense in a manner mutually agreed upon by the Owner and the Installer. Licensed installers are not permitted to prevent disputes for resolution, between manufacturer and installer that could delay the project, should problems be encountered.
- i. After the work is completed, the Installer will provide the Owner with a digital video showing the completed work including the restored conditions.

3.3 Clean-Up

- a. After the work is completed, the Installer shall reinstate the project area affected by his operations. The Contractor or Subcontractor will only be required to reinstate the area equivalent to the condition of the area as it was prior to commencing work.

3.4 Measurement and Payment

- a. Measurement for the work included in this section will be in accordance with the units set forth in the proposal. Unit prices shall include all labor, materials and equipment required to complete the work as specified. The unit prices shall also include CCTV prior to and after lining, lateral cleaning, bypass pumping of main pipe flow, installation of cleanouts (if required by the lateral lining process) and traffic control (standard cones and signs).

3.5 Warranty

- a. Contractor warrants to Owner that all products and work provided by Contractor to Owner under this Agreement will be free from material defects in workmanship and materials for a period of five (5) years from the earlier of the date on which Contractor's work is accepted by Owner or the date on which the Contractor completes performance and leaves the worksite. In the event that a material defect in workmanship or materials supplied by the Contractor is found during the five (5) year period following acceptance of the work, then such defect shall be repaired, replaced or adjusted by Contractor at no additional cost to the Owner. The Owner's exclusive remedy in the event of any warranty claim hereunder is limited to correction of such defect, adjustment, repair or replacement as the Contractor shall at its sole option elect. The foregoing warranty is the exclusive warranty provided by the Contractor and is given in lieu of all other warranties, whether express, implied or statutory, including but not limited to, any implied warranties of merchantability or fitness or suitability for a particular purpose or use; and all other warranties are hereby expressly disclaimed.
- b. In no event shall the Contractor's liability for warranties hereunder exceed the purchase price paid by the Owner for the Contractor's work and materials.
- c. The warranty set out above shall be void and of no effect in the event that (i) the Contractor is not notified of claim of defect within the five (5) year period provided above; (ii) the Contractor is not provided timely unrestricted access to the site at which the claimed defect is located in order to investigate and/or repair, adjust or replace the work or materials claimed to be defective or the Contractor is not provided suitable working conditions to perform such investigation, repair, adjustment or replacement; (iii) any materials or work exposed to chemicals or substances other than those listed in the Specification to the Agreement as accepted by the Contractor; (iv) site conditions or pipeline, conduit or access way conditions are other than those disclosed to and accepted by the Contractor; (v) the Owner's site, pipeline, conduit or access ways are cleaned or modified in a manner not disclosed in writing to and accepted in writing by the Contractor in advance of commencement of the Contractor's work or tampered with prior to, during or after completion of the Contractor's work; or (vi) the site at which the

work is performed or the materials provided by the Contractor are otherwise abused or misused.

Section 02771

CURED-IN-PLACE PIPE LINING – Laterals – Option 2

1.0 INTENT

This specification covers material requirements, installation practices, and test methods for the reconstruction of a sewer service lateral pipe and the main connection without excavation. The pipe renovation shall be accomplished by the inversion and inflation of a resin impregnated, single-piece lateral and main connection liner. When cured, the liner extends over a predetermined length of the service lateral and the full circumference of the main pipe at the connection (CIPP) outfitted with gasket seals. The Materials and Installation practices shall, at a minimum, adhere to the requirements of ASTM F2561-11 “Standard Practice for Rehabilitation of a Sewer Service Lateral and its Connection to the Main Using a One-Piece Main and Lateral Cured-in Place Liner”

2.0 GENERAL

The lateral reconstruction shall be accomplished using a resin absorbent textile tube of particular length and a thermo-set resin with physical and chemical properties appropriate for the application. The launching device and launching hose is winched through the mainline and positioned at the appropriate service lateral connection. The mainline bladder is inflated seating the hydrophilic seals and presses the connection liner against the main pipe at the connection while the lateral tube inverts up into the lateral pipe by the action of the inversion bladder. The resin-saturated liner is cured, the hydrophilic gaskets are in place then the inversion bladder and launching device are removed.

The cleanout riser lining shall be accomplished by the inversion of a resin impregnated, single-piece cured-in-place pipe (CIPP) lateral and riser liner outfitted with engineered, molded hydrophilic gasket seals that are designed specifically for sealing the CIPP termination ends through a T-shaped cleanout connection. When cured, the liner renews the cleanout riser pipe and the connection to the lateral piping.

3.0 PRODUCT AND INSTALLER ACCEPTABILITY

- A. All sewer products are intended to have a minimum 50 year design life, in order to minimize the owner’s long term risk of failure, only proven products and installers with substantial successful long term track records will be considered.

- B. Products and installers must document the following minimum criteria to be deemed commercially acceptable:

<u>Product</u>	<u>Unit</u>	<u>Florida Minimum Requirement</u>
Lateral Liner	LF	10,000
Main / Lateral Connections	EA	1,000
Stack Single or Double Wye	EA	100
Lateral Transitions	EA	100

- 3.1 For materials and product to be considered commercially proven, the above referenced minimum units of successful wastewater collection system installations must be documented to the satisfaction of the owner to assure commercial viability of the proposed liner system. If changes in the product (installation, resin, materials, configuration, assembly, seals) did occur the date and scope of changes must be part of the product history documentation for the owner to review and tabulated to show the quantity of each specific product type or version. Any modifications to the finished product bid must show the date and reason the change was made.
- 3.2 All sewer rehabilitation products submitted for approval must provide third party test results supporting the long term performance and structural strength of the product and such data shall be satisfactory to the owner. Tests are to include the main, laterals, and main/lateral connection materials and hydrophilic gasket seals. 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 for all components proposed.
- 3.3 The Contractor (the firm bidding) must meet the minimum requirements above. This is a company requirement; personal history is valuable, however will not be considered in evaluating the company's ability to meet the minimum requirements of this specification. The Contractor must have installed the same product (in the same constructed configuration) proposed for a minimum of five years.

4.0 MATERIAL

- 4.1 *Liner Assembly*- The liner assembly shall be continuous in length and consist of one or more layers of absorbent needle punched felt, circular knit or circular braid that meet the requirements of ASTM F1216 and ASTM D5813 Sections 6 and 8. No intermediate or encapsulated elastomeric layers shall be in the textile that may cause de-lamination in the CIPP. The textile tube and sheet shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe segments, and flexibility to fit irregular pipe sections. The resin saturated textile tube and sheet shall meet ASTM F 1216, 7.2 as applicable, and the tube shall have 5% to 10% excess resin distribution (full resin contact with the host pipe) that when compressed and cured will meet or exceed the design thickness.
- 4.2 *Mainline Liner Tube*- The main liner tube shall be formed from a flat sheet of resin absorbent material suitable for CIPP. The forming of the tube is accomplished by one end of the textile sheet overlapping the second end and sized accordingly to create a circular lining equal to the inner diameter of the lined main pipe. The interior of the textile sheet shall be laminated with an impermeable, translucent flexible membrane. The textile sheet before insertion shall be permanently marked on the membrane as a “Lateral Identification” correlating to the address of the building the lateral pipe provides service.
- 4.3 *Lateral Liner Tube*- The exterior of the lateral liner tube shall be laminated with an impermeable, translucent flexible membrane. Longitudinal seams in the tube shall be stitched and thermally sealed. The lateral tube will be continuous in length. The lateral tube will be capable of conforming to offset joints, bends, bells, disfigured pipe sections and pipe diameter transitions.
- 4.4 *Mainline Connection*- The main tube and lateral tube shall form a one-piece assembly by stitching the lateral tube to the mainsheet aperture. The connecting end of the lateral tube shall be shaped to match the aperture and curvature of the main tube. The lateral tube and main tube shall be sealed by use of a flexible UV cured adhesive/sealant. The main/lateral tube assembly shall take the shape of a “TEE” or “WYE” with corresponding dimensions such as a curved circle or a curved elliptical opening in the pipefitting. Submittals for the liner assembly must include the manufacturer’s assembly methods and test protocol for the main/lateral liner assembly to be certified as airtight prior to resin saturation. Each liner assembly must include this test data and be certified by the manufacturer to be airtight prior to resin saturation.
- 4.5 *Gasket Seals*- The mainline connection shall include a seamless molded flange shaped gasket attached to the main liner tube. The gasket must be a minimum of 2.5mm and must retain this minimum thickness under installation pressures. The lateral tube shall include a compression O-ring gasket attached six-inches from the terminating end of the lateral tube. The gasket seals required must be a

manufactured molded neoprene seal. Paste or caulk type of sealants are inconsistent in their placement and application and are not acceptable. All seals must be visible after the installation to verify their proper placement.

- 4.6 *Mainline End Seal Test Data-* The hydrophilic gasket seals shall include test data that supports substantial expansion properties so to form a watertight compression end seal at the terminating ends of the CIP-lateral liner. The test protocol shall simulate subterranean conditions and hydraulic loading at surface. Gasket seal submittals must include tests data simulating hydration/ dehydration conditions for a period of 10,000-hours and the test results must successfully demonstrate and document long-term performance without deterioration, loss of material, flexibility, and expansion of the gasket during repeated cycles of hydration and dehydration.
- 4.7 *Bladder Assembly-* The liner assembly shall be surrounded by a second impermeable, inflatable, invertible, flexible translucent membrane bladder that will form a liner/bladder assembly. The translucent bladder shall facilitate vacuum impregnation while monitoring the resin saturation process.
- 4.8 *Cleanout Riser Liner-* The liner shall be constructed of a resin absorbent textile tube and a thermo-set resin with physical and chemical properties appropriate for the application.

5.0 RESIN SYSTEM

- 5.1 The resin/liner system shall conform to ASTM D5813 Section 8.2.2.
- 5.2 The resin shall be a corrosion resistant polyester, vinylester, epoxy or silicate resin and catalyst system that when properly cured within the composite liner assembly, meets the requirements of ASTM F1216, the physical properties herein, and those which are to be utilized in the design of the CIPP, for this project.
- 5.3 The resin shall produce a CIPP, which will comply with the structural and chemical resistance requirements of ASTM F1216.

Table 1 CIPP INITIAL STRUCTURAL PROPERTIES

Property	ASTM Test	Minimum Value	
		PSI	(MPa)
Flexural Strength	D 790	4,500	(31)
Flexural Modulus	D 790	250,000	(1,724)

6.0 DESIGN CONSIDERATIONS

- 6.1 The CIPP shall be designed per ASTM F1216, Appendix X1.
- 6.2 The CIPP design for the lateral tube and main sheet shall assume no bonding to the original pipe.
- 6.3 The resin saturated lateral tube and the main sheet must place the resin in full contact with the host pipe. The cured liner must have any coating on the interior of the lateral piping.
- 6.4 The liner must be smooth and have an average roughness coefficient “n” factor of 0.013 or lower.

7.0 REFERENCES

- 7.1 ASTM F-2561 - Standard Practice for Rehabilitation of a Sewer Service Lateral and Its Connection to the Main Using a One-Piece Main and Lateral Cured-In-Place Liner.
- 7.2 ASTM F1216 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
- 7.3 ASTM D-790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- 7.4 ASTM D-792 Standard Test Methods for Density and Specific Gravity of Plastics by displacement.
- 7.5 ASTM D-2990 Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics
- 7.6 ASTM D5813 Standard Specification for Cured-in Place Thermosetting Resin Sewer Pipe.

ASTM F2561-11 references several complementing standards; one of which is ASTM F1216. The ASTM F1216 standard is referenced for purposes of tube design considerations for a CIPP. ASTM F1216 is not a lateral pipe lining standard and is not applicable to the sealing of lateral connections to mainline pipe and a branch pipe using CIPP. ASTM F2561 is the industry standard for renewing lateral pipes and main/lateral connections with CIPP and pre-molded compression gaskets.

8.0 INSTALLATION RECOMMENDATIONS

- 8.1 *Access Safety* – Prior to entering access areas such as manholes, an excavation pit, performing inspection or cleaning operations, an evaluation of the atmosphere to determine the presence of toxic or flammable vapors or lack of oxygen shall be undertaken in accordance with local, state, or federal safety regulations.
- 8.2 *Cleaning and Inspection* – As per NASSCO Standards.
- 8.3 *Cleaning Accessing the Lateral Pipe* – A cleanout is required to be located on the exterior of the building. The cleanout fitting shall be TEE shaped so to allow upstream and downstream access to the lateral pipe. The cleanout shall be located within two (2) feet of where the finished liner is to terminate.
- 8.4 *Plugging* – The upstream side of the cleanout shall be plugged during insertion and curing of the liner assembly ensuring no flows enter the pipe and no air, steam or odors will enter the building. When required, the main pipe flows will be bypassed. The pumping system shall be sized for peak flow conditions. The upstream manhole shall be monitored at all times and an emergency deflating system will be incorporated so that the plugs may be removed at any time without requiring confined space entry.
- 8.5 *Inspection of Pipelines* – The interior of the pipeline shall be carefully inspected to determine the location of any condition that shall prevent proper installation, such as roots, severe offsets, and collapsed or crushed pipe sections. Experienced personnel trained in locating breaks, obstacles, and service connections by closed circuit television shall perform inspection of pipelines.
- 8.6 *Line Obstructions* – The existing lateral pipe shall be clear of obstructions that prevent the proper insertion and expansion of the lining system. Changes in pipe size shall be accommodated, if the lateral tube is sized according to the pipe diameter and condition. Obstructions may include dropped or offset joints of no more than 20% of inside pipe diameter.
- 8.7 *Resin Impregnation* – The liner assembly is encapsulated within the translucent bladder (liner/bladder assembly), the entire liner including the flat sheet shall be saturated with the resin system (wet-out) under controlled vacuum conditions. The volume of resin used shall be sufficient to fill all voids in the textile lining material at nominal thickness and diameter. The volume shall be adjusted by adding 5% to 10% excess resin for the change in resin volume due to polymerization and to allow for any migration of resin into the cracks and joints in the original pipe. No dry or unsaturated area in the mainline sheet or lateral tube shall be acceptable upon visual inspection.

- 8.8 *7.8 Liner Insertion* – The lateral tube and inversion bladder shall be inserted into the launching hose. The main bladder and flat textile sheet (main liner tube) shall be wrapped around a “T” launching device, formed into a tube and secured by use of rubber bands. A seamless molded flange shaped gasket shall be attached to the main liner tube by use of stainless steel snaps. The flanged gasket shall be inserted into the lateral pipe at the main/lateral juncture so that the brim of the flanged gasket is firmly seated against the mainline pipe liner. An O-ring end seal shall be positioned 6-inches from the terminating end of the lateral liner tube. The launching device is inserted into the pipe and pulled to the point of repair. The pull is complete when the lateral tube is exactly aligned with the lateral pipe connection. The lateral tube is completely protected during the pull. The mainline liner is supported on a rigid “T” launcher that is elevated above the pipe invert through the use of a rotating skid system. The liner assembly shall not be contaminated or diluted by exposure to dirt or debris during the pull.
- 8.9 *Bladder* – The main bladder shall be inflated causing the main sheet to unwrap and expand; pressing the main tube firmly into contact with the main pipe and embedding the flange shaped gasket between the main tube and the main pipe at the lateral opening. The lateral tube is inverted through the main tube aperture by the action of the lateral bladder extending into the lateral pipe to a termination point that shall be no less than 2-feet from the exterior cleanout. The bladder assembly shall extend beyond each end of the liner, so the liner remains open-ended and no cutting shall be required.
- 8.9.1 *Cleanout Riser Liner* - The tube shall be resin impregnated under a controlled vacuum within the translucent bladder. The liner/bladder assembly is then inserted into a mobile air-inversion device. The mobile air-inversion device shall include a camera port for inspecting the resin saturated tube inflated in the pipe before the resin is cured, and for visually verifying the liner has been fully deployed and the ends are open.

9.0 CIPP LATERAL PROCESSING

- 9.1 *Curing* – After the liner has been fully deployed into the lateral pipe, pressure is maintained pressing the liner firmly against the inner pipe wall until the liner is cured at ambient temperatures or by a suitable heat source. The heating equipment shall be capable of delivering a mixture of steam and air throughout the liner bladder assembly to a uniform raise the temperature above the temperature required to cure the resin. The curing of the CIPP shall take into account the existing pipe material, the resin system, and ground conditions

(temperature, moisture level, and thermal conductivity of the soil). The heat source temperatures shall be monitored and logged during the cure and cool down cycles. The manufacturer's recommended cure schedule shall be submitted and followed.

- 9.2 *CIPP Processing* – Curing shall be done without pressure interruption with air or a mixture of air and steam for the proper duration of time per the resin manufacturer's recommendations. The curing process is complete when the temperature of the CIPP reaches 100 degrees Fahrenheit or less.

10.0 FINISH

The finished CIPP – CIPP Shall be a homogenous CIPP liner assembly located within a lateral service pipe for a specific length, and extending into the main pipe to renew 18-inches of the main pipe at the main/lateral service connection. The CIPP shall be smooth with minimal wrinkling and shall increase flow rate. The CIPP shall be free of dry spots, lifts, and delamination. The CIPP shall include a textile taper at each end providing a smooth transition to the host mainline liner for accommodating video equipment and maintaining proper flow in the mainline. After the work is completed, the installer will provide the owner with video footage documenting the repair and the visual markings on the CIPP liner assembly identifying the building address. The finished product shall provide a verifiable non-leaking connection between the mainline liner and the CIP-Lateral liner.

11.0 RECOMMENDED INSPECTION AND TESTING PRACTICES

- 11.1 *Sampling* – As designated in the purchase agreement, the preparation of a CIPP sample is required. The sample shall be prepared by securing a flat plate mold using the textile tube material and resin system as used for the rehabilitated pipe.
- 11.2 *Pressure* – The pressure applied on the plate sample will be equal to the highest pressure exerted on the lateral tube during the inversion process.
- 11.3 *Length* – The minimum length of the sample must be able to produce at least five specimens for testing in accordance with ASTM D-790-03.
- 11.4 *Conditioning* – Condition the test specimens at $73.4 \pm 3.6^{\circ}$ F ($23 \pm 2^{\circ}$ C) and $50 \pm 5\%$ relative humidity for not less than 40 hour prior to test in accordance with Practice ASTM D 618, for those tests where conditioning is required.
- 11.5 *Short-Term Flexural (Bending) Properties* – The initial tangent flexural modulus of elasticity and flexural stress shall be measured for gravity and pressure pipe

applications in accordance with Test Method D 790 and shall meet the minimum requirements of Table 1.

- 11.6 *Gravity Pipe Leakage Testing* – If required by the owner in the contract documents or purchase order, gravity pipes should be tested using an air test method where a test plug is placed adjacent to the upstream and downstream ends of the main sheet CIPP and at the upper most end of the lateral tube. This test should take place no less than 72-hours after returning the lateral pipe back into service. This test is limited to pipe lengths with no service connections. The test pressure shall be 4-PSI for a test time of three-minutes; the pressure shall not drop below 3.5 PSI.

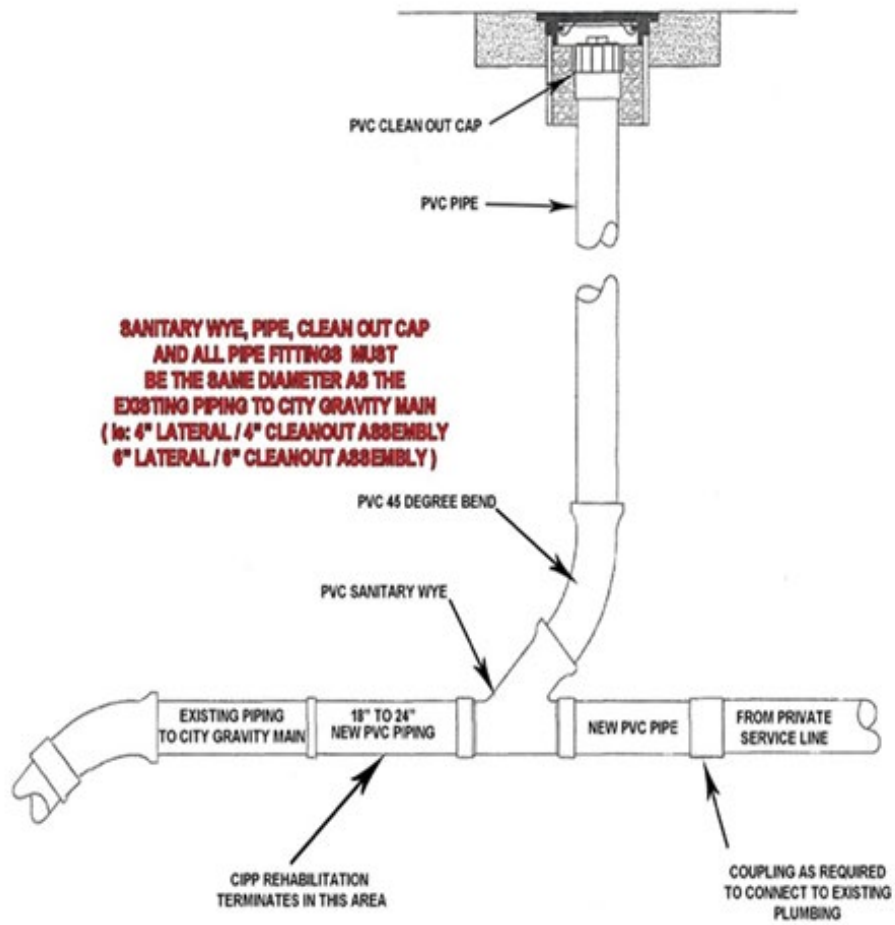
12.0 WARRANTY

All CIPP liners shall be certified by the manufacturer for specified material properties for the particular repair. The manufacturer warrants the liner to be free from defects in raw materials for ten years from the date of acceptance. The contractor guarantees the work to be free from defects caused by faulty workmanship for a period of five years from the date of acceptance. During the warranty period, any defects which affect the integrity, strength or water tightness of the installed pipe shall be repaired at the contractor's expense.

– END OF SECTION –

End of Section

CLEANOUT ASSEMBLY DETAIL



Lateral List for Investigation and potential lining

USMH	DSMH	Foot Location	House/Location Number	St.Rd
01-019	01-011	52	467	Poinciana Dr
		306.6	701	Poinciana Dr
01-022	01-021	28.9	1	Poinciana Dr
		31.7	400	Poinciana Dr
		136.7	406	Poinciana Dr
		143	407	Poinciana Dr
		242.6	419	Poinciana Dr
		248.5	412	Poinciana Dr
		01-028	01-027	6.6
8.8	401			Alamanda Dr
97.6	407			Alamanda Dr
100.5	406			Alamanda Dr
197.5	419			Alamanda Dr
200.3	412			Alamanda Dr
01-053	01-045			45.2
08-062	08-061	63.3	900	SE 9th CT
		100.7	101	SE 9th CT
08-086	08-085	17.9	121	SE 10th ST
		24.9	120	SE 10th ST
		76.8	144	SE 10th ST
		109.5	920	SE 10th ST
		136.5	128	SE 10th ST
		213.8	200	SE 10th ST
		225.1	112	SE 10th ST
		252.4	201	SE 10th ST
08-094	08-080	289.4	206	SE 10th ST
		65.4	214	SE 9th ST
		92.6	221	SE 9th ST
		135	222	SE 9th ST
		156.9	221	SE 9th ST
08-097	08-068	244.2	231	SE 9th ST
		6.8	220	SE 8th ST
		79.5	221	SE 8th ST
		106.5	Town Houses	SE 8th ST
		169	28	SE 8th ST
08-099	08-100	186	800	SE 8th ST
		217.9	Town Houses	SE 8th ST
		10.7	816	SE 2nd Ave

		34.6	860	SE 2nd Ave
		148.8	809	SE 2nd Ave
		185.9	803	SE 2nd Ave
12-039	12-033	89	200	SW 2nd ST
		188	135	SW 2nd ST
		208	203	SW 2nd ST
		246	217	SW 2nd ST
12-114	12-113	6	630	SW 4th CT
		63	628	SW 4th CT
		64	629	SW 4th CT
		132	623	SW 4th CT
		134	613	SW 4th CT
		197	615	SW 4th CT
		260	611	SW 4th CT
		315	610	SW 4th CT
12-115	12-114	23	708	SW 4th CT
		31	705	SW 4th CT
		111	700	SW 4th CT
		224	645	SW 4th CT
		252	640	SW 4th CT
		290	641	SW 4th CT
		348	636	SW 4th CT
		350	637	SW 4th CT
		396	633	SW 4th CT
12-138	12-137	8	705	SW 5th CT
		48	704	SW 5th CT
		93	700	SW 5th CT
		119	701	SW 5th CT
		242	647	SW 5th CT
		244	646	SW 5th CT
		302	641	SW 5th CT
		361	636	SW 5th CT
12-139	12-138	60	721	SW 5th CT
		68	717	SW 5th CT
		76	716	SW 5th CT
		150	712	SW 5th CT
		164	713	SW 5th CT
		171	709	SW 5th CT
12-140	12-139	10	736	SW 5th CT
		24	741	SW 5th CT
		32	737	SW 5th CT
		83	732	SW 5th CT

12-152	12-151	6	636	6th ST
		60	632	6th ST
		117	628	6th ST
		119	631	6th ST
		175	623	6th ST
		188	623	6th ST
12-164	12-151	8	632	SW 6th Terr
		87	628	SW 6th Terr
		98	628	SW 6th Terr
		127	624	SW 6th Terr
		129	623	SW 6th Terr
		208	621	SW 6th Terr
13-048	13-047	157	856	SW 9th Ave
		219	903	SW 9th Ave
13-056	13-049	20	920	SW 10th St
		40	920	Sw 11th St
		60	920	SW 11th st
		140	912	SW 11th St
		153	908	SW 11th St
		209	904	SW 11th St
13-059	13-058	30	1015	SW 10th ST
		92	995	SW 10th ST
		133	855	SW 10th ST
		215	917	SW 10th ST
		229	955	SW 10th ST
09-048	09-047	3	121	NW 9th CT
		21	713	NW 9th CT
		28	712	NW 9th CT
		140	708	NW 9th CT
		161	709	NW 9th CT
09-081	09-080	28	728	NW 4th St
		46	721	NW 4th St
		48	Parking Lot	NW 4th St
		84	720	NW 4th St
		108	717	NW 4th St
		110	716	NW 4th St
		168	712	NW 4th St
		181	713	NW 4th St
		199	709	NW 4th St
		201	708	NW 4th St
		265	705	NW 4th St
		266	704	NW 4th St

09-086	09-083	38	628	NW 3rd CT
		78	632	NW 3rd CT
		110	635	NW 3rd CT
		124	640	NW 3rd CT
		187	646	NW 3rd CT
		218	646	NW 3rd CT
		251	651	NW 3rd CT
		283	652	NW 3rd CT
		291	653	NW 3rd CT
		329	657	NW 3rd CT
		355	660	NW 3rd CT
09-117	09-116	1	501	NW 7th CT
		10	500	NW 7th CT
		41	420	NW 7th CT
		73	411	NW 7th CT
		85	418	NW 7th CT
		107	409	NW 7th CT
		124	406	NW 7th CT
		152	407	NW 7th CT
		173	405	NW 7th CT
		175	401	NW 7th CT
		227	401	NW 7th CT
		229	400	NW 7th CT
09-127	09-126	4	304	NW 5th Terr
		35	820	NW 5th Terr
		48	815	NW 5th Terr
		82	814	NW 5th Terr
		131	811	NW 5th Terr
		215	805	NW 5th Terr
		218	802	NW 5th Terr
07-089	07-084	46	25	NE 4th Ave
08-012	08-011	24	404	SE 4th Ave
		36	Municipal Center	SE 4th Ave
		82	410	SE 4th Ave
		139	414	SE 4th Ave
		176	613	SE 4th Ave
08-035	08-034	38	101	SE 2nd Ave
		123	109	SE 2nd Ave
		157	106	SE 2nd Ave
		204	1012	SE 2nd Ave
		226	115	SE 2nd Ave
		253	1415	SE 2nd Ave

08-036	08-035	6	100	SE 2nd Ave
		8	28	SE 2nd Ave
		8	31	SE 2nd Ave
		146	31	SE 2nd Ave
08-042	08-041	6	117	SE 3rd Ave
		46	117	SE 3rd Ave
		48	16	SE 3rd Ave
		80	120	SE 3rd Ave
		247	131	SE 3rd Ave
		264	132	SE 3rd Ave
08-051	08-050	24	113	SE 4th Ave
		56	116	SE 4th Ave
		93	123	SE 4th Ave
		168	128	SE 4th Ave
		250	129	SE 4th Ave
08-060	08-059	81	114	SE 8th St
		198	115	SE 8th St
		241	117	SE 8th St
01-053	01-045	45	501	Blue Heron Dr
11-002	11-001	65	407	Holiday Dr
		101	401	Holiday Dr
		237	418	Holiday Dr
		272	415	Holiday Dr
07-027	07-026	70	1000	NE 1st Ave
		202	Dog Track	NE 1st Ave
		304	Dog Track	NE 1st Ave
07-032	07-031	11	500	NE 1st Ave
		42	502	NE 1st Ave
		104	520	NE 1st Ave
		234	550	NE 1st Ave
07-035	07-034	9	Apartment	NE 2nd Ave
		26	400	NE 2nd Ave
		88	408	NE 2nd Ave
		100	Apartment	NE 2nd Ave
		142	412	NE 2nd Ave
		206	420	NE 2nd Ave
07-036	07-035	1	121	NE 2nd Ave
		89	121	NE 2nd Ave
		136	316	NE 2nd Ave
		194	320	NE 2nd Ave
		196	Apartment	NE 2nd Ave
		253	324	NE 2nd Ave

07-055	07-054	26	464	NE 1st Ave
		98	440	NE 1st Ave
		211	410	NE 1st Ave
		258	315	NE 1st Ave
07-074	07-073	52	213	NE 2nd Terr
		104	22	NE 2nd Terr
		106	21	NE 2nd Terr
		118	24	NE 2nd Terr
		207	104	NE 2nd Terr
		248	105	NE 2nd Terr
		276	106	NE 2nd Terr
		323	110	NE 2nd Terr
		349	107	NE 2nd Terr