Special Specification 7249
Replacement of Water and Sewer Lines

1. DESCRIPTION

Furnish, install, or replace water pipe, water valves, water meters and boxes, water service connections, fire hydrant assemblies, pipe fittings, encasement pipes for water lines, adjust wastewater manhole, and supporting materials in conformance with the North Central Texas Council of Governments (NCTCOG) and details shown on the plans, or as directed. All work must be completed in accordance with the NCTCOG technical specifications unless otherwise noted on the plans authorized in writing.

2. MATERIALS

Furnish all materials in accordance with the requirements set forth by the NCTCOG technical specifications unless otherwise noted on the plans. Materials must meet the "Buy America" requirements set forth by the Department and the NCTCOG.

2.1. Resilient Seated Gate Valves. Specifications for Public Works Construction, Item 502.6.2, "Resilient Seated Gate Valves" will be modified to include the following items listed below in Sections 2.1.1. through 2.1.2.

2.1.1. Products. Resilient seated gate valves through 24 in. must meet or exceed the latest revisions of AWWA C509 and must meet or exceed the requirements of this Specification.

Valve body must be ductile iron per ASTM A536. Flanged ends must be furnished in accordance with ANSI/AWWA C115/A21.15 Standard Flanged Drilling Mechanical Joints furnished must be furnished with outlets which conform to ANSI/AWWA C111/A21.11 mechanical joint requirements.

The disc must be constructed of ductile iron fully encapsulated in rubber. No iron should be exposed on the disc.

Bolt, hex head and nut, hex must be Steel ASTM A307 Gr. B, Zinc Plate per ASTM B633, SC3 for non-buried service and for 4 in. through 12 in. valves. Bolt, hex head and nut, hex must be 316 Stainless Steel for buried service for valves 16 in. through 24 in.

T-Bolts must be high strength, low alloy Cor-Ten, or approved equal.

Resilient seated gate valves must be U.S. Pipe, Clow, American Flow Control, Mueller, M&H or Waterous for size 4 in. through 12 in.

Resilient seated gate valves for buried service must be furnished with a square 2 in. operating nut. The valve box must be Tyler Pipe 6850 series or approved equal.

Resilient seated gate valves must be non-rising stem type unless otherwise specified.

2.1.2. Shipping Instructions. All parts must be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation.

All equipment and parts must be properly protected against any damage during a prolonged period at the site. The finished surfaces of all exposed flanges must be protected by wooden blank flanges, strongly built

and securely bolted thereto. Finished iron or steel surfaces not painted must be properly protected to prevent rust and corrosion.

Take special care to prevent plastic and similar brittle items from being directly exposed to the sun, or exposed to extremes in temperature, preventing any deformation.

2.2. Trenchless Installation. Standard Specifications for Public Works Construction, Item 503, "Trenchless Installation" will be modified to include the following items listed below in Sections 2.2.1. through 2.2.6.

2.2.1. Steel Casing Material. Provide new, smooth-wall, carbon steel pipe conforming to ASTM A139, Grade B with a minimum yield strength of 35 KSI.

2.2.2. Dimensional Tolerances. Minimum wall thickness at any point must be at least 87.5% of the nominal wall thickness. Steel casing must also meet the following dimensional tolerances:

- outside circumference within 1.0% or 3/4 in. of the nominal circumference, whichever is less,
- outside diameter of the pipe must be within 1/8 in. of the nominal outside diameter,
- roundness such that the difference between the major and minor outside diameters must not exceed 0.5% of the specified nominal outside diameter or 1/4 in., whichever is less, and
- maximum allowable straightness deviation of 1/8 in. in any 10-ft. length.

2.2.3. Steel Pipe Ends. All steel pipe must have square ends.
The ends of pipe sections must not vary by more than 1/8 in. at any point from a true plane perpendicular to the axis of the pipe and passing through the center of the pipe at the end.

When pipe ends must be beveled for welding, the ends must be beveled on the outside to an angle of 35º with a tolerance of ± 2.5º and with a width of root face 1/16 in. ± 1/32 in.

2.2.4. Fabrication. Steel casing pipe must be fabricated with longitudinal weld seams.

All girth weld seams must be ground flush. Steel Casing Pipe connections must be achieved by full penetration field butt welding.

2.2.5. Finishes. Clean and prepare steel casing for coating and lining application in accordance with requirements of AWWA C210.

Coat and line steel casing pipe with a coal–tar epoxy in accordance with the requirements of AWWA C210, meeting the following requirements:

- color: Black,
- minimum dry film thickness: 16 mm, and
- applied in accordance with manufacturer's recommendations.

Touch–up external coating after field welds in accordance with manufacturer's recommendations.

2.2.6. Casing Spacers and Insulators. Provide casing spacers to support the carrier pipe during installation.

Provide restrained-style casing spacers to hold carrier pipe stable during grouting operations and prevent floating or movement.

Provide enough dielectric strength to electrically isolate each component from one another and from casing or liner.

2.2.6.1. Carrier pipe less than 12-in. diameter and in casing less than 150 ft. Provide high density polyethylene spacers manufactured by Raci Spacers North America, Inc. or approved equal.

Provide enough height to allow a minimum clearance of 2 in. between the outside of carrier pipe bells or external restraint system and the inside of the casing or liner surface.

2.2.6.2. Carrier pipe greater than 12-in. diameter and in casing greater than 150 ft. Minimum 14-gauge stainless steel for water line and sewer force main.

Coated steel for gravity sanitary sewer.

Suitable for supporting weight of carrier pipe without deformation or collapse during installation.

2.2.6.3. Risers. Minimum 10-gauge stainless steel for waterline and sewer force mains.

Provide enough height and attached runner to allow a minimum clearance of 2 in. between outside or carrier pipe bells or couplings and the inside of the casing surface.

2.2.6.4. Bands. Stainless steel for waterline and sewer force mains

Provide polyvinyl chloride inner liner with:

- minimum thickness of 0.09 in.,
- Durometer “A” of 85-90 hardness, and
- minimum dielectric strength of 58,000 V.

2.2.6.5. Runners. Pressure-molded glass reinforced polymer or UHMW minimum 2 in. in width and 11 in. in length.

Attach to the band or riser with minimum 3/8 in. welded steel or stainless-steel studs.

Recess runner studs and nuts well below wearing surface of the runner.

Fill recess with corrosion inhibiting filler.

2.3. Manhole Rehabilitation. Standard Specifications for Public Works Construction, Item 602, ‘Manhole Rehabilitation” will be modified to include the following items listed in Sections 2.3.1. through 2.3.2.1.

2.3.1. Repair and Resurfacing Products. Compatible with the specified coating products to bond effectively, thus forming a composite system.

Used and applied in accordance with the manufacturer’s recommendations.

2.3.1.1. Repair and Resurfacing Products. Product must be100% solids, solvent-free epoxy grout specifically formulated for epoxy top coating compatibility.

Factory blended, rapid setting, high early strength, fiber reinforced, non-shrink repair mortar that can be toweled or pneumatically spray applied and specifically formulated to be suitable for top coating with the specified coating product used.

2.3.2. Coating Product. Capable of being installed and curing properly within a manhole or concrete utility environment.

Resistant to all forms of chemical or bacteriological attack found in municipal sanitary sewer systems and capable of adhering to typical manhole structure substrates.

2.3.2.1. Epoxy System. The 100% solids, solvent-free ultra high-build epoxy system must exhibit the characteristics listed below.

- Application Temperature – 50º F, minimum,
- Thickness – 125 mm minimum,
- Color – White, Light Blue, or Beige,
- Compressive Strength (per ASTM D695) – 8,800 psi minimum,
- Tensile Strength (per ASTM D638) – 7,500 psi minimum,
- Hardness, Shore D (per ASTM D4541) – 70 minimum,
- Abrasion Resistance (per ASTM D4060 CS 17F Wheel) – 80 mg loss maximum,
- Flexural Modulus (per ASTM D790) – 400,000 psi minimum,
- Flexural Strength (per ASTM D790) – 12,000 psi minimum,
- Adhesion to Concrete, mode of failure (ASTM D4541): Substrate (concrete) failure,
- Chemical Resistance (ASTM D543/G20) all types of service for Municipal sanitary sewer environment,
- Sulfuric acid, 30%, and
- Sodium hydroxide, 5%.

2.4. Submittal. Contractor must submit submittal for City Review and approval in accordance with Item 5 for all supplied materials.

3. PERMITS, TESTING, AND INSPECTION

3.1. Permits. Acquire all necessary permits from the City of Gainesville to perform the work. Please contact the following as needed:

- City of Gainesville (940)-668-4540, or
- North Central Texas Council of Governments (817) 640-3300.

3.2. Testing. Provide testing for water and sewer improvements in conformance to the NCTCOG or as directed. In general, perform the following testing as minimum:

- for water mains: hydrostatic test, poly pigging, and sterilization test; and
- for sewer lines: low pressure air test, deflection (Mandrel) test, vacuum test, and Closed-Circuit Television (CCTV) Inspection.

Initial testing and required retesting of all materials, construction items, or products incorporated in the work will be performed at the expense of the Contractor by a laboratory approved by the Owner.

3.3. Inspection. All water mains, sewer lines, and their appurtenances will be inspected by a representative of the City of Gainesville. These representative's decision of acceptability of the installation will be final. The City of Gainesville will hold two final inspections, one at water and sewer completion, and the second at roadway completion for final utility grade adjustments.

4. CONSTRUCTION

Perform work in a manner consistent with the construction documents, NCTCOG standard details and specifications, and the Department standard details and specifications excepted where noted on the plans or specifications.

Priority Contract Documents (first with highest priority):

- Contract Drawings;
- North Central Texas Council of Governments (NCTCOG) Details, Specifications, and Special Provisions; and
- Department Details, Specifications, and Special Provisions.

A Copy of the "Public Works Construction Standards" (Standard Specifications for Public Works Construction-North Central Texas Governments- Fifth Edition-2017) may be obtained from the North Central Texas Council of Governments, 616 Six Flags Drive, Arlington, TX 76006 or ordered online at http://store2.nctcog.org/NCTCOG/product/ENV101.html.

4.1. Grade Adjustment Risers. Specifications for Public Works Construction, Item 502.1.4.5, "Grade Adjustment Risers" will be modified to include the following:

Where manholes are to be adjusted upward to meet a new grade, the vertical rise in the manhole neck may be adjusted to a maximum of 18 in. and adhere to the following:

- This rise will be measured from the top of the manhole lid down to the top of the cone section of the manhole,
- the vertical measurement will include all vertical rise previously installed on an existing manhole,
- where this maximum is exceeded, the existing walls will first be removed down to the bottom of the cone section of the walls, or to such an elevation that the inside diameter of the manhole is not less than 3-l/2 ft,
- the manhole will then be rebuilt in conformity with the size and shape requirements for new manholes, and
- salvaged materials in good condition may be used in rebuilding such structures upon approval from the owner.

4.2. Trenchless Installation. Standard Specifications for Public Works Construction, Item 503 "Trenchless Installation" will be modified to include the following items listed below in Sections 4.2.1. through 4.2.5.

4.2.1. Jacking, Tunneling, Boring or Augering.

4.2.2. General. Perform jacking, tunneling, or augering for water mains or sewers at the locations shown on the plans and at other locations specifically designated by the Engineer.

Immediately notify the Inspector if any problems are encountered with equipment or materials or if the Contractor believes the conditions encountered are materially and significantly different than those represented within the Contract Documents.

Where pipe is required to be installed under railroad embankments or under highways, streets or other facilities, construction must be performed in such a manner to not interfere with the operation of the railroad, street, highway or other facility, and to not weaken or damage any embankment or structure.

During construction operations, furnish and maintain barricades and lights to safeguard traffic and pedestrians until the backfill has been completed and then remove from the site.

Properly manage and dispose of groundwater inflows to the shafts in accordance with requirements of specifications and all permit conditions.

Discharge of groundwater inflow into sanitary sewers is not allowed without proper approval and permits.

Furnish all necessary equipment, power, water and utilities for tunneling, spoil removal and disposal, grouting and other associated work required for the methods of construction.

Promptly clean up, remove and dispose of any spoil or slurry spillage.

Do not disturb roadways, railroads, canal channels, adjacent structures, landscaped areas or existing utilities.

Any damage must be immediately repaired to original or better condition and to the satisfaction of the Engineer or permit grantor at no additional cost to the Owner.

Whenever there is a condition that is likely to endanger the stability of the excavation or adjacent structures, operate with a full crew 24 hr. a day, including weekends and holidays, without interruption, until those conditions no longer jeopardize the stability of the work.

Tunnel liner plate must not be used for auger boring.

Contractor will be fully responsible for insuring the methods used are adequate for the protection of workers, pipe, property and the public and to provide a finished product as required.

Blasting is not allowed.

Notify the Texas One Call system (800-245-4545) to request marking of utilities by utility owners and operators that subscribe to One Call. Individually notify all other known or suspected utilities to request marking of these utilities, and perform the following:

- confirm that all requested locates are made before commencing boring operations,
- visually confirm and stake necessary existing lines, cables, or other underground facilities including exposing necessary crossing utilities and utilities within 10 ft. laterally of the designed tunnel, and
- control drilling and grouting practices to prevent damage to existing utilities.

4.2.3. Construction Tolerances.

4.2.3.1. General. Grades shown on drawings must be maintained vertically.

Use methods and equipment that control surface settlement and heave above the pipeline to prevent damage to existing utilities, facilities and improvements.

Limit any ground movements to values that must not cause damage to adjacent utilities or surface features

Repair any damage caused by ground movements at no cost tothe Department.

Provide settlement monitoring to measure ground movement during Auger Boring operations, as required by all applicable Federal, State, or local requirements.

4.2.3.2. Pressurized Carrier Pipe. Lateral or vertical variation in the final position of the pipe casing from the line and grade established by the drawings must be permitted only to the extent of 1 in. in 10 ft. provided that such variation must be regular and only in the direction that will not detrimentally affect the function of the carrier pipe and clearances from other underground utilities or structures.

4.2.3.3. Gravity Carrier Pipe. Lateral variation in the final position of the pipe casing from the line and grade established by the drawings must be permitted only to the extent of 1 in. in 10 ft. provided that such variation must be regular and only in the direction that will not detrimentally affect the function of the carrier pipe and clearances from other underground utilities or structures. Grades shown on the drawings must be maintained.

4.2.3.4. Boring Tolerances. The boring must proceed from a pit provided for the boring equipment and workmen.

Pilot Hole, required for 24-in. and larger casings and all gravity sewer applications. an approximate 2-in. hole must be bored the entire length of the crossing and must be checked for line and grade on the opposite end of the bore from the work pit.

This pilot hole must serve as the centerline of the larger diameter hole to be bored. Check for line and grade on the opposite end of the bore from the work pit.

Other methods of maintaining line and grade on the casing may be approved if acceptable to the Engineer.

Instead of boring a pilot hole, auger must be pulled, at a minimum, after every 40 ft. of progress of steel casing pipe and line and grade must be evaluated.

Other methods of maintaining line and grade on the casing may be acceptable, if approved.

The use of water or other fluids in connection with the boring operation will be permitted only to the extent required to lubricate cuttings.

Jetting or sluicing will not be permitted.

In unconsolidated soil formations, a gel-forming colloidal drilling fluid consisting of at least 10% of high grade carefully processed bentonite may be used to:

- consolidate cuttings of the bit,
- seal the walls of the hole, and
- furnish lubrication for subsequent removal of cuttings and installation of the pipe immediately thereafter.

Allowable variation from the line and grade must be as specified in this Specification.

All voids in excess of 2 in. between bore and outside of casing must be pressure grouted.

4.2.3.5. Control of Line and Grades. Monitor line and grade continuously during boring operations.

Record deviation with respect to design line and grade once at each casing joint.

If the pipe installation does not meet the specified tolerances, correct the installation.

4.2.3.6. Control of Line and Grades Carrier Pipe. Install Carrier pipe inside the steel casing within the following tolerances:

- horizontal ± 2 in. from design line and
- vertical ±1 in. from design grade.

Check line and grade set up before beginning carrier pipe installation.

Perform survey checks of line-and-grade of carrier pipe during installation operations.

Contractor is fully responsible for the accuracy of the installation and the correction of it, as required.

Where the carrier pipe installation does not satisfy the specified tolerances, correct the installation at no additional cost.

All carrier pipe joints must be restrained to allow for future removal.

4.2.4. Contact Grouting. Contact grout any voids caused by or encountered during boring. Modify equipment and procedures as required to avoid recurrence of excessive settlement or damage

4.2.5. Jacking, Tunneling, Boring or Augering Pits. Construct pits with a minimum of 6 in. bedding.

Remove the soil in the pit, excavate to a minimum depth of 6 in. below the bottom of the pipe and replace the soil with bedding material.

If the bottom of the excavation becomes wet due to the presence of groundwater and a dewatering system is not required, and if directed, over excavate an additional 6 in. to a depth of 1 ft. below the bottom of the pipe. Place a non-woven geotextile fabric and then compact 12 in. of bank run sand or concrete sand in a single lift on top of the fabric. Compact the upper 6 in. to 90% of the standard maximum density as determined by Tex-113-E. The Engineer may require the Contractor to remove unstable or unsuitable material, even though the Contractor has not determined the material to be unsuitable.

Mechanically compact the bedding material by using vibratory equipment or any other acceptable equipment. Compact the bedding material to 95% of the standard density within 5% of the optimum moisture, as determined by Tex-113-E.

4.3. Manhole Rehabilitation. Standard Specifications for Public Works Construction, Item 602, “Manhole Rehabilitation” will be modified to include the following items listed below in sections 4.3.1. through 4.3.4.

4.3.1. Coating Application Equipment. Use manufacture approved heated plural component spray equipment.

Hard to reach areas, primer application and touchup may be performed using hand tools.

4.3.2. General. Perform coating after the sewer line replacement, repairs, grade adjustments, and grouting are complete.

Perform application procedures per recommendations of the coating product manufacturer, including environmental controls, product handling, mixing and application.

Only perform application if surface temperature is between 40ºF and 120ºF.

Make no application if freezing is expected to occur inside the manhole within 24 hr. after application.

4.3.3. Coating. Spray apply per manufacturer’s recommendation at a minimum film thickness of 125 mm.

Apply coating from bottom of manhole frame to the bench or trough, including the bench or trough.

After walls are coated, remove bench covers and spray bench or trough to at least the same thickness as the walls.

Apply any topcoat or additional coats within the product’s recoat window.

Additional surface preparation is required if the recoat window is exceeded.

Allow a minimum of 3 hr. of cure time or be set hard to touch before reactivating flow.

4.3.4. Acceptance. Each structure will be visually inspected by the Owner the same day following the application.

The inspector will check for deficiencies, pinholes, and thin spots.

If leaks are detected they will be chipped back, plugged, and coated immediately with protective epoxy resin coating. Make repair 24 hr. after leak detection.

Upon final completion of the work, the manufacturer will provide a written certification of proper application to the Owner.

The certification will confirm that the deficient areas were repaired in accordance with the procedure set forth in this Specification.

4.4. Utility Abandonment. Where the plans call for the abandoning of water lines or sewer, adhere to the general procedures listed below.

- After constructing, testing, inspection and services are transferred to the replacement, located the waterline main or sewer to be abandoned, trace back to the feeder main and at this point cut the line.
- Remove as much of the line as possible or as shown on the plans in accordance with Section 4.5. "Utility Removal."
- Fill the remaining utility with Flowable Backfill in accordance with Item 401.

4.5. Utility Removal. Where the plans call for the removal of utility, remove the items specified as directed. This includes waterlines, sewer lines, valves, manholes, fire hydrants and other items as shown on the plans or as directed. Any excavation and backfill must be in accordance with the Contract Documents.

4.6. Connect to Existing Water Line. Connection to an existing waterline must include valve isolation and temporary water service to disrupted customers. This Item must include proper transition from one pipe material to another.

Advance notice for any connections must be made to the City of Gainesville inspector 48 hr. for any shutdown or switch over.

4.7 Connect to Existing Sewer Line. Connect to existing sewer line as shown on the plans or as directed must include all necessary Fernco couplings.

4.8 Concrete Pipe Encasement. Install concrete encasement as shown on the plans.

Minimum thickness of 6 in. 1,500 psi concrete measured from the outside diameter of the utility line.

5. WORKMANSHIP, WARRANTIES, AND GUARANTEES

Unless otherwise expressly provided in the Contract Drawings or specifications, the work must be performed in accordance with the best modern practice with materials and workmanship of the highest quality and suitable for their purpose. The Owner will judge and determine the Contractor's compliance with these requirements.

Promptly correct or replace all work, rejected by the Owner, as defective or as failing to conform to the Contract Documents whether observed before or after substantial completion and whether or not fabricated, installed, or completed. Contractor will bear all costs of correcting such rejected work, including costs incurred for additional services made necessary thereby.

If within 2 yr. after final acceptance of the work by the Oowner, as evidenced by the final certificate of acceptance or within such longer or shorter period of time as prescribed by law or by the terms of any other applicable special warranty on designated equipment or portions of work as required by the Contract

Documents, any of the work is found to be defective or not in accordance with the Contract Documents, Contractor must correct it promptly after receipt of a written notice from the Owner to do so. This obligation will survive termination of the Contract. The Owner will give such notice promptly after discovery of the condition.

Remove all portions of the work from the site which are defective or nonconforming and which have not been corrected unless removal is waived in writing by the Owner.

All subcontractors', manufactures' and suppliers' warranties and guarantees, express or implied, respecting any part of the work and any materials used therein, will be obtained and enforced by the Contractor for the benefit of the Owner without the necessity of separate transfer or assignment thereof, provided that if directed, Contractor will assign such warranties and guarantees in writing to the Owner.

Any work repaired or replaced, pursuant to this Section, will be subject to the provisions of this Section to the same extent as work originally performed.

The rights and remedies of the Owner provided in this Section are in addition to, and do not limit, any rights or remedies afforded to the Owner by law or any other provision of the Contract Documents, or in any way limit the Owner's right to recovery of damage due to default under the Contract.

6. PROTECTION OF PERSONS AND PROPERTY

Should Contractor cause damage to the work or property of any separate Contractor at the site, or should any claim arise out of Contractor’s work, Contractor must promptly attempt to settle with such other Contractor by agreement, or to otherwise resolve the dispute by arbitration or at law. Should a separate Contractor cause damage to the work or property of Contractor or should the performance of work be any separate Contractor at the site give rise to any other claim, Contractor must not institute any action, legal or equitable, against Engineer or permit any action against any of them to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability on or to recover damages from Engineer on account of any such damage or claim.

Work will not be allowed until trench safety plans are submitted and approved. The preparation and approval of these documents are also included in the total contract time and should be completed expeditiously by the Contractor.

7. EXISTING UTILITIES AND SERVICE LINES

Contractor will be responsible for the protection of all existing utilities and service lines, crossed or exposed, by the construction operations. Where existing utilities and service lines are cut, broken, or damaged, Contractor must replace the utilities and service lines with the same type of original construction, or better, at his own cost and expense.

If it is necessary to change or move the property of any owner or of a public utility, such property will not be moved or interfered with until authorized. The right is reserved to the owner of any public utility to enter upon the limits of the project for the purpose of making such changes or repairs of their property that may be made necessary by the performance of this contract.

8. MEASUREMENT

These necessary Items are required to construct the Water Main and Waste Water Relocations as described in the Contract Documents will be measured as follows.

8.1. C-900 DR-18 PVC Waterline. The pipe must conform to the plan details and meet the requirements of NCTCOG Item 501.14, "Polyvinyl Chloride (PVC) Water Pipe" and pipe must be installed and tested in accordance with NCTCOG Item 506, "Open Cut – Water Conduit Installation," and the details on the plans and specifications. Measured by the foot, of the various sizes and type of installation specified.

8.2. Resilient Seated Gate Valve. Measured by each assembly of the size specified.

8.3. Water Service Connection. The connection must be made from the meter to the service line. Contractor to determine the size of the meter and service line. The water meter will not be paid for directly. Measured as each connection.

8.4. Ductile Iron Fittings. Ductile Iron Fittings, including joint-restraint fittings. Measured as ton of fittings specified.

8.5. Connect to Existing Water Line. Measured as each connection.

8.6. Fire Hydrant Assembly. Fire hydrant assembly must include hydrant, valve, tee, concrete blocking and hydrant extensions in accordance with NCTCOG Item 502.3 "Fire Hydrants." Measured as each assembly.

8.7. Remove Utility. Waterline and sewer lines will be measured by liner foot. Removal of valves, fire hydrants, manholes will be measured by each.

8.8. SDR-26 PVC Sewer Pipe. The pipe must conform to the plans, details and meet the requirements of NCTCOG Item 501.17, "Polyvinyl Chloride (PVC) Wastewater Pipe & Fittings with Dimension Control" and pipe must be installed and tested in accordance with NCTCOG Item 507, "Open Cut – Wastewater Conduit Installation" and the details on the plans and specifications. Measured by the foot, of the various sizes and type of installation specified.

8.9. Steel Casing. Measured by the size, minimum wall thickness and installation type specified.

8.10. Concrete Pipe Encasement. Measured per liner foot of encasement installed.

8.11. Manhole. Measured by the each for a 4-ft. diameter manhole up to 6 ft. in depth. For manhole depth greater than 6 ft. the depth will be measured by vertical foot above 6 ft.

8.12. Connect to Existing Sewer Line. Measured as each connection.

8.13. Manhole Rehabilitation (Epoxy Lining). Measured by each type of manhole rehabilitation specified on the plans. Epoxy Lining will be measured by vertical foot measured from the rim to the flowline.

9. PAYMENT

The work performed in accordance with this Item must be measured and paid for at the unit price for the various items of work listed under Section 8 – "Measurement." The unit price for the various items of work identified under Section 8 – "Measurement" must include the cost of excavation, embankment, backfill, labor, equipment, inspection, joint restraint, casing spacers, end seals, and any other materials necessary for the complete installation in accordance with the construction plans and standard specifications. Water line sterilization and testing of the completed water main system will not be paid for directly but will be subsidiary to the various bid items.