

SECTION 02605

CLEANING, INSPECTING, AND SPOT REPAIR OF SEWERS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Furnish all labor, materials and equipment and do all work necessary, as indicated, as specified and as directed by Engineer for following:
1. Cleaning existing sewers and service connections including root removal and root treatment.
 2. Structural spot repair of pipe defects utilizing short cured-in-place liners
 3. Reinstatement and sealing of laterals connections.
 4. TV inspection, testing, and sealing and retesting of service connections.
 5. Cutting and removal of protruding break-in service connection laterals.
 6. Flow control for sewer sections.
 7. Removal and disposal of materials which are cleaned from sewer during conduct of work.
 8. Dyed water testing for identification of active laterals.

1.02 QUALITY ASSURANCE:

- A. Equipment for Work:
1. Selection of equipment to be used based upon the condition of sewers at the time work commences.
 2. Do not use equipment that might exert internal pressure great enough to damage sewer pipe.
 3. Motorized or mechanical equipment with direct drive not permitted.

4. Special high pressure, hydraulically propelled cleaning equipment and tools incorporating cleaning chemical compounds may be used upon approval by Engineer where deemed suitable and necessary by Engineer.
5. Cleaning in other areas by a combination of standard mechanical equipment such as rodding machines, boring machines, hydraulic balls, B-liners, bucket machines, cones, ferrets and similar equipment.
6. Root removal by chemical root treatment material as specified and by suitable mechanical cutting device. Application equipment to be approved by chemical root treatment material manufacturer.
7. Isolation of sewer section for root treatment by suitable air-inflatable packers.
8. Suitable flow control equipment for plugging, blocking, bypassing and pumping of flow around isolated sewer section. Plug and blocking designed so that any amount of flow can be released into the isolated pipe section.
9. Provide footage metering device(s) such that the location of all equipment, devices, points of reference, on measuring target is known at all times at the ground level. Footage metering device designed so that distance recorder can be set at zero when equipment or devices is at entrance of pipe inside manhole. Metering device to have an accuracy of not less than two-tenths of a foot. Marking of cable, or similar means, that require interpolation of depth of manhole not permitted.
10. Television camera and appurtenances for inspection of main line sewer pipe, specifically designed and constructed for such inspection:
 - a. Lighting to allow clear picture of entire periphery of the pipe.
 - b. Suitable for operation in 100 percent humidity conditions.
 - c. Capable of producing minimum of 500 line resolution in picture quality from camera.
 - d. Capable of being moved through the sewer pipe in either direction at uniform slow rate by means of manual cable winches or motorized mechanical equipment of indirect drive type.
 - e. Continuous color video and audio recording capability capable of variable playback speed ranging from normal to one-third normal speed and video to have capability of not less than 180 lines of

resolution. Equipment appropriate to the medium of recording (VHS and DVD) shall be provided.

- f. Suitable television video and audio playback equipment made available at office of Engineer.
- g. Equipment for taking digital screen shots of monitor.
- h. Capable of pan and tilt inspection within pipeline.

11. Debris Screening, Trapping, Collection and Removal Equipment:

- a. Suitable screening and other devices for installation in downstream manhole to collect and trap solids and other material cleaned from upstream sewers.
- b. Suitable equipment for removal, and disposal of screened and trapped material cleaned and removed from sewers.

12. Cutting and Removal of Protruding Services Connection Laterals:

- a. Select and use equipment specifically designed for cutting and removing protruding service connection laterals.
- b. Use remote-control television camera to allow cutting equipment operator to observe actual work.
- c. Use high speed 15,000 to 25,000 RPM cutting head with air motors.
- d. Modified root cutters will not be allowed.
- e. Cut protruding service connections to within 1/8-inch of mainline and contour to match curvature of main line sewer.

13. Spot Repair Equipment:

- a. Suitable for use in front of television camera used to position the device and in the size of pipe for which it is to be used.
- b. Capable of being moved in either direction in pipeline for installation, positioning and removal by means of manual cable, winches or motorized equipment of indirect drive type.

- c. Equipment and associated devices for application of epoxy resin compounds or installation of repair sleeves to be approved by manufacturer prior to start of work.

B. Quality:

1. Maintain sewer flow around work and in manner that will not cause excessive surcharging of sewers, damage to sewers, and that will protect the public and private property from damage and flooding.
2. Screened and trapped material cleaned from sewers to be promptly removed from sewer and site in suitable containers and disposed of in a manner acceptable to the Engineer and in conformance with all applicable laws and regulations.
3. No debris, equipment, tools or other alien matter to be left in sewer and manholes as the result of the Contractor's operations.
4. Coordinate work and sequence of work as directed by Engineer.

C. Epoxy Resin Compounds, Root Control, and Repair Sleeve Materials:

1. To be used in strict compliance with all applicable federal, state and local requirements relative to material type and usage thereof and in accordance with manufacturer's recommendations.
2. Application equipment to be approved by the product material manufacturer prior to start of application.

1.03 SAFETY:

- A. Contractor is responsible for safety of personnel and public during Contract period.
- B. Provide all devices, materials and equipment necessary to assure safety and health of personnel and public.
- C. Comply with requirements of agencies having jurisdiction including confined space entry requirements.
- D. Take precautions recommended by manufacturer and all other precautions necessary during handling of epoxy resin compounds, chemical grout, additives and root treatment chemicals.

- E. Handling of the chemicals done only by personnel trained and experienced with safe handling of chemicals involved.
- F. The Contractor shall keep informed and adhere to all existing federal, state, or local laws, rules, regulations or ordinances affecting those engaged or employed on the work, and the materials and equipment used for the conduct of the work. In particular, compliance with all regulations concerning confined space entry will be required.

1.04 SUBMITTALS:

- A. In accordance with Section 01300 - SUBMITTALS:
- B. Submit to Engineer for review before start of work:
 - 1. Detailed written description, including pertinent supplemental drawings, literature, tables and other material, or equipment, methods, procedures and scheduling proposed for work.
 - 2. For chemicals proposed; manufacturers literature, material safety data sheets, written instructions and written recommendations regarding use, method of application, dosage, mixing, and safety precautions.
 - 3. Specific documentation, information, number of years performing this type of work, and references that the Contractor or the firm doing the work, and the on-site supervisor for the work, have had successful experience in similar work under similar conditions.
 - 4. Certification including licenses for usage, where required, for each of the personnel handling chemicals that they are trained and experienced in handling the proposed chemicals.
 - 5. Detailed written description, including equipment, methods, and procedures proposed for the heavy cleaning of sewers.
 - 6. When cured-in-place spot repairs are used, furnish a mill certificate from the company manufacturing the fabric attesting that the fabric meets the chemical, physical, and manufacturing requirements. Fabric will be rejected if it is found to have defects, rips, holes, flaws, deterioration or other damage.
 - 7. A list of five municipalities where similar work has been performed in the last 3 years in the Northern US. Provide contact names, telephone numbers, and brief descriptions of the work performed.

8. Detailed written description, including equipment, methods, procedures, and emergency plan for flow control and bypass pumping.
- C. Certification:
1. Certified copies of all test reports on the properties of the selected resin and, later, on the liner coupons performed by, and/or for, the Contractor.
 2. Sworn and notarized certificates indicating that materials supplied for this work comply with appropriate standards.
 3. Sworn and notarized certificates indicating that pipes lined were in suitable condition for relining prior to beginning process. Further, indicate that installation was accomplished in accordance with manufacturer's recommendations.
- D. To Engineer, at the end of each week during progress of the work: Submit copies of the following records, on acceptable printed forms:
1. Cleaning tasks performed and quantity of debris removed.
 2. Root treatment and removal performed.
 3. Spot repairs performed using short cured-in-place liners.
 4. Protruding service laterals cutting and sealing performed.
 5. Flow control methods used and records.
 6. Damages or faults observed including location.
 7. The location of all work performed as measured from the upstream manhole.
 8. Evaluation of any evidence indicating possibility of hidden damages or faults that may exist including estimated location.
 9. TV inspections performed.
 10. Other testing or inspection tasks performed.
- D. To Engineer immediately after completion of recording, a copy of all video and audio tapes from television inspection of repairs of mainline sewers.

- E. To Engineer immediately after development, digital screen shot images taken by Contractor as directed by Engineer.
- F. To Engineer at conclusion of work all video recordings shall be copied onto DVD media in a format compatible with City of Meriden video and computer equipment.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Chemical Root Treatment Material:

1. Active component for destroying roots to be non-systemic toxin, which will kill roots at low concentrations, but which will not permanently affect parts of the plant distant from the treated roots.
2. Must be spontaneously detoxified by natural chemical or biochemical processes in a relatively short interval following its use.
3. Shall not adversely affect the performance of wastewater treatment plants.
4. Shall inhibit root cell growth on contact, but shall not be transported so as to damage other portions of the parent plant.
5. Shall bind firmly to the soil in the vicinity of openings in line joints so as to form a persistent chemical barrier suppressing growth of root tips.
6. To be sufficiently stable under conditions of use to provide protection for twelve months or longer, but shall be subject to decomposition in wastewater treatment plants without disturbing plant processes.
7. To improve transportation of the root control agent into root tissues, the root control agent shall contain emulsifiers to degrease pipe surfaces and remove fatty acids from root tissue and surfactants to convert an aqueous solution of the root control agent into a volatile foam.

B. Chemical Grout Sealing Materials:

1. Two-component chemical grout that mixes within the isolated area formed by the packer-rejointer device.
2. Option of using the acrylamide gel type or the urethane gel type chemical grout:

- a. Acrylamide gel type chemical grout properties:
 - (1) Controllable reaction time from 10 seconds to more than 1 hour at temperatures up to 140 deg. F.
 - (2) Viscosity of grout near two (2) centipoise that remains constant through injection period until gelation or foaming occurs.
 - (3) Capable of tolerating groundwater dilution and reacting in moving water.
 - (4) Final reaction to produce a continuous, irreversible, nonbiodegradable, impermeable stiff gel at chemical concentrations as low as 0.4 pounds per gallon and which is not rigid or brittle.
 - (5) Negligible corrosion rate on mild steel plates.
 - (6) Have documented service of satisfactory performance over long term in similar usage.
 - (7) Minimum 10 percent acrylamide base material by weight in total sealant mix.
- b. Urethane gel type chemical grout properties:
 - (1) Recommended mix ratio of minimum 1 part urethane pre-polymer to 8 parts water mix.
 - (2) Liquid pre-polymer solids content of 77 to 83 percent, specific gravity of 1.04.
 - (3) Final reaction to produce a continuous nonbiodegradable, impermeable, flexible gel.
 - (4) Have documented service of satisfactory performance over long term in similar usage.
3. Sealing grout to contain a root deterrent agent to insure complete treatment of root masses and deter root intrusion through sealing grout. Root deterrent agent may be incorporated in grout material at time of manufacture or added to the grout at the time of mixing and injection. Additive agent must be type recommended by the manufacturer.

C. Short Cured-in-Place Liner:

1. Product Requirements/Quality Standards:

- a. The liner shall be a resin impregnated fiberglass or fiberglass/polyester felt sleeve which is wrapped around an inflatable packer and positioned in the sewer to be rehabilitated and cured in place by circulating hot water, steam, heat or ambient air to cure the resin.
- b. The sleeve shall be fabricated from fiberglass or a combination of fiberglass with polyester felt to form the liner. The material shall be sewn together with multiple polyester threads using zigzag stitching spaced evenly over the full width of the material.
- c. The resin shall be epoxy type liquid thermosetting resin suitable for the intended use as well as the proposed curing method. Epoxy resin shall be in accordance with manufacturer's requirements.
- d. The epoxy resin shall be brought on-site in the resin manufacturer's original containers. Each container shall be clearly labeled as to contents and product data. The resin shall be stored, mixed and applied in accordance with the manufacturer's recommendations.
- e. The cured-in-place liner shall provide a service life of 50 years and shall have, as a minimum, the initial and long-term properties listed below.

<u>Mechanical Property</u>	<u>Initial</u>	<u>Long-Term</u>
Flexural Strength	8,000 psi	—
Flexural Modulus of Elasticity	280,000 psi	140,000 psi
Tensile Strength	5,000 psi	—
Tensile Modulus of Elasticity	280,000 psi	140,000 psi

- f. When cured, the liner shall form a continuous, tight-fitting, hard impermeable liner which is chemically resistant to any chemicals normally found in domestic sewage. The liner shall have a suitable membrane coating for protection of the interior surface and to provide a uniform, smooth flow surface. No membranes or plastic coating shall be allowed between the repair patch and pipe wall.

- g. The fiberglass or fiberglass/polyester felt sleeve shall be fabricated to a size that will tightly fit the sewer being rehabilitated after being installed and cured. The transition from the patch to the existing pipe must be smoothly tapered.
- h. Thickness of the cured liner shall be as recommended by the manufacturer, but shall not exceed 1/4-inch when cured unless authorized in writing by the Engineer. Analysis of design criteria and calculations for the liner thickness to be prepared by a Registered Professional Engineer licensed in the State of Connecticut. The liner shall be designed in accordance with ASTM F1206. Do not submit calculations for review. Submit Certificate of Design as attached in Section 01300.
- i. Cured-in-place liners shall have a minimum length of 3 feet and shall not exceed 15 feet in length. Liners shall extend a minimum of 1 foot beyond the pipe defects at each end of the repaired section. Length of each required repair shall be verified in the field prior to installation.
- j. Cured-in-place liners shall not begin or end at a service connection or pipe joint.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Equipment and materials, including standby, to be on hand at site to permit satisfactory and expeditious performance and completion of work.
- B. Phases of work to be performed and completed in sections, from manhole to manhole, unless approved otherwise by Engineer.
- C. Repair or correct any damage or disturbance to sewer, building connections, manholes, work area, public and private property or structures resulting from Contractor's operations at Contractor's expense.
- D. Conduct work and operation of equipment in a manner to cause minimum inconvenience and disturbance, including noise and other nuisances to the public.
- E. Television inspection work shall be completed just prior to rehabilitative repairs to ensure the inspection captures field conditions at the time the work is to be completed. The contractor shall be advised that groundwater conditions can fluctuate with time. Fluctuations may be rapid during rain events. Should an

extended period of time occur between CCTV inspection and rehabilitative work, the contractor shall complete another CCTV inspection at no additional cost to the owner.

- F. Contractor to verify locations of all laterals within the extent of work limits. Lateral locations and past TV inspection information provided in Appendix A is for informational purposes only and in no way relieves the contractor of his responsibility for verifying the existing condition of the pipe or location of laterals. Contractor is responsible for identifying active lateral locations prior to conducting work.

3.02 RECORDS:

- A. Obtain data for and maintain the records required under subsection SUBMITTALS.
- B. Records to show, as a minimum, the following as appropriate and applicable to the phase of work and specific tasks performed:
 1. Contractor's name.
 2. Project name.
 3. Dates of period covered by record(s).
 4. Street name or brief description of off-street areas.
 5. Type of sewer, size and kind of pipe.
 6. Condition of sewer as found at start of phase of work or task.
 7. Date, time, length and location by distance(s) as measured from the upstream manhole, for each phase of work and task performed.
 8. Location, material, dates and details of flow control used.
 9. Location of work performed including sub-area, manhole-to-manhole reach, actual station as measured at the time work is performed, and station as listed in these specifications.
 10. Depth of flow in pipe sections during phase of work and task performance.
 11. Results of each phase of work, task and tests performed.
 12. Equipment and materials used.

13. Observed damage or faults found.
14. Evaluation of any hidden damage or fault that may be indicated by Contractor's operation. Include estimated location of such hidden damage or fault.
15. Any unusual conditions or events encountered during performance.
16. Refer to Section 1.04, Submittals, of this specification for additional requirements.

3.03 FLOW CONTROL:

- A. Utilize flow control methods and procedures as required. Flow control methods and procedures are to be in accordance with manufacturer's recommendations for proper operation of equipment, application of materials and performance of work, or as directed by Engineer.

1. Plugging or Blocking:

- a. At manhole upstream of section.
- b. Plugging or blocking designed and installed to readily control any amount of flow. Capable of releasing sewage flow or reducing flow from full flow to complete shutoff, to permit satisfactory performance of work and tasks.
- c. When plugging or blocking is no longer needed for performance and acceptance of work, it is to be removed in a manner that permits sewer flow to slowly return to normal without surge, surcharging or causing other major disturbances downstream.

2. Pumping and Bypassing System:

- a. Provide, install, operate and maintain a bypass system to conduct sewer flows around the work area when flow cannot be controlled by plugging and blocking or when it is necessary to maintain system sewer flow around the work area.
- b. System to consist of pumping equipment, conduits and other equipment and appurtenances necessary to bypass the sewer flow around the work area.

- c. System to be of sufficient capacity to handle existing normal sewer flows plus additional flow that may occur during a rain storm.
 - d. Have adequate standby equipment available and ready for immediate installation and use in the event of emergency or breakdown.
 - e. All engines and powered equipment for operation outside of normal work hours to be equipped in a manner to keep noise at a minimum. Noise control to include the use of appropriate baffles or other means of noise control.
 - f. Bypass system to be capable of bypassing the total flow around the work area or of releasing any amount of flow up to full available flow into the work area as necessary for satisfactory performance of the work.
- B. Flow control and flow bypassing methods and procedures must result in minimum inconvenience and nuisance to the public, and prevent damage to public and private property from flooding, surge or excessive surcharging.
 - C. Flow control methods and procedures to meet Owner's requirements and be as directed by Engineer.

3.04 CLEANING AND HEAVY CLEANING:

- A. All dirt, sand, rock, gravel, sludge, grit, grease, coatings and other deleterious materials that would interfere with satisfactory performance of the work and inspection to be removed from the sewer lines before beginning of any inspection.
- B. Provide and install suitable screening and other means of trapping and blocking as required in the downstream manhole to prevent cleaned material from passing downstream.
- C. Promptly remove screened, trapped, blocked material from manhole by suitable means, place in suitable containers, remove from site and dispose of in manner acceptable to Engineer and in conformance with all applicable laws and regulations. Grit and cleanings shall be disposed in accordance with Section 01046 – CONTROL OF WORK.
- D. Sewers to receive chemical root treatment are not to be cleaned prior to chemical root treatment unless extensive grease, root growths, debris, etc. preclude proper application of chemical root treatment material.

- E. Heavy cleaning of the sewer shall include mechanical removal of debris, solids, roots, sand, rock, gravel, pieces of broken pipe, bricks, grease, grit, and all other deleterious materials that would interfere with the satisfactory performance of the work, inspection, or performance of the sewer.

Mechanical equipment acceptable for heavy cleaning includes buckets, scrapers, scooters, porcupines, kites, heavy-duty brushes, metal pigs, and other debris-removing equipment in conjunction with an approved power winching machine.

Other equipment and accessories must be approved by Engineer prior to starting the work.

Mechanical cleaning equipment shall be used in conjunction with variable pressure water nozzles to achieve required results prior to TV inspection.

3.05 CHEMICAL TREATMENT AND ROOT REMOVAL:

- A. Root intrusion shall be removed by chemical root treatment in accordance with manufacturer's recommendations.
- B. After chemical root treatment, a minimum of 60 days shall pass prior to any cleaning, testing, or sealing.
- C. After a minimum 60 days waiting period, any remaining roots and root masses are to be removed by suitable mechanical cutting devices.
- D. Following root treatment and removal, the locations shall be cleaned, inspected, tested, and sealed as specified hereinafter.

3.06 CLOSED CIRCUIT TELEVISION INSPECTION:

- A. Inspect interior of sewer pipe sections during testing and sealing operations, and spot repairs in the presence of the Engineer. Use closed circuit television camera, after cleaning, and in the presence of Engineer.
- B. Inspection to be one section at a time unless otherwise approved by Engineer.
- C. Section being inspected must be isolated from remainder of sewer.
- D. Flow in section being inspected to be minimum possible, to permit inspection of invert of pipe. In no case shall flow exceed manufacturer's recommendation for equipment.
- E. Picture quality and definition to be to satisfaction of Engineer. If unsatisfactory, remove equipment, replace with satisfactory equipment and repeat inspection at no additional cost to Owner.

- F. Make continuous visual and audio tape/DVD recording of each inspection. Provide Engineer with two copies.
 - G. Audio recording to identify run in accordance with applicable portions of subsection RECORDS. Stationing to be recorded at least every 10 ft. on the audio tape and at all points of interest.
 - H. Video tape to be synchronized with audio tape/DVD.
 - I. Make video and audio playback equipment available at Engineer's office.
 - J. Provide suitable means of communication between all points of operation.
- 3.07 CUTTING OF PROTRUDING LATERAL SERVICE CONNECTIONS:
- A. All protruding lateral cutting, removal, and sealing to be performed in the presence of the Engineer.
 - B. Cutting of protruding lateral service connections to be performed as indicated in the contract documents or where the Engineer deems that the protruding lateral prohibits the passage of equipment necessary to perform specified work.
 - C. Protruding laterals shall be cut to the contour of the pipe.
 - D. For each lateral cut, Contractor shall report sub-area, manhole reach, actual station as measured during the performance of the work, and station as indicated in contract documents.
- 3.08 STRUCTURAL SPOT REPAIR: SHORT CURED-IN-PLACE LINER INSTALLATION:
- A. Each pipe segment where short cured-in-place liner is to be installed shall be cleaned from manhole to manhole to remove all debris, as specified under subsection CLEANING.
 - B. Any obstruction (ie, protruding service, concrete) in the sewer that may impede insertion and installation of the liner shall be removed and disposed of as specified in accordance with subsections CUTTING OF PROTRUDING LATERAL SERVICE CONNECTIONS AND CLEANING AND HEAVY CLEANING

- C. TV inspect and videotape pipe section to be rehabilitated. Verify location of defect, exact length of repair liner to be installed and all active service connections.
- D. Flow through sewer section to be repaired shall be controlled by temporarily plugging upstream sewer. Contractor to monitor depth in next upstream manhole and take necessary actions to release flow prior to causing backup into service laterals. In areas where flow is heavy, the Contractor is responsible for by-pass pumping the flow of water aboveground to the closest possible downstream manhole.
- E. The short cured-in-place liner material shall be measured, cut and impregnated with epoxy resin under factory controlled conditions or in the field to the measurements specified herein. The installation and curing of the liners shall be in complete accordance with the manufacturer's specifications and if requested by the Engineer or Owner, a representative of the manufacturer shall be present during the first day of installation.
- F. The spot repair liner shall be cured for the time period and method (i.e., steam, hot water, ambient air, electrical heat) in accordance with the manufacturer's recommendations.
- G. The inflatable element or bladder is covered with the resin wetted sleeve. The bladder and sleeve are inserted into the manhole and positioned in the pipe at the proper location. The inflatable element and hydrostatic pressure used during the installation process shall be sufficient to tightly hold the short liner to the existing pipe wall, producing dimples at all service connections and squeezing resin into any cracks in the pipe. This pressure shall be great enough to overcome or prevent infiltration from entering the existing pipeline during the curing process.
- H. After the resin has fully cured, the bladder is deflated and removed leaving the short liner in place in the pipe. Active service connections noted in the pre-TV inspection of the line shall be reinstated from the main pipe by means of a closed circuit television camera and robotic cutter.
- I. Upon completion of the installation of the short cured-in-place liner and reinstatement of active sewer service connections, television inspection of the completed work shall be conducted. Pre-rehabilitation and post-rehabilitation inspections shall be recorded on the same tape/DVD and provided to the Engineer. Any defects, voids, separations, signs of active infiltration, etc. shall be corrected to the satisfaction of the Engineer either by installing a second liner over the first or digging and replacing a section of pipe at no additional cost to the Owner.

3.09 SERVICE LATERALS:

- A. Work related to lateral service connections during lining of mainline sewers:
 - i) All service laterals identified as active shall be reinstated by cutting into cured-in-place liner. It is the intent of this work to only reinstate active service laterals. While City staff will provide assistance in identifying active laterals where possible, it is the Contractor's sole responsibility to identify the active status of laterals.
 - ii. The Contractor shall make sure through video inspection or whatever other means necessary that each active lateral connection is opened, free to discharge and is not plugged or backed up as a result of the lining operation.
 - iii. The lateral connections shall be opened to provide a capacity not less than 95% of the original opening. It shall be the Contractor's responsibility to determine the status of each existing lateral connection. The lateral reconnection shall be made from the main pipe by means of a closed circuit television camera and robotic cutter. In the event that an active service connection is missed, it will be the Contractor's responsibility to reconnect said service at no additional cost to the Owner.
 - iv. No additional payment will be made for necessary excavations for the purpose of reopening connections and the Contractor will be responsible for all costs and liability associated with such excavation and restoration work.

3.10 SEWER SERVICE LATERAL SEALING

- A. The purpose of the service connection sealing is for the joint between the resin impregnated tube, the host pipe and the lateral to be sealed against infiltration upon the completion of the cured in place pipe installation (and cutting of services). After installation of the liner and reinstatement of service connections, the contractor shall chemically seal the joint between the resin-impregnated tube, the host pipe and the uncapped sewer service lateral against infiltration in accordance with the provisions described in SECTION 02605a.

3.11 DYED WATER TESTING FOR IDENTIFYING ACTIVE LATERALS

- A. Dyed water testing/tracing will be conducted by introducing water colored by a non-toxic dye into the service in question for the purpose of verifying the location and active status of a lateral.

- B. Dyed water testing shall be conducted at the request of the Owner.
- C. Contractor shall notify and coordinate with property owners requiring dyed water testing prior to conducting work. The City should be notified prior to attempting to gaining access to private property.

3.12 WARRANTY PERIOD TESTING:

- A. The Contractor will be required to provide a warranty in which the Contractor will re-inspect spot repairs approximately one year from the date of installation. If any are found to be sub-standard by the Engineer, the Contractor will be required to repair or make repairs to the original spot repair.
- B. Structural Spot Repairs' Inspection: At five (5) separate locations, or 10% of the total number of repair locations, whichever is greater, will be selected by the Engineer to inspect the structural spot repairs. Contractor shall inspect utilizing television inspection equipment. Any structural spot repairs failing the inspection shall be repaired or a new structural spot repair constructed in its place at no additional cost to the Owner. Failure shall be defined as segments with visually evident leakage, tears, buckling, faulty seal, or faulty workmanship. This new installation shall be inspected to the satisfaction of the Engineer. If any location fails the inspection additional inspections may be required. The initial locations selected by the Engineer shall be paid for under the specified bid item, all additional inspection, cleaning and repairs will be at no additional cost to the Owner.

END OF SECTION