ITEM NO. 510 PIPE ~~5-8-24~~06-02-25

510.1 Description

This item governs the furnishing and installing all pipe and/or materials for constructing pipe mains, sewers, laterals, stubs, inlet leads, service connections, culverts, temporary service lines and temporary diversion lines, including all applicable Work such as excavating, bedding, jointing, backfilling materials, tests, concrete trench cap, concrete cap and encasement, etc., prescribed under this item in accordance with the provisions of the Edwards Aquifer Protection Ordinance, when applicable, and City of Austin (COA) Utility Criteria Manual, Section 5, "Working in Public Rights-of-Way." The pipe shall be of the sizes, types, class and dimensions indicated or as designated by the Engineer/Architect (E/A) and shall include all joints or connections to new or existing mains, pipes, sewers, manholes, inlets, structures, etc., as may be required to complete the Work in accordance with specifications and published standard practices of the trade associations for the material specified and to the lines and grades indicated. This item shall include any pumping, bailing, and drainage when indicated or applicable.

Refer to ITEM NO. 513 (POLYETHYLENE (HDPE) PIPE AND FITTINGS AWWA C906, 4-INCH AND LARGER) for Material and Construction Methods for projects with HDPE pipe.

Unless otherwise provided, this item shall consist of the removal and disposition of trees, stumps and other obstructions, old structures or portions thereof such as house foundations, old sewers, masonry or concrete walls, the plugging of the ends of abandoned piped utilities cut and left in place and the restoration of existing utilities damaged in the process of excavation, cutting and restoration of pavement and base courses, the furnishing and placing of select bedding, backfilling and cement or lime stabilized backfill, the hauling and disposition of surplus materials, bridging of trenches and other provisions for maintenance of traffic or access as indicated.

Source: Rule No. R161-22.13, 11-7-2022.

510.2 Materials

(8) Pipe

(b) Iron Pipe

Iron pipe shall be ductile iron pipe meeting all requirements of standards as follows:

-For push-on and mechanical joint pipe: AWWA C-151

-For flanged pipe: AWWA C-115

Barrels shall have a nominal thickness required by Table 1 of AWWA C-115, which thickness corresponds to Special Class 53 in sizes through 54 inch, and Class 350 in 60 and 64-inch sizes. Flanges shall be ductile iron (gray iron is not acceptable); they shall be as shown in ANSI/AWWA C115/A21.15 and shall conform to dimensions shown in Table 2 and Figure 1 of AWWA C115. These flanges are the same in all respects as flanges shown in ANSI/AWWA C110/A21.10 for fittings and are standard for all flanges used with pipe, valve, and equipment units in the COA water distribution and wastewater force main systems. Flanges shall be fabricated and attached to the pipe barrels by U.S. fabricators using flanges and pipe barrels of U.S. manufacture. If fabrication is to be by other than the pipe barrel manufacturer, a complete product submittal and approval by the AW will be required. Additionally, such fabricator shall furnish certification that each fabricated joint has been satisfactorily tested hydrostatically at a minimum pressure of 300 psi.

-Linings and Coating:

Interior surfaces of all iron potable or reclaimed water pipe shall be cement-mortar lined ~~and seal coated~~ as required by AWWA C104. Interior surfaces of all iron wastewater line

and force main pipe shall be coated with a non-corrosive lining material as indicated on AW SPL WW-534. Pipe exteriors shall be coated as required by the applicable pipe specification. The type and brand of interior lining shall be clearly marked on the outside of the pipe and fittings. Except as authorized by the E/A, only one type and brand of pipe lining shall be used on a given project.

Except as described above for flanged pipe (Thickness Class 53) and where not otherwise indicated, ductile iron pipe shall be minimum Class 250 as defined by ANSI/AWWA C150/A21.50-current; all ductile iron pipe and flanges shall meet the following minimum physical requirements:

Grade 60-42-10:

-Minimum tensile strength: 60,000 psi (414 mPa).

-Minimum yield strength: 42,000 psi (290 mPa).

-Minimum elongation: 10 percent.

The flanges for AWWA C115 pipe may be also be made from:

Grade 70-50-05:

-Minimum tensile strength: 70,000 psi (483 mPa).

-Minimum yield strength: 50,000 psi (345 mPa).

-Minimum elongation: 5 percent.

1. Ductile Iron Fittings:

   Fittings shall be push-on, flanged or mechanical joint as indicated or approved and shall meet all requirements of standards as follows:

   -Sizes 4 inch through 24 inch: AWWA C-110 or AWWA C-153

   -Sizes larger than 24 inch: AWWA C-110.

   -Lining and Coating:

      Interior surfaces or all iron potable/reclaimed water pipe fittings shall be lined with cement- mortar and seal coated as required by AWWA C104. Interior surfaces of all iron wastewater and force main fittings shall be coated with a non-corrosive lining material acceptable to Owner. Fitting exteriors shall be coated as required by the applicable pipe specification.

2. Joint Materials

   Gaskets for mechanical joints shall conform to ANSI/AWWA A21.11/C-111.

   Joining of slip joint iron pipe shall, without exception, be accomplished with the natural or synthetic rubber gaskets of the manufacturer of that particular pipe being used. A joint lubricant shall be used and applicable recommendations of the manufacturer shall be followed.

   Gaskets for flanged joints shall be continuous full face gaskets, of ⅛ inch minimum thickness of natural or synthetic rubber, cloth-reinforced rubber or neoprene material, of deformed cross section design and shall meet all applicable requirements of ANSI/AWWA A21.11/C-111 for gaskets. They shall be manufactured by, or satisfy all recommendations of, the manufacturer of the pipe/fittings being used and be fabricated for use with Class 125 ANSI B16.1 flanges.

Tee-head bolts, nuts and washers for mechanical joints shall be high strength, low alloy, corrosion resistant steel stock equal to "COR-TEN A" having UNC Class 2 rolled threads or alloyed ductile iron conforming to ASTM A 536; either shall be fabricated in accordance with ANSI/AWWA A21.11/C-111.

Hex head bolts and nuts shall satisfy the chemical and mechanical requirements of ASTM A449 SAE Grade 5 plain, and shall be fabricated in accordance with ASTM B 18.2 with UNC Class 2 rolled threads.

Either Tee-Head or Hex-Head bolts, nuts and washers as required, shall be protected with bonded fluoro-polymer corrosion resistant coating where specifically required by the E/A.

All threaded fasteners shall be marked with a readily visible symbol cast, forged or stamped on each nut and bolt, which will identify the fastener material and grade. The producer and the supplier shall provide adequate literature to facilitate such identification; painted markings are not acceptable.

3. Polyethylene Film Wrap

~~All iron pipe, fittings and accessories shall be wrapped with standard 8 mil (minimum) low density polyethylene film or 4 mil (minimum) cross laminated high-density polyethylene conforming to AWWA C-105~~ ***All metallic pipe, fittings and accessories shall be wrapped in polyethylene encasement per SPL WW-27D***, with all edges overlapped and taped securely with duct tape to provide a continuous wrap to prevent contact between the piping and the surrounding backfill. Repair all punctures of the polyethylene, including those caused in the placement of bedding aggregates, with duct tape to restore the continuous protective wrap before backfilling. Polyethylene film wrap for reclaimed water pipe shall be purple.

~~(e) Reserved~~

~~(f) Polyethylene (PE) Pressure Pipe, Fittings, and Tubing~~

~~1. General~~

~~PE pressure pipe, fittings and tubing shall be Designation PE4710 and shall meet or exceed a cell classification of 445574 per ASTM D3350.~~

~~2. Pipe~~

~~PE pipe (4-inch and larger) used for pressure applications shall conform to the material requirements specified in AWWA C906. PE pipe shall be ductile iron pipe size (DIPS) outside diameter and minimum Pressure Class 200 (DR 11). Pipe manufacturers shall be listed on SPL WW-706.~~

~~3. Fittings~~

~~PE fittings (4-inch and larger) used for pressure applications shall conform to the material requirements specified in AWWA C906. PE fittings shall be ductile iron pipe size (DIPS) outside diameter and minimum Pressure Class 200 (DR 11, or Equivalent Dimension Ratio (EDR) 11 for fabricated fittings). Fitting manufacturers shall be listed on SPL WW-706A, WW-706B or WW-706C.~~

~~4. Tubing~~

~~PE tubing (3-inch and smaller) shall conform to material requirements specified in AWWA C901 and meet the requirements of ASTM D2737. PE tubing shall be copper tubing size (CTS) outside diameter and minimum Pressure Class 250 (DR 9). Tubing manufacturers shall be listed on SPL WW-65, WW-65A, or WW-65C.~~

(e) Polyethylene (HDPE) Pressure Pipe and Fittings, 4-Inch and Larger

Refer to ITEM NO. 513 – Polyethylene (HDPE) Pipe and Fittings, AWWA C906, 4-Inch and Larger. HDPE Pipe and Fittings manufacturers shall be listed on SPL WW-706, WW-706A, WW-706B, or WW-706C.

(f) Polyethylene (HDPE) Service Tubing

HDPE tubing shall conform to material requirements specified in AWWA C901 and meet the requirements of ASTM D2737. HDPE tubing shall be copper tubing size (CTS) outside diameter and minimum Pressure Class 250 (DR 9). Tubing manufacturers shall be listed on SPL WW-65, WW-65A, or WW-65C.

(g) Copper ***Service*** Tubing

All copper service tubing shall be annealed seamless Type K water tube meeting ASTM B88 and rated at 150 psi working pressure. The tubing shall be homogenous throughout and free from cracks, holes, crimping, foreign inclusions or other defects. It shall be uniform in density and other physical properties. Copper tubing for reclaimed water shall be wrapped in purple polyethylene film wrap. Pipe manufacturers shall be listed on SPL WW-613.

(h) Service Connection Fittings

All fittings used in customer service connection - tapping mains, connecting meters, etc. - must be currently listed on the applicable AW (SPL WW-68), or called for in the COA Standards (520 - series).

(i) Brass Goods

All brass valves, couplings, bends, connections, nipples and miscellaneous brass pipe fittings and accessories used in meter connections, service lines, air release piping assemblies, and wherever needed in the water distribution system, shall conform to the COA Standards, AW SPL, and AWWA C-800, except as herein modified or supplemented.

Unless otherwise noted, the goods described herein shall be fabricated of standard Red Brass (Waterworks Brass) meeting ASTM B62 or B584, alloy 83600, consisting of 85 percent copper and 5 percent each of tin, lead and zinc.

Exposed threads shall be covered with plastic caps or sheeting to protect the threads.

Brass goods of each type and class shall be compatible with other fittings in common usage for similar purposes. Where not otherwise indicated, all such materials shall meet the following requirements:

Inlet threads of corporation valves shall be AWWA iron pipe (IP) thread (male); outlets of service saddles shall be tapped with AWWA IP thread (female). AWWA IP threads shall conform to ANSI/ASME B1.20.1 as required by AWWA C800 for "General Purpose (Inch) Pipe Threads". For ¾" and 1" sizes only, corporation valve inlet threads, and the internal threads of saddles may be the AWWA taper thread conforming to AWWA C800 Figure 1 and Table 6. External threads of corporation valve inlet must be compatible with internal threads of the service saddle.

Connections of all new tubing, and of tubing repairs wherever possible, shall be by compression fittings. Compression connections shall be designed to provide a seal and to retain the tubing, without slippage, at a working water pressure of 150 psig.

Flanges shall conform to ANSI B16.1, Class 125, as to dimensions, drillings, etc. Copper tubing, when used, shall be Type K tubing having dimensions and weights given in Table A.1 of AWWA C800.

Brass pipe shall conform to the weights and dimensions for Extra Strong pipe given in Table A.2 of AWWA C800.

All fittings shall be suitable for use at hydrostatic working pressures up to 150 psig (hydrostatic testing of installed systems is at 200 psig).

(j) ~~Reserved~~ ***Inductive Tracer Detection Tape***

Inductive Tracer Detection Tape shall be placed directly above the centerline of all non-metallic water, reclaimed water, and wastewater pipe (PVC and HDPE) a minimum of 12 inches and no deeper than 36 inches below subgrade or, in areas outside the limits of pavement, a minimum of 18 inches and no deeper than 36 inches below finished grade. The tracer tape shall be encased in a protective, inert, plastic jacket and color coded according to American Public Works Association Uniform Color Code. Except for minimum depth of cover, the tracer tape shall be placed according to manufacturer's recommendations. Manufacturers must be listed on SPL WW-597.

(k) Polyvinyl Chloride Potable/Reclaimed Water Pipe

1. General

   All polyvinyl chloride (PVC) potable/reclaimed water pipe shall be of the rigid (UNPLASTICIZED) type and must bear the National Sanitation Foundation seal of approval for potable water pipe. Each joint of pipe shall consist of single continuous extrusion; bells or other components attached by solvent welding are not acceptable. Pipe shall be pressure rated at 200 psi (SDR-14).

   Pipe shall have push-on, rubber gasket joints of the bell and spigot type with thickened integral bells with rubber gasket joints. The wall thickness of each pipe bell and joint coupling must be greater than the standard pipe barrel thickness. Clearance must be provided in every gasket joint for both lateral pipe deflection and for linear expansion and contraction. Concrete support cradles or blocking shall be required for support of all fire hydrants, valves and AWWA C110 fittings; such support shall be provided for AWWA C153 fittings when required by the E/A.

   Pipe with a whitened exterior (fading of color) that was manufactured more than two (2) years before the proposed installation date shall be rejected.

2. Applicable Specifications

   Except as modified or supplemented herein, PVC pipe shall meet the following standards:

   AWWA C-900, or SDR 14 for PVC Pressure Pipe, in 4, 6, 8 and 12 inch nominal sizes, having Cast Iron Pipe size outside diameters.

   Fittings used with PVC Pressure pipe shall be AWWA C-110 or AWWA C-153 compact ductile iron fittings.

   All pipe 4 inches and larger must be approved Underwriter's Laboratories for use in buried water supply and fire protection systems.

3. Material Requirements

   All pipe and fittings shall be made from clean, virgin, NSF certified, Class 12454 PVC. Clean reworked materials generated from the manufacturers own production may be used within the current limits of the referenced AWWA C-900.

4. Marking

   PVC for reclaimed piping shall be purple or wrapped in purple polyethylene film wrap.

   Permanent marking on each joint of pipe shall include the following at intervals of not more than 5 feet:

Nominal pipe size and OD base (e.g., 4 CIPS).

Type of plastic material (e.g., PVC 12454).

Standard Dimension Ratio and the pressure rating in psi for water at 73 F (e.g., SDR 18, 150 psi).

AWWA designation with which the pipe complies (e.g., AWWA C-900).

Manufacturer's name or code and the National Sanitation Foundation (NSF) mark.

~~5. Tracer Tape~~

~~Inductive Tracer Detection Tape shall be placed directly above the centerline of all non-metallic pipe a minimum of 12 inches below subgrade or, in areas outside the limits of pavement, a minimum of 18 inches below finished grade. The tracer tape shall be encased in a protective, inert, plastic jacket and color coded according to American Public Works Association Uniform Color Code. Except for minimum depth of cover, the tracer tape shall be placed according to manufacturer's recommendations. Manufacturers must be listed on SPL WW-597.~~

(l) Polyvinyl Chloride (PVC) Pipe (Nonpressure) and Fittings

1. General

PVC sewer and wastewater pipe and fittings 6 through 15 inch diameter shall conform to ASTM D 3034. Pipe shall have minimum cell classification of 12364 or 12454. Fittings shall have cell classification of 12454 or 13343. Pipe stiffness shall be at least 115 psi as determined by ASTM D 2412. Pipe manufacturers shall be on SPL WW-227, and fitting manufacturers shall be on SPL WW-227B.

PVC sewer and wastewater pipe and fittings 18 through 27 inch diameter shall conform to ASTM F 679. Pipe shall have minimum cell classification of 12364 or 12454. Pipe stiffness shall be at least 72 psi as determined by ASTM D 2412. Pipe manufacturers shall be on SPL WW-227A, and fitting manufacturers shall be on SPL WW-227B.

Pipe with a whitened exterior (fading of color) that was manufactured more than two (2) years before the proposed installation date shall be rejected.

2. Joints

PVC pipe and fitting shall have elastomeric gasket joints conforming to ASTM D 3212. Gaskets shall conform to ASTM F 477.

3. Pipe Markings

Pipe meeting ASTM D 3034 shall have permanent marking on the pipe that includes the following at intervals of not more than 5 feet:

Manufacturer's name and/or trademark and code.

Nominal pipe size.

PVC cell classification per ASTM D 1784.

The legend "SDR-_ _ PVC Sewer Pipe" (SDR 26, 23.5. or less is required)

The designation "ASTM D 3034"

Pipe meeting ASTM F 679 shall have permanent marking that includes the following at intervals of not more than 5 feet:

Manufacturer's name or trademark and code

Nominal pipe size

PVC cell classification per ASTM D 1784

Pipe stiffness designation "PS _ _ PVC Sewer Pipe" (PS of at least 72 is required

The designation "ASTM F 679"

4. Fitting Markings

Fittings meeting ASTM D 3034 shall have permanent marking that includes the following:

Manufacturer's name or trademark

Nominal size

The material designation "PVC"

The designation, "ASTM F 679"

Fittings meeting ASTM F 679 shall have permanent marking that includes the following:

Manufacturer's name or trademark and code

Nominal size

The material designation "PVC"

The designation "ASTM F 679"

~~5. Tracer Tape~~

~~Inductive Tracer Detection Tape shall be placed directly above the centerline of all non-metallic pipe a minimum of 12 inches below subgrade or, in areas outside the limits of pavement, a minimum of 18 inches below finished grade. The tracer tape shall be encased in a protective, inert, plastic jacket and color coded according to American Public Works Association Uniform Color Code. Except for minimum depth of cover, the tracer tape shall be placed according to manufacturer's recommendations. Manufacturers must be listed on SPL WW-597.~~

510.3 Construction Methods

(25) Backfilling

(a) General

Special emphasis is placed upon the need to obtain uniform density throughout the backfill material. The maximum lift of backfill shall be determined by the compaction equipment selected and in no case shall it exceed 18 inches, loose measurement.

No heavy equipment, which might damage pipe, will be allowed over the pipe until sufficient cover has been placed and compacted. All internal pipe bracing installed or recommended by the manufacturer shall be kept in place until the pipe bedding and trench backfill have been completed over the braced pipe section. Testing of the completed backfill in streets and under and around structures shall meet the specified density requirements. Initial testing shall not be at Contractor's expense and shall conform to the "General Conditions."

(b) General Corrugated Metal Pipe

After the corrugated metal pipe structure has been completely assembled on the proper line and grade and headwalls constructed where indicated; selected material free from rocks over 8 inches in size from excavation or borrow, as approved by the E/A, shall be placed along both sides of the completed structures equally, in uniform layers not exceeding 6 inches in depth

(loose measurement), sprinkled if required and thoroughly compacted between adjacent structures and between the structures and the sides of the trench.

Backfill material shall be compacted to the same density requirements as indicated for the adjoining sections of embankment in accordance with the governing specifications thereof. Above the ¾ point of the structure, the fill shall be placed uniformly on each side of the pipe in layers not to exceed 12 inches, loose measure.

Prior to adding each new layer of loose backfill material, until a minimum of 12 inches of cover is obtained over the crown of the pipe, an inspection will be made of the inside periphery of the corrugated metal structure to determine if any floating, local or unequal deformation has occurred as a result of improper construction methods.

(c) Backfill Materials

The Engineer or designated representative may approve any of the following well graded materials as backfill:

1. Select trench material.
2. Sand.
3. Crushed rock cuttings.
4. Rock cuttings.
5. Foundation Rock.
6. Blasted material with fines and rock.
7. Cement stabilized material.
8. Borrow.

Within the 100-year flood plain, sand will not be permitted for backfilling. The Engineer or designated representative will approve the topsoil for areas to be seeded or sodded.

(d) Backfill in Street Right-of-Way

Placement of backfill under existing or future pavement structures and within 2 feet of any structures shall be compacted to the specified density using any method, type and size of equipment, which will produce the specified compaction without damaging the pipe or bedding. Placement of backfill greater than 2 feet beyond structures in right-of-way shall conform to (g) below. ***Inductive Tracer Detection Tape shall be placed directly above the centerline of all non-metallic water, reclaimed water, and wastewater pipe (PVC and HDPE) per 510.2(8)(j).***

The thickness of lifts, prior to compaction, shall depend upon the type of sprinkling and compacting equipment used and the test results thereby obtained. Prior to and in conjunction with the compaction operation, each lift shall be brought to the moisture content necessary to obtain the specified density and shall be placed in a uniform thickness to ensure uniform compaction over the entire lift. Testing for density shall be in accordance with Test Method Tex-114-E and Test Method Tex-115-E.

It is highly desirable that the backfill lifts be placed in a flat (or level) configuration; however when approved by the Engineer or designated representative, the backfill lifts may be placed at gradients (percent of vertical rise or fall to horizontal run) that do not exceed 30%.

The proposed gradient for each lift or series of lifts shall be established based on the capabilities of the equipment proposed to attain the required compaction.

Each lift of backfill must provide the density as specified herein. Swelling soils (soils with a minimum Liquid Limit of 50, more than 50% passing a #200 sieve and a plasticity index greater than 22) shall be sprinkled as required to provide not less than optimum moisture nor more than 2 percent over optimum moisture content and compacted to the extent necessary to provide not less than 95 percent nor more than 102 percent of the density as determined in accordance with Test Method Tex-114-E. Non-swelling soils shall be sprinkled as specified and compacted to the extent necessary to provide not less than 95 percent of the density as determined in accordance with Test Method Tex-114-E.

After each lift of backfill is complete, tests may be made by the Engineer or designated representative. If the material fails to meet the density indicated, the course shall be reworked as necessary to obtain the indicated compaction and the compaction method shall be altered on subsequent Work to obtain indicated density.

At any time, the Engineer or designated representative may order proof rolling to test the uniformity of compaction of the backfill lifts. All irregularities, depressions, weak or soft spots that develop shall be corrected immediately by the Contractor.

If the backfill, due to any reason, loses the specified stability, density or finish before the pavement structure is placed, it shall be recompacted and refinished at the sole expense of the Contractor. Excessive loss of moisture in the subgrade shall be prevented by sprinkling, sealing or covering with a subsequent backfill layer or granular material. Excessive loss of moisture shall be construed to exist when the subgrade soil moisture content is more than 4 percent below the optimum of compaction ratio density. Backfill shall be placed from the top of the bedding material to the existing grade, base course, subgrade or as specified. The remainder of the street backfill shall either be Flexible Base, Concrete or Hot Mix Asphalt Concrete as specified on the drawings or replacement "in kind" to the surface of the materials originally removed for placement of the pipe.

(e) Backfill in County Street or State Highway Right-of-Way

All Work within the right-of-way shall meet the requirements of (d) above, as a minimum and shall meet the requirements of the permit issued by the County when their requirements are more stringent. Prior to the start of construction, the Contractor shall be responsible for contacting the appropriate TxDOT office or County Commissioner's Precinct Office and following the operating procedures in effect for utility cut permits and pavement repair under their jurisdiction. Approval for all completed Work in the State or County right-of-way shall be obtained from the appropriate Official prior to final payment by the Owner.

(f) Backfill in Railroad Right-of-Way

All Work within the railroad right-of-way shall meet the requirements of (d) above, as a minimum and shall meet the requirements of the permit issued by the Railroad Owner when their requirements are more stringent. Approval for all completed Work in the railroad right-of-way shall be obtained from the Railroad prior to Final Completion.

(g) Backfill in Easements

Where not otherwise indicated, Contractor may select whatever methods and procedures may be necessary to restore entire Work area to a safe, useful and geologically stable condition with a minimum density of 85 percent or a density superior to that prior to construction.

In and near flood plain of all streams and watercourses, under or adjacent to utilities, structures, etc. all backfill shall be compacted to a density of not less than 95 percent conforming to TxDOT Test Method Tex-114-E, unless otherwise directed by E/A.

All soil areas disturbed by construction shall be covered with top soil and seeded conforming to Item No. 604, "Seeding for Erosion Control". All turf, drainways and drainage structures shall be constructed or replaced to their original condition or better. No debris shall remain in the drainways or drainage structures.

Inductive Tracer Detection Tape shall be placed directly above the centerline of all non-metallic water, reclaimed water, and wastewater pipe (PVC and HDPE) per 510.2(8)(j).

(h) Temporary Trench Repair/Surfacing

If details of temporary trench repair/surfacing are not provided in the contract documents, the Contractor shall submit for approval of the E/A (1) a plan for temporary trench repair for areas that will be open to traffic but will be excavated later for full depth repair, and (2) a proposed method for covering trenches to maintain access to properties. The temporary surfacing shall afford a smooth riding surface and shall be maintained by the Contractor the entire time the temporary surface is in place.

(i) Permanent Trench Repair

The Contractor shall install permanent trench repairs conforming to details in the drawings.

(31) ~~Valve Turn Walk-though~~ ***AW Walk-Through***

As part of the acceptance of Water or Reclaimed Water pressure pipe, an AW ~~Valve~~ Walk-~~through~~ ***Through*** will be performed after an initial inspection by the Owner's Representative to identify any deficient items. ***As part of the AW Walk-Through, AW will confirm the installation of inductive tracer detection tape for projects that contain PVC or HDPE.*** If deficient items are present during the AW ~~Valve~~ Walk-Through and the project fails acceptance, a re-inspection fee will apply and must be paid before a re-inspection is scheduled to confirm correction of deficient items. See AW Fee Schedule for the current Distribution Walk-Through Re-inspection Fee.

ITEM NO. 513
POLYETHYLENE (HDPE) PIPE AND FITTINGS
AWWA C906, 4-INCH AND LARGER
06-02-25

513.1 – Description

This specification governs the furnishing and installation of 4-inch and larger high-density polyethylene (HDPE, AWWA C906) pressure pipe and fittings for potable, reclaimed, and wastewater force main applications. See Item No. 510 for 2-inch HDPE (AWWA C901) service tubing. The Materials and Construction Methods, including acceptance testing, shall conform to the Drawings, applicable Standards and Specifications herein with the intention of providing a leak-free, self-restraining pipe system. For any item not covered in this Specification, the applicable requirements of Item No. 510 (Pipe) shall govern.

513.2 – Submittals

The Contractor shall submit descriptive information and evidence that the materials the Contractor proposes for incorporation in the Work are of the kind and quality that satisfy the requirements in the Contract Documents. Austin Water (AW) shall be included in all submittal reviews. The AW Standard Products Lists (SPLs) are considered a part of the Specifications for the Work. The Contractor shall use products from the SPLs for all water and wastewater construction unless alternative products are shown on the Drawings; called for in the specifications; or specified in the Bidding Requirements, Contract Forms and Conditions of the Contract.

The products included in the SPLs current at the time of plan approval shall govern unless a specific product or products on the lists have subsequently been removed from those SPLs because of quality or performance issues. Products and materials that are not covered by the SPLs shall meet the requirements in the contract documents.

Submittals for the products and materials covered by this specification shall include manufacturer catalog sheets, technical data sheets, shop drawings, product or material test results, requirements listed below, and any other information needed to adequately describe the product or material. For products covered by SPLs, the submittal shall include a copy of the applicable SPL with the proposed product identified. An SPL by itself is not considered an adequate submittal.

The submittal requirements of this specification item include:

A. PIPE AND FITTINGS
    1. HDPE Pipe
    2. HDPE Fittings – Molded
    3. HDPE Fittings – Fabricated
    4. HDPE Fittings – Electrofusion
B. PIPE BEDDING
C. TRACER TAPE
D. TRENCH BACKFILL
    1. Material
    2. Placement, compaction, and quality control means and methods.
E. MANUFACTURER'S RECOMMENDED FUSION PROCEDURES

F. FUSION TECHNICIAN CERTIFICATIONS

G. ACCEPTANCE TEST MEANS AND METHODS FOR THE COMPLETED PIPE INSTALLATION INCLUDING:

1. Hydrostatic pressure testing procedures
2. Disinfection procedures

H. EVIDENCE OF CURRENT DATA LOGGER CALIBRATION

513.3 – Materials

A. PIPE

1. HDPE pipe shall comply with SPL WW-706.
2. All pipe shall be examined before installation and no pipe shall be installed which is found to be defective. HDPE pipe that has scratches, notches, cuts, or any other abrasions that exceed 10% of the pipe wall thickness shall be replaced at the Contractor's expense.
3. DI pipe, when called for in the Drawings, shall comply with Standard Specification Item No. 510, and SPLs WW-27 and/or WW-27E. DI pipe for wastewater shall be lined with approved corrosion resistant material per SPL WW-534.

B. FITTINGS

1. All molded and fabricated HDPE fittings that will be installed by butt fusion shall have butt end outlets matching the dimension ratio (DR) and pressure rating of the HDPE pipe to which it is connected.
2. All fittings shall be examined before installation and no fittings shall be installed which are found to be defective.
3. Molded HDPE fittings shall be from manufacturers listed on SPL WW-706A. Metal glands and associated hardware used with molded MJ or Flange Adapters shall also comply with WW-706A.
4. Fabricated HDPE fittings shall be from manufacturers listed on SPL WW-706B. Field fabrication of HDPE fittings and field beveling of HDPE fitting ends is prohibited. Metal glands and associated hardware used with fabricated MJ or Flange Adapters shall also comply with WW-706B.
5. Electrofusion HDPE fittings shall be from manufacturers listed on SPL WW-706C.
6. DI fittings, when called for in the Drawings, shall be from manufacturers listed on SPLs WW-27B and/or WW-27C. DI fittings for wastewater shall be lined with approved corrosion resistant material per SPL WW-534.
7. Service connections shall be made as shown in Drawings. Service connection branch saddles installed by electrofusion shall comply with SPL WW-706C. Strap on mechanical service saddles shall be approved for use with HDPE pipe and shall comply with SPL WW-264. Service saddles that require spring washers are not allowed for use with HDPE pipe.

C. BEDDING AND BACKFILL

Bedding materials shall consist of one of the following, in conformance with the requirements of Standard Specification Item No. 510: Natural or Manufactured Sand; Pea Gravel; Uncrushed Gravel; Crushed Gravel; Crushed Stone; Stone Screenings. The particle size of bedding material in contact with the pipe shall not exceed the following: 0.5-inch size for 4-inch pipe; 0.75-inch size for 6 or 8-inch pipe; 1-inch size for 10-inch and larger pipe. Backfill material shall comply with the requirements defined by the Drawings or Item No. 510.

D. TRACER TAPE

Tracer tape shall be from manufacturers listed on SPL WW-597.

513.4 – Equipment

A. DATA LOGGER

A data logger shall be used to record and document all butt fusion joint connections. The data logger must be compatible and outfitted with an electronic data recording device. A digital report or printout for all fusion joints made that complies with, but is not limited to, ASTM F3124 must be delivered to the Owner upon request and at the completion of the project. All hydraulic fusion must be recorded and able to produce a graphic representation of the time and pressure data. Every manual fusion must be recorded with, but not limited to: Fusion Tech Name and ID; Joint ID; Pipe Diameter and DR; and Heater Plate Temperature. The recording unit shall be a DataLogger 6 or newer model as manufactured by McElroy Manufacturing, Inc, or approved equivalent. The DataLogger shall be calibrated prior to beginning each project.

513.5 – Construction Methods

A. FUSION JOINTS

1. Butt Fusion: PE pipe, molded fittings, and fabricated fittings shall be joined using the butt fusion method in accordance with ASTM F2620. Technicians performing butt fusion shall be qualified in accordance with ASTM F3190.

2. Electrofusion: Electrofusion fittings shall be joined in accordance with ASTM F1290 and manufacturer's recommended procedures. Technicians performing electrofusion shall be qualified in accordance with ASTM F1290.

3. Technician Certification: Technicians performing fusion procedures shall provide proof of certification for Butt Fusion or Electrofusion to Owner or Engineer upon request. Qualification shall have occurred not more than 12 months before fusing joints on the Project and shall be a documented demonstration of proficiency by making joints in accordance with ASTM F3190 for butt fusion joints or ASTM F1290 for electrofusion joints.

B. MECHANICAL OR FLANGED JOINT CONNECTIONS

1. Mechanical connections of PE pipe to ductile iron fittings or valves shall use HDPE mechanical joint (MJ) adapters or flange adapters. MJ or flange adapter connections shall be assembled, installed and tightened in accordance with the manufacturer's instructions and shall be in compliance with SPL WW-706A. Stainless steel insert stiffeners are not required for MJ connections. Note that an HDPE flange adapter acts as both a flange and a gasket and as such, no 'gasket' is required. MJ wedge action joint restraint devices shall not be used on HDPE pipe without written approval by the Owner. If allowed, the device shall be designed specifically for use on HDPE pipe and shall be assembled, installed, and tightened in accordance with the manufacturer's instructions, and a stainless-steel insert stiffener shall be used.

2. GASKETED, PUSH-ON FITTINGS
   Gasketed push-on fittings are prohibited.

3. EXPANSION AND FLEXIBLE COUPLINGS
   Expansion-type mechanical couplings are prohibited.

4. CONNECTION HARDWARE
   Connection hardware shall comply with SPL WW-706A.

C. INSTALLATION

1. The HDPE pipe and fittings shall be installed such that HDPE pipe curvature is not less than the minimum bending radius allowed by the pipe manufacturer. Sections of curved HDPE pipe shall not be tapped or contain an MJ or flanged fitting or valve unless approved in the Drawings.

2. Direct burial installation of HDPE pressure pipe shall be in accordance with the pipe manufacturer's recommendations, and the following:

   a) Pipe shall be installed in a continuous bedding envelope of the type shown on the drawings or as described herein. The envelope (comprised of the bedding, haunch zone, and initial backfill) shall extend the full trench width, to a depth of at least 6-inch below the pipe and to a depth at least 12-inch above the pipe. The envelope shall be placed in lifts not exceeding 8 inches loose thickness and compacted thoroughly, by hand or mechanical equipment, to provide uniform support for the pipe barrel and to fill all voids around the pipe.

      i. The bedding is the soil placed in the trench bottom and serves as a cushion under the HDPE pipe. The bedding shall have a minimum thickness of 6-inch as described above and be uncompacted.

      ii. The haunch zone is between the pipe bottom and spring-line. Care shall be taken to ensure soil is adequately and evenly placed and compacted within the haunch zone to eliminate any empty voids or pockets. This can be done by shovel slicing the soil into the haunch zone.

      iii. The initial backfill is then placed between the spring-line and 12-inch above the pipe. The initial backfill shall be lightly and evenly compacted except directly over the top of the pipe.

   b) Final backfill shall comply with applicable sections of Item No. 510.3(25), Backfilling.

3. Cuts or gouges on an HDPE pipe wall that exceed 10% of wall thickness must be removed by cutting the damaged section of pipe string and butt fusing the ends.

4. HDPE fittings shall be used unless otherwise shown in the Drawings.

5. When butt fusion is not possible between two HDPE pipe ends, the pipe ends shall be connected by electrofusion coupling per SPL WW-706C.

6. Detectable Tracer Tape shall be installed directly above the centerline of all HDPE pipe a minimum of 12-inch below subgrade under pavement, or 18-inch below final grade outside of pavement, and maximum of 36-inch below grade.

7. Buried metallic, non-HDPE components shall be wrapped in 8-mil polyethylene encasement (per SPL WW-27D), including but not limited to, DI fittings, DI glands used with HDPE MJ and Flange adapters, valves, etc. Polyethylene encasement shall be black for potable, purple for reclaimed and brown for wastewater.

D. CONCRETE IN-LINE ANCHORS

1. Concrete In-Line Anchors (Anchors) shall be installed at locations shown in the Drawings. Anchors are used within 10 feet of where a HDPE pipe terminates at the following locations:

   a) Connection to unrestrained PVC, DI or CI pipe

   b) Wastewater lift station

2. Approximate locations for non-HDPE piping systems are shown on the Drawings or detailed in the Specifications. Prior to making connections into existing piping systems, the Contractor shall verify the actual field location, size, piping material and service of non-HDPE piping systems and obtain all required pipe and fittings to accommodate the connection as shown in the Drawings.

3. Where HDPE pipe connects in-line to unrestrained gasketed push-on piping, the end of the HDPE pipe shall be anchored in-line within 10 feet of the connection to restrict longitudinal movement of the HDPE pipe. Anchors shall be installed in accordance with applicable details using electrofusion Flex Restraints per SPL WW-706C.

E. HYDROSTATIC PRESSURE TESTING

1. General

   a) After the HDPE pipe has been installed and backfilled (including HDPE fittings, DI fittings, valves, and attached appurtenances), hydrostatic testing of the buried HDPE pipeline shall be conducted to discover material defects or substandard work. All service laterals, air release assemblies, fire hydrants, drain assemblies and other appurtenances shall be included in the test.

   b) The section of the piping system to be tested shall be isolated from other parts of the system and restrained against movement to prevent catastrophic failure. Components that are not to be subjected to test pressure or could be damaged by test pressure are isolated or removed as necessary. Isolated components are vented to atmosphere. The test section is filled with water, raised to the test pressure, and allowed to stabilize. The system is inspected or monitored for leakage, and then test pressure is relieved. If repairs or corrections are necessary, they are performed only when the test section is depressurized. If necessary, a retest is performed after a relaxation period. Purging and disposal of water from the test section may be necessary.

   c) Required Test Pressure – The test pressure for acceptance shall be 200 psi for DR11 HDPE pipe, or 250 psi for DR9 pipe when DR9 pipe is required for use to accommodate high system operating and/or surge pressures. When DR9 is required for trenchless installations such as Horizontal Directional Drilling (HDD) or Pipe Bursting, the Required Test Pressure shall be 200 psi for that segment. The test pressure shall not exceed the pressure rating of the lowest pressure-rated component in the test section.

   d) Expansion Allowance – When test pressure is applied, polyethylene pipe will expand slightly. To compensate for expansion, make-up water is added during the initial expansion phase. The amount of make-up water (expansion allowance) will vary because expansion is not linear. This procedure compensates for expansion with an initial expansion phase, followed by a test phase.

   e) Leakage Allowance – There is no leakage allowance for a section of heat-fusion joined polyethylene piping, because properly made heat fusion joints do not leak.

   f) Joint leakage and any defective materials and/or workmanship shall be repaired or replaced by the Contractor at no additional cost to the City.

2. Hydrostatic Test Procedure

   After the HDPE pipe has been installed and backfilled and all appurtenances installed and connected, a hydrostatic test will be conducted by City Forces. The City will furnish the pump and gauges for the tests. The Contractor shall be present and shall furnish all necessary assistance for conducting the test. The Required Test Pressure will be based on the elevation of the lowest point of the line or section under test.

   The entire project or each valved section shall be tested at the Required Test Pressure to discover defective materials or substandard work. The Contractor assumes all risks associated with testing against valves. Repairs shall be made by the Contractor to correct any defective

materials or substandard work. The Contractor shall pre-test new lines in accordance with E.2.a.(i-v) of this Section before requesting the acceptance test by City Forces.

1. Pre-Test Procedure

   (i) Fill the test section slowly. All air shall be purged from the pipe through permanently installed air vents located at all high points. Take all appropriate precautions to ensure that no air is trapped in the test section. To allow air to escape from the test section, flow velocities during filling should not exceed the capacities of air release devices or other openings used to release entrapped air. To avoid or limit transient pressure surges, the filling flow velocity should not exceed the design velocity of the piping system.

   (ii) TEMPERATURE EQUILIZATION - Allow the test section and the test liquid to equalize to a common temperature.

   (iii) INITIAL EXPANSION PHASE - When the test section is completely filled and purged of air, gradually increase pressure in the test section to the Required Test Pressure.

   (iv) Add make up water as necessary to maintain the Required Test Pressure. The Required Test Pressure should be maintained for a minimum of four hours to confirm the test section has stabilized.

   (v) After the test section has stabilized at the Required Test Pressure for at least four hours, the acceptance testing may be conducted. The Contractor shall maintain the Required Test Pressure until City Forces arrive on site to perform the acceptance test.

2. Acceptance Testing

   City Forces shall perform acceptance testing on the newly installed HDPE pipeline after the Contractor has completed the Pre-Test Procedure. The Contractor must be on site with the test section ready and pressurized to the Required Test Pressure upon the arrival of City Forces or acceptance testing will not be performed.

   (i) TEST PHASE - City Forces shall monitor the pressure in the test section for two hours or longer if the pressure has not stabilized at the end of two hours. Do not increase pressure or add make up water.

   (ii) PASS / FAIL CRITERIA - If no visual leakage is observed and pressure remains steady within +/- 3 psi of the Required Test Pressure during the Test Phase, a passing test is indicated. If testing or visual inspection discloses leakage, the Contractor, at the Contractor's expense, shall locate and correct all defects in the pipeline. Once corrected, the Contractor shall perform the Pre-Test Procedure and upon receipt of Retesting Fees the Inspector will submit a request to AW Valve Exercising to reschedule acceptance testing.

   (iii) SERVICE CHARGES FOR TESTING - Initial testing performed by City forces for the Contractor will be at the City's expense. Retesting, by City forces, of Contractor's work that fails initial testing will be at the Contractor's expense. The City's charge for retests will be a base fee plus an hourly rate published in the current AW Fee Schedule. The charges incurred by the City for retesting will be billed to the Contractor. The City will withhold acceptance of the Contractor's work until the Contractor has paid the City for the retesting costs.

F. DISINFECTION OF POTABLE WATER LINES

1. General

   a) Prior to performing any disinfection of potable water lines, the Contractor shall submit a Disinfection Plan (Plan) and obtain approval in accordance with Section 01300 (Submittals)

contained in the Standard Contract Documents. The Plan shall comply with AWWA C651 (Disinfecting Water Mains) and AWWA C655 (Field Dechlorination), latest editions, and shall be developed using the Continuous-Feed Method template located at: austintexas.gov/department/construction-standards.

b) Disinfection of HDPE pipe using the Tablet/Granule Method is prohibited.

c) The liquid disinfection chemical solution should be limited to less than 12% active chlorine.

d) The time-duration of the disinfection should not exceed 24 hours.

e) The Slug Method and Spray Method are also acceptable if better suited for disinfection. The initial plan shall be submitted for review a minimum of 60 calendar days prior to when the water main is scheduled to be placed into service, or at the preconstruction conference if the project requires that the waterline be placed in service in less than 60 days, as indicated in the Contractor's Construction Schedule.

f) If any appurtenances are required for injection, sampling, or flushing purposes that are not shown in the original plan/profile sheets, then the Contractor shall include the appurtenances in the project As-Built Drawings. The Contractor shall disinfect potable water lines only in accordance with an approved Plan.

2. Preventing Contamination

The Contractor shall protect all piping materials from contamination during storage, handling, and installation. Prior to disinfection, the pipeline interior shall be clean, dry, and unobstructed. All openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of the day's work.

3. Cleaning

Prior to disinfection the Contractor shall clean the pipeline to remove foreign matter. For pipelines 16 inches diameter or smaller, cleaning shall consist of flushing the pipeline. For pipelines greater than 16 inches in diameter, cleaning shall be performed by operating hydrants and blow-offs located at low points in the pipeline, or by mechanical means (sweeping or pigging.) Water for the Work shall be metered and furnished by the Contractor in accordance with Section 01500 of the Standard Contract Documents.

4. Procedure and Dosage

a) The Contractor, at its expense, will supply the test gauges and the 5% to 12% sodium hypochlorite solution conforming to ANSI/AWWA B300 and will submit for approval a written plan for the disinfection process. The Contractor, at its expense, shall provide all other equipment, supplies, and the necessary labor to perform the disinfection under the general supervision of the City.

b) One connection to the existing system will be allowed with a valve arranged to prevent the concentrated disinfecting solution from flowing back into the existing water supply piping. The valve shall be kept closed and locked in a valve box with the lid painted red. No other connection shall be made until the disinfection of the new line is complete and the water samples have met the established criteria. The valve shall always remain closed and locked-out except when filling or flushing the line and must be staffed during these operations. As an option, backflow prevention in the form of a reduced pressure backflow assembly may be provided if the valve is left unattended. The new pipeline shall be filled completely with disinfecting solution by feeding the concentrated 5% to 12% sodium hypochlorite solution and approved water from the existing system uniformly into the new piping in such proportions that every part of the line has a minimum concentration of 25 mg/liter available chlorine.

c) The disinfecting solution shall be retained in the piping for at least 16 hours and all valves, hydrants, services, stubs, etc. shall be operated to disinfect all their parts. After this retention period, the water shall contain no less than 10 mg/liter chlorine throughout the treated section of the pipeline.

d) For pipelines larger than 16-inch in diameter, the Contractor may use the AWWA C651 "Slug Method" for disinfecting the pipeline. Chlorine shall be fed at a constant rate and at a sufficient concentration at one end of the pipeline to develop a slug of chlorinated water having not less than 100 mg/liter of free chlorine. The Contractor shall move the slug through the main so that all interior surfaces are exposed to the slug for at least three hours. The chlorine concentration in the slug shall be measured as it moves through the pipeline. If the chlorine concentration drops below 50 mg/liter, the Contractor shall stop the slug and feed additional chlorine to the head of the slug to restore the chlorine concentration to at least 100 mg/liter before proceeding. As the slug flows past fittings and valves, related valves and hydrants shall be operated to disinfect appurtenances and pipe branches.

e) Unless otherwise indicated, all quantities specified herein refer to measurements required by the testing procedures included in the current edition of AWWA C651. The chlorine concentration at each step in the disinfection procedure shall be verified by chlorine residual determinations.

5. Final Flushing

a) The heavily chlorinated water shall then be carefully flushed from the potable water line by a dechlorination process until the chlorine concentration is no higher than the residual generally prevailing in the existing distribution system. This is necessary to ensure that there is no injury or damage to the public, the water system or the environment. The plans and preparations of the Contractor must be approved by the City before flushing of the line may begin. The Contractor will supply the dechlorination chemical conforming to ANSI/AWWA C655. Additionally, the flushing must be witnessed by an authorized representative of the City.

b) Approval for discharge of the diluted chlorine water or heavily chlorinated water into the wastewater system must be obtained from AW. The line flushing operations shall be regulated by the Contractor so as not to overload the wastewater system or cause damage to the odor feed systems at the lift stations. The City shall designate its own representative to oversee the work.

c) Daily notice of line discharging must be reported to the AW Dispatch office.

6. Bacteriological Testing

a) After disinfection and final flushing, samples shall be collected per one of the two options. Option A: Before approving a main for release, take an initial set of samples and then resample again after a minimum of 16 hours. Both sets of samples must pass for the main to be approved for release. Option B: Before approving a main for release, let it sit for a minimum of 16 hours without any water use. Then collect two sets of samples a minimum of 15 minutes apart while the sampling taps are left running. Both sets of samples must pass for the main to be approved for release. The two sets of water samples from the line will be tested for bacteriological quality by the City and must be found free of coliform organisms before the pipeline may be placed in service. Each set shall consist of one sample that is drawn from the end of the main, at least one from each branch greater than one pipe length, and additional samples that are collected at intervals of not more than 1,200 feet along the pipeline. All stubs shall be tested before connections are made to existing systems.

b) The Contractor, at its expense, shall install sufficient sampling taps at proper locations along the pipeline. Each sampling tap shall consist of a standard corporation cock installed in the line and extended with a copper tubing gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed and retained for future use.

c) Samples for bacteriological analysis will only be collected from suitable sampling taps in sterile bottles treated with sodium thiosulfate. Samples shall not be drawn from hoses or unregulated sources. The City, at its expense, will furnish the sterile sample bottles and may, at its discretion, collect the test samples with City personnel.

d) If the initial disinfection fails to produce acceptable sample test results, the disinfection procedure shall be repeated at the Contractor's expense. Before the piping may be placed in service, two consecutive sets of acceptable test results must be obtained.

e) An acceptable test sample is one in which: (1) the chlorine level is similar to the level of the existing distribution system; (2) there is no free chlorine and (3) total coliform organisms are absent. An invalid sample is one, which has excessive free chlorine, silt or non-coliform growth as defined in the current issue of the AWWA C-651. If unacceptable sample results are obtained for any pipe, the Contractor may, with the concurrence of the Inspector, for one time only flush the lines and then collect a second series of test samples for testing by the City. After this flushing sequence is completed, any pipe with one or more failed samples must be disinfected again in accordance with the approved disinfection procedure followed by appropriate sampling and testing of the water.

f) The COA Water Quality Laboratory will notify the assigned COA Inspector in writing of all test results. The Inspector will subsequently notify the Contractor of all test results. The Water Quality Laboratory will not release test results directly to the Contractor.

7. Cleanup and Restoration

a) It shall be the Contractor's responsibility to keep the construction site neat, clean and orderly at all times. Cleanup shall be vigorous and continuous to minimize traffic hazards or obstructions along the streets and to driveways. Trenching, backfill, pavement repair (as necessary), and cleanup shall be coordinated as directed by the City. The E/A will regulate the amount of open ditch and may halt additional trenching if cleanup is not adequate to allow for orderly traffic flow and access.

b) Materials at the site shall be stored in a neat and orderly manner so as not to obstruct pedestrian or vehicular traffic. All damaged material shall be removed from the construction site immediately and disposed of in a proper manner. All surplus excavated materials shall become the property of the Contractor for disposal at the Contractor's expense. After trenching, the Contractor shall immediately remove all excavated materials unsuitable for or in excess of, backfill requirements. Immediately following the pipe laying Work as it progresses, the Contractor shall backfill, grade and compact all excavations as provided elsewhere. The backfill placed at that time shall meet all compaction test requirements. The Contractor shall immediately clean up and remove all unused soil, waste and debris and restore all surfaces and improvements to a condition equal or superior to that before construction began and to an appearance which complements the surroundings. The Contractor shall grade and dress the top 6 inches of earth surfaces with soil or other material similar and equal to the surrounding, fill and smooth any visible tracks or ruts, replace and re-establish all damaged or disturbed turf or other vegetation and otherwise make every effort to encourage the return of the entire surface and all improvements to a pleasant appearance and useful condition appropriate and complementary to the surroundings and equal or similar to that before construction began.

c) Placement of the final lift of permanent pavement, if a pavement is required, shall begin immediately after all testing of each segment of piping is satisfactorily completed.

8. AW Walk-Through

As part of the acceptance of Water or Reclaimed Water pressure pipe, an AW Walk-Through will be performed after an initial inspection by the Owner's Representative to identify any deficient items. As part of the AW Walk-Through, AW will confirm the installation of inductive tracer detection tape for projects that contain PVC or HDPE. If deficient items are present during the AW Walk-Through and the project fails acceptance, a re-inspection fee will apply and must be paid before a re-inspection is scheduled to confirm correction of deficient items. See AW Fee Schedule for the current Distribution Walk-Through Re-inspection Fee

9. 2-inch Jumper Hose

During connections to the water distribution system, the Contractor may be required to install a temporary jumper hose between the unpressurized water segment and an adjacent pressurized water segment for the purpose of maintaining water service to customers who can't operate without water service during the connection. The jumper shall include an approved backflow preventer and be of adequate size and pressure rating to maintain service to the customer. It shall be polyethylene tubing meeting the requirements of COA SPL WW-65. The jumper hose and other components in the temporary service shall be disinfected, and bacteriological samples will be taken and pass before the temporary service is provided to the customer. Contractor shall provide adequate protection for the jumper hose in vehicular traffic areas at all times during use.

513.6 – Measurement

A. HDPE pressure piping will be measured by the linear foot for dimension ratios and diameters. Parallel lines shall be measured individually. Concrete In-Line Anchors, if required, will not be measured as such but shall be included in the unit price bid for constructing pipe. Non-HDPE pipe will be measured in accordance with Item No. 510.

B. Where a new HDPE pipe connects to an existing system, the length of the new pipe will be measured from the visible end of the existing system at the completed joint. Unless otherwise indicated, the length of new pipe will be measured along the pipe's horizontal centerline stationing through fittings, valves, or other appurtenances.

C. The Contractor shall be responsible for removing and treating ground water flowing into a trench up to a baseline flow rate of 350 gpm of sustained flow for each mainline open trench (no more than 300 linear feet open trench per work zone segment is allowed at one time). This baseline flow rate is not a prediction of ground water conditions to be expected on the project. Rather, it establishes contract terms regarding the quantity of ground water for which the contractor is responsible without extra or separate compensation. The flow rate must exceed 350 gpm continuously for at least 4 consecutive hours to be considered sustained flow. It is expected that trench dewatering for this baseline rate may be accomplished with a single 3-inch trash-type pump per open trench; however, measured flow rate, not pump size, type, or characteristics shall be used to determine if the baseline rate has been exceeded. Flow rate shall be determined by measurements made at the discharge point of the water treatment facilities. Surface storm water flowing into a trench shall be the Contractor's responsibility to remove and treat without compensation, regardless of inflow rate or volume.

D. Adjustment of elevations during construction resulting in changes in flow line elevations of plus or minus two feet or less will not be considered for credit or additional compensation, and no measurement for payment will be made.

E. Excavation and backfill, when included as pipe installation, will not be measured as such but shall be included in the unit price bid for constructing pipe and measured as pipe complete in place including excavation and backfill.

F. When pay items are provided for the other components of the system, measurement will be made as addressed hereunder.

513.7 – Payment

A. Payment for HDPE pipe will be made at the unit price bid per linear foot for the various sizes and DR of pipe, unless unstable material is encountered or trench excavation and backfill is bid as a separate item. Concrete In-Line Anchors, if required, will not be paid for separately but shall be included in the unit price bid for constructing pipe. Non-HDPE pipe will be paid in accordance with Item No. 510. DI pipe for wastewater shall be lined with approved corrosion resistant material per SPL WW-534.

B. No separate payment will be made for dewatering a trench with ground water inflow of less than the baseline rate of 350 gpm of sustained flow as described above. Dewatering of those trenches shall be included in the contract unit price of the Pipe pay item. Dewatering of bore pits shall be included in the contract unit price for Bore Entry Pit or Exit Pit regardless of inflow rate or volume unless specified otherwise in the bid item for Bore Entry Pit or Exit Pit.

C. Payment for pipe, measured as prescribed above, will be made at the unit price bid per linear foot *(redundant to A above)* complete-in-place as designed and represented in the Drawings and other Contract documents. Unless otherwise provided herein, as separate pay item(s), the bid price per linear foot of pipe shall include the following:

1. Clearing
2. Constructing any necessary embankment
3. Excavation
4. Disposal of surplus or unusable excavated material
5. Furnishing, hauling, and placing pipe
6. Field constructed joints, collars, anchors, temporary plugs, caps, or bulkheads
7. All necessary lugs, rods, or braces
8. Connections to existing systems or structures
9. Preparing, shaping, pumping for dewatering, and shoring of trenches
10. Bedding materials
11. Backfill materials
12. Hauling, placing, and preparing bedding materials
13. Particle migration measures
14. Hauling, moving, placing, and compacting backfill materials
15. Temporary and permanent pavement repairs and maintenance
16. Temporary removal and replacement of pavement, curb, drainage structures, driveways, sidewalks, and any other improvements damaged or removed during construction
17. Cleanup
18. All other incidentals necessary to complete the pipe installation as indicated. No separate payment will be made for thrust restraint measures or connections to existing pipe.

D. BORING OR JACKING
Boring or jacking will be paid under Item No. 501, "Jacking or Boring Pipe."

E. FITTINGS

1. HDPE fittings will be subsidiary to the pipe to which it is installed.

2. DI fittings will be paid for at the unit price bid per ton, complete in place, according to the schedule of weights in SPL WW-27B, and in accordance with Item No. 510. DI fittings for wastewater shall be lined with approved corrosion resistant material per SPL WW-534. No separate payment will be made for MJ Adapter connections to DI fittings.

F. EXCAVATION SAFETY SYSTEMS
Trench Safety Systems shall conform to and be paid under Item No. 509, "Excavation Safety Systems."

Payment, when included as a Contract pay item, will be made under one of the following:

Pay Item No. 513-AR___ Dia., DR___:	Pipe, ___ Dia., DR__ HDPE Type (all depths), including excavation and backfill	Per Linear Foot
Pay Item No. 513-AW___ Dia., DR___:	Pipe, ___ Dia., DR__ HDPE Type (all depths), including excavation and backfill	Per Linear Foot
Pay Item No. 513-AFM___ Dia., DR___:	Pipe, ___ Dia., DR__ HDPE Type (all depths), including excavation and backfill	Per Linear Foot

An "R" after the pay item indicates the use for reclaimed water.
A "W" after the pay item indicates the use for potable water.
An "FM" after the pay item indicates the use for wastewater force main.