



ADDENDUM 1

January 2, 2019

ITB WS 20-19

Gravity Sewer Rehab Project (2019)

This addendum is to provide various documents including specifications, requirements, inspections and other documents.

The opening date for this RFP remains February 13, 2019 at 3:00 PM CST.

SECTION 02566

CLEANING OF SANITARY SEWER LINES

Part 1 - GENERAL

It is the intent of this specification to provide the requirements for cleaning of sewers prior to television inspection and/ or rehabilitation.

1.1 Requirements:

Contractor shall clean the sewers specified for television inspection and rehabilitation of debris, roots, and grease accumulations. All materials dislodged during cleaning shall be removed from the sewer and disposed of by the Contractor. Sewer cleaning methods shall include water jetting, rodding, cleaning ball and/or Hinged-Disc cleaner, or bucketing.

Television inspection is not required during cleaning operations. However, the Contractor may, at his own expense, inspect the sewer to view current line conditions.

1.2 Cleaning Classification

Sewer line cleaning shall be categorized into three distinct classifications.

- A. **Light** – Light cleaning shall be defined as debris levels found in the pipe line that are not greater than 15% of the pipe diameter.
- B. **Medium** – Medium cleaning shall be defined as debris levels found in the pipe line that are greater than 15% but do not exceed 30% of the pipe diameter.
- C. **Heavy** - Heavy cleaning shall be defined as debris levels found in the pipe line that are greater than 30% of the pipe diameter.

1.3 Root Intrusion Classification

Sewer root intrusion shall be categorized into three distinct classifications.

- A. **Light** – Light roots shall be defined as small, solitary roots or groups of roots that cover less than 10% of the pipe diameter.
- B. **Medium** – Medium roots shall be defined as groups of roots or root mass that covers 10% to 30% of the pipe diameter.

- C. **Heavy** - Heavy roots shall be defined as groups of roots or root mass that covers more than 30% of the pipe diameter. This also includes larger taproots that impinge beyond the normal sewer flow level.

1.4 Major Blockage

A major blockage shall be defined as an obstruction within the sewer that cannot be removed by cleaning with commercially available hydraulic or mechanical cleaning equipment. Removal of a major blockage shall be by spot repair, which at the discretion of the Owner may be performed by the Owner's maintenance crew.

Part 2 - MATERIALS

2.1 Equipment

A. General:

All equipment specified in this section shall be in good working condition and manufactured or fabricated to withstand the severity of the work covered under this section.

B. Hydraulic and Mechanical Cleaning

1. All hydraulic cleaning equipment shall be truck mounted. Water jet cleaning equipment shall include a water tank, auxiliary engine, pumps, and hydraulically driven hose reel. The Contractor shall provide high-pressure hose and a selection of high velocity nozzles required to perform the cleaning operation. A relief valve adjustable for the capacity of the high-pressure hose and nozzles shall regulate pressure to the jet nozzle. Nozzles shall be capable of producing a jet stream angle of 15° to 45° from the horizontal. The Contractor shall also provide a high velocity gun with sufficient discharge and pressure to thoroughly clean manhole interiors.
2. Sewer cleaning balls and/or Hinged-Disc cleaners which are propelled by water shall be readily collapsible at any time during the cleaning operations to protect against flooding of sewer lines. The Contractor shall provide cleaning balls and/or Hinged-Disc cleaners in sizes consistent with the pipe diameters encountered. Each cleaning ball and/or Hinged-Disc cleaner shall have a flexible scraper at its periphery to ensure the total removal of grease. Sewer cleaning balls and/or Hinged-Disc cleaners that are not readily collapsible are prohibited.
3. Mechanically powered equipment such as bucket machines shall be provided in pairs and shall be belt-driven or employ an overload device. Power rodding machines shall be the "continuous rod" type capable of rodding distances of

up to 1,000 feet in one setup. Rodding machines shall have the ability to spin the rod either clockwise or counterclockwise and be able to be pushed straight out or pulled back without rotating the machine. It shall be capable of pulling pipe-size swabs or brushes back through the sewer for cleaning and flushing purposes. The rodding machine shall have a positive drive and shall be capable of producing a 2,0000-pound pull. The rod shall be specifically designed for use with the rodding machine.

C. Root Removal:

The Contractor shall employ sewer-cleaning equipment to cut all roots encountered back to the pipe surface. When large roots are encountered, the Contractor shall consult with the Owner as to the proper method of root cutting to ensure sufficient clearance for passage of the television camera or cleaning equipment. After removal of the root mass, the Contractor shall re-televising the line to verify satisfactory removal of the root(s). Initial re-televising for verification shall be a pay item. If root removal is not satisfactory, all additional verification televising shall be at the Contractor's expense.

D. Debris Removal:

The Contractor shall provide suitable equipment to remove all debris dislodged during cleaning operations from the nearest downstream manhole. Equipment or methods, which require a member, or members, of the Contractor's crew to physically excavate debris from within the manhole, is prohibited. All debris shall be promptly removed from the sewer from the nearest manhole and shall be disposed of off site in a lawful manner at an Owner-approved location. Hauling containers shall be watertight.

E. Hammer Tap Removal:

The Contractor shall provide suitable equipment to cut protruding hammer taps that hinder passage of the television camera or cleaning equipment. After removal of the hammer tap, the Contractor shall re-televising to verify satisfactory removal of the tap. Initial re-televising for verification shall be a pay item. If tap removal is not satisfactory, all additional verification televising shall be at Contractor's expense.

Part 3 - EXECUTION

3.1 General

The Contractor shall at all times conduct his work so as to prevent any blockage and minimize surcharging in the sewer manholes and connecting sewer pipelines. Damage to

existing facilities as a result of the Contractor's work shall be promptly repaired in kind at the Contractor's expense.

A. Sewer Locates

1. Owner Responsibilities – Owner shall locate all sanitary sewer manholes prior to mobilization of Contractor. Manholes located under pavement will be uncovered by the Owner just prior to cleaning and televising and other rehabilitation work by the Contractor. Contractor must notify Owner 48 hours prior to needing access to a manhole that is covered by pavement. All work in a given “uncovered manhole” must be completed in as short a period as practical to allow the area to be repaved to minimize disruption to traffic. A close degree of coordination will be needed between the Contractor and the Owner.
2. Contractor Responsibilities
 - a. During the course of cleaning and televising, the Contractor may encounter manholes that are not shown on the drawings. The Contractor must contact the Owner's designated representative to obtain appropriate identification numbers for all newly discovered manholes. Television and written inspection logs must have the new numbers incorporated in them to facilitate rehabilitation work in the future.
 - b. In the event of line blockages that cannot be removed by cleaning (i.e. severely offset joints, pipe collapses, wedged foreign objects or severely protruding hammer taps), the Contractor should reverse his setup and attempt to complete the inspection from the other end of the line. If two blockages in the same reach are encountered, the Contractor should note the inability to inspect the entire the line segment. Then he should measure the distance from center-of-manhole above ground and include this distance on the log reports.

B. Sewer Bypassing and Dewatering

The Contractor shall be responsible for bypassing sewer flow around his work and dewatering of sewer lines in accordance with the requirements of Section 02565, Sewer Flow Control.

3.2 Cleaning

- A. Cleaning shall remove all sludge, rocks, debris, roots, grease accumulations and obstructions from the sewer including “hammer taps” that prevent passage of closed-circuit cameras. Sewer cleaning methods may include water-jetting, rodding, cleaning ball and/or Hinged-Disc cleaner, or bucketing. Unless

otherwise directed by the Project Manager, the Contractor shall select the most effective of these cleaning methods according to the prevailing site conditions.

- B. Where bucketing is warranted, bucket machines must be used to remove the major portion of the debris. Bucket operations shall proceed in the upstream direction in one sewer reach at a time. The operation shall continue until the buckets can pass the entire reach with minimum collection of debris. Upon completion, the line shall be cleaned using a sewer cleaning ball and/or Hinged-Disc cleaner and then hydraulically cleaned.
- C. During cleaning operations, the Contractor shall provide a means of catching and removing the dislodged debris conveyed downstream with the sewer flow. The method chosen shall not allow the transport of debris to downstream sewer reaches. All debris removed from the sewer shall be removed from the work site by the end of each work day.

3.3 Re-cleaning

Where the sewer is not adequately cleaned, the Contractor shall re-clean and re-televisize at his own expense.

END OF SECTION 02566

SECTION 02567

TELEVISION INSPECTION OF SANITARY SEWER LINES

Part 1 - GENERAL

It is the intent of this specification to provide the requirements for internal television inspection of sanitary sewer lines.

1.1 Requirements:

- A. The Contractor shall inspect the sewer interior using a **color** closed-circuit television camera (CCTV) and document the inspection in DVD format with freeze frame clarity. Handwritten or computer-generated logs shall accompany the DVD for each sewer reach (manhole to manhole) inspected. The nature of the inspection shall be to provide a permanent record of the existing sewer conditions as it relates to line dimensions, materials, obstructions, breakage, connections, deterioration and other visual defects.
- B. **All sewer lines shall be cleaned within 24 hours prior to TV inspection in accordance with Section 02566, Sewer Cleaning.** If the line to be inspected has been cleaned more than 24 hours previously, at the discretion of the Owner's Representative, the line may be inspected if at least one pass of the water jet is made to remove any fresh debris buildup which results in inspection conditions that are satisfactory to the Owner's Representative.

Part 2 - MATERIALS

2.1 Television Camera and Monitor

- A. The camera shall be enclosed in an explosion-proof case and shall be operative in 100% humidity conditions. The camera shall be of the pan and tilt or fish-eye lens system, which will allow for viewing service laterals and defects. Lighting intensity shall be remote controlled and shall be adjusted to minimize reflective glare. Lighting and camera quality shall provide a clear, in-focus picture of the entire inside periphery of the sewer for all conditions except submergence. Camera focal distance shall be remotely adjustable through a range of 6 inches to infinity. An electronic data view shall be used during the inspection, which projects the date of inspection, the manhole numbers of the sewer line being inspected, and the footage at which camera is located to the video recorder and the TV monitor. The footage counter device, which measures the distance traveled by the camera in the sewer, **shall be accurate to ± 1 foot in 100 feet.** The Contractor shall physically measure the length of each reach from the centerline of each manhole to verify the accuracy of the counter.

- B. The monitor shall be color and measure at least 13” diagonally across the picture tube. Monitor resolution shall be as specified in the following paragraph, 1.2-B, “Video Recordings” of this section. The Owner’s Representative shall have access to observe the monitor and all other operations at all times. The camera shall be mounted on skids or a tractor suitably sized for each pipe diameter inspected. The system of cabling employed to transport the camera and transmit its signal shall not obstruct the camera’s view.

2.2 Video Recordings

- A. Recordings of all sewer line inspections shall be made DVD with freeze frame clarity. Replays when reviewed on the Contractor’s field television monitor shall be free of electrical interference and provide a clear, stable image with horizontal resolution greater than 350 lines.
- B. The audio portion of the composite videotape shall be sufficiently free from electrical interference and background noise to provide complete intelligibility of the oral report. Audio reports shall be recorded by the operating technician on the recording as they are being produced and shall include the sewer location, identification of terminating manholes, inspection direction, and complete descriptions of the sewer line conditions as they are encountered.

Part 3 - EXECUTION

3.1 Internal Television Inspection

- A. The camera may be pulled or crawl through the sewer in either direction, provided that the pan and tilt or fish-eye capabilities will allow viewing of the service laterals. At all points within the sewer showing defects, laterals and sewer appurtenances, the Contractor shall stop the forward travel of the camera long enough to ensure adequate video coverage. Inspection crews shall be in constant communication with each other via walkie-talkies or other suitable means during all operations.
- B. If the camera cannot pass the entire sewer reach from its starting direction, the reach shall be inspected as much as possible from each direction. Inspection logs for the reach shall include the nature of the blockage, its location, and why pre-inspection cleaning was ineffective in removing the obstruction. Where a major obstruction exists, as defined in Section 02566, Sewer Cleaning, the Owner may elect to perform a point repair with its own maintenance crew. Roots and “hammer taps” encountered during the TV inspection should be removed and the reach re-televised to document removal for payment.

3.2 Sewer Bypassing and Dewatering

The Contractor shall be responsible for bypassing sewer flow around his work and dewatering of sewer lines in accordance with the requirements of Section 02565, Sewer Flow Control. Where sags or submerged sections of the sewer are encountered during TV inspection, the Contractor shall first complete inspection of the entire reach to determine the extent of such areas prior to dewatering the sewer. Dewatered sections of the sewer shall then be TV inspected.

3.3 Manhole Numbering

Manholes shall be designated as on the drawings provided by the Owner.

3.4 TV Inspection Report

The TV inspection report includes video recordings and inspection logs. The Contractor shall provide equal documentation on both the tapes and logs and shall maintain a copy of all report material.

- A. Inspection Logs – Inspection logs may be hand-written or computer generated and should contain all information necessary to fully describe the location of the segment inspected and its existing condition.
- B. DVDs shall be complete with audio narrative of each feature and defect in the sewer. Text information shall be displayed on the television monitor using a video titling device and positioned away from the feature being inspected. Text shall include the date of inspection, manhole identification, line size and the distance from the camera position to the centerline of the insertion manhole. The color of text shall be in contrast to the background picture and may be changed during the inspection as background color changes.

END OF SECTION 02567

SECTION 02570

CHEMICAL GROUTING

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, accessories, equipment, and tools required for the rehabilitation, infiltration reduction, and root treatment of pipe sections, lateral connections, and manholes using chemical grouting as shown on the Drawings and as specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 – Submittals
- B. Section 02565 – Bypass Pumping
- C. Section 02566 – Cleaning of Sewers
- D. Section 02567– TV Inspection of Sewers
- E. Section 02580 – Cured-in-Place Pipe Lining

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of the other requirements of the Specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.
 - 1. ASTM F2304 Standard Practice for Sealing of Sewers Using Chemical Grouting
 - 2. ASTM F2414 Standard Practice for Sealing Sewer Manholes Using Chemical Grouting
 - 3. ASTM F2454 Standard Practice for Sealing Lateral Connections and lines from the mainline Sewer Systems by the Lateral Packer Method, Using Chemical Grouting
 - 4. NASSCO Specification Guidelines – Specification for Sewer Line Cleaning
 - 5. NASSCO Specification Guidelines – Specification for Television Inspection Main Sewer
 - 6. NASSCO/ICGA Suggested Standard Specification for Pressure Testing and Grouting of Sewer Pipe Joints, Laterals and Lateral Connections Using the Packer Method with Solution Grouts

1.4 SUBMITTALS

- A. Shop Drawings: The Contractor shall submit the following in accordance with the requirements set forth in Section 01300 – Submittals:
1. Chemical grout and additive product data showing physical and chemical properties
 2. Manufacturer's installation instructions
 3. MSDS sheets

1.5 QUALIFICATIONS

- A. The qualifications of the Contractor shall be submitted with the Bid Proposal. These qualifications shall include detailed descriptions of the following:
1. Name, business address, and telephone number of the Contractor
 2. Name(s) of all supervisory personnel that will be directly involved in the Project
 3. Proposed product information showing compliance with the specified requirements listed herein, including chemical grouts, additives, and packers
 4. Documentation of certification of Contractor/installer by the chemical grout manufacturer and/or its authorized representative
 5. A reference list of previous projects on which the Contractor and/or installer has provided chemical grouting over the last five years, including project name, project number, customer name, and owner's contact information (name and phone number)
 6. The chemical grout shall have documented service of successful performance in similar usage, with a minimum of 10,000 joints, laterals, and manholes grouted in the United States.
 7. The Contractor shall sign and date the information provided and certify that, to the extent of his knowledge, the information is true and accurate and that the supervisory personnel will be directly involved with and used on the Project. Substitutions of personnel and/or methods will not be allowed without written authorization by the Owner and/or Engineer.

PART 2 - PRODUCTS

2.1 CHEMICAL GROUT

- A. For main lines and laterals, chemical grout shall be a minimum of 10 percent acrylamide base material by weight.
- B. Chemical grout shall have the ability to tolerate dilution and react in moving water.

- C. Chemical grout shall have the ability to increase viscosity, density, and strength with the use of approved additives.
- D. Chemical grout shall have an initial viscosity of approximately 2 centipoise.
- E. Chemical grout shall have a controllable reaction time of 10 seconds to 60 minutes.
- F. Contractor shall provide a chemical sealant solution containing a principal chemical sealant constituent, initiator (trigger), and catalyst specifically recommended for the purpose of sealing in sanitary sewer lines and manholes. Chemical sealant constituent, initiator (trigger), and catalyst shall be compatible when mixed.
- G. After final reaction, cured grout shall be continuous, irreversible, impermeable, firm yet flexible, chemically-stable, and non-biodegradable.
- H. Grout used shall be Avanti AV-100 acrylamide or Engineer pre-approved equal. Urethane based grout may be used for infiltration control in manholes.

2.2 ADDITIVES

- A. The following additives, in quantities as recommended by the manufacturer and as approved by the Engineer, shall be used for all grouting applications:
 - 1. Strengthening Agents: For joint grouting, a latex or diatomaceous earth additive shall be added to increase compressive and tensile strength. The strengthening agent shall be Avanti AV-257 Icoset or Engineer-approved equal.
 - 2. Root Inhibitor: A root deterrent chemical shall be added to control root re-growth. The root inhibitor shall be Avanti AC-50W or Engineer-approved equal.
- B. If required by field conditions, the following additives, in quantities as recommended by the manufacturer, may be used at the Contractor's discretion:
 - 1. Dye: A manufacturer-approved water soluble dye without trace metals may be added to the grout tank(s) for visual confirmation.
 - 2. Gel Time Modifier: A gel time extending agent may be used to extend gel time as necessary.
 - 3. Freeze/Thaw: In those lines where the grouting material may be exposed to a freeze-thaw cycle, ethylene glycol or an alternative Engineer-approved additive shall be used to prevent chemical grout cracking once set.
- C. When using non-soluble additives, the grout tanks shall have mechanical mixing devices to keep the additives in suspension and maintain a uniform solution of grout and additive.

PART 3 - EXECUTION

3.1 CLEANING SEWER LINES

- A. Prior to any chemical grouting of a pipe, the Contractor shall remove internal deposits, protrusions, and anything that prevents proper packer seating from the pipeline in accordance with Section 02566 – Cleaning of Sewers. After application of the chemical grout, the Contractor shall remove any excess chemical grout in accordance with same Section prior to post-installation inspection.

3.2 TELEVISION SURVEY

- A. Prior to application of the chemical grout and again after application of the chemical grout, a television survey of each grouted pipeline shall be performed in accordance with Section 02567 – TV Inspection of Sewers. Post-installation inspection shall be submitted and approved by the Engineer prior to approval of payment application.
- B. The interior of the pipeline shall be carefully surveyed to determine the location(s) and extent(s) of any structural failures. The location(s) of any conditions which may prevent proper application of grouting materials in the pipeline shall be noted so that these conditions can be corrected. A videotape and suitable log shall be maintained and submitted to the Engineer.

3.3 FLOW BYPASSING

- A. When required, the Contractor shall provide for the transfer of flow around a section or sections of pipe to be grouted. The proposed bypassing system shall be approved in advance by the Owner and Engineer. The approval of the bypassing system shall in no way relieve the Contractor of his responsibility and/or public liability. The flow bypassing shall be performed in accordance with Section 02565 – Bypass Pumping.
 - 1. If the grouting can be completed in a few hours, bypass pumping may not be required. The placement carriage shall be equipped with a bypass section to allow flow once grouting is completed.

3.4 LINE OBSTRUCTIONS

The Contractor shall clear each pipeline of obstructions prior to grouting. If the survey reveals an obstruction that cannot be removed by conventional cleaning equipment, the Contractor shall notify the Engineer.

3.5 CHEMICAL GROUT APPLICATION

- A. The entire chemical grouting process shall be performed in strict accordance with the manufacturer's current guidelines. If any deviations from the guidelines are proposed, Contractor shall submit explanation and approval from grout and/or packer manufacturer(s).
- B. Repairs shall take place at joints, generally small circumferential cracks, small holes, or similar points of infiltration as listed in the Pipe Rehabilitation Schedules and Manhole Rehabilitation Schedules on the Drawings or in Task Order. The repair shall not permanently reduce or change the original cross-sectional area and shape of the interior of the sewer pipeline.

C. Sewer Pipe Joints or Defects:

1. Contractor shall position the sealing packer over the area to be repaired using a metering device at the surface and CCTV camera in the line.
2. Accurate measurement of the location of the defect to be sealed shall be made using the portion of sealing packer as the datum (i.e. measurement point or target).
3. A similar measurement to the target shall also be used to obtain the necessary measurement for positioning the injection area of the sealing packer over the area to be sealed.
4. Contractor shall expand the sealing packer sleeves using controlled pressures.
5. Expanded sleeve shall seal against the inside periphery of the pipeline to form a void area at the point of infiltration that is completely isolated from the rest of the pipeline.
6. Contractor shall pump sealant materials into the isolated area through those systems at controlled pressures that are in excess of groundwater pressures.
7. Contractor shall pump as much grout as is required to seal any leaks and fill the voids. Under pressure, the grout shall then be forced out into the soil through any leaking joints and pipe defects. No more than 20 gallons of grout shall be pumped into a single sewer section. If a sewer section requires more than 20 gallons of grout to achieve an effective seal, the Engineer shall be notified and shall approve the use of the additional grout before pumping is continued.
8. Chemical grout shall break away from the packer and stay in place when the packer is deflated and moved from the point of infiltration.
9. Upon completion of injection, Contractor shall test the point of repair. If testing shows the seal was not completely effective, Contractor shall repeat the sealing process until the defect successfully passes the pressure test.
10. After sealing each sewer section, Contractor shall remove surplus grouting material from the section at the manhole immediately downstream of the grouting location.
11. If surplus grouting materials left in a sewer section by the Contractor result in sewer surcharging and subsequent damage to public or private property, Contractor shall be responsible for damage to property and payment of any related expenses incurred by Owner.
12. For sealing main line sewer pipe joints and laterals connected to manholes by packer injection grouting, gel times shall be plus or minus 30 seconds unless otherwise approved by Engineer.

D. Lateral Connections:

1. All lateral connections that are not designated on the Drawings or directed by the Owner and/or Engineer to be replaced via excavation or CIPP lining shall be chemically grouted after the CIPP liner is installed and lateral opening has been reinstated in accordance with

Section 02580 – Cured-in-Place Pipe Lining. The grout shall extend a minimum of 6 inches up the lateral pipe. If a minimum of 6 inches of grout in the lateral cannot be achieved due to blockages, the Contractor shall proceed to the next connection and shall immediately inform the Engineer of the location and cause of the blocked connection.

2. The lateral packer shall remain in position during the sealing of the connection so the isolated void is maintained. Grout shall be pressure-injected through the lateral packer into the annular space between the inversion tube and the lateral pipe. Under pressure, the grout shall then be forced out into the soil through any leaking joints and pipe defects. No more than 20 gallons of grout shall be pumped through a single lateral connection. If a connection requires more than 20 gallons of grout to achieve an effective seal, the Engineer shall be notified and shall approve the use of the additional grout before pumping is continued.
3. Upon completion of the lateral sealing procedure, the lateral shall be air-tested to confirm the sealing of the connection. If the lateral fails the air test, the grouting procedure shall be repeated at no additional cost to the Owner. This sequence of grouting and subsequent air testing shall be repeated until either the lateral is sealed or it is determined that the grout consumption is too high and may result in the blockage of the lateral pipe. The final determination to stop subsequent attempts to seal a lateral will be jointly made by the Engineer and the Contractor.
4. The Contractor shall confirm lateral flow after the successful sealing of each lateral tap. With the lateral packer in position, the inversion tube shall be retracted and air shall be pressure-injected into the lateral. If a pressure builds in the lateral and does not drop to approximately zero in a few seconds, the packer shall be moved off the connection and the connection shall be viewed with a television camera. With the camera viewing the connection point, an attempt shall be made to obtain a water flush by the property owner served by the lateral. If water is not visible during this flushing procedure, it shall be assumed that the building sewer connection is blocked with grout and the Contractor shall clear the lateral at no additional cost to the Owner. Contractor shall not be responsible for clearing blockages in the lateral that are not due to grouting operations.

3.6 ACCEPTANCE AND TESTING

- A. Prior to and during the joint testing phases of the work, the Contractor shall perform control, intermediate, and final testing in accordance with ASTM F2304, ASTM F2414, and ASTM F2454.
- B. Testing Sewer Main Joints:
 1. Joint testing pressure shall be equal to 0.5 psi per vertical foot of pipe depth plus 2 psi. Test pressure shall not exceed 10 psi without prior approval by the Engineer.
 2. Joints in laterals which are directly connected to manholes shall be tested to 18 inches.
 3. Each sewer pipe joint shall be tested at the previously-specified pressure in accordance with the following air test procedure:

- a. The packer shall be positioned within the pipe so it straddles the joint to be tested.
- b. The packer ends shall be expanded so the joint is isolated from the remainder of the pipe and a void area is created between the packer and the pipe joint. The ends of the testing device shall be expanded against the pipe per the manufacturer's recommendations. If all attempts to isolate the joint fail, grout shall be pumped to seal the leak around the packer end elements. The Contractor shall be paid at the unit price for grout to seal the packer unless the Engineer determines that the sewer was inadequately cleaned or the packer is not properly working.
- c. Air shall then be slowly introduced into the void area until a pressure equal to or greater than the required test pressure, but in no cases greater than 2 psi above the required test pressure, is observed on the pressure monitoring equipment. When the desired pressure is reached, the air flow shall be stopped. If the void pressure decreases by more than 1.0 psi within the next 15 seconds, the joint will have failed the test and shall be sealed.
- d. Upon completing the testing of each individual joint, the packer shall be deflated with the pressure meter continuing to display void pressure. If the void pressure reading does not drop to 0.0 plus or minus 0.5 psi, the test equipment shall be cleaned of residual grout material or repaired as needed to result in an accurate void pressure reading.

C. Testing Lateral Connections:

1. Lateral connection testing pressure shall be equal to 0.5 psi per vertical foot of pipe depth plus 2 psi. Test pressure shall not exceed 10 psi without prior approval by the Engineer.
2. Each lateral connection shall be tested at the previously-specified pressure in accordance with the following air test procedure:
 - a. The area to be tested shall be isolated using the lateral connection packer and by applying positive pressure into the isolated void area. For laterals directly connected to the main line sewer, a pan and tilt camera shall be used to position the lateral packer.
 - b. The lateral bladder shall be inverted from the main line assembly into the lateral pipe and inflated. The main line elements shall then be inflated to isolate the lateral connection and the portion of the lateral to be tested.
 - c. A sensing unit shall monitor the pressure of the packer void and shall accurately transmit a continuous readout of the void pressure to the control panel at the grouting truck or to a pressure gauge on the packer recorded by the CCTV camera.
 - d. Air shall then be slowly introduced into the void area until a pressure equal to or greater than the required test pressure, but in no cases greater than 2 psi above the required test pressure, is observed on the pressure monitoring equipment. When the desired pressure is reached, the air flow shall be stopped. If the void pressure

decreases by more than 2.0 psi within the next 15 seconds, the lateral will have failed the test and shall be grouted and retested.

- e. Upon completing the testing of each individual lateral, the lateral packer shall be deflated with the pressure meter continuing to display void pressure. If the void pressure reading does not drop to 0.0 plus or minus 0.5 psi, the test equipment shall be cleaned of residual grout material or repaired as needed to result in an accurate void pressure reading.

3.7 SITE RESTORATION

- A. After the grouting has been completed and accepted by the Owner, the Contractor shall restore the entire Project area and shall return the ground cover to its original or better condition. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor.
- B. A container shall be furnished for the collection of solvents used in the cleaning of the grouting equipment. Contractor shall use an approved solvent recovery process to dispose of the collected solvents. Disposal of cleaning solvents into the sewer system or into natural watercourses is strictly prohibited.

END OF SECTION 02570

SECTION 02580

REHABILITATION OF SEWERS BY CURED-IN-PLACE PIPE (CIPP) METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cleaning and flushing existing sanitary/storm sewers.
2. Television inspection of existing sewers.
3. Inserting liner into existing sewers.
4. Television inspection of post-construction, rehabilitated sewers.

1.2 REFERENCES

A. ASTM International:

1. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance Notched Specimens of Plastics.
2. ASTM D543, Standard Practice for Evaluating the Resistance of Plastics to Chemical Reagents
3. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
4. ASTM D695, Standard Test Method for Compressive Properties of Rigid Plastics
5. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
6. ASTM D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
7. ASTM F1216 – Rehabilitation of pipelines by the inversion and curing of a resin-impregnated tube.
8. ASTM F1743 – Rehabilitation of pipelines by pulled-in-place installation of a cured-in-place thermosetting resin pipe.
9. ASTM F2019 – Rehabilitation of existing pipelines and conduits by the pull in place installation of glass reinforced plastic (GRP) cured-in-place thermosetting resin pipe.
10. ASTM F2561, Standard Practice for Rehabilitation of a Sewer Service lateral and

Its Connection to the Main Using a One Piece Lateral Cured-in-Place Liner

11. ASTM D2990, Standard Test Methods for Tensile, Compressive and Flexural Creep and Creep-Rupture of Plastics
12. ASTM D3567, Standard Practice for Determining Dimensions of Fiberglass (Glass-Fiber Reinforced Thermosetting Resin) Pipe and Fittings
13. ASTM D3681, Standard Test Method for Chemical Resistance of "Fiberglass" (Glass Reinforced Thermosetting Resin) Pipe in a Deflected Condition
14. ASTM D5813, Standard Specification for Cured-In-Place Thermosetting Resin Sewer Pipe

1.3 DESIGN REQUIREMENTS

- A. Design lining material to have sufficient structural strength to support loads, live loads and groundwater load imposed assuming existing pipe cannot share loading or contribute to structural integrity of liner.
- B. Design lining material to support reasonable anticipated settlement and movement in aerial and elevated pipe segments without jeopardizing the structural integrity or uniformity of the liner.
- C. Design liner to least possible thickness, but in no instance less than 4mm for 6" pipe and no less than 6 mm for 8" and larger pipe, to minimize decreasing of inside pipe diameter.
- D. Design liner material to provide jointless and continuous structurally sound construction able to withstand imposed static, dynamic and hydrostatic loads on long term basis.
- E. Identify design provisions for shrinkage control to prevent future misalignment of service reconnections.

1.4 PERFORMANCE REQUIREMENTS

Perform relining and internally reestablish service connections (if applicable) without need for excavation while minimizing disruptions to adjacent occupied buildings and traffic

1.5 SUBMITTALS

The Contractor shall submit to OCWS/Engineer the following specifications, drawings, test results, and other data showing details of the fabrication and installation of the CIPP liner; these submittals shall be considered incidental to this project, unless a specific bid item for such is included in the project bid proposal:

1. Product specifications and technical data for the resin catalyst system, sealing materials, and liner tube.

2. Manufacturer provided information that describes the CIPP materials, curing speeds, curing installation processes, installation pressures, and temperature limitations.
3. Certified test results of physical properties testing and chemical resistance testing of the proposed resin material.
4. If a field wet-out procedure will be used for liner impregnation, submit a complete description of the proposed wet-out procedure with detailed information on equipment and material storage locations, resin volumes and/or weights, liner length, start times, finish times, resin injection locations, and any other pertinent data documenting the wet-out procedure. Provide plan indicating procedure for reconnection of laterals and pipe end seals.
6. Map that legibly shows proposed liner insertion location(s), construction staging area(s), and bypass pump and piping locations.
7. Traffic control plan (if required) in accordance with Okaloosa County or FDOT
8. Bypass pumping plan
9. Hydraulic flow capacity calculations with a copy of certification verifying Manning's roughness "n" value for the proposed liner.
10. Schedule of operations for each project or work order.
11. Liner curing parameter records.
12. Pre and post television inspection videos and logs on DVD in accordance with "Section 02567 - TV Inspection of Sewers".
13. Physical samples. Samples removed for testing shall be individually labeled and logged with the following information:
 - a. Owner's Project number and title.
 - b. Sample number.
 - c. Segment number of line as noted on plans.
 - d. Date and time of sample.
 - e. Name of Contractor.
 - f. Name and location of firm performing testing on sample.
14. Certified test results of structural properties of CIPP samples for each segment installed under this contract.
15. Log of pulling forces measured during insertion.
16. Any other testing results or submittals specified in this document or required by applicable ASTM standards.

1.6 CLOSEOUT SUBMITTALS

- A. Section 01700 – Contract Closeout.
- B. Project Record Documents: Record actual locations of each service connection (if applicable).

1.7 QUALIFICATIONS AND PRE-APPROVAL

Manufacturers have been pre-approved for this project, and others will be considered. To be considered as an equal, manufacturers must be formally approved by addendum, prior to bid. All pre-approval requests must be submitted at least 10-days prior to bid. The engineer will have sole discretion in determining whether a manufacturer is to be approved on this project, based upon documentation submitted as required below and

communication with references.

- A. **Manufacturer:** Company specializing in manufacturing Products specified in this section with minimum five years documented experience. Manufacturer shall provide evidence of a minimum of 500,000 linear feet of documented successful installations in sanitary sewer systems and a minimum of 2,000 documented, successful manhole-to-manhole line sections in sanitary or storm sewer systems. Of this experience, qualifications must indicate the successful completion of a minimum of 100,000 linear feet of documented successful installations in sanitary or storm sewer systems with pipe diameters 12” and larger.

Pre-Approved Manufacturers:

I. Applied Felts

II. Liner Product, LLC

- B. **Installer:** Installer shall have a minimum of 100,000 linear feet of documented successful installations of full main cured-in-place pipe.
- a. Installation of the CIPP products shall be performed by a work force that is experienced and certified in installation of the products. The installer shall be certified by the CIPP product manufacturer to have been trained and approved in the installation of their CIPP products and have a minimum of 3 years total experience with the product.
 - b. The Contractor shall submit such certification of hot water or steam cured CIPP Installer to Owner.
 - c. Contractor shall also submit to Owner at least five (5) recent references of the CIPP installer, indicating successful installation of proposed hot water or steam cured CIPP on projects of similar size and scope. For each reference, include at a minimum the Project Name, Location, Length of Segments Lined, Diameter of Segments Lined, Dollar Value of Contract, Customer’s Name and Contact Information.
 - d. Installer’s project manager must have a minimum of 3 years of CIPP installation experience and must be on-site during the installation of the CIPP products
 - e. **Installer Equipment Requirements**
Installer shall only use hot water or steam curing equipment that has been certified and approved for use by the CIPP product manufacturer.

1.8 PRE-INSTALLATION MEETINGS

Convene a minimum of one week prior to commencing each phase of work of this section to review pre-rehabilitation video.

1.9 DELIVERY, STORAGE, AND HANDLING

Receive, store, and protect liner materials.

1.10 FIELD MEASUREMENTS

Verify field measurements of pipes prior to design, fabrication and delivering of liner material.

1.11 COORDINATION/PUBLIC NOTIFICATION

The Contractor shall maintain service usage throughout the duration of the project. In the event that a service will be out of service, the maximum amount of time of no service shall be 8 hours for any property served by the sewer. A public notification program shall be implemented, and shall as a minimum, require the Contractor to be responsible for contacting each home or business connected to the sanitary sewer informing them of the work to be conducted, when the sewer will be offline, and any alternative method of service that may be provided. The Contractor shall also provide the following:

- A. Written notice to be delivered to each home or business two business days prior to the beginning of work being conducted on the section, and a local telephone number of the Contractor they can call to discuss the project or any problems which could arise.
- A. Personal contact with any home or business which cannot be reconnected within the time stated in the written notice.
- B. Inform OCWS Maintenance Department 48 hours prior to starting the work.
- C. Owner will supply water for the work described within this section at no charge. Water must be metered and connection provided with suitable backflow protection. Contractor must provide transmission to site. Coordinate the use of the nearest feasible fire hydrant with the Owner. (See Special Conditions)

PART 2 – PRODUCTS

2.1 CURED-IN-PLACE (CIPP) LINER

- A. Pre-Approved Manufacturers: Other products will be considered but must be pre-approved. Pre-approval requests must be made a minimum of 10-days prior to bid (See section 1.7)
- B. Materials:
 - 1. Tube consisting of one or more layers of absorbent non-woven felt fabric or glass reinforced plastic. It shall not be possible to separate the tube layers. The application of the resin to the felt tubing or fiberglass layers shall be conducted under factory conditions and the materials shall be fully protected against UV Light degradation, excessive heat and contamination at all times.
 - 2. Furnish product material in accordance with ASTM F1216, ASTM F1743 and ASTM F2019.
 - 3. Liner effective length to match length of piping to be lined as determined by the Contractor to effectively carry out the rehabilitation and extend into the adjoining manhole structures. The Contractor shall be responsible for field verifying all liner lengths prior to liner fabrication. Each liner shall contain an end section which shall be bonded to each end of the host pipe to prevent leakage from the liner and host pipe.

4. Furnish wet-out tube with uniform thickness that when compressed at installation pressures will meet or exceed design thickness.
5. The outside layer of the tube (before wet out) shall be coated with an impermeable, flexible membrane that will contain the resin and facilitate monitoring of resin saturation during the resin impregnation (wet out) procedure.
6. The tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers. No material shall be included in the tube that may cause delamination in the cured CIPP. No dry or unsaturated layers shall be evident.
7. The wall color of the interior pipe surface of CIPP after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.
8. Seams in the tube shall be stronger than the un-seamed felt and meet the requirements of ASTM D5813.
9. Furnish tube of sufficient size to provide tight fit to existing pipe. Allowances shall be made for longitudinal and circumferential expansion. All dimensions shall be verified by the Contractor prior to fabrication.
10. Furnish resin system consisting of corrosion resistant polyester, vinyl ester, or epoxy. Recycled resins will not be allowed.
11. Chemical and Physical Testing: Test samples in accordance with ASTM D790. Comply with minimum property values shown below with applicable ASTM requirements.

Property	ASTM Method	Test Value
Flexural Modulus	D790	250,000 psi
Flexural Strength	D790	4,500 psi
Compressive Strength	D695	6,500 psi
Longitudinal Flexural Modulus	D2990	150,000 psi

13. Liner Thickness: All liner thickness calculations shall be submitted in accordance with provisions made in this Specification. The thickness design shall be in accordance with ASTM D2412 and F1216. Calculations shall be based on fully deteriorated gravity pipe values. Liner thickness calculations shall comply with, at a minimum, the following design constraints and the following considerations shall be made:

- a. Minimum Factor of Safety = 2.0
- b. Service Temperature = 33 to 150 degrees F
- c. Groundwater Elevation = At Surface
- d. Minimum Liner Thickness = 4.5mm for 6" pipe and 6 mm for 8" and larger
- e. Maximum Long Term Deflection = 5%

- f. Long term flexural modulus shall be estimated as one-half of the lowest short term flexural modulus dictated by ASTM.
- g. Liner thickness shall be the maximum of that dictated by bending, deflection, buckling, and stiffness calculations.
- h. Soil Characteristics
 - 1. Unit Weight = 120 pcf
 - 2. Modulus of Elasticity = 1,000 psi
 - 3. Coefficient of Friction = 0.130r
- i. The liner shall be designed for a minimum fifty-year service life under continuous loading conditions.

2.2 SOURCE QUALITY CONTROL

- A. Inspect each lot of liner for defects. Verify liner is homogeneous throughout, uniform in color, free of cracks, holes, foreign materials, blisters or deleterious faults.
- B. Marking:
 - 1. For testing purposes, mark each production lot with identical marking number.
 - 2. The outside of the tube shall be marked for distance at regular intervals along its entire length, not to exceed 5 ft. Such markings shall include the manufacturer's name or identifying symbol. The tubes must be manufactured in the USA.
 - 3. At end of production shift, change marking code to indicate where new production shift started.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify location of piping to be relined.

3.2 CLEANING AND FLUSHING

- A. Clean existing sewer pipes of debris, sedimentation and mineral deposits with high velocity cleaner, bucket and scraper, root saws, rolling or balling units. All cleaning and flushing must be in accordance with liner manufacturer's requirements. Any protruding taps, roots, and any and all other obstructions not removed during the pre-installation television inspection shall be removed and surfaces cleaned as required by the lining manufacturer to avoid liner puncture.

3.3 INITIAL VIDEO INSPECTION AND REPAIR

- A. Conduct closed-circuit video inspection

- B. Determine condition of existing piping, degree of offset of joints, crushed walls, and obstructions.
- C. Determine and document in writing sizes and locations of service entrances and service connections.
- D. Clear obstructions, service piping protrusions, roots, and other materials from existing pipe to ensure inserted pipe liner contacts only existing pipe wall.

3.4 BYPASSING SEWAGE

Set up bypassing pump system to isolate each section of piping if required. A detailed bypass plan shall be submitted by contractor and approved by Engineer and Owner prior to starting work.

3.5 POINT REPAIRS

- A. When and where indicated by the video inspection, point repairs shall be completed, as necessary, in order to enable lining. All point repairs shall be approved by the Engineer prior to construction. At Owner's discretion, point repairs may be completed by Others, including Owner's staff.
- B. Point repairs shall be completed if required
- C. Point repairs completed to correct pre-existing conditions shall be paid for at the unit bid price as detailed.

3.6 PROTECTION

The Contractor shall provide for the general safety of workers, pedestrians and traveling public throughout the project. Existing surface improvements and underground facilities and utilities shall also be protected. Damage caused by the Contractor shall be repaired at his own expense. Protection to be provided shall include but not be limited to:

- A. Provide barricades, warning lights and signs for excavations created by point repairs and/or excavation pits. Conform to requirements of FDOT, Okaloosa County, or any other governing entity, and of contract documents.
- B. Protection of Manholes/Structures: Install all pulleys, rollers, bumpers, alignment control devices and other equipment required to protect existing manholes/structures, and to protect the pipe from damage during installation. Lubrication may be used as recommended by the manufacturer. Under no circumstances will the liners be stressed beyond their elastic limit.
- C. Do not allow sand, debris, or runoff to enter sewer system.
- D. Verify location of all underground utilities and facilities potentially impacted by rehabilitation or other related project activities and take necessary precautions to provide protection from damage. Damage caused by the Contractor shall be his responsibility and repaired at no additional cost to OCWS.
- E. Protect the liner and components during all phases of work including, but not limited to hauling, installation, entry into the entry pit, and prevention of scarring or gouging of the liner, pipe or components.
- F. Contractor will be responsible for monitoring weather prior to planning a CIPP tube insertion to account for a sufficient duration of tube wet out and insertion and curing

in order to ensure that wet weather that will prevent access to the project site is accounted for. Contractor's failure to account for oncoming weather will be Contractor's sole responsibility which may extend to removal of damaged or improperly cured CIPP resulting from interrupted CIPP construction process.

- G. Contractor shall notify owner 72 hours prior to liner wet out process for approval. Weather conditions and on-site conditions need to be considered.

3.7 INSTALLATION – CURED-IN-PLACE PIPE (CIPP) LINER FOR MAINLINE

- A. Install liner in accordance with ASTM F1216, ASTM F1743, ASTM 2019 and manufacturer's instructions.
- B. Pull or invert liner through existing pipe through access points or using existing manholes. Take care not to damage deformed pipe during installation. Use appropriate sleeves and rollers to protect liner.
- C. Contractor shall stop infiltration or leakage into the existing pipeline to prevent contamination of resin in liner.

D. Liner Curing:

Use steam or circulated hot water to cure liner. Ensure temperatures inside liner pipe are sufficient to effect resin curing and are within manufacturers' instructions. Monitor temperature for entire curing period.

E. Cool-down:

Cool cured pipe in accordance with manufacturer's recommendations.

F. Finish:

1. Install finished lining continuous over entire length of piping free of visual defects including foreign inclusions, pinholes and delamination. Confirm lining is impervious and free of leakage from pipe to surrounding ground or from ground to inside lined pipe.
2. Repair defects affecting integrity or strength of lining.

3.8 FIELD QUALITY CONTROL

- A. When liner fails to meet installation requirements, remove failed liner and install new liner.
- B. Conduct closed-circuit video inspection of completed rehabilitation work.
- C. No infiltration of groundwater is permitted. No visual defects including foreign inclusions, dry spots, pinholes, cracks or delamination are allowed.

- D. Confirm service connections are complete and are unobstructed.
- E. Submit summary report of final inspection with copy of video documentation.
- F. Measurement - All sewer pipes will be measured from center of manhole to center of manhole or end of main

3.9 CLEANING

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

END OF SECTION 02580