SECTION 330130.61 - PACKER INJECTION GROUTING

This Section specifies grout sealing of sewer pipe joints and cleaning, plugging, and grout sealing of defective manholes. Included in this Section are preparatory Work, root control, inspection, and testing.

1. GENERAL
	* + 1. SUMMARY
				1. Section Includes:

Pipe cleaning and flushing.

Manhole interior cleaning.

Gravity sewer joint and manhole sealing.

Plugging.

Bypassing sewage.

Joint inspection and testing.

* + - * 1. Related Requirements:

List other Sections directly related to or affecting Work of this Section. Include Sections specifying information expected to be found in this Section as well as Sections required to describe complete system or assembly requirements.

Section 015720 - Temporary Maintenance of Sewer Flows and Sewer Service: Safety requirements when bypassing sewage flow.

Section 330130.11 - Television Inspection of Sewers: Audio-video inspection for roots and other blockages.

Section [**330505.33 - Infiltration and Exfiltration Testing**] [**330505.36 - Vacuum Testing**]: Leak testing of manholes.

Section 330561 – Concrete Manholes: Manholes for gravity sewerage piping.

Section 333100 - Sanitary Sewerage Piping: Pipe materials and accessories normally encountered with gravity sewerage piping.

* + - 1. REFERENCE STANDARDS

List reference standards included within text of this Section, with designations, numbers, and complete document titles.

* + - * 1. ASTM International:

ASTM C33 - Standard Specification for Concrete Aggregates.

ASTM C150 - Standard Specification for Portland Cement.

* + - 1. SCHEDULING
				1. Schedule Work of this Section to coincide with [**relining sewers**] [**joint sealing**].
				2. Furnish Work schedule for periods of time when sewer piping section and manholes are out of service for joint sealing.
			2. SEQUENCING

Indicate in following paragraph in which order pipe joints should be sealed.

* + - * 1. Sequence Work [**in following order**] [**by following manhole designations**]:

<**\_\_\_\_\_\_\_\_**>.

<**\_\_\_\_\_\_\_\_**>.

* + - 1. SUBMITTALS

Only request submittals needed to verify compliance with Project requirements.

* + - * 1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Product Data: Submit manufacturer information regarding grout, sealant, and root growth inhibitor.
				5. Reports:

Submit weekly report with daily entries showing the following:

Location of joints sealed and successfully tested.

Results of air or liquid joint tests before and after sealing joints.

Volume of joint sealant or joint sealant/root treatment additive pumped.

Pounds of acrylamide and N,N1-methylenebisacrylamide mixture used.

Pounds of ammonium persulfate used.

Gallons of root treatment additive material used each day, including gallons of triethanolamine.

[**Elevation**] [**Depth**] of ground water.

Location of pipe fractures and misalignment.

Location of leaking joints, including non-leaking joints failing air test.

Location of connections discharging continuous flow or incorrectly connected to sewer main.

Submit weekly reports on form approved by Director’s Representative prior to start of testing and sealing.

* + - * 1. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
				2. Prior to starting Work, submit certifications attesting to following:

Composition and manufacturer of joint sealing material and root treatment additive.

Chemical compatibility of sealant material and root treatment additive material.

Calibration of meters used to measure joint sealant and root treatment additive and pressure gages are accurate to within <**\_\_\_\_\_\_\_\_**> gpm) and <**\_\_\_\_\_\_\_\_**> psi respectively.

Include separate paragraphs for additional certifications.

* + - * 1. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
				2. Qualifications Statement:

Coordinate following subparagraphs with requirements specified in QUALIFICATIONS Article.

Submit qualifications for manufacturer and applicator.

Submit manufacturer's approval of applicator.

* + - 1. CLOSEOUT SUBMITTALS
				1. Project Record Documents: Record actual locations of repaired joints.
			2. QUALITY ASSURANCE

Include this Article to specify compliance with overall reference standards affecting products and installation included in this Section.

In following paragraph insert "State of New York Department of Transportation," "Municipality of \_\_\_\_\_\_\_\_ Department of Public Works," or other agency as appropriate.

* + - * 1. Perform Work according to <**\_\_\_\_\_\_\_\_**> standards.

Include following paragraph only when cost of acquiring specified standards is justified.

* + - * 1. Maintain <**\_\_\_\_\_\_\_\_**> [**copy**] [**copies**] of each standard affecting Work of this Section on Site.
			1. QUALIFICATIONS

Coordinate following paragraphs with requirements specified in SUBMITTALS Article.

* + - * 1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum [**three**] <**\_\_\_\_\_\_\_\_**> years' [**documented**] experience.
				2. Applicator: Company specializing in performing Work of this Section with minimum [**three**] <**\_\_\_\_\_\_\_\_**> years' [**documented**] experience [**and approved by manufacturer**].
			1. DELIVERY, STORAGE, AND HANDLING
				1. Section 016500 - Materials and Equipment: Requirements for transporting, handling, storing, and protecting products.
				2. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
				3. Store materials according to manufacturer instructions.
				4. Protection:

Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.

Provide additional protection according to manufacturer instructions.

1. PRODUCTS
	* + 1. GROUT SEALANT
				1. Chemical Grout:

Description:

Mixture of dry acrylamide and dry N,N1-methylenebisacrylamide in proportions capable of diluting aqueous solutions and, when properly catalyzed, forming stiff gels.

Capable of tolerating ground water dilution and reacting in moving water.

Reaction: Produce continuous and irreversible gel.

Solution Concentration:

Maximum: <**\_\_\_\_\_\_\_\_**> lb./gal. of water.

Minimum: <**\_\_\_\_\_\_\_\_**> lb./gal. of water

Viscosity:

Maximum: 0.0000418 lbf-s/sq. ft..

Variation: Remaining constant until gelation concurs.

Reaction Time: Controllable from 10 seconds to 1 hour.

Reaction produces continuous and irreversible gel at chemical concentrations as low as <**\_\_\_\_\_\_\_\_**> lb./gal. of water.

* + - * 1. Catalyst:

Material: Ammonium persulfate.

Use in combination with activator.

Catalyst containing (dimethylamino)propionitrile is prohibited.

Activator: Triethanolamine or other compounds of equivalent properties.

Inhibitor: Potassium ferricyanide.

* + - * 1. Root Growth Inhibitor:

Material:

Dichlorobenzonitrile.

Properties: Meet recommendations of grout manufacturer.

Root Treatment Additive:

Capable of remaining active for minimum of two years.

Active Ingredient: Sodium methyldithiocarbamate.

Root Cell Inhibiting Agent: 2,6-dichlorobenzonitrile (dichlobenil).

For each application, disperse root control agent into clear, cool water free of acid, alkali, oxidizing agents, or large amounts of oil or other organic compounds or materials.

Use tanks for transportation or storage of makeup water.

* + - * 1. Portland Cement: Comply with ASTM C150, Type II.
				2. Fine Aggregate Gradation: Comply with ASTM C33.
				3. Packer for Joint Sealing:

Bladder:

Furnish air-impervious, pneumatically inflatable bladder on each end of mounting cylinder.

Seal ends of each bladder to cylinder by broad, confining bands.

Connect at each end by winch-powered cables.

Form positive seal between inflated bladders and interior periphery of sewer pipe and form annular void between inflated end bladders.

Design to allow restricted quantity of sewage flow through packer at designated times.

1. EXECUTION
	* + 1. EXAMINATION
				1. Verify which sewer pipes require joint sealing.
			2. PREPARATION
				1. Pipe Cleaning and Flushing:

Perform cleaning of pipe interior to extent necessary to pass equipment and materials required for joint sealing.

Flush foreign material cleaned from interior of sewer pipe, intercept, remove, and properly dispose.

Dumping of raw sewage on private property, in city streets, or into surface or groundwater is not permitted.

* + - * 1. TV Inspection of Piping: As specified in Section 330130.11 - Television Inspection of Sewers.
				2. Plugging:

Conditions Requiring Plugging of Pipes:

Depth of flow within sewer pipe is greater than 20 percent of sewer pipe ID.

Exposing complete inside periphery of sewer pipe is required to conduct inspection, sealing, or testing.

Repair damage resulting from plugging sewer piping.

* + - * 1. Bypassing:

Bypass sewage flow when plugging cannot control flows, in accordance with Section 015720 – Temporary Maintenance of Sewer Flows and Sewer Service.

Install and operate pump to manage bypassing of peak sewage flow rate.

Provide standby pump of equal or greater capacity at bypass location.

Provide safety precautions, including barricades, lights, and flaggers as specified in [**Section 015000 – Construction Facilities Temporary Controls**] [**015526 – Traffic Maintenance and Protection**].

* + - 1. APPLICATION
				1. Root Control:

Apply chemical root control agent by foaming or soaking according to conditions in piping under treatment.

Foaming:

Agent: Solution containing not less than 24 percent by weight of anhydrous vapam (sodium methyldithiocarbamate) and not less than 1.7 percent by weight of dichlobenil (2,6-dichlorobenzonitrile).

Surfactant: Capable of producing foam and able to transmit at pressure of 30 psig.

Concentration: Deliver foam to pipe to yield approximately 20 gal. of foam for each gallon of five-percent solution.

Soaking:

Fill entire pipe with freshly prepared and well-mixed solution containing not less than one percent by volume of specified root growth inhibitor.

Fully charge for soaking period of [**one hour**] <**\_\_\_\_\_\_\_\_**>, and replenish solution to maintain its level above upper end of section under treatment at specified concentration.

Following specified soaking period, pass solution downstream to treat additional segments of piping, add additional root control agent to maintain concentration of solution at one percent, and charge each segment for designated soaking period by addition of solution.

* + - * 1. Joint Sealing:

Seal joints that fail pre-sealing test.

Monitor and record actual maintenance pressures when grouting and testing joints.

Pass sealing materials from dual independent pumping system through instantaneously controlled system and read flow meter to annular void in packer through dual hose systems.

Maximum Sealant:

If sealant material injected into joint exceeds [**15**] <**\_\_\_\_\_\_\_\_**> gal. in [**8**] <**\_\_\_\_\_\_\_\_**>-inch pipe, stop injection.

Do not resume sealing of joint until other joints in manhole run are sealed.

Re-clean and repeat sealing process until positive seal is achieved.

Clean joint after sealant material has set.

Examine joint repair for visible defects using television camera and fix defects prior to testing of post-joint seal.

* + - 1. FIELD QUALITY CONTROL
				1. Section 017716 - Contract Closeout: Requirements for testing, adjusting, and balancing.
				2. Pre-Sealing Joint Test:

Air test each joint between manholes as follows:

Conduct pre-sealing test as specified for post-sealing test.

Record failure of pre-sealing test in weekly report.

Notify Director’s Representative when pre-sealing test passes.

Record passing tests in weekly report and discontinue joint sealing and post-sealing test sequence for passed joint.

Use pressure meters accurate to within <**\_\_\_\_\_\_\_\_**> psi.

Use flow meters accurate to within <**\_\_\_\_\_\_\_\_**> gpm.

* + - * 1. Post-Sealing Joint Test:

Perform visual inspection of joint.

Apply positive air pressure in void area to raise void pressure between <**\_\_\_\_\_\_\_\_**> and <**\_\_\_\_\_\_\_\_**> psi above maximum ground water pressure and allow to stabilize due to temperature effect.

Complete air pressure stabilization.

Test Pressure: Not less than maximum ground water pressure or more than 7.5 psi above maximum ground water pressure at initiation of test procedure.

Record initial test pressure, stabilized test pressure, and period of time required to have 1.0-psi pressure drop from stabilized test pressure.

Minimum Test Duration:

Pipe Diameter 8 inches: Zero minutes, 18 seconds.

Pipe Diameter 10 inches: Zero minutes, 28 seconds.

Pipe Diameter 12 inches: Zero minutes,40 seconds.

Pipe Diameter 15 inches: 1 minute, 3 seconds.

Pipe Diameter 18 inches: 1 minute, 31 seconds.

Pipe Diameter 21 inches: 2 minutes, 4 seconds.

Pipe Diameter 24 inches: 2 minutes, 16 seconds.

Pipe Diameter 27 inches: 2 minutes, 42 seconds.

Failure: Joint has failed if pressure drop exceeds 1.0 psi from stabilized test pressure during minimum time specified above.

Passage:

Discontinue test if minimum time has been completed and 1.0-psi pressure drop has not occurred from stabilized test pressure.

In this circumstance, joint has satisfactorily passed test.

Following procedures for sealed joint failing air test:

Visually inspect.

Re-seal.

Visually inspect.

Retest until successful test is obtained or sealant limit is attained.

* + - * 1. Manhole Interior Cleaning:

Clean each defective or fouled manhole interior with high-velocity water jet to remove grease, dirt, sludge, and roots.

Cut remaining roots flush with manhole interior.

Debris:

Flush foreign material cleaned from interior of manhole.

Remove and properly dispose of material off Site.

If leaks are not readily identifiable upon completion of cleaning operation, use blower to dry manhole interior for positive identification of leaks and sweep areas.

* + - * 1. Manhole Grout Sealing:

Drill hole at each identifiable leakage point from inside manhole extending through sidewall of manhole.

Insert metal rod through hole to determine if exterior void space exists.

Fill exterior void spaces with chemical grout mix, pumping into void space until refusal is recorded by rise in pressure on pump pressure gauge.

Ensure that hole through manhole wall is kept open and free of chemical grout.

Plug hole and allow one hour for chemical grout to set.

Upon completion of grouting, pump manhole sealant until refusal at minimum pressure of 3.0 psig through probe-type injection equipment.

Deposit sealant from interior surface of set chemical grout through drilled hole to inside surface of manhole.

Upon setting of manhole sealant, remove excess material protruding into interior of manhole.

* + - * 1. Manhole Testing: As specified in Section [**330505.33 - Infiltration and Exfiltration Testing**] [**330505.36 - Vacuum Testing**].

END OF SECTION 330130.61