

**DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA**

SPECIAL PROVISION

PROJECT NO: P.I. 4005001

Sun Valley Drive Improvement

Section 670—Water Distribution System

Delete Section 670 and substitute the following:

670.1 General Description

This work consists of furnishing materials, labor, tools, equipment, and other items necessary for installing, removing, abandoning, relocating, and adjusting water distribution systems according to the Plans and Specifications.

670.1.01 Definitions

- A. General Provisions 101 through 150
- B. Whenever the terms “City”, “County,” or [Fulton County] are used in this Special Provision and its related documents, it shall be understood to mean [Fulton County] its subsidiaries, successors and/or assigns, hereafter referred to as Utility Owner.
- C. The term “Project Manager” shall mean the authorized individual having the authority to give instructions pertaining to the work and to approve or reject the work. The “Project Manager” shall not however be authorized to revoke, alter, enlarge, relax, or release any requirements of the Contract, Plans, and Specifications, nor shall they act as an agent for the Contractor. All Contract items pertaining to the Utility Owner shall be coordinated with the Georgia Department of Transportation’s (GDOT) Project Manager and the Utility Owner.

670.1.02 Related References

A. Standard Specifications

[Section 104—Scope of Work](#)

[Section 107—Legal Regulations and Responsibility to the Public](#)

[Section 108—Prosecution and Progress](#)

[Section 205—Roadway Excavation](#)

[Section 207—Excavation and Backfill for Minor Structures](#)

[Section 210—Grading Complete](#)

[Section 400—Hot Mix Asphaltic Concrete Construction](#)

[Section 444—Sawed Joints in Existing Pavements](#)

[Section 500—Concrete Structures](#)

[Section 600—Controlled Low Strength Flowable Fill](#)

[Section 611—Relaying, Reconstructing or Adjusting to Grade of Miscellaneous Roadway Structures](#)

[Section 615—Jacking or Boring Pipe](#)

[Section 810—Roadway Materials](#)

B. Related Documents

1. General Provisions 101 through 150.
2. All products supplied and all work performed shall be in accordance with [Fulton County Technical Specification for Water Main Construction], applicable standards from American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), GDOT Utility Accommodation Policy and Standards, and the Georgia Environmental Protection Division (EPD) Minimum Standards for Public Water Systems. Latest revisions of all standards shall apply.

670.1.03 Submittals

- A.** General Provisions 101 through 150.
- B.** Refer to the [Fulton County Technical Specification for Water Main Construction], current published edition, for water utility submittal requirements. Copies of all submittals and documentation shall be submitted to GDOT, who shall distribute to the Utility Owner.
- C. Shop Drawings / Product Data**
 1. Submit [4] copies of the following submittals to the GDOT Project Manager:
 - a. Product data, including size, dimension, capacity, pressure rating, accessories, and special features, installation instructions, and operating characteristics for all proposed materials to show compliance with the requirements of this Special Provision.
 - b. Test reports specified in the Quality Acceptance section of this Special Provision.
 - c. Pipe manufacturer certification of compliance with specifications.
 - d. Operation and maintenance literature, warranties, and other specified information.
- D. Construction Record Documentation**
 1. The Contractor shall record on two sets of utility as-built drawings that will record changes and deviations from the Contract Drawings in sizes, lines or grade. Record also the exact final horizontal and vertical locations of underground utilities and appurtenances to an accuracy of +/- 0.2 ft, referenced to permanent surface improvements. Drawings shall utilize State Plane Coordinates and shall be legibly marked to record actual construction and submitted to GDOT no later than 30 days after installation and prior to Final Acceptance of the Project. The Utility Owner shall determine if the utility record drawings are complete prior to Final Acceptance of the project.
 2. Record Drawings shall be signed and sealed by a professional engineer or land surveyor registered in the State of Georgia.
 3. Record Drawings shall also be submitted in digital format as indicated in accordance with the Department's current Electronic Utility File Guidelines.
 4. Except for standard bound materials, bind all 8.5"x11" (A4) documentation, including 11" x 17" (A3) drawings folded to 8.5"x11" (A4), in logical groupings in loose-leaf binders of either the 3-ring or plastic slide-ring type. Permanently and appropriately label each such bound grouping of documentation.

670.1.04 Quality Assurance

- A.** The Contractor shall comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction over the Project.
- B.** Furnish manufactured items, pipe, fittings, valves, service components, and appurtenances from manufacturers having regularly produced such items as specified herein which have proven satisfactory in actual service, over at least a 2-year period, or as approved by the Utility Owner and GDOT.
- C.** Regardless of tolerances permitted by industry standards specified herein, the Utility Owner or the GDOT Project Manager may reject pipe or appurtenances at the manufacturing plant or project site which have cracks, chips, blisters, rough interior or exterior surface, evidence of structural weakness, joint defects, or other imperfections that might in the opinion of the Project Manager contribute to reduced functional capability, accelerated deterioration or reduced structural strength.
- D.** The Utility Owner and the Utility Owner's consultant shall have the right to visit and inspect the work at any time. The Utility Owner may also have an Inspector assigned to the project authorized to inspect portions or all of the utility work done and the preparation, fabrication, or manufacture of the materials to be used. The Utility Owner shall be able to advise GDOT Project Manager of any observed discrepancies or potential problems. The cost of these inspections shall be the responsibility of the Utility Owner.
- E.** GDOT shall notify the Utility Owner before authorizing any changes or deviations which might affect the Utility Owner's facilities. Contractor shall notify GDOT and Utility Owner a minimum of 24 hours prior to beginning work on utilities.

- F. The Utility Owner shall be notified by GDOT Project Manager when all utility work is complete and ready for final inspection. The Utility Owner shall be invited to attend the final inspection and may provide a corrections list to GDOT Project Manager prior to the final inspection.
- G. The Contractor shall verify the actual location and depth of all utilities prior to construction. All utilities and structures shall be protected during construction. Any damaged facilities shall be repaired or replaced at the Contractor's expense.

670.2 Materials

All materials provided shall be in conformance with the requirements and standards set forth in the [Fulton County Technical Specification for Water Main Construction], current published edition. All pipeline and appurtenance materials in contact with potable water shall be National Sanitation Foundation (NSF) 61 Certified and part of GDOT QPL list.

Pipes and appurtenances shall comply with Section 1417(a)(1) of the Safe Water Drinking Act as amended in 2011 which prohibits the use of any pipe, any pipe or plumbing fitting or fixture, and solder, or any flux, after June 1986, in the installation or repair of (i) any public water system; or (ii) any plumbing in a residential or non-residential facility providing water for human consumption, that is not lead free as defined in Section 1417(d).

670.2.01 Water Piping systems and Appurtenances

A. Ductile Iron Pipe and Fittings

1. Ductile iron pipe shall meet the latest edition of ANSI/AWWA C150/A21.50 and C151/A21.51 for the class and joint specified with a nominal laying length of 18 (5.5 m) to 20 feet (6 m). Joints for buried ductile iron pipe shall be mechanical or push-on joints. Unless specified otherwise in [Fulton County Technical Specification for Water Main Construction], ductile iron pipe diameters 12 inch (300 mm) or less shall be minimum Pressure Class 350, while pipe diameters greater than 12 inch (300 mm) shall be minimum Pressure Class 250.
2. Ductile iron pipe for the interior of structures and above ground installations shall be flanged. Flanges shall be ductile iron and shall be threaded-on flanges conforming to ANSI/AWWA C115/A21.15 or cast-on flanges conforming to ANSI/AWWA C110/A21.10. The minimum class thickness for ductile iron flanged pipe to be threaded is Class 53.
3. Interior surfaces of ductile iron pipe and fittings shall be cement mortar lined in accordance with AWWA C104.
4. Ductile iron shall have an exterior coating as specified in AWWA C151 for ductile iron pipe and AWWA C153/C110 for ductile iron fittings.
5. Buried ductile iron pipe and fittings shall be polyethylene encased at locations indicated on the Plans or as conditions warrant. Polyethylene encasement tubing shall be in accordance with ANSI/AWWA C105/A21.5 and ASTM A674 and shall have a minimum thickness of 8 mils. Polyethylene encasement tubing shall be blue in color to designate potable water.
6. Fittings: Ductile iron fittings shall be epoxy coated and meet the requirements of ANSI/AWWA C153/A21.53 or ANSI/AWWA C110 A21.10 with a minimum pressure rating of 250 psi. Ends shall be restrained mechanical joint. All ductile iron fittings shall bear the NSF approval seal for potable water pipe.
7. Mechanical Joint Fittings: Mechanical joints consisting of bell, socket, gland, gasket, bolts, and nuts shall conform to ANSI/AWWA C111/A21.11.
8. Push-On Joints: Push-on joints shall be designed in accordance with ANSI/AWWA C111/A21.11. Joint lubrication shall be as furnished by the manufacturer.
9. Rubber gasket joints for push-on or mechanical joints shall conform to the requirements of ANSI/AWWA C111/A21.11.
10. Restrained Joints: Restrained joints shall be provided as shown on the Plans and where required for thrust restraint. Restrained joints shall not require field welding or grooves cut into the pipe barrel for restraint. The restraining joints for mechanical joint fittings shall conform to the requirements of ANSI/AWWA C111/A21.11 with assembly in conformance with AWWA C600 and manufacturer's recommendations. Restrained joints for pipe shall be mechanical joints with ductile iron retainer or push-on type joints and shall have a minimum rated working pressure of 250 psi.
11. Mechanical joint retainer glands may be used to restrain mechanical joint pipe and fittings to the plain end of ductile iron pipe and fittings. Restraint glands shall be manufactured of ductile iron per ASTM A536.
12. Corrosion-resistant bolts used with ductile iron joints shall be high-strength, low-alloy steel as specified in ANSI/AWWA C111/A21.11.
13. Welded Outlets: Welded outlets in ductile iron pipe shall be provided where specified and indicated on the Plans. Outlets shall be fabricated by welding sections of ductile iron pipe manufactured in accordance with ANSI/AWWA

C151/A21.51. Welded outlet pipe shall be fabricated only by the pipe manufacturer. The minimum ductile iron pipe thickness for fabrication of welded outlet pipe shall be Thickness Class 53 for 4-inch to 54-inch (100 to 1350 mm) diameter pipe. All joints on welded-on branch outlets shall be provided in accordance with the latest revision of ANSI/AWWA C111/A21.11 and/or ANSI/AWWA C115/A21.15, as applicable. After the outlets are welded together and prior to finishing, the assembly shall be subjected to a 15 psi air test for leakage. The maximum size and laying length of the welded-on branch outlet shall be recommended by the pipe manufacturer and acceptable to the Utility Owner for the field conditions and connecting pipe or valve.

B. Polyvinyl Chloride (PVC) Pipe

1. PVC pipe diameters 4-inch through 12-inch (100 mm to 300 mm) shall meet ANSI/AWWA C900 requirements, and shall be a minimum pipe dimension ratio (DR) 18, Pressure Class 235 psi. PVC pipe diameters 14-inch (350 mm) and greater shall meet ANSI/AWWA C905 requirements, shall be DR 18 minimum, Pressure Class 235 psi. Pipe shall have a bell with an integral wall section with a factory installed, solid cross section elastomeric ring in accordance with ASTM F477.
2. All PVC pipe shall be formulated for sunlight exposure, be blue in color to designate potable water, and bear the NSF approval seal.
3. Joints for 4-inch (100 mm) and larger PVC pipe shall meet the requirements of AWWA C900/C905, latest edition. The rubber gaskets used for the joints shall consist of flexible elastomeric material conforming to ASTM F477.
4. PVC pipe shall have the same outside diameter (OD) as ductile iron pipe and be compatible for use with ductile iron fittings.
5. Fittings for PVC pipe 4 inches (100 mm) and larger shall be ductile iron mechanical joint and comply with the requirements set forth in the specifications for Ductile Iron Pipe and Fittings.
6. Restrained Joints: Restrained joints shall be provided as shown on the Plans and where required for thrust restraint. Restrained joints shall comply with the requirements set forth in the specifications for Ductile Iron Pipe and Fittings.
7. Unless specified otherwise in the Plans or [Fulton County Technical Specification for Water Main Construction], 2-inch (50 mm) and 3-inch (75 mm) diameter PVC pipe shall conform to the requirements of ASTM D2241 Class 1120 or 1220 (SDR 21) with a working pressure rating of 200 psi with integral bell gasketed joints. Pipe is to be manufactured to IPS standard pipe equivalent outside diameters.
8. Schedule 80 PVC pipes smaller than 4-inch (100 mm) nominal diameter shall be in accordance with ASTM D1785. Schedule 80 pipe shall have threaded joints. Solvent cemented joints are not allowed for buried pipes. Threaded type fittings for Schedule 80 PVC pipe shall be in conformance with ASTM D2464. All threaded joints shall be watertight.
9. Flanges for Schedule 80 PVC pipe shall be rated for a 150 psi working pressure with ANSI B16.1 dimensions and bolting pattern. Flanges shall be connected to PVC piping with threaded joints in accordance with ASTM D2467 or ASTM 2464, respectively.

C. Fusible PVC Pipe

1. Fusible PVC pipe sizes 4-inch (100 mm) to 36-inch (900 mm) shall conform to AWWA C900/C905 as applicable and follow the dimension ratios (DR) set forth in the requirements listed for PVC pipe.
2. Fusible PVC pipe shall be blue in color to designate potable water.
3. Fusible PVC pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.
4. Fusible PVC pipe shall be manufactured in a standard 40-foot nominal length-, or custom lengths as specified.
5. Joints shall be made by butt fusing sections of pipe with manufacturer-approved equipment.
6. Fittings shall be ductile iron mechanical joint and comply with the requirements set forth in the specifications for Ductile Iron Pipe and Fittings.

D. High Density Polyethylene (HDPE) Pipe

1. HDPE pipe sizes 4-inch (100 mm) and larger shall be a PE 4710/3408 high density, extra-high molecular weight polyethylene manufactured from first-quality high density polyethylene resin containing no additives, fillers, or extenders. The HDPE pipe shall have an ASTM D3350 cell classification of PE 445574C, shall meet the requirements of AWWA C906, and shall be sized based upon the ductile iron pipe size (DIPS), outside diameter (OD) sizing system.. The HDPE pipe shall be a minimum DR 11, pressure class 160 psi, and shall bear the NSF approval seal.
2. HDPE pipe shall be blue or marked with a permanent blue stripe to designate potable water.

3. Joints shall be made by butt fusing sections of pipe with manufacturer-approved equipment.
4. Fittings shall be ductile iron mechanical joint meeting the requirements of ANSI/AWWA C110/A21.10 and ANSI/AWWA C111/A21.11.
5. The pipe shall have fusion welded restrainer ring, follower gland, and a 12-inch (300 mm) stainless steel insert for the mechanical joint connection.
6. HDPE water mains shall be properly sized utilizing the inside diameter of the nominal pipe diameter. If during construction HDPE is substituted for other pipe materials, the Contractor shall verify that the inside diameter of the HDPE is the same or larger than the inside diameter of the pipe originally specified.

E. Steel Casing Pipe

1. All materials, design, fabrication, handling, and testing of steel casing pipe shall conform to the requirements of ASTM A139, AWWA C200 and AWWA Manual M11 "Steel Pipe – A Guide for Design and Installation."
2. Steel casing pipe shall be new, smooth-wall, carbon steel pipe conforming to ASTM Specification A139, Grade B with a minimum yield strength of 35,000 psi. Steel casings shall be used with the size, minimum thickness, length, and coating specified on the Plans or [Fulton County Technical Specification for Water Main Construction].
3. Additional anti-corrosion measures, as specified by the manufacturer or indicated on the Plans, shall be provided at connectors, couplings, rollers, restraints, etc.
4. Unless specified otherwise in the Plans or [Fulton County Technical Specification for Water Main Construction], casing pipe end seals shall consist of 1/8-inch (6 mm) thick flexible synthetic rubber boot with adjustable stainless steel banding straps. The annular space of the casing shall not be filled with concrete or grout.
5. Casing spacers shall consist of a stainless steel shell, PVC ribbed liner, and non-conducting separators to keep the carrier pipe from touching the casing pipe. Spacers shall be provided at a maximum of 10-foot intervals and within 2 feet (0.6 m) of the end of the casing pipe.

F. Pipe Detection Wire

1. Unless otherwise specified by the Plans or [Fulton County Technical Specification for Water Main Construction], open cut installations of non-metallic pipe shall include minimum #12 gauge tracing wire. Pipe installed by directional drill shall include two (2) insulated 8 gauge tracer wire. Wire shall be solid copper insulated with HDPE installed along pipe, wrapped around service line stub outs and stubbed into valve boxes for locating purposes. Wire shall be properly spliced to provide continuous conductivity.

G. Warning Tape

1. Water mains shall be installed with polyethylene film warning tape manufactured for marking and identifying underground water utilities. Tape shall be a minimum of 2 inches (50 mm) wide and 4 mils thick, blue in color, with continuously printed letters reading "CAUTION BURIED WATER LINE BELOW".

H. Gate Valves

1. Gate valves 3 inches (80 mm) and larger shall be of the resilient seat type meeting the requirements of AWWA C509 or C515. Valves shall be iron body, bronze trimmed, with non-rising stems, and shall be fusion-bonded epoxy coated per ANSI/AWWA C550. Valves shall have a minimum design working pressure of 200 psi.
2. Valves shall be manually operated by nut and open counter-clockwise unless specified otherwise in the Plans or [Fulton County Technical Specification for Water Main Construction].
3. The resilient seating arrangement shall provide zero leakage at the design working pressure when installed with line flow in either direction. All ferrous surfaces inside and outside shall have a fusion bonded epoxy coating. All valves shall be provided with O-ring seals. The design and machining of valves shall be such as to permit replacing the O-ring seals in the valves while in service without leakage.
4. All gate valves, when fully opened, shall have an unobstructed waterway diameter equal to or larger than the full nominal diameter of the valve.
5. In general, valves shall be designed for vertical installation. Valves installed in the horizontal position shall be provided with bevel gears, extended gear case, rollers, tracks, and scrapers.
6. Exposed or above-ground gate valves shall be outside screw and yoke (OS&Y) flanged joint type with an operating hand wheel. The face-to-face dimensions and drilling shall conform to ANSI B16.10 for Class 125 flanged joint end gate valves.
7. Valves shall include mechanical joints, bolts, glands, gaskets, and all other materials necessary to join to existing work.

8. Provide brass identification tag imprinted with “WATER”, valve size, valve type, and direction and number of turns to open. Provide a ¼-inch (8 mm) hole in the brass tag and attach the tag to the end of the locate wire (twist wire around tag). Tag shall be 2-inch (50 mm) diameter and ⅛-inch (6 mm) thick brass with a ¼-inch (8 mm) hole.

I. Insertion Valve

1. Insertion type valves shall be resilient wedge gate valves designed to be installed into an existing pressurized potable water main without interruption of flow through the pipe and no reduction of line pressure.
 - a. Valve shall be fusion-bonded epoxy coated in compliance with AWWA C550.
 - b. The construction of the resilient wedge shall comply with AWWA C509 requirements.
 - c. The resilient wedge shall be fully encapsulated with EPDM rubber and shall seat on the valve body and not the pipe. The resilient wedge shall be totally independent of the carrier pipe.
 - d. Valve shall be restrained to the pipe.
 - e. Valves shall be suitable for operating pressures up to 250 psi.

J. Butterfly Valves

1. Butterfly valves shall be of the tight-closing, rubber seated type, with rubber seat positively locking in place sealing against flow from either direction. Valves shall be hand operated with cast or ductile iron bodies. Valves shall conform to the requirements of AWWA C504, Class 150B, and shall be fusion-bonded epoxy coated per ANSI/AWWA C550.
2. Valves shall have a 2-inch (50 mm) square operating nut and shall be installed with extension stems to extend the operating nut in accordance with the project details. Valves shall open by turning the operating nut counter clockwise unless specified otherwise in the Plans or [Fulton County Technical Specification for Water Main Construction].
3. Valve shafts shall be of 304 or 316 stainless steel.
4. Buried butterfly valve end connections shall be installed using restrained mechanical joints.
5. Flanged valves shall be fully faced and drilled in accordance with ANSI Standard B16.1, Class 125.
6. Provide brass identification tag imprinted with “WATER”, valve size, valve type, and direction and number of turns to open. Provide a ¼-inch (8 mm) hole in the brass tag and attach the tag to the end of the locate wire (twist wire around tag). Tag shall be 2-inch (50 mm) diameter and ⅛-inch (6 mm) thick brass with a ¼-inch (8 mm) hole.

K. Ball Valves

1. Ball valves 2-inch (50 mm) and smaller shall be designed for a working pressure of not less than 175 psi. End connection shall be threaded. The body and all parts shall be made in accordance with AWWA C800 and ASTM B62 latest revision.

L. Tapping Sleeves and Valve Assembly

1. Tapping sleeves and valves sizes 4-inches (100 mm) and larger shall be stainless steel with wraparound gasket style, or ductile iron of the split-sleeve, mechanical joint type. Tapping sleeves shall be rated for a minimum 150 psi working pressure in accordance with ANSI/AWWA C110/A21.10.
2. When tapping an existing asbestos cement pipe, a stainless steel tapping sleeve which contains a full gasketed surface within the sleeve body shall be used due to variances in the manufactured outside diameter of the asbestos cement pipe.
3. Tapping sleeve shall have an outlet flange per ANSI B16.1, Class 125 standard.
4. The Contractor shall determine the outside diameter of the existing main before ordering the sleeve.
5. Tapping valves shall be mechanical joint outlet, non-rising stem, resilient seated gate valves meeting the applicable requirements of ANSI/AWWA C509/C515 and C550 with a minimum design working pressure of 200 psi.
6. Tapping valves shall be specifically designed for pressure tapping with sufficient seat opening to allow full diameter taps to be made.
7. Tapping valves shall be manufactured with an integral tapping flange having a raised lip design.
8. Tapping valves shall be furnished with a combination flange and mechanical joint for connecting the branch to the main.

M. Valve Boxes

1. All valves shall be equipped with valve boxes. The valve boxes shall be heavy, roadway type boxes. The valve box cover shall be marked “WATER VALVE” or “WATER”.

2. Valve box materials shall conform to the requirements and standards set forth in the [Fulton County Technical Specification for Water Main Construction], current published edition.
3. The valve boxes shall be adjustable up or down from the nominal required cover over the pipe. Extensions shall be provided as necessary. A precast concrete ring shall be placed around the valve box opening when outside of paved areas.
4. Valves shall be furnished with extension stems as necessary to bring the operating nut to within 24 inches (600 mm) minimum of the top of the valve box.

N. Service Connection Assemblies

1. Water service connections and plumbing should conform to the standards set forth in the [Fulton County Technical Specification for Water Main Construction] and relevant local and/or state plumbing codes or to the Standard Plumbing Code as applicable within the jurisdiction in which the system is located.
2. Service connection assemblies shall be provided for all new service line connections to existing meters. Existing service lines indicated for replacement shall be replaced with new materials from the water main to the existing or new water meter.
3. Service connection assemblies shall include:
 - a. Service saddle
 - b. Corporation stop
 - c. Service line
 - d. Fittings
 - e. Curb stop
 - f. Water meter box
 - g. Water meter (separate Pay Item for new service connections)
 - h. Backflow preventer (separate Pay Item for new service connections)

O. Service Saddles

1. Service saddles shall have ductile iron or bronze body with stainless steel epoxy coated double tie straps and nuts with pressure rating not less than that of the pipe to which it is to be connected.
2. Saddles shall have a rubber gasket cemented to the body, with compatible threading between the saddle and corporation stop. Saddles shall conform to ANSI/AWWA C800 standards.
3. The service saddle shall provide full support around the circumference of the pipe, providing a bearing area of sufficient width so that pipe will not distort when the saddle is tightened.

P. Water Service Pipe

1. Polyethylene (PE) pipe for water service lines shall conform to AWWA C901 and ASTM D-2737 and shall be 200 psi pipe, SDR 9 for copper tube size (CTS). Polyethylene extrusion compound from which the polyethylene pipe is extruded shall comply with applicable requirements for PE 3408 ultra-high molecular weight polyethylene plastic material as specified in AWWA C901.
2. Marking on the PE service pipe shall include the nominal pipe or tubing size, the type of plastic material, the standard thermoplastic pipe dimension ratio or the pressure rating in psi, the ASTM designation with which the pipe complies, and manufacturer's name or trade mark and code. It shall also include the NSF seal of approval for use with potable water.
3. Copper tubing for water service lines shall be seamless and shall conform to ANSI/AWWA C800 and ASTM B88, Type K soft, suitable for potable water use with a working pressure of 150 psi.
4. Water service line fittings shall be as indicated in [Fulton County Technical Specification for Water Main Construction].

Q. Corporation and Curb Stops

1. Corporation stops, curb stops, and other appurtenances for plastic or copper service lines shall meet the requirements of ASTM B62 and AWWA C800.
2. Service line taps shall be equipped with corporation stops. Corporation stops in sizes 1-inch (25 mm) through 2-inch (50 mm) shall be manufactured from cast bronze with machined fitting surfaces. The corporation shall be pressure rated to no less than 150 psi.
3. Curb stops shall be ball valve type and made of bronze. Pipe connections shall be suitable for the type of service pipe used and shall be pressure rated for no less than 150 psi.

R. Water Meters

1. Water meters shall conform to the requirements and standards set forth in the [Fulton County Technical Specification for Water Main Construction].

S. Meter Boxes

1. Water meter boxes shall be high density reinforced plastic body with one piece cast iron lid with lettering “WATER METER” on cover unless otherwise indicated on the Plans. Recessed hole shall be included in lid, if required by Utility Owner for electronic reading capability. Provide box of size and height appropriate to installation of meter and accessories required. Meter and curb stop shall be fully encased by the meter box.

T. Concrete Vault

1. Concrete vaults shall conform to the requirements and standards set forth in the [Fulton County Technical Specification for Water Main Construction] and standard details.

U. Air Release Valve Assembly

1. Air release, air/vacuum valves, and combination air valves shall be suitable for use with potable water systems and manufactured in compliance with ANSI/AWWA C512.
2. Air release valves shall have a small venting orifice to vent the accumulation of air and other gases in the line or system under pressure.
3. Air/vacuum valves shall have a large venting orifice to permit the release of air as the line is filling or relieve the vacuum as the line is draining or is under negative pressure.
4. Combination air valves shall have operating features of both the air/vacuum valve and air release valve.
5. Valves shall be suitable for pressures up to 250 psi.
6. Air release, air/vacuum valves, and combination air valves shall conform to the requirements set forth in the [Fulton County Technical Specification for Water Main Construction] and standard details.

V. Fire Hydrant Assembly

1. Fire hydrants shall be the compressive, post style, dry barrel type, and shall conform to the requirements of ANSI/AWWA C502 and local code requirements. The valve opening shall not be less than 4½-inch (115 mm). All hydrants shall be complete including joint assemblies.
2. Hydrants shall be suitable for working pressure of 150 psi and shall be hydrostatically factory tested to 300 psi.
3. All working parts, including the seat ring, shall be removable through the top without excavating or disturbing the barrel of the hydrant.
4. Hydrants shall be constructed with a lubricant chamber which encloses the operating threads and which provides automatic lubrication of the threads and bearing surfaces each time the hydrant is operated. This assembly shall be comprised of a top O-ring serving as a dirt and moisture barrier and a lower O-ring which will serve as a pressure seal.
5. Hydrants shall include two 2½-inch (65 mm) hose nozzles and one 4½-inch (115 mm) pumper connection with National Standard Fire Hose Threads unless specified otherwise in the Plans or [Fulton County Technical Specification for Water Main Construction]. Hydrant threads shall comply with the specifications of the local agency providing fire service.
6. Hydrant nozzle shall be constructed to face in any direction at any time by removing the safety flange bolts and revolving the head without digging or shutting off water.
7. Hydrants shall have pentagon operating nut measuring 1½-inch (40 mm) point to flat and shall open by turning counter-clockwise.
8. Hydrant shall have a safety-type vertical barrel with a minimum 3½-foot bury and be designed with safety flange and/or bolts to protect the barrel and stem from damage, eliminate flooding, and allow rapid replacement if hydrant is struck. All risers necessary for deeper bury applications shall be provided by the hydrant manufacturer.
9. Hydrants shall include positive, automatic drain valves which shall be fully closed when the main valve is open.
10. Bottom inlet of hydrant shall be provided with mechanical joint connection complete with accessories as specified and shall be 6-inch (150 mm) nominal diameter.
11. Fire hydrant shall be painted above ground with rust inhibiting enamel paint in accordance with [Fulton County Technical Specification for Water Main Construction].
12. Hydrant assemblies shall be restrained from the hydrant to the tee at the main.

W. Backflow Prevention Devices

1. Backflow prevention devices shall be installed where indicated on the Plans and shall meet all applicable AWWA, State, and local code/ordinance requirements.
2. Backflow preventer materials shall conform to the requirements and standards set forth in the [Fulton County Technical Specification for Water Main Construction].

X. Thrust Collars and Thrust Blocks

1. Concrete used for thrust collars or thrust blocks shall meet the “Class A” requirements for concrete listed in Section 500.
2. Thrust collars shall include welded-on collars attached by the pipe manufacturer or retainer glands. Concrete shall be poured continuous around the pipe and bear against undisturbed earth.
3. Reinforcing steel shall meet the requirements set forth in the Plans or [Fulton County Technical Specification for Water Main Construction].
4. Mechanical joint restraints shall be utilized in lieu of thrust blocks with the approval of Utility Owner.

Y. Manholes

1. Precast reinforced manholes shall be manufactured in accordance with ASTM C478 and shall have a minimum wall thickness of 5 inches (127 mm). All concrete shall have a minimum compressive strength of 4,000 psi when tested in accordance with ASTM C478.
2. Joints between precast sections shall be sealed by means of rubber O-ring gaskets or flexible butyl rubber sealant.
3. Non-shrinking grout or a flexible seal shall be used to seal the pipe penetrations and prevent water from entering the manhole.
4. Manhole rings and cover shall be per the [Fulton County Technical Specification for Water Main Construction] and standard details.

670.2.02 Delivery, Storage, and Handling

- A. Handle pipe, fittings, valves, and accessories carefully to prevent damage. Handle pipe by rolling on skids, forklift, or front end loader. Do not use material damaged in handling. Slings, hooks, or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior coatings or internal lining of the pipe. Do not use chains in handling pipe, fittings, or appurtenances.
- B. To unload pipe, carefully lift and lower it into position using approved padded slings, hooks, or clamps. Furnish equipment and facilities for unloading, handling, distributing, and storing pipe, fittings, valves, and accessories. Make equipment available at all times for use in unloading. Do not roll, drop or dump materials. Any materials dropped or dumped shall be subject to rejection without additional justification.
- C. Stored materials including salvaged materials shall be kept in suitable areas safe from damage. The interior of all pipe, fittings, and other appurtenances shall be kept free from dirt or foreign matter at all times. Store and support plastic pipe to prevent sagging and bending. Store plastic pipe and gaskets to prevent exposure to direct sunlight. Valves and hydrants shall be stored and protected from damage by freezing.
- D. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails, or concrete.

670.3 Construction Requirements

670.3.01 Personnel

- A. General Provisions 101 through 150.
- B. Construction and installation of all water utilities shall be performed by a Contractor prequalified/registered with GDOT.
- C. All work specified in this section, except for water system service line installation shall be performed by a Contractor with a valid Utility Contractor’s license issued by the State of Georgia. Water service line installation shall be performed by either a Utility Contractor licensed in the State of Georgia or by a Master Plumber licensed in the State of Georgia.

670.3.02 Equipment

- A. Ensure all equipment used is in conformance with the requirements and standards set forth in the [Fulton County Technical Specification for Water Main Construction], current published edition.

670.3.03 Preparation

General Provisions 101 through 150.

670.3.04 Fabrication

General Provisions 101 through 150.

670.3.05 Construction

A. Finding Existing Underground Utilities and Obstructions

1. Comply with Subsection 107.13 and Subsection 107.21.
2. According to the best information available to GDOT, all known water lines, sewer lines, gas lines, telephone conduits, drainage structures, etc. are shown on the Plans. However, to find such installations, use an electronic pipe and cable finder in locating existing installations or obstructions to the work.
3. When unforeseen conflicts require Plan changes, perform the work as altered according to Subsection 104.03 and Subsection 104.04.
4. Follow all Utility Owner customer notification requirements and obtain approval from the Utility Owner and GDOT Project Manager prior to disrupting any existing water services as required to install the water facilities shown on the Plans.

B. Jack and Bore

Comply with Section 615 for sewer main installations by jack and bore.

C. Directional Drilling

1. Install water mains and services by means of directional drilling at locations shown on the Plans or where approved by GDOT or Utility Owner. Provide submittals and follow all relevant procedures and requirements set forth in the [Fulton County Technical Specification for Water Main Construction].
2. The Contractor shall not initiate horizontal directional drilling until all submittals are received, reviewed, and accepted by GDOT and the Utility Owner, and all required permits are obtained.
3. The Contractor shall select drilling additives and fluid mixture proportions to ensure continuous circulation, bore stability, reduce drag on the pipe, and completely fill the annular space between the bore and the pipe to ensure stability and control settlement.
4. The Contractor shall submit contingency plans for remediation of potential problems that may be encountered during the drilling operations. The contingency plans shall address the observations that would lead to the discovery of the problem and the methods that would be used to mitigate the problem. Potential problems that shall be addressed include:
 - a. Loss of returns/loss of circulation of drilling fluid.
 - b. Encountering obstruction during pilot bore or reaming/pullback.
 - c. Drill pipe or product pipe cannot be advanced.
 - d. Deviations from design line and grade exceed allowable tolerances.
 - e. Drill pipe or product pipe broken off in borehole.
 - f. Product pipe collapse or excessive deformation occurs
 - g. Utility strike.
 - h. Hydrolock occurs or is suspected.
 - i. Excessive ground settlement or heave of ground surface or existing utilities.
 - j. Inadvertent returns / hydrofracture or surface spills resulting in drilling fluids entering water or reaching the surface.
5. Pipe damaged in directional drilling operations shall be removed and replaced at no additional expense to GDOT or the Utility Owner.
6. Voids developed or encountered during the installation operation shall be pressure grouted with a grout mix approved by GDOT.
7. Installation shall include a locatable conduit system, with identification markers on each side of GDOT right-of-way where applicable. Two (2) insulated 8 gauge solid copper tracers wire shall be attached to the leading end of the pipe pulling head and shall extend the full length of the installed pipe.
8. The location and alignment of the pilot drill progress shall be continuously monitored for compliance with the proposed installation alignment and for verification of the depth of the bore. Monitoring shall be accomplished by computer generated bore logs which map the bore path based on x, y, z coordinate information provided by the locating/tracking system. Readings or plots shall be obtained on every drill rod, and shall be provided to the Inspector on a daily basis. Deviations between the recorded and design bore path shall be calculated and reported on the daily log. If the deviations exceed tolerances specified elsewhere, such occurrences shall be reported

- immediately to GDOT. The Contractor shall undertake all necessary measures to correct deviations and return to design line and grade.
9. Upon completion of the directional drill the Contractor shall furnish GDOT and the Utility Owner an as-built drawing along with a report of the monitoring of the drilling fluids during the pilot hole and back reamed hole.
 10. Drilling fluid pressures, flow rates, viscosity, and density shall be monitored and recorded by the Contractor. The pressures shall be monitored at the pump. These measurements shall be included in daily logs submitted to GDOT. The Contractor shall document modifications to the drilling fluids, by noting the types and quantities of drilling fluid additives and the dates and times when introduced. The reason for the addition of drilling fluid additives or other modifications shall be documented and reported.
 11. Management and disposal of drilling fluids shall be the Contractor's responsibility. Excess drilling fluids shall be contained at the entry and exit points until recycled or removed from the site. All drilling fluids shall be disposed of in a manner acceptable to the appropriate local, state and federal regulations. The Contractor's work will be immediately suspended by GDOT whenever drilling fluids seep to the surface other than in the boring entrance or exit pit, or when a paved surface is displaced.
 12. Surfaces damaged by the work shall be restored to their preconstruction conditions at no additional cost to GDOT or Utility Owner, and with no increase in contract time.
 13. The following items shall be as shown on the Plans, unless otherwise approved in writing by GDOT:
 - a. Entry / exit points
 - b. Drill entry / exit angles
 - c. Pilot bore path
 - 1) Radius of Curvature
 - 2) Entry / exit tolerances: Contractor shall be solely responsible for all work necessary to correct excessive deviations from line and grade, including re-drilling, redesigning connections, and acquiring additional easement, at no additional cost to GDOT or Utility Owner and without schedule extension.
 14. The pilot bore shall be pre-reamed and reamed using equipment and methods submitted by the Contractor. The Contractor shall completely ream the bore to the final diameter prior to pullback.
 15. Pullback: The pipe shall be installed by pulling it into the reamed bore path in a continuous operation, behind a final reaming tool selected by the Contractor. The pipe shall be isolated from excessive torsional and axial stresses by a swivel device with a pre-established breakaway tensile capacity that is lower than the allowable tensile strength of the pipe. The maximum pull (axial tension force) exerted on the pipelines shall be measured continuously and limited to the maximum allowed by the pipe manufacturer with an appropriate factor of safety so that the pipe or joints are not overstressed. The end of the pipe shall be closed during the pull back operation.
 16. Pipelines shall be adequately supported during installation so as to prevent overstressing or buckling. The Contractor shall provide adequate support/rollers along the pipe layout area to support the required length of pipe for the bore. The pipe layout area shall be cleared of all large stones, construction debris, or other foreign objects that could damage the pipe during pullback. The Contractor shall monitor and inspect pipe rollers and method for suspending pipe at entry during the pullback operation to avoid damage to the pipe.
 17. The end of the pipe shall be closed during the pull back operation.
 18. Each length of pipe shall be inspected and cleaned as necessary to be free of debris immediately before joining.
 19. The Contractor shall at all times handle the pipe in a manner that does not overstress or otherwise damage the pipe. Vertical and horizontal curves shall be limited so that wall stresses do not exceed 50% of yield stress for flexural bending of the pipe. If the pipe is buckled or otherwise damaged, the damaged section shall be removed and replaced by the Contractor at his expense. The Contractor shall take appropriate steps during pullback to ensure that the pipe and tracer wires will be installed without damage.
 20. If necessary, the pipe shall have water added as it enters the bore to achieve neutral buoyancy and reduce pullback loads and to ensure that adequate internal pressure is maintained at all points to counter balance collapse pressures.
 21. The Contractor shall cease pullback operations if the pipe is damaged and shall remove the pipe from the bore and repair the pipe using the manufacturer's recommended procedure or replace the damaged pipe before resuming installation.
 22. Damage to the pipe resulting from manufacturer defects, installation, or grouting is the responsibility of the Contractor, including costs for replacement and labor and materials. To confirm no damage to the pipe, upon completion of pull back, the Contractor shall pull a sphere or pig through the entire length of the pipeline. The pig shall be one inch less in diameter than the internal diameter of the product pipe, capable of allowing water to pass

through it, complete with a pulling cable on either side. If the pig or sphere cannot pass through the pipe, it shall be considered collapsed and damaged.

23. After the carrier pipe is completely pulled through the bore, a sufficient relaxation period as recommended by the pipe manufacturer shall be provided before the final pipe tie-in.
24. The Contractor shall conduct a final hydrostatic test of the installed pipeline. Final test shall be in accordance with these specifications. The Contractor shall repair any defects discovered during this test, and repeat until the pipe passes the test.

D. Excavating Trenches

1. The Contractor shall provide all necessary shoring and bracing materials as required to assure safe working conditions and to protect the excavations. The Contractor shall be required to fully comply with all applicable OSHA Excavation Safety Standards. No separate payment shall be made for any special procedure used in connection with the excavation.
2. Excavate trenches to the proper depth and width as follows:
 - a. Trench to Grade: Excavated trench bottoms shall be firm, free from boulders, and conform to the established grade. Limit open trench excavation to a maximum of three 300 feet (90 m) ahead of completed backfill.
 - b. Care shall be taken not to over excavate except where necessary to remove unstable material, irregularities, lumps, rock, and projections. Unnecessary over excavation shall be replaced at the Contractor's sole expense and in accordance with Subsection 670.3.05.
 - c. Excavation carried below the established grade lines shown or established by the Utility Owner shall be backfilled according to Section 207 and Subsection 670.3.05. Use Class I or Class II Soils (defined in Section 810) and firmly compact the soil.
 - d. Where the established grade of a trench is in rock, undercut the bottom of the trench by at least 6 inches (150 mm) beneath the pipe or conduit and the greater of 24 inches (600 mm) wider than the pipe/conduit (12 inches or 300 mm each side) or 42 inches (1050 mm) wide, then backfill and compact according to Subsection 670.3.05.
 - e. Excavation in pavement and pavement patching shall be according to GA Standard No. 1401. Remove the pavement according to Section 444, except no separate payment shall be made for sawed joints.
 - f. Dewatering: Remove all water from excavations and maintain the excavations free of water while construction therein is in progress. Provide dewatering equipment as necessary to conform to this requirement. Dewatering procedures must meet all state and local regulatory requirements.
3. Minimum Trench Depth
 - a. Excavate trenches to provide at least 48 inches (1.2 m) cover depth directly above the pipe to the finished pavement surface, sidewalk, grass, etc. unless indicated otherwise on the Plans or by the Utility Owner and GDOT Project Manager. In order to avoid existing utilities, it may be necessary for the pipe to be laid shallower or deeper than the minimum cover specified. At such time the Contractor shall not be allowed extra compensation for additional excavation necessary for deeper installations.
 - b. Side slopes of the trenches shall be as nearly vertical as practicable. Trenches in excess of 5 feet (1.5 m) deep shall either have the trench sides laid back to conform to OSHA requirements for trench safety, if such area is available within the limits of excavation, or, alternatively, trenches deeper than 5 feet (1.5 m) shall be excavated via trench box or shored and braced.
 - c. If any part of a water main is to be placed in or under a new embankment, finish the embankment to at least a 2-foot plane above the outermost portion of the pipe barrel before excavating the trench.
4. Trench Width: Excavate trenches to uniform widths wide enough to allow proper installation of pipe, fittings, and other materials, a minimum of 6 inches (150 mm) and a maximum of 12 inches (300 mm) each side of the pipe or conduit.
5. Trench Bell Holes: Excavate bell holes deeply and widely enough to make joints and to allow the pipe barrel to rest firmly on the trench bottom.
6. Trench bottom: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduits. Shape subgrade to provide continuous support of bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits/pipes. Remove projecting stones, tree roots, debris, and sharp objects along trench subgrade. Abrupt changes in grade of the trench bottom shall be avoided. Unless otherwise indicated in the Plans or **Fulton County**

Technical Specification for Water Main Construction], trenches for water mains shall be graded as much as possible to avoid high and low points that necessitate air release valves.

7. Excavations may be completed and refilled either by hand or by machinery. Hand tool excavation shall be conducted where necessary to protect existing utilities and structures.
8. In the event that unsuitable material is encountered at or below the excavation depth specified or shown on the Plans, the Utility Owner and GDOT Project Manager shall be notified. Such material shall be removed and replaced with suitable material in accordance with Section 205 by the written request of the GDOT Manager.

E. Connecting to Existing Mains

1. Connect to an existing main with the appropriate fittings according to the Plans or the Utility Owner and GDOT Project Manager. When making connections under pressure, (i.e. when normal water service must be maintained), furnish and use a tapping sleeve and valve assembly or line stop fittings as indicated. Coordinate with Utility Owner 72 hours in advance for water service interruptions and temporary shut-offs. Evening or weekend work may be required to complete direct connections and tie-ins. Connect to existing mains as follows:
 - a. Before opening new pipeline trenches, locate the various points of connection to be made into existing pipelines. If necessary, uncover pipelines for the Utility Owner and GDOT Project Coordinators to prescribe the connections and fittings needed.
 - b. Connect to existing pipelines only to meet operating requirements. Cut existing lines only after obtaining the Utility Owner and GDOT Project Manager's permission.
 - c. Provide temporary line stops, associated fittings, and bypass pumping as indicated on the Plans and as necessary when cutting and plugging existing water mains to prevent service interruptions. Line stop and associated fittings shall be suitable for working pressures of 250 psi.
 - d. Connections to existing asbestos cement pipe shall be installed as indicated on the Plans or in **Fulton County Technical Specification for Water Main Construction**. Cutting, removing, handling, and disposing of asbestos cement pipe shall be in accordance with requirements established by EPA, OSHA, GDOT, NIOSH, and the State of Georgia Environmental Protection Division, and any other applicable laws and ordinances.

F. Laying Water Mains and Appurtenances

1. Preparing and Handling Pipes
 - a. Thoroughly clean the pipe and fittings before laying them. Keep them clean until accepted.
 - b. Use suitable tools and equipment. Do not damage the pipe, especially the cement lining inside the pipe.
 - c. Cut pipe in a manner to avoid damage to pipe or lining, leaving a smooth end at right angles to pipe axis. Smooth and bevel edges of cut pipe for push-on, gasket type joints.
 - d. Bedding shall be provided as specified by the Utility Owner or pipe manufacturer for the type of conditions encountered. Bedding typically consists of granular soil free of lumps, clods, cobbles, and frozen materials, and shall be graded to a firm-but-yielding surface without abrupt changes in bearing value. Unstable soils and rock ledges shall be undercut from the bedding zone and replaced with suitable material.
 - e. Bed pipe on coarse granular material in flat bottom trench with entire pipe barrel bearing uniformly on coarse granular material, except for an approximately 18-inch (450 mm) gap at pipe balance point for sling removal. Hand excavate and backfill as required to provide uniform and continuous bearing and support for the pipe. Do not support pipe on hubs or end bells. Consolidate coarse granular material under and around pipe up to pipe centerline by tamping.
 - f. Join pipe with bells facing direction in which laying operation is progressing. Lay pipe upgrade wherever line grade exceeds 10%.
 - g. Carefully examine pipe for cracks and other defects and do not lay defective pipe. If pipe or castings appear to be cracked, broken, or defective after laying, remove and replace those sections.
2. Alignment and Gradient
 - a. Pipe alignment and gradient shall conform to the Plans. Deflect pipe lines only where indicated on the Plans, within allowable horizontal and vertical deflection angles according to the manufacturer.
 - b. Water mains shall be laid at least 10 feet (3 m) horizontally from any existing or proposed sanitary sewer, storm sewer or sewer manhole. The distance shall be measured edge-to-edge. When local conditions prevent a horizontal separation of 10 feet (3 m), the water main may, on a case-by-case basis, be laid closer to a sewer provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches (450 mm) above the top of the sewer.

- c. Maintain a vertical separation of at least 18 inches (450 mm) between the crown of sanitary sewers and the invert of existing or proposed water mains with the sewer located below the water main. Where a vertical separation of 18 inches (450 mm) cannot be provided, and the water main cannot be relocated to provide adequate clearance, center one full length of water main over the sewer so that both joints of the water main will be as far from the sewer as possible.
3. Special Requirements for Laying Water Mains
 - a. Excavate, clean, lay, joint, and backfill progressively and uniformly according to these requirements:
 - 1) Never leave pipe in the trench overnight without completely jointing and capping.
 - 2) Do not leave completed pipeline exposed in the trench. Backfill and compact the trench as soon as possible after laying, jointing, and testing are complete.
 - 3) At the close of work each day and when laying pipe, close the exposed end of the pipeline in the trench with an approved wood or metal head or barrier.
 - 4) If necessary to cover the end of an incomplete pipeline with backfill, close the end of the pipe with a satisfactory cap or plug.

G. Installing Water Mains by Open Cut

1. Use the following flexible joints for connections inside the roadway shoulders or curbs and gutters:
 - a. Mechanical Joints:
 - 1) When using mechanical joints, thoroughly wash bell sockets, spigots, gland, gasket, nuts, and bolts with soapy water before assembly. Keep these parts wet until the jointing operation is complete.
 - 2) Tighten nuts within the torque range recommended by the manufacturer. Check the tightening tolerance with a torque wrench.
 - 3) If effective sealing is not attained at the maximum recommended torque, disassemble, thoroughly clean, then reassemble the joint.
 - 4) Do not overstress bolts to compensate for improper installation or defective parts.
 - b. Push-On Type Joints
 - 1) Use push-on joints made according to the manufacturer's recommendations.
 - 2) Install PVC pipe in accordance with AWWA C605.
 - 3) Install ductile iron pipe in accordance with AWWA C600.
2. Restraints for pipe joints and fittings shall be provided as specified and as shown on the Plans. Restraints shall be installed per manufacturer's recommendations.
3. Buried ductile iron pipe and fittings shall be polyethylene encased as specified and as indicated on the Plans. Polyethylene encasement tubing shall be secured with polyethylene tape and installed in accordance with ANSI/AWWA C105/A21.5.
4. Unless otherwise specified by [Fulton County Technical Specification for Water Main Construction], provide pipe detection wire on all non-metallic pipe systems. Tape the tracer wire to the top center of the pipe at intervals which prevent wire displacement during backfilling operations. Stub tracer wire up 6 inches (150 mm) above finished grade at all valves and fire hydrants. For splices, use direct bury kits. After backfilling is complete, test electrical continuity of each tracer wire segment and provide test results to Utility Owner and GDOT Project Manager.
5. Install continuous underground warning tape during backfilling of trench for underground water distribution piping. Install 12 inches (300 mm) below finished grade, or 6 inches (150 mm) below subgrade under pavements and walkways, and buried directly over piping.
6. Use pipe cutters when cutting pipe or special castings. Do not use a hammer, chisel, or a cutting torch.
7. Locations where water mains do not meet minimum depth of cover requirements shall include a steel casing or concrete encasement installed per [Fulton County Technical Specification for Water Main Construction].
8. If HDPE pipe is to be installed where high groundwater table or water surrounding the pipe is expected, precautions shall be taken to provide neutral buoyancy to prevent floatation or a change in alignment.
9. Isolation Valves on Water Mains: Install and joint gate and butterfly valves as specified in Subsection 670.2.01 in accordance with AWWA C600. Include the valve box and valve marker where required.
10. Air release valves shall be located at high elevation points on the pipeline. Air release valves shall be installed at locations indicated in the Plans and in accordance with manufacturer's recommendations.

- a. Air release valves shall be installed in a shallow manhole or vault as indicated in the Plans and [Fulton County Technical Specification for Water Main Construction]. Automatic air relief valves shall not be used in areas where flooding of the manhole or vault may occur.
 - b. An isolation valve shall be installed between the air release assembly and the connection to the main.
 - c. The Contractor shall furnish and install at no additional cost to GDOT or Utility Owner all necessary fittings for the installation of air release valves at high points.
11. Pressure reducing/sustaining valves of the size and type indicated shall be installed as shown on the Plans per manufacturer's recommendations and [Fulton County Technical Specification for Water Main Construction].
12. Fire Hydrants: Install and joint hydrants as specified in Subsection 670.2.01 and in accordance with AWWA C600. Include required vertical extension sections. Also, include pipe strap installation, restraints, crushed stone drain, and backfill according to the Plans and this Section. Spacing of fire hydrants shall be as indicated in [Fulton County Technical Specification for Water Main Construction].
13. Concrete Thrust Collars and Thrust Blocks: If required, furnish materials and install thrust collars or concrete blocking according to Subsection 670.2.01. Form and pour concrete thrust collars or blocks in accordance with the Plans and the [Fulton County Technical Specification for Water Main Construction]. Blocking shall be poured against undisturbed earth and all forms shall be removed before backfilling.
14. Backfilling
- a. Furnish equipment, labor, and when necessary material required for backfilling the pipe line trenches according to Section 207, and as follows:
 - 1) When testing for visual leaks in open trenches, do not backfill until testing is complete and leaks are eliminated.
 - 2) When retaining pavement adjacent to trenches, replace removed pavement with the same or better material when approved in accordance with the appropriate Section for the pavement type replaced.
 - 3) Place backfill on subgrades free of mud, frost, snow, or ice.
 - 4) Place and compact bedding course on trench bottoms and where indicated. Shape the bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits/pipes.
 - 5) Backfill shall include Class I or Class II Soils as defined in Section 810 or suitable material that conforms with [Fulton County Technical Specification for Water Main Construction].
 - 6) Backfill shall be placed in two stages: first, side fill to a height of 12 inches (300 mm) above the top of pipe; second, overfill to former surface grade. Side fill shall consist of granular material laid in 6-inch (150 mm) layers each consolidated by mechanical tamping and controlled addition of moisture, to a density of 95% as determined by as determined by the Standard Proctor test (AASHTO T-99 Method D) or GDT 67. Overfill shall be layered and consolidated to match the entrenched material in cohesion and compaction. The top 12 inches (300 mm) shall be compacted to 100% of specified density. Consolidation by saturation or ponding shall not be permitted.
 - 7) Soil Moisture Control: Uniformly moisten and aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2% of optimum moisture content. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2% and is too wet to compact to specified dry unit weight.
 - 8) Initial backfill shall be carefully compacted under pipe haunches and evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Place and compact fill and backfill of satisfactory soil to final subgrade elevation. Backfill voids with satisfactory soil while removing shoring and bracing and/or trench boxes.
 - 9) After backfilling, maintain temporary surface restoration per GA Standard No. 1401 until permanent repaving is complete. No separate payment shall be made for replaced pavement.
15. Disinfection of Water Mains
- a. New and existing pipelines and appurtenances shall be disinfected before placing into service. Disinfection can be conducted in conjunction with the pressure test.
 - b. Before the main is chlorinated, it shall be filled to eliminate air pockets and shall be flushed to remove particulates.
 - c. During disinfection of the water mains, an appropriate cross-connection control device, consistent with the degree of hazard, shall be provided for backflow protection of the active distribution system.

- d. Chlorination: Sterilize using only potable water with calcium hypochlorite (HTH), 1% chlorine solution, or other products acceptable to the Utility Owner and GDOT Project Manager and Department of Public Health. Comply with AWWA C651 including Section 9 procedures on final connections to existing mains.
 - 1) The chlorine solution used for disinfection of water mains shall have a free chlorine residual concentration not less than 25 mg/L or in accordance with [Fulton County Technical Specification for Water Main Construction].
 - 2) Add enough disinfectant to provide a chlorine residual of not less than 10 parts per million (ppm) in 24 hours or as required in [Fulton County Technical Specification for Water Main Construction]. All valves and hydrants shall be operated to ensure disinfection of the appurtenances.
 - 3) At the end of 24 hours, check the chlorine residual. If it is less than 10 ppm, add additional chlorine and check the line again after 24 hours.
- e. After the applicable retention period, the chlorinated water must not be disposed in a manner that will harm the environment. Neutralizing chemicals, such as Sulfur Dioxide, Sodium Bisulfite, Sodium Sulfite or Sodium Thiosulfate can be used to neutralize the chlorine residual remaining in the water to be wasted.
- f. After sterilization, flush the line with potable water until the chlorine residual is equal to the existing system.
 - 1) After final flushing and before the water main is placed into service, water samples shall be collected from the main and tested for microbiological quality in accordance with the Georgia Rules for Safe Drinking Water. Samples shall be taken in the presence of the Utility Owner and GDOT Project Manager.
 - 2) When test results are not satisfactory, the pipeline shall be flushed and disinfected again as necessary without additional compensation until satisfactory results are obtained.

H. Laying Service Lines and Appurtenances

1. Except as modified in this Section, construct and install service connection assemblies and lines according to the Plans and the requirements for laying water mains. Install service lines at locations shown on the Plans or where designated by the Utility Owner and GDOT Project Manager.
2. Install new pipe from the water main to the final location of the meter or to points designated by the Utility Owner and GDOT Project Manager to connect with existing or future service lines on abutting property.
3. No water service connections shall be performed until the main is tested and disinfected. Water service lines shall be tested and disinfected prior to connection to the main.
4. If required, install water service line inside casing pipe according to the Plans or [Fulton County Technical Specification for Water Main Construction].
5. At roads, paved drives, retaining walls, and other paved areas, install service tubing or casing pipe by pushing, pulling, or augering techniques. At all other locations, install service tubing by trenching and backfilling unless directed otherwise by GDOT.
6. Service line installation includes all connections using saddles, unions, valves, fittings, corporation stops, curb stops, casing, and any and all appurtenant work required to provide a complete water service connection.
7. Excavate for service lines as specified in Subsection 670.3.05 with the following exceptions:
 - a. Ensure that trenches under pavements and across driveways are deep enough to provide at least 48 in (1.2 m) of cover, unless otherwise specified by [Fulton County Technical Specification for Water Main Construction] or directed by the Utility Owner and GDOT Project Manager.
 - b. At other areas, trench depth and backfill cover may be adjusted at the discretion of the Utility Owner and GDOT Project Manager to provide at least 18 in (450 mm) of cover.
8. Backfill service lines as specified in Subsection 670.3.05.
9. All service lines, fittings, and appurtenances necessary for the water service connections shall be installed and backfilled in accordance with the manufacturer's recommendations and as per [Fulton County Technical Specification for Water Main Construction] and standard details.

I. Cutting and Capping Existing Water Mains

1. Disconnect by sawing or cutting and removing a segment of existing pipe where cutting and capping or plugging is shown on the Plans or directed by the Utility Owner or GDOT Project Manager. Provide a watertight pipe cap or plug and restraint mechanism to seal off existing mains indicated to remain in service. If water main is to be abandoned or removed and not specified to be grout filled, seal ends with a pipe cap or plug or with a masonry plug and minimum 6-inch (150 mm) cover of concrete on all sides around the end of the pipe.

2. The Contractor shall be responsible for uncovering and verifying the size and material of the existing main to be capped or plugged.
3. Abandoned manholes and water mains greater than 6-inch (150 mm) shall be filled with flowable fill per Section 600 at the locations indicated on the Plans. Air release valves and water service connections along the abandoned main shall be plugged prior to grouting. Prior to backfilling, the bottom of the manhole shall be broken up in such a manner that water will readily pass through. The top portion of the manhole structure shall be removed in order to establish a minimum of 3 feet cover from subgrade or finished grade when not under the pavement and filled with sand or suitable backfill.
4. Water mains shall be flushed prior to placement of flowable fill. Use concrete or grout pumps capable of continuous delivery at planned placement rate with sufficient pressure to overcome friction and fill the sewer main.

J. Relocating, Adjusting, and Removing

1. Fire Hydrant Assemblies
 - a. Relocate, adjust to grade, or remove fire hydrant assemblies including valve and valve boxes according to the Plans or as designated by the Utility Owner and GDOT Project Manager.
 - b. Protect items during removal and relocation. Replace lost or damaged Items at no expense to GDOT or the Utility Owner.
 - c. Disconnect each joint before removing items from the trench.
 - d. Install relocated fire hydrant assemblies with tapping sleeve, and as specified herein for new fire hydrant assemblies.
 - e. Test for leakage, adjust, and retest until no leaks appear.
 - f. Backfill as specified in Subsection 670.3.05.
 - g. Consider valve boxes part of the valve assembly and remove them intact with the valve.
2. Water Valves and Boxes
 - a. Adjust or remove water valves and valve boxes according to the Plans or as designated by the Utility Owner and GDOT Project Manager.
 - b. Protect items during adjustment or removal. Replace lost or damaged Items at no expense to GDOT or the Utility Owner.
 - c. Disconnect each joint before removing items from the trench.
 - d. Test for leakage, adjust, and retest until no leaks appear.
 - e. Backfill as specified in Subsection 670.3.05.
 - f. Consider valve boxes part of the valve assembly and remove them intact with the valve.
3. Existing Water Meters and Boxes
 - a. Relocate existing water meters and boxes according to the Plans or the Utility Owner and GDOT Project Manager.
 - b. To relocate water meters, remove the existing meter, associated backflow preventer, and box and replace with a short section of pipe.
 - c. Inspect along with the Utility Owner and GDOT Project Manager each meter and backflow preventer before removal to determine the condition of each.
 - d. Unless specified otherwise in the Plans or [Fulton County Technical Specification for Water Main Construction], new water meters and backflow preventers shall be furnished by the Contractor as necessary if these devices are deemed unsuitable for reuse. Contractor shall provide new water meter boxes if deemed unsuitable for reuse. The Contractor shall coordinate delivery of the water meters and backflow preventers to correspond to construction operations to minimize service interruptions.
 - e. Relocation of water meters and boxes shall include without additional compensation, required pipe, unions and appurtenances, adapter fittings, necessary storage protection, and installation of meter, backflow preventer, meter box, and curb stop in the existing service line.
4. Existing Water Service Lines
 - a. Water lines shall be adjusted to grade by excavating the existing lines, lowering or raising the lines, and backfilling according to the Plans or the Utility Owner and GDOT Project Manager.
 - b. Furnish new materials or fittings required for the adjustment without additional compensation.
 - c. Change connections at the main that result from this work.
 - d. Repair leaks and damage caused by the operations at no expense to GDOT.
 - e. When retaining a water meter where an existing service line is to be adjusted, adjust the existing meter and box to the proper grade without additional compensation.
5. Other Water Appurtenances

- a. Relocate, adjust to grade, or remove water main appurtenances including but not limited to air release valves, backflow preventers, pressure reducing/sustaining valves according to the Plans or as designated by the Utility Owner and GDOT Project Manager.
6. Utility related items identified on the Plans to be salvaged are the property of the Utility Owner. Contractor shall coordinate with Utility Owner on delivery of salvaged materials. Should the Utility Owner choose to not accept these materials they shall be removed from the project site as soon as practical.

K. Aerial Crossings

1. Support must be provided for all joints in pipes utilized for aerial crossings. The supports must be installed to prevent frost heave, overturning, and settlement. Precautions against freezing, such as insulation, shall be provided.
2. When the aerial crossing is accomplished by attachment to a bridge or drainage structure, the crossing shall meet all requirements of the agencies that own or have jurisdiction over such structures.
3. Aerial installations shall be installed to avoid or minimize stream blockage during normal high water events.
4. Underground valves shall be provided at both ends of the aerial crossing so that the section can be isolated for testing or repair. The valves shall be restrained, easily accessible, and not subject to flooding. An air release/vacuum relief valve shall be installed at all high points along the aerial crossing.
5. Appropriate guards shall be installed at both ends of the aerial crossing to prevent public access to the pipe.

670.3.06 Quality Acceptance

A. Materials Certification

For certain products, assemblies and materials, not on GDOT QPL List, and in lieu of normal sampling and testing procedures by the Contractor, the Utility Owner, and GDOT may accept from the Contractor the manufacturer's certification with respect to the product involved under the conditions set forth in the following paragraphs:

1. Material certifications shall be provided to GDOT, who shall distribute to the Utility Owner. Material certifications shall be approved by GDOT and the Utility Owner prior to construction. The certification shall state/specify that the named product conforms to these specifications and requirements of the Utility Owner and GDOT, and representative samples thereof have been sampled and tested as specified.
2. The certification shall either:
 - a. Be accompanied by a certified copy of the test results, or
 - b. Certify such test results are on file with the manufacturer and will be furnished to the Utility Owner and GDOT Project Coordinators upon demand.
3. The certification shall state/specify the name and address of the manufacturer and the testing agency and the date of tests; and sets forth the means of identification which shall permit field determination of the product delivered to the project as being the product covered by the certification.
4. Submit certification in triplicate with two copies of the covered product to the GDOT Project Coordinator, and one copy sent to GDOT's State Materials and Research Engineer at 15 Kennedy Drive, Forest Park, Georgia. The certification shall specify the project number and contract ID number. No certificate shall be required for Portland cement when furnished from a manufacturer approved by GDOT.
5. GDOT or the Utility Owner will not be responsible for any costs of certification or for any costs of the sampling and testing of products in connection therewith.
6. GDOT and the Utility Owner reserve the right to require samples and test products for compliance with pertinent requirements irrespective of prior certification of the products by the manufacturer. Any materials that fail to meet specification requirements will be rejected.
7. In accordance with the BUY AMERICA requirements of the Federal regulations (23 U.S.C. 313 and 23 CFR 635.410) all manufacturing processes for steel and iron products or predominantly of steel or iron (at least 90% steel or iron content) furnished for permanent incorporation into the work on this project shall occur in the United States. The only exception to this requirement is the production of pig iron and the processing, pelletizing and reduction of iron ore, which may occur in another country. Other than these exceptions, all melting, rolling, extruding, machining, bending, grinding, drilling, coating, etc. must occur in the United States.
 - a. Products of steel include, but are not limited to, such products as structural steel piles, reinforcing steel, structural plate, steel culverts, guardrail steel supports for signs, signals and luminaires, and cable wire/strand. Products of iron include, but are not limited to, such products as cast iron frames and grates and ductile iron pipe. Coatings include, but are not limited to, the applications of epoxy, galvanizing and paint. The coating material is not limited to this clause, only the application process.

- b. Records to be provided by the Contractor for this certification shall include a signed mill test report and a signed certification by each supplier, distributor, fabricator, and manufacturer that has handled the steel or iron product affirming that every process, including the application of a coating, performed on the steel or iron product has been carried out in the United States of America, except as allowed by this Section. The lack of these certifications will be justification for rejection of the steel and/or iron product or nonpayment of the work.
- c. The requirements of said law and regulations do not prevent the use of miscellaneous steel or iron components, subcomponents and hardware necessary to encase, assemble and construct the above products, manufactured products that are not predominantly steel or iron or a minimal use of foreign steel and iron materials if the cost of such materials used does not exceed one-tenth of one percent (0.1%) of the total contract price or \$2,500.00, whichever is greater.

B. Flushing

- 1. Prior to testing, water mains shall be cleaned and flushed to remove all sand and foreign matter. Water used for filling and cleaning shall be from an approved potable water source. Sufficient flushing water shall be introduced into the mains to produce a scouring velocity of not less than 3.5 feet per second to resuspend the solids, and this rate of flow shall be continued until the discharge is clear and no evidence of silt or foreign matter is visible. The Contractor shall dispose of all water used for flushing without causing a nuisance or property damage.
- 2. In the event that the Contractor cannot obtain the flushing velocity, a poly-pig swab may be used to clean the pipeline. The Contractor shall submit pigging plan to the Utility Owner and GDOT for review. The plan shall include type of pig material, water flow rate, discharge points, poly-pig detector and retrieval options.

C. Hydrostatic Testing of Water Mains

- 1. When the Utility Owner and GDOT Project Manager approve a section of pipe for testing, the Contractor shall furnish the materials, equipment, and labor to conduct the pressure and leakage tests. Use a test pump, pressure gauge, and a means of measuring the water necessary to maintain the required pressure during the prescribed testing time. All pressure and leakage testing shall be done in the presence of the Utility Owner and GDOT Project Coordinators as a condition precedent to the approval and acceptance of the system. All pipes shall have been thoroughly flushed prior to testing. Simultaneous or separate pressure and leakage tests may be performed.
- 2. All water for testing and flushing shall be potable water provided by the Contractor, at no cost to the Utility Owner or GDOT, from an approved source. Flow velocity during line filling shall not exceed 2 feet (0.6 m) per second (fps).
- 3. Testing Requirements
 - a. Water mains shall be tested in sections between valves, thereby, testing each valve for secure closure. Testing shall be done immediately after installation and backfilling has been completed.
 - b. The mains shall be tested in accordance with the latest revision of AWWA C600 for ductile iron and C605 for PVC under an average hydrostatic pressure of the greater of 1.5 times the maximum working pressure or 150 psi as measured at the lowest point in the system for a minimum of 2 hours. Pressure shall be maintained until all sections under testing have been checked for evidence of leakage.
 - c. While the system is being filled with water, air shall be carefully and completely exhausted. If permanent air vents are not located at all high points, the Contractor shall install corporation stops or fittings and valves at such points at no additional expense to the Utility so the air can be expelled as the pipe system is slowly filled.
 - d. Makeup water shall be added, as required, to maintain the pressure within 5 psi of the test pressure. The quantity used shall be measured by pumping from a calibrated container. The maximum amount of makeup water allowed shall be determined by the following formula:

$$L = \frac{SD P^{0.5}}{148,000}$$

in which,

L = Allowable Leakage in gallons per hour

S = Length of pipe being tested in feet

D = Nominal pipe diameter in inches

P = Average test pressure during the test in psi gauge

- e. Visible leaks shall be corrected regardless of total leakage shown by test. All pipe fittings and other materials found to be defective under test shall be removed and replaced. Lines which fail to meet test requirements shall be repaired and retested as necessary until test requirements are met. No additional compensation shall be made for repairs or retesting.

670.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

670.4 Measurement

Incidentals including excavation, rock removal, backfilling, disinfection, testing, temporary water connections, pavement removal, pavement replacement, and other incidentals required for the installation of water distribution items are not measured for separate payment and shall be included in the applicable Pay Items below. Water mains, service lines, and other associated Items of work in this Specification, complete, in place, and accepted, are measured for payment as follows:

A. Ductile Iron Water Mains

Ductile iron water mains shall be measured in linear feet (meters) for each size, thickness class, and type (restrained, non-restrained) installed. Measurement shall be horizontally above the centerline of the pipe and shall include the length of valves and fittings.

B. PVC Water Main

PVC water mains shall be measured in linear feet (meters) for each size and type (restrained, non-restrained) installed. Measurement shall be horizontally above the centerline of the pipe and shall include the length of valves and fittings.

C. Fusible PVC Water Main

Fusible PVC water mains shall be measured in linear feet (meters) for each size and type installed. Measurement shall be horizontally above the centerline of the pipe and shall include the length of valves and fittings.

D. HDPE Water Main

HDPE water mains shall be measured in linear feet (meters) for each size and type installed. Measurement shall be horizontally above the centerline of the pipe and shall include the length of valves and fittings.

E. Ductile Iron Fittings

Ductile iron fittings are considered subsidiary to the water line in which they are used and are not measured for separate payment. This Item includes, but is not limited to, wyes, tees, bends, crosses, sleeves, plugs and caps, and reducers.

F. Restrained Joints

Joint restraints used with the installation of PVC or ductile iron pipe are considered subsidiary to the water line in which they are used and are not measured for separate payment.

G. Gate Valves

Gate valves shall be measured on an individual basis for each size valve and box assembly acceptably installed.

H. Butterfly Valves

Butterfly valves shall be measured on an individual basis on the number of each size valve and box assembly acceptably installed.

I. Tapping Sleeve and Valve Assembly

Tapping sleeve and valve assemblies shall be measured on an individual basis on the number of each size tapping sleeve and valve assembly acceptably installed.

J. Fire Hydrant Assemblies

Fire hydrant assemblies shall be measured on an individual basis on the number of hydrants acceptably installed.

K. Water Service Lines

Service lines shall be measured in linear feet (meters) for each size of service pipe installed. Measurements are made from end to end and from center of lines to ends of branches and include tapping saddle, sleeve, valves, service connection assemblies, sleeves, adapters, and fittings.

L. Air Release Valve Assembly

Air release valve assemblies shall be measured on an individual basis on the number of each size and type of air release valve assembly acceptably installed.

M. Blow-Off Assemblies

Blow-off assemblies shall be measured on an individual basis on the number of each blow-off assembly acceptably installed.

N. Backflow Prevention Device

Backflow prevention devices shall be measured on an individual basis on the number of each size and type backflow preventer acceptably installed.

O. Water Meter

Water meters shall be measured on an individual basis on the number of each size meter acceptably installed.

P. Steel Casing

Steel casing pipe of the wall thickness and diameter specified shall be measured by the linear foot for each size and thickness of steel casing pipe installed. Measurement shall be horizontally above the centerline of the casing.

Q. Relocation of Existing Fire Hydrant Assemblies, Air Release Valves, Water Meters, Backflow Preventers, and Pressure Reducing or Sustaining Valves

Relocation of existing fire hydrant assemblies, air release valves, water meters, backflow preventers, and pressure reducing or sustaining valves shall be measured on an individual basis on the number of each acceptably relocated including relocation and final adjustment of boxes.

R. Adjustment of Existing Meter Boxes and Valve Boxes to Grade

Adjustment of existing meter boxes and valve boxes adjusted to grade in their original locations shall be measured on an individual basis on the number of each acceptably adjusted in accordance with Section 611.

S. Adjustment of Existing Backflow Preventers

Adjustment of existing backflow preventers to grade in their original locations shall be measured on an individual basis on the number of each acceptably adjusted in accordance with Section 611.

T. Removal of Water Meters, Fire Hydrant Assemblies, and Backflow Preventers

Removal of existing water meters and boxes, fire hydrants assemblies, and backflow preventers shall be measured on an individual basis on the number of each removed.

U. Adjustment of Water Service Lines

Adjustment of water service lines shall be measured in linear feet (meters) of service line pipe lowered or raised, and shall include the length of valves, fittings, meters, boxes, and other appurtenances. Measurements are made from end to end of actual adjustments.

V. Concrete Thrust Blocks

Concrete thrust blocking installed shall be measured as indicated in Section 500 per cubic yard of concrete acceptably installed. When Concrete Thrust Blocks is not shown as a pay item, include the cost of the work in the bid price for the appropriate item.

W. Concrete Thrust Collars

Concrete thrust collars shall be measured on an individual basis on the number of each size thrust collar acceptably installed. When Concrete Thrust Collars is not shown as a pay item, include the cost of the work in the bid price for the appropriate item

X. Cut and Cap Water Main

Cutting and capping of water mains shall be measured on an individual basis per each instance of cutting and plugging existing mains as shown on the Plans.

Y. Removal of Water Mains

Unless specified removal of water mains shall be removed in accordance with Section 210. If specified removal of water mains shall be measured per linear foot for each size pipe actually removed in accordance with Section 610. Measurement shall be horizontally above the centerline of the pipe removed and shall include the length of valves and fittings.

Z. Line Stop

Line stops shall be measured on an individual basis on the number of each size line stop actually installed.

AA. Flowable Fill

Flowable fill shall be measured as indicted in Section 600 per cubic yard of flowable fill acceptably installed. When flowable fill is not shown as a pay item, include the cost of the work in the bid price for the appropriate item.

BB. Insertion Valve

Insertion valves shall be measured on an individual basis on the number of each size valve acceptably installed.

CC. Three-Dimensional (3D) Survey

Three-dimensional survey shall be measured as one lump sum for a complete and accepted survey. This item will be included in the overall pipe measurement. No separate payment for this work.

670.4.01 Limits

General Provisions 101 through 150.

670.5 Payment

The Contract Unit Price for each Item, complete and accepted, shall include all costs incidental to the construction of the Item according to the Plans and as specified in this Section. The unit prices bid shall include due allowance for the salvage value of all materials removed from existing or temporary lines and not installed in the completed work. All such surplus items shall become the property of the Contractor unless such surplus items are specified to be salvaged. Payment for any Item listed below is full compensation for the Item or Items complete in place.

A. Ductile Iron Water Mains

Ductile iron mains shall be paid for at the unit price per linear foot for each diameter pipe installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of pipe, joints and jointing materials, anchoring, warning tape, polyethylene encasement, protection of existing utilities, connections to existing water mains, sampling taps, temporary blow-offs, flushing, cleaning, pigging, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration and all work and materials necessary to place the pipe into service.

B. PVC Water Main

PVC water mains shall be paid for at the unit price per linear foot for each diameter pipe installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of pipe, anchoring, tracer wire, warning tape, protection of existing utilities, connections to existing water mains, sampling taps, temporary blow-offs, flushing, cleaning, pigging, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the pipe into service.

C. Fusible PVC Water Main

Fusible PVC water mains shall be paid for at the unit price per linear foot for each diameter pipe installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, entry/exit pits, installation of pipe, joints and jointing materials, tracer wire, warning tape, mechanical joint adapters, protection of existing utilities, connections to existing water mains, fusion process materials and equipment, directional drilling materials and equipment, tracking system, assembling, welding, supporting, stringing, pulling, pigging, cleaning, sampling taps, temporary blow-offs, flushing, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, and restoration, and all incidentals necessary to place the pipe into service except where such items are shown to be paid for under a separate Pay Item.

D. HDPE Water Main

HDPE water mains shall be paid for at the unit price per linear foot for each diameter pipe installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, entry/exit pits, installation of pipe, tracer wire, warning tape, mechanical joint adapters, protection of existing utilities, connections to existing water mains, fusion process materials and equipment, directional drilling materials and equipment, tracking system, assembling, welding, supporting, stringing, pulling, pigging, cleaning, sampling taps, temporary blow-offs, flushing, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping,

testing, densities, utility crossings, dewatering, trench stabilization, clean-up, and restoration, and all incidentals necessary to place the pipe into service except where such items are shown to be paid for under a separate Pay Item.

E. Ductile Iron Fittings

Ductile iron fittings are considered subsidiary to the water line in which they are used and are not measured for separate payment as outlined in the manufacturers' catalogues and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of fittings, joints and jointing materials, anchoring, warning tape, polyethylene encasement, protection of existing utilities, flushing, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, all other related and necessary materials, work and equipment required to install a complete and operable pipeline fitting. This Item includes, but is not limited to, wyes, tees, bends, crosses, sleeves, plugs and caps, couplings, and reducers.

F. Restrained Joints

Restrained joints are considered subsidiary to the water line in which they are used and are not measured for separate payment as outlined in the manufacturers' catalogues and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting, shoring, installation of the restraint device, polyethylene encasement, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the restrained joint.

G. Gate Valves

Gate valves shall be paid for at the unit price per each size gate valve and box assembly installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the gate valves (including valve box), concrete pad or collar, valve identification disc, valve marker, valve tag, polyethylene encasement, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the gate valve and place it in service.

H. Butterfly Valves

Butterfly valves shall be paid for at the unit price per each size butterfly valve and box assembly installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the butterfly valves including valve box, concrete pad or collar, valve identification disc, valve marker, valve tag, polyethylene encasement, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration and all work and materials necessary to install the butterfly valve and place it in service.

I. Tapping Sleeve and Valve Assembly

Tapping sleeve and valves assemblies shall be paid for at the unit price per each size tapping sleeve and valve assembly installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of tapping sleeves and valve assemblies including valve box, concrete pad or collar, valve marker, valve tag, polyethylene encasement, protection of existing utilities, tapping the potable water main, chlorine for disinfection, disinfection, sampling points, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and necessary hardware to install the tapping sleeve assembly and valve and place it in service.

J. Fire Hydrant Assembly

Fire hydrant assemblies shall be paid for at the unit price per each hydrant installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the fire hydrant assemblies (all configurations), vertical extensions, tapping sleeve, valve, hydrant lead piping, joint connections, fittings, tees, restraints, crushed stone drain, polyethylene encasement, protection of existing utilities, valve box, concrete pad or collar, valve identification disc, valve marker, valve tag, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the fire hydrant assembly and place it in service.

K. Water Service Line

Water service lines shall be paid for at the unit price per linear feet (meters) of the size service line installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of water service line, tracer wire, tapping saddle, sleeve, corporation stops, fittings, curb stops, casing pipe, plugging abandoned water service connection, removal of abandoned water service line, protection of existing utilities, locating and connection to existing or new water main, chlorine for disinfection, disinfection, sampling points, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the water service line into service. Water meter and box shall be paid for under a separate Pay Item.

L. Water Meter and Box

Water meters shall be paid for at the unit price per each size water meter installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the meter and box, adjustment to final grade, fittings, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the meter into service except where such items are to be paid for under a separate Pay Item.

M. Backflow Preventer

Back flow prevention devices shall be paid for at the unit price per each type backflow preventer installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the backflow preventer, concrete vault, adjustment to final grade, testing and certification, fittings, tees, restraints, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the meter into service except where such items are to be paid for under a separate Pay Item.

N. Air Release Valve Assembly

Air release valve assemblies shall be paid for at the unit price per each size and type of air release valve assembly installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the air release assembly, tapping saddle, isolation valve, reducers, piping, restraints, fittings, tracer wire, concrete manhole or vault, ring and cover, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the air release assembly into service.

O. Pressure Reducing / Sustaining Valve

Pressure reducing / sustaining valve shall be paid for at the unit price per each size and type of pressure reducing / sustaining valve installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the pressure reducing / sustaining valve, reducers, piping, restraints, fittings, tracer wire, concrete manhole or vault, ring and cover, tracer wire, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the pressure reducing / sustaining valve into service.

P. Blow-Off Assembly

Blow-off assemblies shall be paid for at the unit price per each blow-off assembly installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the blow-off assembly, valves, valve boxes, concrete pad or collar, piping, restraints, fittings, tracer wire, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to place the blow-off assembly into service.

Q. Steel Casing

Steel casing pipe shall be paid for at the unit price per linear foot according to the diameter and thickness of the steel casing installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, protection of existing utilities, steel casing pipe, skid, steel straps, coatings, casing spacers, end seals, boring and jacking pits, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, densities,

dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the steel casing except where such items are shown to be paid for under a separate Item. The carrier pipe shall be paid from other applicable Pay Item.

R. Relocation of Existing Air Release Valve

Relocation of air release valves shall be paid for at the unit price per each air release valve assembly relocated and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, removal of existing air release valve assembly, installation at another location, piping, restraints, tracer wire, fittings, adjustment to final grade, polyethylene encasement, protection of existing utilities, chlorine for disinfection, disinfection backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration and all work necessary to locate, remove and relocate the air release valve except where such items are shown to be paid for under a separate Pay Item.

S. Relocation of Existing Fire Hydrant Assembly

Relocation of fire hydrants shall be paid for at the unit price per each hydrant assembly relocated and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, removal of existing fire hydrant assembly, installation at another location, vertical extensions, hydrant lead piping, joint connections, fittings, tees, restraints, crushed stone drain, polyethylene encasement, valve box, concrete pad or collar, valve identification disc, valve marker, adjustment to final grade, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work necessary to locate, remove and relocate the hydrant.

T. Relocation of Existing Backflow Prevention Devices

Relocation of backflow prevention devices shall be paid for at the unit price per each backflow preventer relocated and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, removal of existing backflow preventer, installation at another location, adjustment to final grade, testing and certification, fittings, tees, restraints, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work necessary to locate, remove and relocate the backflow prevention device. The service line from the main to the relocated backflow preventer shall be paid for under a separate Pay Item.

U. Relocation of Water Meter and Box

Relocation of existing water meter and boxes shall be paid for at the unit price of each water meter and box relocated and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, removal of existing water meter and box, installation at another location, adjustment to final grade, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to relocate the water meter and box except where such items are shown to be paid for under a separate Item. The new service line from the main to the relocated meter shall be paid for under a separate Pay Item.

V. Adjustment of Existing Water Service Line

Adjustment of existing water service lines shall be paid in accordance with Section 611, for at the unit price per linear foot of service line adjusted and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, adjustment of service line, tracer wire and splices, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to adjust the service line except where such items are shown to be paid for under a separate Pay Item.

W. Adjustment of Existing Water Valve Boxes to Grade

Adjustment of existing valve boxes shall be paid for in accordance with Section 611, at the unit price per each valve box adjusted to final grade and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, valve case and lid, trench adapter and operating nut extensions/reductions, tracer wire and splices, tracer wire riser and threaded plug, concrete pad, valve identification disc, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to adjust the valve box.

X. Adjustment of Blow-off Assembly

Adjustment of existing blow-off assemblies shall be paid for at the unit price per each blow-off adjusted to final grade and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, valve case and lid, trench adapter and operating nut extensions/reductions, tracer wire and splices, tracer wire riser and threaded plug, piping, concrete pad or collar, valve identification disc, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to adjust the blow-off assembly.

Y. Adjustment of Existing Water Meter Boxes to Grade

Adjustment of existing meter boxes shall be paid for at the unit price per each meter box adjusted to finished grade and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, adjustment of water meter box to final grade, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to adjust the water meter box.

Z. Adjustment of Backflow Preventer

Adjustment of existing backflow preventers shall be paid for at the unit price per each backflow preventer adjusted to finished grade and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, adjustment of backflow preventer to final grade, adjustment of backflow preventer vault to final grade, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to adjust the water meter box.

AA. Adjustment of Existing Fire Hydrant Assembly to Grade

Adjustment of existing fire hydrants shall be paid for at the unit price per each hydrant adjusted to finished grade and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, adjustment of hydrant, protection of existing utilities, chlorine for disinfection, disinfection, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to adjust the hydrant.

BB. Removal of Water Valve and Box

Removal of water valves shall be paid for at the unit price per each valve removed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, removal of existing water valve and box, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, storage and delivery of removed valves identified to be salvaged, and all work necessary to remove the valve and box.

CC. Removal of Water Meter and Box

Removal of water meters shall be paid for at the unit price per each meter removed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, removal of existing water meter and box, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, storage and delivery of removed meters and boxes identified to be salvaged, and all work necessary to remove the meter.

DD. Removal of Fire Hydrant Assembly

Removal of fire hydrant assemblies shall be paid for at the unit price per each hydrant assembly removed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, removal of existing fire hydrant assembly, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, storage and delivery of removed hydrants identified to be salvaged, and all work necessary to remove the hydrant.

EE. Removal of Air Release Valve

Removal of air release valves shall be paid for at the unit price per each air release valve removed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, removal of air release valve assemblies, piping, concrete manholes or vaults, and fabricated enclosures, backfilling, backfill materials, disposal of

unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, storage and delivery of air release valves identified to be salvaged, and all work necessary to remove the air release valve.

FF. Removal of Backflow Prevention Devices

Removal of backflow prevention devices shall be paid for at the unit price per each backflow preventer removed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheet and shoring, removal of existing backflow preventer and vault, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, storage and delivery of removed backflow preventers identified to be salvaged, and all work necessary to remove the backflow preventers.

GG. Concrete Thrust Blocks

Concrete thrust blocks shall be paid for at the unit price per cubic yard of concrete complete in place as indicated in Section 500 and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, concrete, forming, reinforcement, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install a complete thrust block. When Concrete Thrust Blocks is not shown as a pay item, include the cost of the work in the bid price for the appropriate item

HH. Concrete Thrust Collars

Concrete thrust collars shall be paid for at the unit price per each size of thrust collar and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, reinforced concrete thrust collars, retainer glands, reinforcement, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install a complete thrust collar. When Concrete Thrust Collar is not shown as a pay item, include the cost of the work in the bid price for the appropriate item

II. Removal of Water Main

Removal of water mains shall be paid for at the unit price per linear foot of the size of water main to be removed in accordance with Section 610 and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, bypass pumping (as required), restoration, and all work and materials necessary to locate, remove and dispose of the pipe and associated appurtenances. Unless indicated for removal in a separate Pay Item, appurtenances to be removed shall include but not be limited to fittings, isolation valves, air release valves, valve boxes, blow-offs, steel casings, casing spacers, fire hydrant assemblies, water service lines, water meter boxes, thrust blocks, and concrete. All such surplus items shall become the property of the Contractor unless specified to be salvaged by the Utility Owner.

JJ. Cut and Plug Existing Water Main

Cutting and plugging of existing water mains shall be paid for at the unit price per each installation and shall cover all materials, transportation, labor, equipment, excavation, sheeting and shoring, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to cut and plug existing water mains, except where such items are shown to be paid for under a separate Pay Item.

KK. Line Stops

Line stops shall be paid for at the unit price per each size line stop installed and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the line stop assemblies, valves, valve boxes, fittings, restraints, protection of existing utilities, chlorine for disinfection, disinfection, sampling points, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the gate valve and place it in service.

LL. Flowable Fill

Flowable fill shall be paid for at the unit price per cubic yard of flowable fill complete in place as indicated in Section 600 and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, flushing, plugging air release valves and service connections, installation of flowable fill, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, utility crossings,

Section 670—Water Distribution System

dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the gate valve and place it in service. When flowable fill is not shown as a pay item, include the cost of the work in the bid price for the appropriate item

MM. Insertion Valve

Insertion valves shall be paid for at the unit price per each size valve inserted and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the valve, valve boxes, fittings, restraints, concrete pad or collar, valve identification disc, valve marker, polyethylene encasement, protection of existing utilities, chlorine for disinfection, disinfection, sampling points, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, densities, dewatering, trench stabilization, clean-up, restoration, and all work and materials necessary to install the insertion valve and place it in service.

NN. Three-Dimensional (3D) Survey

Three-dimensional survey cost will be included in the overall pipe measurement and no separate payment for this work will be made, and it shall cover the costs for all non-destructive methods of locating installed utilities and associated electronic deliverables per Utility Owner specifications.

Payment will be made under:

Item No. 670	Water Main_____ in (mm)	Per linear foot (meter)
Item No. 670	Gate Valve_____ in (mm)	Per each
Item No. 670	Tapping Sleeve and Valve Assembly __ in (mm) x_____ in (mm)	Per each
Item No. 670	Fire Hydrant	Per each
Item No. 670	Water Service Line_____ in (mm)	Per linear foot (meter)
Item No. 670	Relocate Existing Fire Hydrant	Per each
Item No. 670	Relocate Existing Water Valve including Box	Per each
Item No. 670	Relocate Existing Water Meter including Box	Per each
Item No. 670	Adjust Water Service Line to Grade	Per linear foot (meter)
Item No. 670	Remove Existing Water Meter including Box	Per each
Item No. 670	Remove existing fire hydrant	Per each
Item No. 670	Steel casing_____ in (mm)	Per linear foot (meter)
Item No. 670	Butterfly valve_____ in (mm)	Per each
Item No. 670	Double strap saddle_____ in (mm) x_____ in (mm)	Per each

Item No. 670	Tapping Valve, ___ in(mm)	Per each
Item No. 670	Air Release Valve Assembly_____ in (mm)	Per each
Item No. 670	Water Meter, ___ in	Per each
Item No. 670	Insertion Valve, ___in	Per each
Item No. 670	Line Stop_____ in (mm)	Per each
Item No. 670	Cut and Plug Existing Water Main	Per each
Item No. 670	Blow-Off Assembly, Complete	Per each
Item No. 670	Pressure Reducing/Sustaining Valve	Per each
Item No. 670	Backflow Prevention Assembly	Per each
Item No. 670	Concrete Thrust Collar, _____ in	Per each
Item No. 670	Relocate Backflow Prevention Assembly	Per each

Section 670—Water Distribution System

Item No. 670	Relocate Existing Water Meter, including Bypass & Vault_____ in (mm)	Per each
Item No. 670	Relocate Pressure Reducing/Sustaining Valve	Per each
Item No. 670	Adjust Blowoff Assembly	Per each
Item No. 670	Remove Existing Water Valve, including Box	Per each
Item No. 670	Remove Existing Fire Hydrant	Per each

670.5.01 Adjustments

General Provisions 101 through 150.