Revised: December 15, 2022

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

SPECIAL PROVISION

COUNTY: DEKALB

SSD2022.01

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 potable water distribution mains and appurtenances according to the Plans and Specifications.

670.1.01 Definitions

A. General Provisions 101 through 150

B. The term "The Facility Owner" or "Utility Owner" shall be understood to mean "**Dekalb County Department of Watershed Management**" or "**DCDWM**".

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 City of Brookhaven (COB) 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 156—GPS Specifications for Conveyance Structures GIS Mapping

Section 205—Roadway Excavation

Section 207—Excavation and Backfill for Minor Structures

Section 209—Subgrade Construction

Section 210—Grading Complete

Section 310—Graded Aggregate Construction

Section 400—Hot Mix Asphaltic Concrete Construction

Section 402—Hot Mix Recycled Asphaltic Concrete Construction

Section 444—Sawed Joints in Existing Pavements

Section 500—Concrete Structures

Section 600—Controlled Low Strength Flowable Fill

Section 610—Removal of Miscellaneous Roadway Items

Section 611—Relaying, Reconstructing or Adjusting to Grade of Miscellaneous Roadway Structures

Section 615—Jacking or Boring Pipe

Section 668 – Miscellaneous Drainage Structures

Section 801 – Fine Aggregate

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 **The Facility Owner's Design Standards Manual (Dekalb County Department of Watershed Management)**, American Water Works Association (AWWA), 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. Portions of the Owner's Standard Specifications are defined below for convenience, but this does not relieve the Contractor from the requirement to comply with the complete specification requirements of the Utility Owner. These documents can be reviewed online at the Utility Owner's website. Online specifications, standards and details can be reviewed at: https://www.dekalbcountyga.gov/sites/default/files/user3576/DWM Water and Sewer Design Standards - 5 10 18.pdf.

670.1.03 Submittals

A. General Provisions 101 through 150.

B. Refer to The Facility Owner's (DCDWM) Standard Specifications, current published edition, for potable water utility submittal requirements. Copies of all submittals and documentation shall be submitted to COB, who shall distribute to the Utility Owner.

C. Shop Drawings / Product Data

1. Submit one digital copy of the following submittals to the COB 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.
   e. The Contractor shall submit promptly to the Project Manager or his/her representative one digital copy of each material submittal prepared in accordance with the approved schedule, to be reviewed for acceptance by the Utility Owner's representative. After examination of such submittal drawings by the Utility Owner and the return thereof, the Contractor shall make such corrections to the drawings as have been indicated and shall furnish the Project Manager and Utility Owner with corrected copies. Regardless of corrections made in or approval given to such drawings by the Project Manager, the Contractor shall nevertheless be responsible for the accuracy of such drawings and for their conformity to the Plans and Specifications at the time the drawings are provided.

D. Construction Record Documentation

1. The Utility Owners may have certain GIS requirements that vary from the GDOT Specification Section 156. Therefore, the requirements of Section 156 and pay item 156-0100 shall be modified to meet the requirements herein as shown below:

   The Contractor shall submit one set of utility record drawings that records 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 +/- 0.1ft, referenced to permanent surface improvements. Drawings shall utilize State Plane Coordinates and shall be legibly marked to record actual construction and submitted to the COB and the Facility Owner no later than 30 days after installation and prior to Final Acceptance of the Project. The Project Manager shall consult with the Utility Owner and together shall determine if the utility record drawings are complete prior to Final Acceptance of the project. Horizontal locations shall be referenced to Georgia State Plane Coordinates (West Zone feet). Vertical locations shall be shown referenced to Mean Sea Level. Reference all horizontal locations to the NAD83 datum (latest adjustment) and reference all vertical locations to the NAVD88 datum. All orthometric locations shall be referenced to Geoid 99/03. All points shall be verifiable by the Utility Owner control network. All Horizontal and Vertical location shall have no translation, rotation or angle adjustment. All points are subject to verification by the Utility Owner.

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. At the completion of the installation, testing and acceptance of the potable water main and appurtenances, the Project Manager shall receive from the Contractor one (1) set of printed As-Built plans and electronic data prepared in accordance with the following requirements:

   a. The plans shall show all water system information As-Built in the field and any field changes made to the approved plans. The Contractor must furnish certification from a licensed engineer or surveyor attesting to the accuracy of all elevations, grades, locations of valves and hydrants, and service meter locations. This certification and the certification of the engineer/land surveyor preparing the As-Builts must be shown on the drawings. As-Built drawings shall include utility plan sheets. Stationing of the water main alignments, fittings, valves, hydrants and service meters shall be required on the As-Builts along with the Point I.D.

   b. As-built plans shall be submitted on 24" x 36" drawing sheets and shall be submitted concurrently in an "AutoCAD" drawing electronic format and Adobe PDF of entire project. As-built information for utility locations shall be shown on plans and submitted in ASCII text electronic format for each point. The water As-Builts must be printed from the electronic files supplied to the Project Manager concurrently with the As- Builts. These plans shall have been corrected to show all field changes made to the construction drawings. Hand marked copies prepared by the contractor will not be accepted for As-Builts.

      The information submitted electronically for water mains shall include corrected locations of the water main, Point I.D. of water mains at all transitions (bends-vertical and horizontal), relocated fire hydrants, relocated valves, ALL fittings, tapping sleeves, main line service taps, relocated master meters, and relocated fire line meters, relocated residential meters and commercial meters, and relocated DCDA assemblies shall include:

      A.) **Point Identification (I.D.), including description of point, such as top of pipe, type of fitting, size of main, and valve type/size.**
      B.) **North Coordinate**
      C.) **East Coordinate**
      D.) **Ground Elevation**
      E.) **Elevation of Top of Pipe, Top of Fitting, Top of Valve Operating Nut or Top of Hydrant Operating Nut**

      The information shown above regarding the as-built survey shall supersede any requirement dictated in Section 156 re as-builts for water or sanitary sewer facilities.

The following are specific guidelines for the preparation of the printed version of the Record Drawings:

A.) Water Record Drawing shall be a separate set of sidewalk/trail plans.

B.) Location of service tap, meter and backflow preventer shall be shown.

C.) The center of all fire hydrants shall be located horizontally and vertically as described above.

D.) Printed Record Drawings are to be clear and legible.

E.) Roads and road names shall be shown on all plans.

F.) "Record Drawings" is to be in large clear print on plans.

G.) Plan sheets shall be 24" x 36".

H.) Scale set to same scale as original plan.

I.) Ground water and solid rock encountered during construction will be noted on Record Drawings.

J.) Water point I.D. shall be on plans, electronic data and ASCII or EXCEL data file. All point I.D.'s shall correspond.

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 5-year period, or as approved by the Utility Owner and COH.

C. Regardless of tolerances permitted by industry standards specified herein, the Utility Owner or the COB 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. COB, GDOT, the Utility Owner and the Utility Owner's consultant shall have the right to visit and inspect the work at any time. Along with the COB Inspector, 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 COB Project Manager of any observed discrepancies or potential problems. The cost of these inspections shall be the responsibility of the Utility Owner.

E. COB shall notify the Utility Owner before authorizing any changes or deviations which might affect the Utility Owner's facilities. Contractor shall notify COB and Utility Owner a minimum of 48 hours prior to beginning work on utilities.

F. The Utility Owner shall be notified by COB 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 COB Project Manager prior to the final inspection. Testing and Inspection requirements for water mains are detailed below.

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.

H. The contract documents are complementary, and what is called for by any one shall be as binding as if called for by all. The intent of the documents is to describe all construction entailed in this project. The contractor will furnish all labor and materials, equipment, transportation, tools and appurtenances such as may be reasonably required under the terms of the contract to make each part of the work complete. The Drawings are intended to conform and agree with the Specifications; if, however,

discrepancies occur, the Project Manager shall consult with the Utility Owner to decide which shall govern. Special specifications stated on the Drawings govern that particular piece of construction and have equal weight and importance as the printed specifications. In the event of any discrepancies between the Drawings and the figures written thereon, the figures are to be taken as correct.

670.2 Materials

MATERIALS, SERVICES AND FACILITIES

It is understood that except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, superintendence, temporary construction of every nature, and all other services and facilities of every nature whatsoever necessary to execute, complete, and deliver the work within the specified time. Any work necessary to be performed by the Contractor to complete the project on time after regular working hours, on Sundays or Legal Holidays, shall be performed without additional expense to the Owner.

CONTRACTOR'S TITLE TO MATERIALS

No materials or supplies for the work shall be purchased by the Contractor or by any Subcontractor subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. The Contractor warrants that he has good title to all materials and supplies used by him in the work, free from all liens, claims and/or encumbrances.

MATERIALS FURNISHED BY THE CONTRACTOR

All materials used in the work including equipment shall be new and unused materials of a reputable U.S. Manufacturer conforming to the applicable requirements of the Specifications, and no materials shall be used in the work until they have been approved by the Utility Owner. The Contractor shall furnish all materials necessary except as otherwise specifically noted or specified. **For clarity on this requirement, refer to Section 670.3.07.a.7.**

INSPECTION AND TESTING OF MATERIALS

All materials and equipment used in the construction of the project shall be subject to adequate inspection and testing in accordance with accepted standards. The laboratory or inspection agency shall be selected by the Project Manager. Materials of construction, particularly those upon which the strength and durability of the structure may depend, shall be subject to inspection and testing to establish conformance with specifications and suitability for uses intended.

"OR APPROVED EQUAL" CLAUSE

Whenever a material, article or piece of equipment is identified on the plans or in the specifications by reference to manufacturer's or vendor's names, trade names, catalogue numbers, etc., it is intended merely to establish a standard; and any material, article, or equipment of other manufacturers and vendors which will perform adequately the duties imposed by the general design will be considered equally acceptable provided the material, article, or equipment so proposed, is in the opinion of the Utility Owner, of equal substance and function. It shall not be purchased or installed by the Contractor without the Utility Owner's written approval.

MATERIAL SPECIFICATIONS

All materials provided shall be in conformance with the requirements and standards set forth in The Facility Owner's Design Standards Manual, current published edition. All materials used in the work including equipment shall be new and unused materials of a reputable U.S. Manufacturer conforming to the applicable requirements of these Standards, and no materials shall be used in the work until they have been approved by the Utility Owner. Any reference to an AWWA, ANSI or other such specification shall mean the latest revision published.

All materials that are used and come into contact with drinking water during its treatment, storage, transmission, or distribution shall not adversely affect drinking water quality and public health and must be certified for conformance with ANSI/NSF Standard 61. PVC pipe shall meet all requirements set forth in ASTM Standard D2241. Gasket materials shall meet the requirements established in ASTM F477.

In addition, any pipe, pipe fittings, plumbing fittings or fixtures, solder or flux used in the installation or repair of a public water system must meet the new definition of lead-free meaning: (a) not containing more than 0.2 percent lead when used with respect to solder and flux; and (b) not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings and fixtures.

670.2.01 Water Piping systems and Appurtenances

For the convenience of the Contractor, a portion of the Utility Owner's material specifications is provided below:

A. WATER MAIN MATERIALS

1.) Ductile Iron Pipe

Ductile iron pipe shall be Special Thickness Class 51 or Pressure Class 350, designed in accordance with AWWA C150, and manufactured in accordance with AWWA C151. Ductile iron pipe shall have an outside bitumastic coating per AWWA C151. It shall have an inside standard cement lining with bituminous seal coat per AWWA C104, applied at the point of manufacture, with the following modifications: Cement mortar shall be composed of 100% Portland Cement Type II and Type V, sand and water. Cement-mortar lined pipe shall have smooth dense interior surfaces and shall be free from fractures, excessive interior surface crazing, disbondment and roughness.

Joints - Except where restrained, flange, or mechanical joints are specified, straight pipe joints shall be push-on, rubber gasket type such as Fastite or alternate acceptable to the Utility Owner conforming to AWWA C111. Pipe shall be in 18' to 20' nominal lengths with standard deflection pipe sockets. Where restrained joints are shown, the joints shall be "Flex-Ring" type as made by American Ductile Iron Pipe, TR Flex as made by U.S. Pipe, or approved equal. Where river crossing pipe is required, the pipe shall be "Flex-Lok Boltless Ball Joint Pipe" as manufactured by American Pipe or approved equal. Where specified, flanged pipe shall meet AWWA C151 specifications and be used with fittings meeting AWWA C110 or AWWA C153.

Certificates of conformance with the foregoing specifications shall be furnished with each lot of pipe supplied.

2.) Copper Tubing for Water Service Laterals

Service lateral pipe shall be copper service pipe, type K, soft temper, seamless copper tubing, conforming to ASTM B-88. Flare joints shall be used for ¾" and 1" services. Compression joints shall be used for 2" services, including stainless steel clamp screws. Couplings shall be Ford C44-77 or approved equal.

Service line size shall be three-quarter inch (3/4") or one-inch (1") for single residential services (equal to meter size) and one inch (1") for a double residential service to the wye. Service line size shall be one-inch (1") minimum for all other types of developments. All service lines smaller than four inches (4") in diameter shall be copper. Service lines four inches (4") in diameter and larger shall be ductile iron.

3.) PVC Casing for Copper Services

Long side service lines shall be bored and encased in PVC pipe. PVC casing pipe used for long-side services shall be Schedule 40 thickness and a minimum of two inches (2") in diameter for 1" and smaller services and four inches (4") in diameter for 2" services.

4.) Ductile Iron Pipe Fittings

Fittings shall be ductile iron and furnished in accordance with AWWA C110 or AWWA C153, latest revisions, and shall be a minimum of 350 psi pressure class rating. Joints shall be mechanical joint with retainer glands conforming to AWWA C111. Cement mortar lining conforming to AWWA C104 or fusion-bonded epoxy coating conforming to AWWA C116 shall be furnished for fittings.

B. FIRE HYDRANTS

All fire hydrants shall comply in all respects with Utility Owner's Standards and shall be designed and manufactured to comply with the latest revision of AWWA C502 for dry barrel hydrants. The hydrants shall be designed for 250 pounds working pressure. The hydrants shall be of simple design, easy to operate, effectively and positively drained and protected from damage by freezing, and convenient for repairing and replacing parts.

Hydrants shall be equipped with one four & one-half inch (4-1/2") diameter pumper nozzle and two (2) two & one-half inch (2-1/2") diameter hose connections, which shall have threads meeting the latest requirements of the State Fire Insurance Commission. Hydrants shall have a safety flange on the barrel and a safety coupling on the valve stem to prevent damage to barrel and stem in case of traffic accident. Safety coupling shall be set two to six inches (2" to 6") above the finish grade. Hydrants shall be Mueller Company's Super Centurian traffic model, M&H Style 129 traffic model, or East Jordan Ironworks Watermaster 5CD250.

The connection at the base of the hydrant shall be mechanical joint with ductile iron retainer gland for six-inch (6") ductile iron pipe. The valve opening shall meet the requirements of the AWWA Specifications for a five and one quarter inch (5-1/4") hydrant. The valve, valve seat and inner working parts shall be easily accessible. The height from the surface of the ground to the bottom of the hose nozzle shall be no less than eighteen inches (18"). Each hydrant shall be neatly painted by the manufacturer with a silver reflecting paint.

Each hydrant shall be tested to two hundred (200) psi. The first test shall be made with the valve closed. The second test shall be made with the main valve open but all nozzles closed. While the test is being carried on, the hydrant shall be subjected to a hammer test. Any hydrant showing defects by leakage, sweating, or otherwise shall be rejected. The barrel and all parts shall withstand these tests. These tests shall be made in the field after the hydrants are installed.

Leads from the main line to the fire hydrant shall use six-inch (6") ductile iron pipe and shall have a six-inch (6") gate valve between the main line and fire hydrant. The valve shall be connected to the main line by using a locked hydrant tee. Retainer glands or steel rods must be used to insure adequate connection of fire hydrant to valve. When the hydrant is close enough to the valve to allow its use, the hydrant shall be connected to the valve by using an anchor coupling acceptable to the Utility Owner.

C. VALVES AND ACCESSORIES

1.) Gate Valves

Valves twenty-four inch (24") and smaller shall be gate valves. The valves shall be of non-rising stem design, and have an iron body, bronze mounted, resilient-seated, meeting all requirements of AWWA C509. All interior ferrous surfaces of valves shall have a fusion-bonded epoxy coating meeting the requirements of AWWA C550. Valves shall be designed for a minimum working pressure of 250 psi and shall have two inch (2") square operating nuts, except in meter vaults where hand wheels shall be installed. Valves for pipe smaller than four-inch (4") in diameter shall have hand wheels suitable for use inside standard valve boxes. Valves shall open when turned counter-clockwise.

Valves sized three through twenty-four-inch (3" through 24") shall be Mueller Co. A-2361 with mechanical joints or approved equal. Valves sized smaller than three-inches (3") shall be Mueller Co. A-2362 with mechanical joints or approved equal. Mechanical joints shall be fitted with retainer glands. Where flange joints are used, flanges must meet the requirements of AWWA C115.

2.) Valve Boxes

Valves boxes for valves shall be approved standard cast iron adjustable shaft boxes having a minimum shaft diameter of five and one quarter inch (5-1/4"). The casing shall be coated with two coats of bitumastic paint. The

lids of all boxes shall bear the word "Water" or the letter "W". Boxes shall be Tyler/Union 6850 Series Box 562-S or approved equal. Valve box extensions are not acceptable for use in roadways.

3.) Pipe Connection Couplings

Pipe connections between new pipe and existing pipe shall be made with Dresser Style 90 long steel couplings for pipe sizes two-inch (2") and below; for pipe sizes above two-inch (2"), M.J. solid sleeves (long style) shall be used. Spacer rings must be used at all solid sleeve locations. A spacer ring is defined as a short section of pipe cut to fit into the gap between the two plain ends of pipe at the sleeve location. Field joints shall be made to insure permanently tight joints under all reasonable conditions of expansion, contraction, shifting, etc.

4.) Curb Stops

All metal parts of curb stops shall be made of bronze. The stops shall be approved by Marietta Water. The cock shall be operated with a combined cap and tee and shall open when turned counter-clockwise. All curb stops for services less than 2” in diameter shall be flare joint inlet with female iron pipe thread outlet. The model number will depend on the meter size. For a 1” meter, the curb stop shall be a Ford Model B21-444W with padlock wings or approved equal. All curb stops for services 2” in diameter shall be compression joint inlet with flange outlet. The model number will depend on the meter size. For a 2” meter, the curb stop shall be a Ford Model BF43-777W with padlock wings or approved equal.

5.) Service Line Couplings

Service line pipe couplings shall be compression style Ford C44 or approved equal. Where approved for use, wyes shall be Ford Model Y22-243 or approved equal for a 1” x 3/4”/3/4” wye.

6.) Corporation Stops

Corporation cocks for services less than 2” in diameter shall have AWWA tapered thread inlet and flare joint outlet connection. All metal parts of the cock assembly shall be made of bronze. The cock shall be operated with a tee head and shall open when turned counter-clockwise. The cock shall be a Ford model FB600 or approved equal. Corporation cocks for services 2” in diameter and larger shall have a male iron thread inlet and compression joint outlet connection. The cock shall be a Ford model FB1100 or approved equal. Service saddles are required for all services larger than 1” in diameter.

7.) Meter Boxes for 5/8” through 1” Meters

Meter boxes for services shall be made of polypropylene materials. The box shall be approximately 19” long, 13” wide and 12” deep. The lid shall be made of the same material as the box, and shall have an AMR locator pad attached to the bottom of the lid to accept AMR transponders. The lid shall seat securely and evenly inside the meter box and shall not overlap the top edge of the box. Meter Boxes shall be DFW Plastics Series A 1200.SBAMR or approved equal.

8.) Service Saddles – Double Strapped

Service saddles shall be equal to Smith Blair 313 double strap clamps suitable for use with ductile iron or PVC pipe. Service saddles are required for taps larger than 1” in diameter. **Direct taps are required for 1” and smaller services.**

9.) Polyethylene Tubing for Ductile Iron Pipe

All ductile iron water mains shall be encased in polyethylene encasement tubing, which shall be manufactured of virgin polyethylene material conforming to the requirements specified in AWWA C105, Section 4.1.1 for linear, low density polyethylene film. The polyethylene film shall have a minimum thickness of 8 mil. Black polywrap shall be used for water mains and green polywrap shall be used for sewer mains.

10.) Valve Markers

One concrete valve marker shall be furnished and set at each line valve. The marker shall be made of 3,000 PSI concrete, and shall be four feet (4') long and four inches (4") on each side, with two #3 or #4 reinforcing bars as shown on the Utility Owner's Standard Details.

The markers shall be set an even number of feet between the center line of the valve and the center line of the aluminum disc in the top of the marker, and the distance in feet between the valve and marker shall be stamped in the marker at the time of setting.

11.) Valve Box Collars

Each valve box shall have a concrete collar. These collars must be a minimum of three and one half inches (3 1/2") thick. They shall be square and sized 24" x 24". Precast collars may be used, provided that they are grouted in place to the valve box. The box is to be flush with or a maximum of one inch (1") above the finished grade. The edge of the valve box is to be one half inch (1/2") above the edge of the concrete collar.

12.) Class A Concrete for Thrust Blocks and Thrust Collars – High Early Strength

Concrete for thrust blocks and thrust collars shall be Class A Concrete, High Early Strength, and have a minimum compressive strength of 3,000 PSI at 28 days, and shall be sized in accordance with the Utility Owner's Standard Detailed Drawings.

13.) Stabilizer Material, Type I (Subgrade Stabilizer Stone)

Stabilizer Material Type I for subgrade shall be either approved crushed stone or gravel, uniformly graded from 1/4" to 1.25" in size (#57 Stone).

14.) Retainer Glands

Retainer glands for mechanical joints shall be EBAA Mega-Lug or approved equal. Note the different models required for DIP and PVC pipe.

15.) Locked Fire Hydrant Tee and Adapter

Locked fire hydrant tees shall be American A-10180 or approved equal. Locked hydrant adapter (anchor coupling) shall be American A-10895 or approved equal.

16.) Restrained Joint Gaskets

Inside of all casings and wherever else required by the plans or Utility Owner, DIP water main joints shall be slip joint restrained by using American Pipe "Fast-Grip" gaskets, US Pipe "Field-Lok" gaskets or approved equal.

17.) Nitrile (NBR) Gaskets

In areas where underground fuel storage tanks are located or are known to have been located and as directed by the Project Manager or Utility Owner, the D.I.P. water main joints shall use "Nitrile (NBR)" (Acrylonitrile Butadiene) gaskets or approved equal.

18.) Precast Concrete Vaults for Master Meters and DCDA Assemblies

Precast concrete vaults shall conform to the Utility Owner's Standards and Specifications.

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 potable water utilities shall be performed by a Contractor prequalified/registered with GDOT.

C. All work specified in this section 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.

D. SUPERINTENDENCE BY CONTRACTOR

At the site of the work, the Contractor shall employ a construction superintendent or foreman who shall have full authority to act for the Contractor. It is understood that such representative shall be acceptable to COB and the Utility Owner and shall be one who can be continued in that capacity for the particular job involved unless he ceases to be on the Contractor's payroll.

E. COMPETENT LABOR

The Contractor shall employ only competent and skilled workers on the project. The Contractor shall have a competent superintendent or foreman present at all times when the work is in progress and with authority to receive orders and execute the work. The Contractor shall, upon demand from COB or the Utility Owner, immediately remove any superintendent, foreman or worker whom COB or the Utility Owner may consider incompetent or undesirable.

670.3.02 Equipment

A. Ensure all equipment used is in conformance with the requirements and standards set forth in The Facility Owner's Design Standards Manual. The Contractor shall provide all necessary equipment in good repair for the expeditious construction of the work. Any equipment not adapted for the work, in such repair as to be dangerous to the project or workers, shall not be used.

670.3.03 Preparation

General Provisions 101 through 150.

670.3.04 Fabrication

General Provisions 101 through 150.

670.3.05 General

A. CONTRACTOR'S OBLIGATIONS

The Contractor shall and will, in good workmanlike manner do and perform all work and furnish all supplies and materials, machinery, equipment, facilities and means, except as herein otherwise expressly specified, necessary or proper to perform and complete all the work required by this contract, within the time herein specified, in accordance with the plans and drawings covered by this contract any and all supplemental plans and drawings, and in accordance with the directions of the Project Manager as given from time to time during the progress of the work. He/she shall furnish, erect, maintain and remove such construction plant and such temporary works as may be required. He/she alone shall be responsible for the safety, efficiency and adequacy of the plant, appliances, and methods, and for any damage which may result from their failure of their improper construction, maintenance, or operation.

The Contractor shall observe, comply with, and be subject to all terms, conditions, requirements, and limitations of the Contract and specifications, and shall do, carry on, and complete the entire work to the satisfaction of the Project Manager.

B. CONTRACTOR'S RESPONSIBILITY

The Contractor shall be responsible for all material and work until they are finally accepted by the Project Manager, and shall repair at his own expense any damage that they sustain before their final acceptance. The Contractor shall be responsible for all damages caused by him of whatever nature and must settle all claims arising from such damage without cost to the Owner; he shall act as defendant in, and bear the expense of each and every suit of any and every nature which may be brought against him/her, COB, or the Utility Owner, by reason of, or connected with the work under the Contract.

C. PUBLIC CONVENIENCE AND SAFETY

Materials stored at the site of the work shall be so placed and the work shall, at all times, be so conducted as to cause no greater obstruction to traffic than is considered permissible by the GDOT or COB. No roadway shall be closed or opened except by express permission of the GDOT and/or COB and the Contractor's proper notification of local fire and police departments. Precaution shall be exercised at all times for the protection of persons and property. The safety provisions of applicable laws, building and construction codes shall be observed. Machinery, equipment and other hazards shall be guarded in accordance with the safety provisions of the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America to extent that such provisions are not in contravention ofapplicable laws.

D. PROTECTION OF WORK AND PROPERTY - EMERGENCY

The Contractor shall at all times safely guard the project from injury or loss in connection with this contract. At all times, the Contractor shall safely guard and protect his own work, and that of adjacent property from damage. The Contractor shall replace or make good any such damage, loss or injury unless such be caused directly by errors contained in the contract or by the Project Manager, or his duly authorizedrepresentative.

In case of an emergency which threatens loss or injury of property, and/or safety of life, the Contractor will be allowed to act, without previous instructions from the Project Manager in a diligent manner. He shall notify the Project Manager immediately thereafter. Where the Contractor has not taken action, but has notified the Project Manager of an emergency threatening injury to persons or damage to the work or any adjoining property, he shall act as instructed or authorized by the Project Manager.

E. CORRECTION OF WORK

All work, all materials, whether incorporated in the work or not, all processes of manufacture, and all methods of construction shall be at all times and places subject to the review of the Utility Owner who shall be the final judge of the quality and suitability of the work, material, processes of manufacture and methods of construction for the purposes for which they are used. Should they fail to meet approval, they shall be forthwith reconstructed, made good, replaced and/or corrected, as the case may be, by the Contractor at his own expense. Rejected material shall immediately be removed from the site.

F. COORDINATION WITH OTHER CONTRACTORS

The Contractor shall coordinate his operations with those of other contractors. Cooperation will be required in the arrangement for the storage of materials and in the detailed execution of the work. The Contractor, including his Subcontractors shall keep

informed of the progress and the detail work of other Contractors and shall notify the Project Manager immediately of lack of progress or defective workmanship on the part of other contractors. Failure of a Contractor to keep informed of the work progressing on the site and failure to give notice of lack of progress or defective workmanship by others shall be construed as acceptance by him of the status of the work as being satisfactory for proper coordination with his own work.

G. OWNER'S EXAMINATION OF WORK COMPLETED

At the request of the Project Manager or Utility Owner or their representatives, the Contractor shall, at any time before final acceptance of the work, remove, or uncover such portions of the finished work as may be directed. After examination the Contractor shall restore said portions of the work to the standard required by the Specifications. Should the work thus exposed or examined prove acceptable, the uncovering or removing, and the replacing or making good of the parts removed, shall be paid for as Extra Work, but should the work so exposed or examined prove unacceptable, the uncovering or removing, and the restoration shall be at the Contractor'sexpense.

H. NOTIFICATION OF CONSTRUCTION

Prior to the commencement of construction, the Contractor shall give written notice to each property owner and/or business owner. The notice shall include the nature of the construction, the approximate duration of the construction, and the Contractor's name and contact information.

I. PRIOR NOTIFICATION OF SERVICE INTERRUPTION

The Contractor shall organize his work in such a way that water and sewer service will remain uninterrupted except for short periods of time when connections are being made. When it is necessary for water or sewer service to be interrupted, the Contractor shall first receive approval from the Utility Owner and shall then notify all affected customers of the proposed time of interruption and the expected duration. Notification shall be in person whenever possible. When in person notification is not possible, a written notice shall be distributed to each residence or business. Ideally, both in person notification and a written notice shall be given.

Notification shall be sufficiently prior to the interruption of service so as to allow customers to make necessary arrangements to their personal or business schedules. Notice of any planned service interruption must be submitted to the Utility Owner 48 hours prior to that service interruption. 24 hours shall be considered a standard minimum notification to any customer.

The Contractor shall maintain a log of times, dates, duration, the addresses affected, and the reason for any interruption of water service.

The Contractor will notify the Utility Owner Dispatch as soon as possible upon the occurrence of any unplanned service interruption of water or sewer services.

J. BASIC EQUIPMENT REQUIRED

The nature of the work is such that due to the proximity of existing facilities, there is the possibility that existing water and/or sewer services or mains may be damaged and necessitate immediate repair. Consequently it is essential that the Contractor not perform any work unless certain basic and essential tools and materials are present on the job site. Tools and materials considered basic and essential shall include but not be limited to:

- All tools and materials necessary to repair a four (4) inch or six (6) inch sanitary sewer service,
- All tools and materials necessary to repair a three-quarter inch (¾) or one (1) inch copper or galvanized iron water service,
- All tools and materials necessary to correctly perform the construction currently underway,
- Any additional equipment or material that the Owner's Representative may require,
- Valve wrench with extension, and
- Fire Hydrant wrench.

K. TRAFFIC CONTROL AND DETOURS

The Contractor shall organize his work in such a way as to minimize the impact on traffic flow on streets and highways. No local street shall be cut or blocked without prior approval from the COB and/or GDOT. No state highway or route shall be cut, blocked, or have traffic restricted without prior approval from the GDOT.

Traffic is to be maintained on all roads and streets which must be crossed by the proposed facilities. If the open-cut method is approved and employed, one lane must be open to traffic at all times.

The Contractor shall notify COB and/or GDOT prior to performing any work which disrupts the normal flow of traffic, and shall utilize appropriate warning signs, flagmen, and other procedures necessary to ensure safety and minimize inconvenience to the public. The Contractor shall coordinate all necessary permitting for lane closures with the proper authority.

If it is determined by COB and/or GDOT that traffic flow shall not be impeded during certain hours (i.e. "rush hour"), the Contractor shall organize his work accordingly. No extra payment will be made for delays resulting from any traffic related restrictions on working hours.

L. CONTRACTOR IDENTIFICATION AND LANGUAGE REQUIREMENTS

The construction foreman shall carry a name badge that identifies the utility company for whom he/she is working. At least one person in each operation or location shall be fluent in English. This individual shall have knowledge of what his or her company is doing and why.

M. PERMISSION TO ENTER PRIVATE PROPERTY

Comply with Section 107—Legal Regulations and Responsibility to the Public.

Through an agreement between the Department and the Company; the Contractor is given the permission to enter upon private properties found outside the project's construction limits. This permission is granted for the sole purpose of activities relating to the installation and/or adjustments of distribution facilities only and is limited to the area of existing easements obtained by the company. Such permission to enter upon private properties is temporary and such rights commence upon project award and automatically expire upon completion and project final acceptance by the Department.

In all cases where it is necessary to enter upon private property; it is the Contractors sole responsibility to minimize any disruptions to personal property in the commencement of such work thereof. Additionally, the following restrictions and requirements apply:

1. All Work is limited to the installation, relocation, or replacement of distribution facilities, including the Work necessary to restore each private property as required in number 6 of this subsection.

2. Notify the Engineer and the private property owner, and resident 72 hours before commencing Work on said private property.

3. Only vehicles and equipment required for the Work are allowed on any private property.

4. Do not store any materials, vehicles, or equipment on any private property longer than the duration required to perform the Work.

5. Do not use any private property as an on-site detour or vehicle path.

6. Immediately following any construction located on private property, restore all areas of the same parcel to a condition substantially the same as existed immediately prior to any such disturbances, including without limitation, any and all necessary repairs, and replacement of grassing, landscaping and pavement which may be removed and excavated by the Contractor. Ensure all necessary repairs are made to restore the original contours and re-establish the ground cover to control erosion.

670.3.06 Construction Specifics

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 COB, 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 COB Project Manager prior to disrupting any existing water services as required to install the water facilities shown on the Plans.
5. The accuracy of information furnished by the plans as to underground and surface structures, foundation conditions, character of soil, position and quantity of ground and subsoil water, etc., are not guaranteed by COB. Bidders must satisfy themselves by personal examination and by such other means as they desire with respect to actual conditions in the nature of the ground and subsoil water and in regard to the locations of existing underground or surface structures. Unforeseen conditions shall not constitute a claim for increased compensation under the terms of the contract, nor constitute a basis for the cancellation thereof. If conditions are found to be such that the construction methods herein described are inappropriate or insufficient, the Utility Owner shall have the authority to modify the required construction methods as necessary.
6. It is the responsibility of the Contractor to locate and protect all underground utilities and structures. No utility is to be moved or disturbed without the approval of the utility company. Any damage caused by water or sewer line installation to any utility or structure shall be immediately reported to the Project Manager and repaired at the Contractor's expense.

B. Jack and Bore

Comply with Section 615 and with Utility Owner's Specifications for water main installations by jack and bore.

C. General Requirements of 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. It is the responsibility of the General Contractor, any subcontractor, their employees, and inspectors to job sites to observe all safety regulations. Deficiencies in safety measures noted should be immediately reported to the Contractor's superintendent, so that immediate corrective measures can be taken by the Contractor. It is, however, the Contractor's responsibility to conform to all safety regulations and practices as pertain to his construction site. The Contractor shall contact the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), Region IV, Atlanta, Georgia for any assistance needed to comply with the appropriate regulations.
3. All unsuitable excavated material must be properly disposed of in a manner acceptable to COB and in a manner that will not adversely affect the environment.
4. It shall be expressly understood that these Standards are for the installation of all potable water mains and appurtenances. All work shall conform to the applicable provisions of the AWWA Specifications or ASTM Specifications of latest revision except as otherwise specified herein.

D. Excavating Trenches for Water Mains

1. Trenches shall have a minimum width of twenty-four (24) inches (12" each side) plus the diameter of the outside of the bell of the water main. The water main shall be installed at the depth specified in the cross-sections and

drainage profiles and marked on the plans. Water mains shall be installed so that the maximum trench width at the top of the pipe shall not be more than the outside diameter of the bell plus two feet (2'). The sides of the trench above the pipe shall be sloped or benched as necessary to maintain stability.

2. Pipe trenches shall be straight and true to grade and in the location shown on the plans. Trenches shall be dug so that the pipe can be laid to the alignment and depth required, and the trench shall be of such width and shall be braced and drained so that the workmen may work therein safely and efficiently. No chocking under the pipe will be permitted. All joints shall be as specified herein. Excavation must be made under the bell of each pipe so that the entire length of the pipe will lie uniformly on the bottom of the trench and the pipe weight shall not rest on the bells.

3. Trenches shall be free of water during the work. Whenever water is present in the trench, it shall be removed in a manner satisfactory to the Project Manager and enough backfill shall be placed on the pipe to prevent floating. Any pipe that has floated shall be removed from the trench and re-laid later during dry conditions. No pipe shall be laid in wet trench conditions that preclude proper bedding, or on frozen trench bottom, or when the trench conditions or the weather are unsuitable for proper installation.

   The Contractor shall do all necessary pumping or bailing, build all drains and do all other work necessary at his own expense to keep the trenches clear of water during the progress of the work. No structure shall be built or pipe shall be laid in water, and water shall not be allowed to flow over or rise upon any concrete, masonry or pipe until the same has been inspected and the concrete or joint material has thoroughly set. All water pumped, bailed or otherwise removed from the trench or other excavation shall be conveyed in a proper manner to a suitable place of discharge where it will not cause injury to the public health or to public or private property or to work completed or in progress, or to the surface of the streets or cause any interference with the use of same by the public.

4. All changes in grade shall be made gradually. At crossings of storm sewers and cross drains on GDOT right-of-way, the pipe will be run in the location shown on the drainage profiles.

5. In laying pipe across water courses, the top of the water main or casing shall be a minimum of three feet (3') below the creek or river bed. Three feet (3') of cover shall be maintained over water mains crossing ditches or depressions of any kind unless shown otherwise on the plans.

6. Where necessary, the line shall be lowered at valves so that the top of the valve stem is approximately three feet (3') below the finished grade. The trench shall be deepened to provide a gradual approach to all low points of the line.

7. No excavation shall be made under highways, streets, alleys or private property until satisfactory arrangements have been made with the State, City, County or owners of the property to be crossed. All excavated material shall be placed so as to not interfere with public travel on the streets and highways along which the lines are laid. All work shall be performed to cause the least possible inconvenience to the public. Adequate temporary bridges or crossings shall be constructed and maintained where required to permit uninterrupted vehicular and pedestrian traffic. Not more than one hundred feet (100') of trench shall be opened on any line in advance of pipe laying. The Project Manager shall have the right to limit the amount of trench open at any one time to less than one hundred feet (100') if he believes the reduced limits are necessary.

8. All excavations shall be adequately guarded with barricades and lights in compliance with all OSHA, COB, and GDOT requirements so as to protect the public and workers from hazard.

9. When possible, all crossings of paved highways or driveways shall be made by boring or jacking the pipe under the pavement and shall be done in such manner as not to damage the pavement or sub-grade.

   Wherever streets, roads, or driveways are cut, they shall be immediately backfilled and compacted after the pipe is laid and shall be maintained in first-class condition as passable at all times until repaved. Backfilling, compaction, dressing and clean-up shall be kept as close to the line laying crew as is practical, and negligence in this feature of

the work will not be tolerated.

Streets, sidewalks, parkways, and other public and private property disturbed in the course of the work shall be restored to as near as original condition as possible or better in a manner satisfactory to the COB.

10. In excavation and backfilling and laying pipe, care must be taken not to remove or injure any water, sewer, gas or other pipes, conduits or other structures without an order from the Project Manager. When an obstruction is encountered, the Contractor shall notify the Project Manager who will have the Owners of the obstruction adjust same or make necessary changes in grade and/or alignment to avoid such obstruction. Any house connection, drains or other structures damaged by the Contractor shall be repaired immediately.
11. All excavation shall be placed on one side of the trench, unless permission is given by the COB to place it on both sides. Excavation materials shall be so placed as not to endanger the work and so that free access may be had at all times to all parts of the trench and to all fire hydrants or water valve boxes, etc.
12. Excavations adjacent to existing or proposed buildings and structures, or in paved streets or alleys shall be adequately protected by the use of trench boxes, sheathing, shoring and bracing to support the sides of the excavation and to prevent cave-ins of the excavation, or the undermining or subsequent settlement of adjacent structures or pavements. Underpinning of adjacent structures shall be done when necessary to maintain structures in safe condition.
13. Construction occurring around active sewer systems shall be done in such a way so as to prevent the passage of wastewater onto the ground. **Absolutely no wastewater shall be allowed to spill onto the ground.**
14. During the water main construction, an effort will be made to minimize the cutting of trees.

E. Solid Rock Excavation for Water Mains

1. Wherever rock is encountered in the excavation, it shall be removed by suitable means. Drilling and blasting operations shall be conducted with due regard for the safety of persons and property in the vicinity and in strict conformity with requirements of all ordinances, laws and regulations relative to the handling, storing and use of explosives. The Contractor is fully responsible for filing for and acquiring any blasting permits which may be required by those agencies with such jurisdiction. Before blasting, the Contractor shall cover the excavation with heavy timbers and mats in such a manner as to prevent damage to persons or the adjacent property. Rock excavation near existing pipelines or other structures shall be conducted with the utmost care to avoid damage. The Contractor shall be wholly responsible for any damage resulting from blasting, and any injury or damage to structures or property shall be promptly repaired by the Contractor to the satisfaction of the Project Manager, the Utility Owner and property owner.

   When the use of explosives is necessary for the prosecution of the work, the Contractor shall use the utmost care not to endanger life or property, and whenever directed or otherwise indicated, the number and size of the charges shall be reduced. The Contractor shall notify the proper representatives of any public service corporation, any company, or any individual at least eight (8) hours in advance of any blasting which may endanger his or their property on, along, or adjacent to the site of the work. All explosives shall be stored in a secure manner and all storage places shall be marked clearly "DANGEROUS EXPLOSIVES", and shall be in care of competent watchmen at all times.

   A pre-blast and post-blast survey will be done for all homes/buildings in the area of the blast. Photos or a video will be made of all structures and houses near to the blast showing existing cracks in walls, foundations, slabs, pavement or sidewalks, etc. Before blasting, a company with experience with vibration monitoring will place portable seismographs near structures to measure vibrations during all blasting. The seismograph monitors should record ground vibrations whenever they exceed PPV (Peak Particle Velocity) of 0.05 in/sec and record them on a printout. The maximum allowable limit for construction vibration should be no more than 0.50 in/sec. A vibration monitoring report shall be done after that blasting is complete.

2. In rock excavation, the backfill from the bottom of the trench to one foot (1') above the top of the pipe shall be finely pulverized soil, free from rocks and stones. The rest of the backfill shall not contain over fifty percent (50%) broken stone, and the maximum sized stone placed in the trench shall not exceed two inches (2") in diameter. Excess rock and fragments of rock larger than two inches (2") in diameter shall be loaded and hauled to disposal. If it is necessary, in order to comply with these specifications, selected backfill shall be borrowed and hauled to the trenches in rock excavation. Sides of the trench shall be trimmed of projecting rock that will interfere with backfilling operations. Rock excavation by blasting shall be at least seventy-five feet (75') in advance of pipe laying.

3. Rock in trenches shall be excavated over the horizontal limits of excavation and to depths as follows:

Size of Pipeline, Inches	Depth of Excavation Below Bottom of Pipe, Inches
4 and Less	4
4 to 6	6
8 to 18	8
18 to 30	10

The space below grade for pipe lines shall then be backfilled with subgrade stabilizer (#57 Stone) and compacted.

F. Subgrade And Bedding

1. The bottom of the trench shall be accurately cut to grade so that the pipe will have a longitudinal bearing on undisturbed soil for the full length of the pipe, except for such distances that are necessary for bell holes.

2. If the soil at the bottom of the trench is in such condition that it cannot be properly shaped or graded, due to the hardness of the soil and in all cases where rock or shale is encountered at sub-grade, the trench shall be refilled with suitable backfill material to the required sub-grade elevation, thoroughly tamped with mechanical tampers and shaped to fit the outside of the pipe as specified in the preceding paragraph. Wherever water is encountered in conjunction with the additional sub-grade excavation, the backfill shall consist of subgrade stabilizer material, Type I, (#57 Stone).

3. In the event that a trench is excavated below grade, the Contractor shall refill the trench to the proper grade with suitable, thoroughly compacted material. Allowable soils shall be dry course-grained soils ranging from well-graded gravel-sand mixtures with little or no fines to clayey sands and sand-clay mixtures with appreciable amounts of fines. All soil materials shall have one hundred percent (100%) passing a 1-1/2 inch sieve and a maximum of fifty-five percent (55%) passing a No. 200 sieve. The maximum volume change allowable shall be fifteen percent (15%). Allowable soils shall be Class I and Class II as defined in Section 810, of the GDOT Specifications for the Construction of Roads and Bridges.

4. All gravel or crushed stone used for Class "C" bedding shall have a gradation equal to #57 stone in order to limit the void area, and all the material must pass a 1-1/2 inch sieve. Where sand or other acceptable soil is used, it shall be spread over the trench bottom, compacted to at least ninety percent (90%) maximum density and shaped before placing the pipe; after the pipe is placed, additional material shall be compacted under the haunches and for the full trench width as described above.

G. Installation of Water Main

1. Pipe and accessories shall at all times be handled with care to avoid damage. Proper and suitable tools and equipment for the safe and convenient handling and laying of pipe shall be used. Whether moved by hand, skid ways or hoists, material shall not be dropped or bumped. Great care shall be taken to prevent the pipe from being damaged, particularly the cement lining on the interior of ductile iron pipe. Each joint of pipe shall be unloaded opposite or near the place where it is to be laid in the trench. All pipe shall be carefully examined for cracks and other defects. All such material that is defective in manufacture, has been damaged in transit, after delivery or in

installation, shall be removed from the job site and replaced with new material.

2. All pipe shall be laid straight, true to line and grade. Bell and coupling holes shall be dug in the trench and the pipe shall have a continuous bearing with the trench bottom between bell or coupling holes. No shimming or blocking up of the pipe shall be allowed. When the work is not going on, all pipe openings shall be securely closed by the insertion of the proper size plug and caulking so that dirt and debris will not be washed into the pipe in case of rain. The inside of the pipe shall be clean and free of trash and dirt, and if necessary a swab or brush shall be used to clean the pipe before lowering it into the trench. All pipe and fittings shall be kept clean until completion of the work.
3. Water mains shall be joined by "push-on" joints using elastomeric gaskets to affect the pressure seal. The spigot end of the pipe and the inside of the bell shall be thoroughly cleaned and the gasket inspected to see that it is properly placed; Lubricant shall be applied to the spigot end of the pipe and it shall be inserted into the bell of the adjoining pipe to the stop mark on the pipe, and the assembly shall be made as recommended by the pipe manufacturer. Lubricant used must be non-toxic and supplied or approved for use by the pipe manufacturer.
4. Restrained joints shall be provided where specified on the approved plans and shall be of the type specified herein. Assembly shall be in accordance with the manufacturer's recommendations.
5. Water shall not be allowed to run or stand in the trench before the trench has been backfilled. The Contractor at no time shall open up more trench than his available pumping facilities are able to dewater.
6. At changes in direction of the main and at other points shown on the plans or directed by the Inspector, the line shall be adequately blocked with concrete or restrained in some other manner approved by the Utility Owner. The Inspector shall be notified by the Contractor before blocking is placed. Prior to blocking any joint or fitting with concrete, that joint or fitting shall be wrapped with polyethylene film in such a manner that the concrete will not stick directly to the pipe but that the load bearing capacity of the blocking will not be affected.

H. Backfilling Trenches

1. Backfill material shall consist of fine, loose earth containing sufficient but not excessive moisture content for thorough compaction. Material that is too dry for adequate compaction shall receive a prior admix of sufficient water to secure adequate moisture content. Material having excessive water content shall not be placed at any time. Backfill material shall be free of large clods, stones, vegetable matter, debris, and other objectionable material. All unsuitable excavated material and excess material must be properly disposed of in a manner that will not adversely affect the environment.
2. After the pipe has been laid, backfilling shall be done in two (2) distinct operations. In general, all backfill beneath, around and to a depth of twelve inches (12") above the top of the pipe shall be placed by hand in six-inch (6") layers for the full width of the trench and thoroughly compacted by hand with vibratory equipment. The remainder of the backfill shall be placed in six-inches (6") layers and compacted to the top of the trench, either by pneumatic hand tamps, hydro-tamps, or other approved methods. Care shall be taken so that the pipe is not laterally displaced during backfilling operations. The backfill lifts shall be placed by an approved method in accordance with that hereinafter specified. Backfill materials shall be the excavated materials without bricks, stone, or corrosive materials.
3. Backfill under permanent concrete or bituminous pavement and as elsewhere specified or indicated on the plans shall be compacted graded aggregate base free from large stones and containing not more than ten percent (10%) by weight of loam or clay. This backfill shall be compacted to one hundred percent (100%) as determined by the Standard Proctor test. Mechanical vibrating equipment shall be used to achieve the required compaction.
4. Backfill under gravel or crushed stone surfaced roadways and surface treated type bituminous roadways shall be

the approved suitable excavated material placed as described above for the full depth and width of the trench. Backfill shall be free from large stones and contain no more than ten percent (10%) by weight of loam or clay. This backfill shall be compacted to ninety-eight percent (98%) as determined by the Standard Proctor test. Mechanical vibrating equipment shall be used to achieve the required compaction.

5. Backfill in unpaved areas shall be the approved suitable excavated material placed as described above for the full depth and width of the trench. Backfill shall be free from large stones and contain no more than ten percent (10%) by weight of loam or clay. This backfill shall be compacted to ninety-five percent (95%) as determined by the Standard Proctor test. Mechanical vibrating equipment shall be used to achieve the required compaction.
6. Contractor shall fully restore and replace all pavement, surface structures, etc., removed or disturbed as part of the work to a condition equal to that before the work began. Pavement shall be replaced immediately after the backfilling is completed. In areas where the existing pavement is to be replaced by the road contractor, the COB may allow existing pavement to be replaced with concrete trenchcap poured flush with the existing pavement or with two 3" thick layers of hot mix asphalt (total of 6" thick) in accordance with COB directions.
7. Contractors which are utilizing the roadway shoulders for construction are required to stabilize the earth shoulders every three days as a maximum time period. Also, they are required to stabilize the shoulder before leaving the work area on any particular day if rain is forecast within the next 24 hours.
8. Where sheeting is used in connection with the work, it is in no case to be withdrawn before the trench is sufficiently filled to prevent damage to banks, road surfaces, adjacent pipes, adjacent structures or property. When the removal of sheeting endangers adjoining improvements, it will be left in place.
9. All costs of compaction testing shall be the responsibility of the Contractor.
10. Topping of trenches in paved areas shall be completed in accordance with the directions of the Project Manager.

I. Thrust Restraint For Pressure Lines

1. Reaction Blocking

A.) Underground piping laid around curves and at all unsupported changes of direction, all tees, wyes, crosses, plugs and other like fittings shall be solidly and properly blocked with high early strength concrete against solid earth to take the reaction of the main pressure and to prevent lateral movement of the pipe or fittings when under pressure. Concrete for reaction blocking shall be Class A concrete and shall have a minimum compressive strength of 3,000 psi at twenty-eight (28) days. The Contractor shall allow the concrete to set up for a minimum of four hours before backfilling. The blocking, unless otherwise shown, shall be so placed that the pipe and fitting joints will be accessible for repair.

B.) Reaction blocking shall be constructed in conformance with the Utility Owner's Standard Details for Reaction Blocking. Prior to blocking any joint or fitting with concrete, that joint or fitting shall be wrapped with polyethylene film is such a manner that the concrete will not stick directly to the fitting, but that the load bearing capacity of the blocking will not be affected.

C.) The sizing of the thrust block bearing area and thrust collars is given in the Utility Owner's Standard Detailed Drawings and is based on a soil strength of 1500 PSF and a water pressure of 200 PSI. The Contractor shall verify the soil conditions before the thrust block design is implemented.

2. Retainer Glands

Mechanical joint fittings and valves on Ductile Iron Pipe shall be installed with retainer glands where specified herein. Retainer glands shall be EBAA Mega-Lug or approved equal.

3. Rodding / Straps

   Where blocking cannot be poured against undisturbed earth, the Contractor shall pour concrete deadmen (anchors) with threaded rods and/or metal straps coming out of the deadman and connecting to the valve/fitting for restraint. The rods and metal straps shall be coated with an approved bitumastic coating prior to backfilling. Vertical bends shall be restrained with threaded rods and concrete deadmen as shown in the Utility Owner's detailed drawings.

4. Restrained Joints

   Where approved by the Project Manager and Utility Owner, another option to using concrete blocking in restricted areas is the use of restrained joints. Restrained joints shall be provided where specified on the approved plans and shall be of the type specified herein. Assembly shall be in accordance with the manufacturer's recommendations. Mechanical joints shall be restrained by retainer glands. Push-on joints shall be restrained by restrained joint gaskets.

J. SETTING FIRE HYDRANTS

Fire hydrants shall be placed at the locations shown on the plans and installed in accordance with Utility Owner Standards. Gate valves for fire hydrants shall be connected directly to the main by means of a "Locked Hydrant Tee". All other connections between the main and the fire hydrant shall be mechanical joint with ductile iron retainer glands. Fittings shall be restrained by a "Locked Hydrant Adapter" whenever the fire hydrant is located close enough to the main to allow its use. Not less than (4) four cubic feet of No.5 or No.57 stone shall be placed around the base of the hydrants, as shown in the Utility Owner's Standards. Before placing the hydrants, care shall be taken to see that all foreign material is removed from within the body. The stuffing boxes shall be tightened and the hydrant valve opened and closed to see that all parts are in first class working condition. All hydrant openings shall be kept capped, except when hydrant is being worked on.

When a fire hydrant has been constructed but is not yet in service, the Contractor shall provide and attach to the fire hydrant a flag or collar indicating that the fire hydrant is not in service. Said flags or collars shall remain on the fire hydrant until it is put into service. Whenever an existing fire hydrant is taken out of service, whether temporarily or permanently, it shall be equipped with a flag or collar indicating that it is not in service. The Contractor shall provide and install flags or collars as required and shall notify the Fire Department whenever the operating status of any fire hydrant changes.

FIRE HYDRANTS SHALL NOT BE OPERATED WITH ANY TOOL EXCEPT A SPECIFICALLY DESIGNED FIRE HYDRANT WRENCH. If the Contractor observes any other contractor or person operating a fire hydrant with an unapproved fire hydrant wrench, he shall report that fact to the Utility Owner immediately. It is the Contractor's responsibility to ensure that all new facilities are maintained in new condition until final completion of the project and acceptance by the Utility Owner. Fire hydrants with damaged operating nuts shall not be accepted.

K. Setting Valves And Fittings

Valves and fittings shall be placed where shown on the plans. Valves shall be set plumb, and shall have cast iron valve boxes. The valve boxes shall be placed directly over the valve and set plumb, the top of the box being brought to the surface of the ground. After the boxes are in place, earth shall be filled in the trench and thoroughly tamped around the box. After all settlement has taken place, a concrete collar shall be constructed for each valve box.

Fittings shall be properly braced to ensure that they will not be blown off or broken loose under the greatest possible working pressure. All fittings shall be mechanical joint unless specified otherwise. In situations where there is insufficient undisturbed earth to act as a bearing surface or where otherwise directed by the Inspector, fittings shall be restrained by the use of threaded rods or other method acceptable to the Project Manager and Utility Owner. Line valves shall be supported and restrained by concrete blocking and threaded rods as shown in the Utility Owner's Details.

Valve stem extensions shall be installed where the valve operating nut is more than four feet (4') below the finished grade. The valve stem extension shall be of sufficient length to place its operating nut at a depth between three feet and four feet (3' & 4') below finished grade.

L. Marking Location Of Valves And The End Of The Main

1.) Concrete valve markers shall be set for main line water valves with an even number of feet between the center line of the valve and the center line of the concrete marker, and the distance in feet between the valve and marker shall be stamped in the aluminum pad in the marker at the time of setting.

2.) A concrete valve marker shall be placed directly over the end of any water main stubbed out for future use or any dead end main. The letters "EOL" shall be cast into the top of the marker or stamped into the aluminum disc in the top of the marker.

3.) Each main line water valve shall also be marked by cutting a letter "V" in the curb. **The "V" shall be turned to point toward the valve**. The letter height shall be 6".

M. Installation of Steel Casing Pipe by Bore and Jack

1.) Casing pipe shall be installed at the locations shown on the plans. Unless directed otherwise, the installation procedure shall be the dry bore method. The hole is to be mechanically bored and cased through the soil by a cutting head on a continuous auger mounted inside the casing pipe. The installation of the casing and boring of the hole shall be done simultaneously by jacking. Lengths of casing are to be full circumference butt-welded to the preceding section installed. Excavation material will be removed and placed at the top of the working pit.

2.) Jacks for forcing the casing pipe through the roadbed shall have a jacking head constructed in such a manner as to apply uniform pressure around the ring of the pipe. The casing to be jacked shall be set on guides, braced together, to properly support the section of the pipe and direct it to the proper line and grade. In general, roadbed material shall be excavated just ahead of the pipe, the excavated material removed through the pipe, and the pipe then forced through the roadbed into the excavated space.

3.) Where pipe is required to be installed under railroads, highways, streets or other facilities by jacking or boring methods, construction shall be done in a manner that will not interfere with the operation of the facility, and shall not weaken the roadbed or structure.

4.) The use of water or other fluids in connection with the boring operation will be permitted only to the extent necessary to lubricate cuttings. Jetting will not be permitted.

5.) The diameter of the excavation shall conform to the outside diameter and circumference of the casing pipe as closely as practicable. Any voids which develop during the installation operation shall be pressure grouted.

6.) The casing shall be jacked from the low or downstream end. At each end of the casing pipe the void between the carrier pipe and casing shall be sealed with brick and mortar. Any pipe damaged in jacking operations shall be removed, and replaced by the Contractor at the Contractor's expense.

7.) After the steel casing pipe has been installed, the DIP carrier pipe shall be installed in the casing pipe. Care shall be exercised at all times to protect the coating and lining of this pipe and to maintain tight, full-seated joints in the carrier pipe. Where the carrier pipe is 24" in diameter or less, joint gaskets shall be "Field-Lok" gaskets or approved equal inside of the casing.

N. Connection To The Existing DCDWM Water System

1.) The Contractor shall make all required connections and taps to the Utility Owner's water system. The Inspector will observe the tap and all associated work. The Contractor shall give the Project Manager a minimum of four days notice prior to any tap on or connection to the water system.

2.) The Contractor will provide proper traffic control devices and certified personnel to direct traffic if required.

3.) All taps shall be wet taps (on pressurized water mains in service). All taps shall be made with saddles or tapping sleeves.

4.) Abandoned water mains shall be capped or plugged at each end and grout filled, where directed by the plans and the Inspector.

O. Interruption Of Water Supply During Construction

No interruptions of water service will be allowed without the permission and supervision of Utility Owner personnel. Residents and building occupants shall be informed of the date, time of cutoff and the duration of stoppage. Failure to do so will make the Contractor liable for any damages reported to the Utility Owner. Four (4) days' notice shall be prepared and given to the affected customers and must be coordinated with the Utility Owner. When it is necessary to schedule a water outage for any construction, signs must be posted at least four (4) days in advance to notify the public. In some cases, the water outage may need to be scheduled for nights or weekends to lessen the inconvenience to businesses or schools. **(See Standard Details for sign requirements). These signs are to be provided and installed by the Contractor.**

P. Highway Crossings

1.) The Contractor shall be responsible for coordinating and scheduling all construction work in the Georgia State Highway right-of-way with the GDOT.

2.) Work along and across Georgia State Highway right-of-way shall conform to GDOT Standard Specifications for Construction of Roads and Bridges.

3.) Traffic control within the Georgia State Highway right-of-way shall comply with GDOT Standard Construction Specifications and the U.S. Manual on Uniform Traffic Control Devices for Streets and Highways.

Q. Clean-Up

1.) The Contractor shall remove all unused material, excess rock and earth, and all other debris from the construction site as closely behind the work as practical.

2.) All trenches shall be backfilled and tamped before the end of each day's work.

3.) Prior to requesting the "completion of water main construction" inspection, the Contractor shall do the following:

A.) Remove and dispose of in an acceptable manner all shipping timbers, shipping bands, spacers, excess materials, broken material, crates, boxes and any other material brought to the job site.

B.) Insure that all valves have been located, cleaned out and valves are fully open. Adjust all valve boxes to grade and pour concrete collars around all valve boxes outside paved areas.

C.) Insure that fire hydrants are set to grade and that connections are open.

D.) All easement areas shall be cleared of trees, stumps and other debris and left in a condition such that the easement can be maintained by bush-hog equipment.

E.) All shoulders, ditches, culverts, and other areas impacted by the water main construction shall be at the proper grades and smooth in appearance.

R. Standard Detailed Drawings

Installation of water mains, fire hydrants, water valves, valve boxes, meters, water services, etc. shall be made in accordance with the Standard Details of the Utility Owner. These documents can be reviewed online at the Utility Owner's website. For Marietta Water, online specifications, standards and details can be reviewed at https://www.dekalbcountyga.gov/sites/default/files/user3576/DWM Water and Sewer Design Standards - 5 10 18.pdf.

670.3.07 Quality Acceptance

A. Materials Certification

For certain products, assemblies and materials, in lieu of normal sampling and testing procedures by the Contractor, the Utility Owner and COB 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 COB, who shall distribute to the Utility Owner. Material certifications shall be approved by COB 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 COB, 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 COB Project Manager 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 with two copies of the covered product to the COB Project Manager and the Utility Owner.
5. Neither COB nor the Utility Owner will be responsible for any costs of certification or for any costs of the sampling and testing of products in connection therewith.
6. COB 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. 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. Potable Water System Inspection and Testing

Inspection

1.) Inspection will be done by the COB and the Utility Owner. Notifications to both parties must be provided two (2) days prior to any construction of water or sewer facilities.
2.) The Project Manager and the Utility Owner shall be notified when specific inspections are required so that the inspection time can be scheduled.
3.) Under no circumstances shall any buildings and plumbing fixtures be connected to the main until the main is inspected and approved by the Utility Owner.
4.) Upon request, the Contractor shall furnish the Inspector with appropriate copies of the manufacturer's certification that the materials to be used meet the materials requirements of these specifications. The Inspector may reject any materials not meeting specifications or any faulty or damaged materials. Any materials so rejected must be removed from the project immediately and must be prominently marked so that they can be spotted on this or any other project.
5.) Authorized representatives of COB, GDOT and the Utility Owner, which may include appropriate city, county, state or federal agencies, shall have access to the site for inspection at any time.
6.) The Project Manager and the Utility Owner may at any time direct that he/she be allowed to see any pipe work, bedding, fire hydrant, tee, valve or other appurtenance. If the Project Manager or the Utility Owner so directs, all pipe work shall be left open until the Inspector views the work. The trench may be backfilled with the approval of the Inspector if the work is not inspected by the close of the working day. No valves, fire hydrants, tees, thrust blocking or lot services shall be backfilled without the approval of the Inspector.
7.) The Contractor shall complete the project and shall have cleaned up the job site prior to requesting a final project inspection. The Project Manager may terminate the inspection and direct further work at any time he feels that the project is not substantially complete and ready for inspection. Valve boxes shall be to grade and cleaned out prior to scheduling the inspection. The Contractor shall furnish adequate personnel to check for open valves and give assistance needed by the Project Manager.
8.) The representative of COB and the Utility Owner will normally visually inspect all water lines and appurtenances for conformance to the specifications and will check the measurements shown on the As-Builts for accuracy. The representative will observe pressure and leakage tests to insure all lines are watertight. The representative shall also observe a disinfection test. Any of the following tests may also be required at the discretion of the Project Manager and the Utility Owner:

A.) Fire Hydrant / Hammer Test
B.) Trench compaction tests

Any defects found by these tests must be corrected before construction of the project may conclude.

Compaction Testing

All trenches shall be subject to compaction testing after backfilling and shall meet specified compaction requirements set forth in **Section 670.3.06.H**. All trenches failing to meet compaction requirements shall be excavated and recompacted and retested. This process shall continue until a passing test is achieved. All costs of compaction testing shall be the responsibility of the Contractor.

Fire Hydrant And Valve Testing

All fire hydrants shall be tested per **Section 670.2.01.B** and flushed to check the operation of the hydrant. All valves shall be located and their operation checked. All valves shall be left fully open unless marked as a future stub-out plug to be closed.

Water System Testing - General

All water mains designed to operate under pressure shall be successfully tested. Tests of installed piping shall consist of a pressure and leakage test and a disinfection test. All piping to be tested must satisfactorily comply with these tests before being eligible for connections and acceptance. In general, tests shall be conducted in accordance with AWWA C600 and C651 except as otherwise herein specified.

Pressure and Leakage Testing

A.) After all piping has been placed, each section between line valves shall be tested by the Contractor in the presence of the Inspector or his designated representative and tests shall be continued until all leaks have been made tight to the satisfaction of the Project Manager and the Utility Owner. The Contractor shall furnish all necessary meters, pumps, gauges, bulkheads, and other materials and appliances necessary to conduct the test as herein required. Every precaution must be taken to valve-off or otherwise protect control equipment in or attached to the pipe line to prevent damage thereto.

B.) Before applying the specified test pressure, all air shall be expelled from the pipe. If hydrants, blow-offs or air release valves are not available at the high places, the Contractor shall make the necessary taps at points of highest elevation before the test is made and insert plugs before the test has been completed.

C.) Prior to the pressure test, pipe laid in trenches shall be backfilled adequately to secure the pipe during the test. Any observed leakage shall require corrective measures to pipe lines and/or joints to the satisfaction of the Inspector.

D.) The Utility Owner will furnish the necessary water for testing and disinfection of the lines; however, any water lost through breakage of lines or unnecessary or excessive flushing of lines will be charged to the Contractor at the current residential rate. All lines shall be tested to a pressure of 2 times the working pressure at the lowest point of the system to be tested. Test duration shall be two (2) hours. Tapping sleeves shall be tested via the port on the tap valve and shall be tested for 30 minutes. However, test pressure shall not exceed pipe, valve and/or thrust-restraint design pressures. The Inspector or his representative may require a twenty-four (24) hour test if he so desires. Test pressure shall not vary by more than $\pm$ 5 psi for the duration of the test which may require periodic pumping (in which case the added water will be counted as part of the leakage). Lines shall be tested in sections between the valves. The rate of leakage shall not exceed 13.5 gallons per 24 hours per inch diameter per mile of water main. (See Table below.)

LEAKAGE TABULATION

SIZE OF PIPE	GALLONS/HOUR/100 FT.	GALLONS/DAY/100 FT.
20”	0.213	5.112
16”	0.171	4.091
12”	0.128	3.068
10”	0.107	2.557
8”	0.085	2.046
6”	0.064	1.534

Any section of the line not meeting the above test shall have the leaks found and corrected at once and re-tested until the leakage falls within the limits specified above. Leakage testing must be witnessed and approved by the Utility Owner.

Disinfection

After leakage testing and all necessary repairs have been made, the Contractor shall flush and disinfect all potable water mains and equipment installed in strict accordance with AWWA Standard for Disinfecting Water Mains, C651, latest revision, subject to the following special conditions:

A.) The method of disinfection shall be the Continuous - Feed Method as per AWWA C651, latest revision, Section 4.4.3. Care shall be taken in filling the mains so that extrained air is drawn from the pipes at all high points so as to permit intimate contact of the disinfection agent with the entire inside surface of the pipe and appurtenances. The potable water main shall be chlorinated as to indicate a residual chlorine of at least fifty (50) ppm or as otherwise determined by the Utility Owner at the opposite end of the water main in which the chlorine was injected. Valves shall then be closed and the chlorine solution permitted to remain in the water main section for not less than twenty-four (24) hours.

B.) The form of chlorine shall be a 1 percent solution made from either sodium hypochlorite or calcium hypochlorite which shall be measured and pumped into the pipeline. Water must be flowing during the feeding operation and the injection point must be located so that the flow of water will disperse the chlorine throughout the pipeline. AWWA C651 requires the injection point be located at a point not more than ten feet (10') from the point of connection to the existing water supply.

C.) After 24 hours, the line shall be flushed until the chlorine content is not more than 2.0 parts per million. When this step is completed, the Contractor will notify the Utility Owner to schedule the taking of the water sample for the bacteria test. If the samples show evidence of contamination upon testing, the above procedure of disinfection shall be repeated until approved samples are obtained. No connections shall be made to the existing system until all of the samples have been tested and approved by the Utility Owner. The Contractor may be required to add additional taps for bleeding purposes at the ends of water mains or wherever necessary for taking samples.

D.) The Contractor shall de-chlorinate the highly-chlorinated water being flushed from the water main to open areas where the discharge will not damage the roadbed or adjacent property. The chlorine residual of water being disposed may be neutralized by treating the water with one of the chemicals listed in the table below:

Chemical Required

Residual Chlorine Concentration	Sulfur Dioxide (SO_2)	Sodium Bisulfite ($NaHSO_3$)	Sodium Sulfite (Na_2SO_3)	Sodium Thiosulfate ($Na_2S_2O_3.5H_2O$)

mg/L	lb	(kg)	lb	(kg)	lb	(kg)	lb	(kg)
1	0.8	(.36)	1.2	(.54)	1.4	(.64)	1.2	(.54)
2	1.7	(.77)	2.5	(1.13)	2.9	(1.32)	2.4	(1.09)
10	8.3	(3.76)	12.5	(5.67)	14.6	(6.62)	12.0	(5.44)
50	41.7	(18.91)	62.6	(28.39)	73.0	(33.11)	60.0	(27.22)

Amounts of chemicals required to neutralize various residual chlorine concentrations in 100,000 gal ($378.5\ m^3$) of water.

670.3.08 Contractor Warranty and Maintenance

A. General Provisions 101 through 150.

B. All water and sanitary sewer structures erected under this contract shall be fully guaranteed by the Contractor for a period of one year from the date of final inspection and acceptance by the Project Manager and Utility Owner. The date that some or all of the water or sanitary sewer system is placed into service has no relation with the date that the guarantee begins. This guarantee shall cover any and all defects in workmanship or materials that may develop in this specified time, and any failure in such workmanship or materials shall be repaired or replaced to the satisfaction of the Utility Owner by the Contractor at his own expense.

C. All equipment of whatever nature incorporated in the work covered by this contract shall carry the same guarantee as outlined above for construction. Failure of any equipment or part thereof within the specified time shall be corrected to the satisfaction of the Utility Owner, at the Contractor's expense. It is the intent of these specifications that all pipe lines, both underground and above ground, together with all appurtenances attached thereto and any driveways or other property restoration items, under this contract, shall be classified as structures. Neither the final certificate of payment nor any provision in the contract documents nor partial or entire occupancy of the premises by the Utility Owner shall constitute an acceptance of work not done in accordance with the contract documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.

670.4 Measurement

Incidentals including excavation, backfilling, pressure and leakage testing, disinfection, temporary water connections, pavement removal, 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. Any item of work required by the plans but not listed as a pay item shall be covered by the pay items listed for measurement 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 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. Payment for water mains shall include payment for all connections, fittings, retainer glands, restrained joint gaskets, and other incidentals necessary to install the water main, test the main, and place the new water main into service.

B. Adjust Water Main to Grade

Water mains adjusted to grade to avoid roadway and drainage structures shall be measured in linear feet 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. Payment for water mains shall include payment for all connections, fittings, retainer glands, restrained joint gaskets, and other incidentals necessary to install new sections of DIP water main, test the main, and place the new water main into service at the new location.

C. 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 and other fittings.

D. Expansion Joints

Expansion joints 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.

E. 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.

F. Air Release Valve

Air Release valves shall be measured on an individual basis for each size valve installed. This item includes, but is not limited to the air release valve, nipple, ball valve, saddle, adjustment of valve, and any other incidental materials or items of work necessary for its installation and operation.

G. Relocate Existing Gate Valve

Existing gate valves that are relocated shall be counted on an individual basis for each size valve and box assembly acceptably relocated and reinstalled correctly. Unit price bid and paid shall include but not be limited to the gate valve, valve stem extensions, valve box, valve box collar, grouting of the VB collar to the valve box, adjustment of all new valve boxes to final grade in pavement or grass, and any other incidental materials or items of work necessary to remove and install the gate valve at the new location.

H. Water Service Lines

Service lines shall be measured in linear feet 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 curb stops, service connection assemblies, sleeves, adapters, connections and fittings.

I. Adjust Water Service Line to Grade

Water service lines adjusted to grade to avoid roadway and drainage structures shall be counted on an individual basis per each for each service adjusted as needed. Payment for adjustment of water service lines shall include payment for all connections, fittings, and other incidentals necessary to install new sections of copper water service in the required location, and place the new water service into use at the new location.

J. Steel Casing for Water or Sewer Mains – Open Cut or Jack and Bore

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. There are separate pay items for open cut casings and for casings installed by jack and bore as needed.

K. Relocation of Existing Fire Hydrant Assemblies, Hose Bibbs, Water Meters, Water Backflow Preventers, Pressure Reducing or Sustaining Valves, and Water Meters including Bypass and Vault

Relocation of existing fire hydrant assemblies, hose bibbs, water meters, backflow preventers, pressure reducing or sustaining valves, and water meters including bypass and vault shall be measured on an individual basis on the number of each acceptably relocated including relocation, reconnection and final adjustment of hydrants, hose bibbs, meters, backflow preventers, valve boxes, manhole covers, meter boxes or meter vaults to final grade after road construction is complete.

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

Adjustment of existing meter boxes and existing valve boxes that are to remain in service and must be 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.

M. Removal of Water Meters, Fire Hydrant Assemblies, Backflow Preventers, Water Valves, and Air Release Valves

Removal of existing water meters and boxes, fire hydrant assemblies, backflow preventers, water valves, and air release valve assemblies/vaults, shall be measured on an individual basis on the number of each removed, salvaged and delivered back to the Utility Owner.

N. Concrete Thrust Blocks (Class A Concrete, HES)

Concrete thrust blocking installed shall be measured as indicated in Section 500 per cubic yard of concrete acceptably installed. The pay item is listed on the quantity spreadsheet as Class A Concrete, HES. Pay quantities will be according to the concrete blocking details shown in the 44 Series details included in the plans.

O. Fill and Cap Existing Abandoned Water Main

Filling and capping of existing water mains to be abandoned shall be measured in linear feet for each size water main abandoned. Measurement shall be horizontally above the centerline of the pipe and shall include the length of valves and fittings. Payment shall include payment for all caps, flowable (grout) fill and any other incidentals necessary to abandon the water main.

P. Abandonment of Water Valve (Remove Valve Box)

Removal of existing water valve boxes, thereby abandoning the water valve in place, shall be measured on an individual basis on the number of each valve box removed and properly disposed of.

Q. GPS Data Collection and Submittal

The collection, preparation, and submittal of required Record Drawing data as described in Section 670.1.03 above shall be considered incidental to the water and sewer work required for this project and no extra payment shall be made for the survey work required and information gathered and submitted to the Utility Owner.

R. Graded Aggregate Base Course, incl. Material (For Backfill of Trenches in Paved Areas)

Please review the requirements of Section 670.3.06.H.3. This pay item covers Graded Aggregate Base (GAB) placed and compacted in trenches under future paved roadways, driveways and parking lots. The quantity of GAB to be paid for will be the actual quantity placed at the direction of the Project Manager and the Standard Details and these specifications. The unit price bid per ton shall be full compensation for all materials, hauling, labor, and equipment necessary to complete the work and compact the GAB as required in these specifications. The quantity to be paid for may be determined from the supplier's drayage tickets or by measurement and computation. If there is a conflict between the drayage tickets and the computed quantity, the computed quantity shall govern. **All trenches for water mains in areas under existing or proposed roadways, driveways or parking areas shall be backfilled with GAB and compacted per these Specifications**. Drayage tickets shall designate the GAB for the specific site of this project. The Contractor is responsible for all costs of compaction testing by an approved geotechnical engineer. Other than the requirements defined herein, Section 310 may be referred to for additional requirements, but Section 310 shall not supersede the requirements stated here in Section 670.

S. Stabilizer Material, TP I (#57 Stone)

This pay item covers subgrade stabilizer for water mains. The quantity of subgrade stabilizer to be paid for will be the actual quantity placed, as directed by the Project Manager. No payment will be made for any stabilizer placed without the direction of the Inspector. This item will be paid for at the unit price bid per ton, which price shall be full compensation for all materials, hauling, labor, and equipment necessary to complete the work. The quantity to be paid for may be determined from the supplier's drayage tickets or by measurement and computation. If there is a conflict between the drayage tickets and the computed quantity, the computed quantity shall govern. Other than the requirements defined herein, Section 209 may be referred to for additional requirements, but Section 209 shall not supersede the requirements stated here in Section 670.

T. Rock Excavation for Water Main Installation

Solid Rock excavated and removed in accordance with Utility Owner specifications shall be measured per cubic yard.

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. Items of construction required but not included herein as a pay item shall not be measured for payment and shall be included in the costs/payments for the pay items listed.

A. Ductile Iron Water Mains

Ductile iron water mains shall be paid for at the unit price bid 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, fittings, retainer glands, expansion joints, restrained joint gaskets, nitrile gaskets where required, protection of existing utilities, connections to existing water mains, sampling taps, temporary jumpers, temporary blow-offs, flushing, cleaning, pigging, chlorine for disinfection, disinfection, backfilling, backfill materials (except for GAB in roadways), disposal of unsuitable backfill material, tamping, pressure and leakage testing, compaction testing, densities, utility crossings, dewatering, trench stabilization, clean-up, property restoration and all work and materials necessary to place the water main into service.

B. Adjust Water Main to Grade

Water mains adjusted to grade for whatever reason shall be paid for at the unit price bid per linear foot for each diameter pipe adjusted and shall cover the cost for all new pipe materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of pipe, joints and jointing materials, anchoring, warning tape, polyethylene encasement, fittings, retainer glands, restrained joint gaskets, protection of existing utilities, connections to existing water mains, sampling taps, temporary blow-offs, flushing, cleaning, pigging, chlorine for disinfection, disinfection, backfilling, backfill materials (except for GAB in roadways), disposal of unsuitable backfill material, tamping, pressure and leakage testing, compaction testing, densities, utility crossings, dewatering, trench stabilization, clean-up, property restoration and all work and materials necessary to place the water main back into service.

C. 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, couplings, reducers and all other fittings.

D. Expansion Joints

Expansion joints for PVC or DIP water mains/fittings/valves are considered subsidiary to the water line in which they are used and are not measured for separate payment.

E. Restrained Joints

Joint restraints for PVC or DIP water mains/fittings/valves are considered subsidiary to the water line in which they are used and are not measured for separate payment.

U. Air Release Valve

Air release valves shall be paid for at the unit price bid per each size of valve installed. The cost for this item shall cover the cost for all materials, transportation, labor, equipment, and installation of the valve the valve, nipple, ball valve, saddle, adjustment of valve, and any other incidental materials or items of work necessary for its installation and operation, and testing.

F. Relocate Existing Water Valves

Water valves relocated shall be paid for at the unit price bid per each for each size valve and box assembly removed and relocated and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of the water valves including valve box, valve stem extension, concrete pad or collar, grouting of valve box to valve box collar, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, trench stabilization, clean-up, adjustment of new valve boxes to final grade after road construction is complete, cleaning out valve box after road construction is complete, verifying the valve is accessible and in the correct position (open or closed) after road construction is complete, property restoration, and all work and materials necessary to remove and relocate the water valve and place it back into service.

G. Relocate Fire Hydrant Assembly

Fire hydrant assemblies relocated shall be paid for at the unit price bid per each fire hydrant removed and relocated and shall cover the cost for all materials, transportation, labor, equipment, excavation, sheeting and shoring, relocation of the fire hydrant assembly (all configurations), vertical barrel extensions, joint connections, fittings, restraints, crushed stone drain, protection of existing utilities, clean-up, property restoration, and all work and materials necessary to remove and relocate the fire hydrant assembly and place it back into service. No separate payment shall be made for hydrant tees and anchor couplings. Payment made shall include the final adjustment to grade after sidewalk construction and grading is complete, including any barrel extensions necessary to set the breakaway flange 2” to 6” above final grade.

H. Water Service Line

Copper water service lines shall be paid for at the unit price bid per linear foot 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, fittings, curb stop, PVC Casing and bore for long side services, plugging abandoned water service connection, removal of abandoned water service line, connection to existing water meter, protection of existing utilities, connection to new corporation stop at the new double strap saddle, chlorine for disinfection, disinfection, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, clean-up, cleaning out meter box after road construction is complete, verifying the meter is accessible and in the correct position (curb stop is accessible and meter is able to be read) after road construction is complete, property restoration, and all work and materials necessary to place the water service line into service. Any relocation of a water meter and box shall be paid for separately.

I. Adjust Water Service Line to Grade

Water service lines adjusted to grade for whatever reason shall be paid for at the unit price bid per each for each water service adjusted to grade and shall cover the cost for all new service materials, transportation, labor, equipment, excavation, sheeting and shoring, installation of water service at the correct location, joints and jointing materials,

anchoring, warning tape, fittings, protection of existing utilities, connections to existing water services, flushing, cleaning, chlorine for disinfection, disinfection, backfilling, backfill materials (except for GAB in roadways), disposal of unsuitable backfill material, tamping, pressure and leakage testing, compaction testing, densities, utility crossings, dewatering, trench stabilization, clean-up, property restoration and all work and materials necessary to place the water service back into use.

J. Steel Casing for Water or Sewer Mains – (Install by Open Cut)

Steel casing pipe shall be paid for at the unit price bid 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, steel straps, coatings, casing spacers, end seals, backfilling, backfill materials, disposal of unsuitable backfill material, tamping, testing, dewatering, trench stabilization, clean-up, property restoration, and all work and materials necessary to install the steel casing on grade in accordance with the plans, specifications and Utility Owner Standards except where such items are shown to be paid for under a separate item. The carrier pipe shall be measured and paid for separately under "Water Main" or "Sanitary Sewer Pipe".

K. Relocation of Water Meter, Backflow Preventer (BFP) and Boxes

Relocation of existing water meters, backflow preventers and boxes shall be paid for at the unit price bid for each water meter, backflow preventer and boxes relocated and reconnected and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, removal of existing water meter, BFP and boxes, installation at proposed location, adjustment to final grade after all road construction is complete, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, clean-up, property restoration, and all work and materials necessary to relocate the water meter, BFP and boxes 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 and the new curb stop and between the meter and the BFP shall be paid for under a separate Pay Item.

L. Relocation of Hose Bibb and Box

The relocation of existing water hose bibbs with meter boxes housing the hose bibb shall be paid for at the unit price bid for each water hose bibb relocated and reconnected and shall cover the cost of all materials, transportation, labor, equipment, excavation, sheeting and shoring, removal of existing hose bibb and box, installation at proposed location, adjustment to final grade after road construction is complete, protection of existing utilities, backfilling, backfill material, disposal of unsuitable backfill materials, tamping, testing, trench stabilization, clean-up, property restoration, and all work and materials necessary to relocate the water hose bibb with meter box except where such items are shown to be paid for under a separate Item. The new copper service line from the water service to the relocated hose bibb shall be paid for under a separate Pay Item.

M. Adjustment of Existing Water Valve Box to Final Grade

Adjustment of existing valve boxes shall be paid for in accordance with Section 611, at the unit price bid per each valve box adjusted to final grade and shall cover the cost of all materials, transportation, labor, equipment, excavation, and valve stem extensions, new concrete collar/pad, and all work and materials necessary to adjust the valve box to final grade after all sidewalk construction is complete. Payment shall also cover cleaning out valve box and verifying valve is accessible and in the correct position (open/closed) after sidewalk/trail construction is complete.

N. Adjustment of Existing Water Meter Boxes to Final Grade

Adjustment of existing meter boxes to final grade shall be paid for at the unit price bid per each existing meter box adjusted to final grade and shall cover the cost of all materials, transportation, labor, equipment, excavation, adjustment of water meter box to final grade, protection of existing utilities, clean-up, property restoration, and all work and materials necessary to adjust the existing water meter box to the final grade after all sidewalk/trail construction is complete.

O. Remove Existing Fire Hydrant, including Salvage

Removal of existing fire hydrants shall be paid for at the unit price bid per each fire hydrant removed and salvaged and shall cover the cost for all materials, transportation, labor, equipment, excavation, removal of existing fire hydrant, delivery of salvaged hydrant to Utility Owner, protection of existing utilities, and all work necessary to remove and salvage the fire hydrant.

P. Concrete Thrust Blocks (Class A Concrete, HES)

Concrete thrust blocks shall be paid for at the unit price bid per cubic yard of Class A Concrete – High Early Strength, 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, dewatering, clean-up, restoration, and all work and materials necessary to install a complete thrust block in accordance with the Standard Details of the Utility Owner.

V. Fill and Cap Existing Abandoned Water Main

Filling and capping of existing water mains to be abandoned in place shall be paid for at the unit price bid per linear foot for each size of water main abandoned. Payment shall cover all materials, transportation, labor, equipment, protection of existing utilities, and all work and materials necessary to fill and cap existing water mains. No payment shall be made for fittings required.

Q. Abandonment of Water Valve (Remove Valve Box)

Removal of existing water valve boxes, thereby abandoning the water valve in place, shall be counted on an individual basis on the number of each valve box removed and properly disposed of. Payment shall be made for this work at the unit price bid per each for each valve box removed and properly disposed of. Payment shall cover the cost for all materials, transportation, labor, equipment, excavation, and all work necessary to locate, remove and properly dispose of the valve box.

R. GPS Data Collection and Submittal

As stated above, no additional payment shall be made for the work required to complete the record drawing survey and data gathering and drawings; this work is incidental to the water and sanitary sewer work.

S. Graded Aggregate Base Course, incl. Material (For Backfill of Trenches in Paved Areas)

Please review the requirements of Section 670.3.06.H.3. This pay item covers Graded Aggregate Base (GAB) placed and compacted in trenches under future paved roadways, driveways and parking lots. The quantity of GAB to be paid for will be the actual quantity placed at the direction of the Project Manager and the Standard Details and these specifications. The unit price bid per ton shall be full compensation for all materials, hauling, labor, and equipment necessary to complete the work and compact the GAB as required in these specifications. The quantity to be paid for may be determined from the supplier's drayage tickets or by measurement and computation. If there is a conflict between the drayage tickets and the computed quantity, the computed quantity shall govern. **All trenches for water mains in areas under proposed roadways, driveways or parking areas shall be backfilled with GAB and compacted per these Specifications**. Drayage tickets shall designate the GAB for the specific site of this project. The Contractor is responsible for all costs of compaction testing by an approved geotechnical engineer. Other than the requirements defined herein, Section 310 may be referred to for additional requirements, but Section 310 shall not supersede the requirements stated here in Section 670.

T. Stabilizer Material, TP I (#57 Stone)

This pay item covers subgrade stabilizer for water mains. The quantity of subgrade stabilizer to be paid for will be the actual quantity placed, as directed by the Project Manager. No payment will be made for any stabilizer placed without the direction of the Inspector. This item will be paid for at the unit price bid per ton, which price shall be full compensation for all materials, hauling, labor, and equipment necessary to complete the work. The quantity to be paid for may be determined from the supplier's drayage tickets or by measurement and computation. If there is a conflict between the drayage tickets and the computed quantity, the computed quantity shall govern.

U. Rock Excavation for Water Main Installation

Solid Rock excavated and removed in accordance with Utility Owner specifications shall be measured and paid for at the unit price bid per cubic yard for solid rock in the path of the new water main. Rock excavated shall be removed and disposed of at a site away from the backfill for the water main, i.e., the rock shall not be used for backfill over the water main. Payment width for solid rock excavation is limited to the diameter of the water main plus 4 feet.

670.5.01 Adjustments

General Provisions 101 through 150.