

ARTICLE VI - WATER SUPPLY SYSTEMS

Section 601: Purpose

- A. The Developer shall be responsible for the design of an adequate water distribution system. The purpose of this section is to address the minimum requirements for design and construction of public water systems as defined by the City of Cornelia and the Georgia Environmental Protection Division. The methods of design and construction shall be in accordance with all city codes, accepted engineering practices, Georgia EPD's *Minimum Standards for Public Water Systems*, and this Article.
- B. The authority for discretionary provisions for design and construction of water systems shall vest with the Administrative Officer or his/her designee.
- C. This document is intended to convey the general design and construction requirements for a typical project. It also lists specific requirements relating to inspection, testing and acceptance of facilities. It is not intended as a substitute for site-specific engineering and construction techniques. Individual project conditions may require waivers from the provisions in this document.
- D. This chapter is subject to periodic revision to meet changing requirements for materials, environmental regulations, etc. At the beginning of a project the user should verify that he has the latest edition.

Section 602: General Policy and Requirements

- A. Water systems shall be designed in accordance with the densities and intensities reflected in the Future Land Use Plan and Map of the adopted City of Cornelia Comprehensive Plan.
- B. The approximate location and character of proposed public water facilities shall correspond with the Existing and Proposed Water System Map, as amended.
- C. Water systems shall be designed for the estimated future population from all contributing points under consideration. The estimated future population shall be based on the adopted Comprehensive Plan and/or the existing zoning of the land to be served, whichever is greater.
- D. Except as provided below, all future buildings within the City's corporate limits that are to be utilized for human occupancy or any other use such as commercial or industrial purposes that requires water facilities shall be connected to the public water system.
- E. All water service connections from the meter to the building, except when within a dedicated easement, are regulated by the Standard Plumbing Code (SBCCI) and shall be privately maintained.
- F. There shall be no physical connections between a drinking water supply and a sanitary or storm sewer, or appurtenance thereof. All facilities furnished with a public drinking water supply will have no physical connection with private wells or other

private water supply systems, or any other source of contamination.

- G. The City will not accept ownership of water mains installed along roadways that are not dedicated for public use (i.e., are without public right-of-way). The City will not extend water mains along private roadways that do not have a dedicated, recorded right-of-way.

Section 603: Fire Safety

- A. Fire safety systems shall be designed and constructed in accordance with Article VII of this Development Ordinance.

Section 604: Plans and Submittals

Section 604.01 General

All projects which involve construction of lateral water lines, main water lines, or trunk lines shall have detailed construction plans and specifications prepared by a Registered Professional Engineer licensed in the State of Georgia or a Design Professional who meets state licensure requirements applicable to the profession or practice he is engaged in. Developments that only involve water systems for buildings may have plans and specifications prepared by the project architect.

Section 604.02 Water Flow Test

- A. A water flow test shall be performed on the existing water line nearest the proposed subdivision or development prior to submitting design drawings for approval to determine the adequacy of the existing water supply line for the project. The test shall consist of a fire hydrant flow test and a 24-hour pressure test. Refer to Section 704.02 and 704.03 for additional information.

Section 604.03 Preliminary Plan Review

- A. All site development plans involving water systems improvements shall be submitted to the City and GA EPD for technical review. The City shall facilitate the review and approval of all elements of the plan in accordance with Article III of these Regulations. Questions relating to availability of water and proposed location of connection should be resolved at the conceptual and preliminary planning stages before submittal of the final plans. The submittal for preliminary plan review must include all land to be developed even though the land is to be developed in several phases or units. Availability determinations will be made for the total project.

Section 604.04 Final Plan Review

All final plans for public water mains shall be prepared in accordance with the requirements described in Article III and as required in regulations promulgated by the Georgia EPD. The Developer shall be responsible for submitting all necessary plans and other data to EPD for required approvals and for obtaining other permits, such as DOT, railroad, etc. For example, a completed *Drinking Water Project Submittal Form*, including a

signed letter from the City of Cornelia approving the proposed Water System Improvements, must be submitted to Georgia EPD.

Section 604.05 Plan Elements

In addition to the information to be provided in Article III, the following information shall be provided on all site development plans:

1. All proposed water lines and the location and size of all valves, fittings, air relief valves, meters, discharge lines, blow-off chambers and other appurtenances.
2. On industrial and commercial developments the water meter and service line size and location.

Section 604.06 As-Built Drawings

At the completion of construction and preferably prior to the final field inspection, "As-Built" drawings of the project shall be submitted to the City to serve as a permanent record of the project. A reproducible copy of the final plan and two (2) sets of as-builts shall be submitted. A digital copy of the as-built plans shall also be submitted in a format and coordinate system compatible with the City's Geographic Information System (GIS). Each sheet of these drawings shall bear the words "As-Built" or "Record Drawings".

- A. Guidelines for Preparation of As-Built Drawings
 1. As-Built drawings will be same format as the original construction plans.
 2. Road names and lot numbers should be on plans.
 3. "As-Builts" or "Record Drawing" is to be stamped in large clear print on plans.
 4. Sheet should be no larger than 24" x 36".
 5. Water Mains including size and type should be shown.
 6. Service and meter locations and sizes should be shown.
 7. Fire hydrants, gate valves, air release valves should be shown.
 8. Plan of fire meters or detector meters should be shown if applicable.

Section 605: Easement

- A. All easements shall allow adequate room to construct the water line and appurtenances. Permanent easements shall be a minimum of 20 feet wide except that when the depth of the water line exceeds ten (10) feet the required easement width shall increase such that the easement width is at least twice the depth from the ground surface to bottom of the pipe. Easements with dual utilities are to be a minimum of 35 feet in width.
- B. To provide for maximum utilization of public water systems, appropriate easements shall be provided to adjacent properties for access to, or extension of, said utilities. Such easements shall be dedicated to the City of Cornelia.
- C. It shall be the responsibility of the developer to obtain any off-site easements required to connect the project to existing public water system. Easements will be conveyed to

the City of Cornelia for all facilities that are to be conveyed to the City. Final plans cannot be approved until all necessary off-site easements have been submitted, approved and recorded.

Section 606: Water Design Criteria

Section 606.01 General

The criteria listed herein is not intended to cover all aspects of design, but rather to mention the basic guidelines and those particulars that are required by the City of Cornelia. In addition to the design criteria presented herein, proposed public water systems must meet all requirements of the *Minimum Standards for Public Water Systems* (Minimum Standards) published by Georgia EPD.

Section 606.02 Water Lines in Public Rights-of-Way

1. Water lines will be allowed within the right-of-way of any roadway unless as determined by the City or GDOT there are compelling design or safety issues which would demand consideration of an alternate location.
2. GDOT should be contacted at the preliminary plan stage to determine the acceptability of locating water lines under the pavement and/or within the right-of-way of State roadways, especially if, from preliminary review, it appears their guidelines will be difficult or impossible to meet.

Section 606.03 Surface Water Crossings

1. Water lines crossing surface waters, both above and below the watercourse, present special problems and should be discussed with the Development Department before plans are prepared for submission.
2. Crossing of surface waters above the watercourse shall only be made when other methods are impractical.
3. When crossings are permitted, they shall be as close to a right angle to the stream as possible. No more area shall be disturbed than is necessary to provide for the construction of the water line at that location.

Section 606 Design Calculations

Residential water supply for domestic use shall be in accordance with Table 6-1 and at a minimum residual pressure of 20 psi. For determining the instantaneous peak demand for other types of developments, refer to Georgia EPD's *Minimum Standards*.

**TABLE 6-1
INSTANTANEOUS WATER DEMANDS
FOR RESIDENTIAL AREAS**

Total Number of Residences Served	Gallons per Minute
5	40
10	40
20	58
30	73
40	85
50	96
60	106
70	115
80	124
90	132
100	140
150	175
200	205
300	255
400	295
500	335
750	480
1,000	600

Note: Fire flows are not included in the instantaneous water demands above and should be added to these demands. See Article VII for more information.

Section 607 Water Mains and Appurtenances

Section 607.01 Water Mains

1. Materials - Ductile iron pipe (DIP) or polyvinyl chloride (PVC) shall be used for water mains (see later Section for material specifications). Water mains shall be DIP under pavement, at stream crossings and where mains cross under storm sewers, sanitary sewer lines or other utilities.
2. Existing Streets - On existing roads, water lines shall be located on the north or east side of the road, within five (5) feet of the right-of-way line with a minimum cover of 48 inches below the level of the roadbed or with 48 inches of cover, whichever is more restrictive. Permission must be obtained by the City to vary from this requirement. Fire hydrants on existing roads shall be located between the waterline and the street right-of-way.
3. New Streets - On new streets, water lines shall be located on the north or east side of the road, eight (8) feet from back of curb with a minimum cover of 48 inches below the level of the roadbed or with 48 inches of cover, whichever is more restrictive. All

curbing must be installed before any water lines are installed. Fire hydrants shall be located between the water main and the street right-of-way. Mains shall be located in accordance with the Utility Location Detail (see Standard Details).

Section 607.02 Service Laterals

1. Service laterals shall be located with a minimum cover of 48 inches within the right-of-way and rise to a buried depth of 18 inches at the water meter location. There shall be no splices of service lateral pipe under any pavement.
2. Service laterals crossing all roads shall be placed inside a minimum of a 2-inch diameter Sch. 40 PVC casing.
3. A "W" shall be sawed into the curb where each service tap is made to indicate its permanent location,
4. Service tubing shall be ¾" or 1" cross-linked polyethylene, SDR 9 tubing. Long and short side services shall be 1" for service to two (2) meters and ¾" for one (1) meter.
5. Services for subdivision shall be sized and located as shown on the Standard Detail Drawings.
6. Water meters shall be located at the limits of the street right-of-way.
7. Backflow preventers shall be installed in a small 5-inch diameter valve box downstream of the water meter. The backflow preventers downstream of the water meter shall be owned and maintained by the water customer.
8. Fire line meters shall be designed to meet site-specific conditions, see Standard Details for conceptual layout of meter.
9. Detector meters shall be designed to meet site-specific conditions, see Standard Details for conceptual layout.

Section 607.03 Water Valves

1. At Intersections - Valves on water mains at intersections shall be located behind the curb. Generally, the number of valves shall equal the number of streets in the intersection minus one. The City may require valves in excess of this requirement if the water system layout warrants additional valves.
2. At End of Line - A water valve and a minimum of 36 feet of pipe shall be provided at the end of all lines for phased developments, and at locations where the water main may be extended in the future for water system improvements. The end of the line shall be provided with a temporary plug and thrust collar. A 1-inch tap for chlorination/dechlorination purposes shall be provided.
3. Along Mains - Maximum spacing of water valves along water mains shall be 1,000 feet. In addition, a hydrant lead valve shall be located at every fire hydrant.

4. Concrete Pads - All valves shall have a concrete pad.
5. Valve Markers - One concrete valve marker shall be furnished and set at each line valve.
6. Air and Vacuum (A&V) Release Valves - Air and vacuum release valves shall be located where appropriate as determined by the design professional responsible for the project design. All A&V release valve locations are subject to approval of the City. In general, within subdivision A&V release valves are not necessary as long as services are located at the water main high points.
7. Polyethylene Encasement - DIP water mains shall be provided with polyethylene encasement where the water main either crosses, or is in close proximity to, a steel gas main.

Section 608: Water Line Extension Requirements

Developers shall extend all water mains along their entire property frontage if the existing main is adjacent to the proposed development. The size of the extension shall be at least the size of the existing main and may be required to be larger according to the City's Water Plan or the results of the hydraulic analysis of the water system.

Section 609: Material Specifications

Section 609.01 General

1. 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. All materials used and that come in contact with the drinking water must meet NSF Standard 61 for potable water use.
2. Any pipe, solder or flux used in the installation or repair of the water lines must be lead free. Pipes and fittings must not contain more than 8.0% lead and solders and flux must not contain more than 0.2% lead.

Section 609.02 Ductile Iron Pipe (DIP)

Ductile iron pipe must be used on all installations 12" or larger in diameter or with working pressure above 125 psi (generally below elevation 1430 MSL) and at all other locations outlined herein in Section 607. Pipe shall be designed in accordance with ANSI A21.50 (AWWA C150), latest revision, and ANSI A21.51 (AWWA C151), latest revision. Minimum wall thickness for 6"-16" diameter pipe shall be Pressure Class 350. Minimum wall thickness for 18" — 20" diameter pipe shall be Pressure Class 300. The minimum wall thickness for pipe larger than 20" in diameter shall be Pressure Class 250.

Pipe shall have an outside asphaltic coating per AWWA C151, latest revision. Pipe shall be standard cement lined and seal coated with approved bituminous seal coat in accordance with AWWA C104, latest revision. Joints shall be push-on or mechanical joints equivalent to "Fastite", "Bell-Tite" or "Tyton", conforming to ANSI A21.11 (AWWA C111), latest revision. Pipe shall be in 18' to 20' nominal lengths with standard deflection pipe sockets. Where

restrained joints are shown or specified for pipe larger than 12" in diameter, the joints shall be "Lok-Fast" or "Lok-Ring" as manufactured by American 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 ANSI A21.10 (AWWA C110) or ANSI A21.53 (AWWA C153) having a minimum pressure class of 250psi. Flanged fittings shall be manufactured in accordance with ANSI B16.1, Class 125 flanges unless Class 250 are needed. Bolts shall conform to ANSI B18.2.1 and nuts shall conform to ANSI B18.2.2. Gaskets shall be 1/8" inch thick full face and conform to dimensions recommended by AWWA C115, latest revision.

Section 609.03 Polyvinyl Chloride Pipe (PVC)

All PVC pressure pipe used for water service must meet the requirements of AWWA C-900, latest revision, "Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch for Water Distribution" and shall be furnished in ductile iron pipe equivalent outside diameters with rubber gasketed joints as listed C-900 standard. All pipe shall have a minimum dimension ratio (DR) of 14, rated for Class 305 psi sustained working pressure. Certificates of conformance with the foregoing specifications shall be furnished with each lot of pipe supplied. All pipe shall conform to ASTM D-2241 and be installed in accordance with ASTM D-2321. Joints shall be in accordance with ASTM D-3036. 2-inch PVC pipe shall be SDR 13.5.

Section 609.04 Tubing for Water Services

Service pipe shall be cross-linked polyethylene (PEXa) pipe manufactured to Copper Tube Sizes (CTS) using high-pressure peroxide (Engel) method of cross-linking with an approved cell classification of 354400 in accordance with ASTM D 3350, and a minimum degree of cross-linking of 80% when tested in accordance with ASTM D2765, Method B. Pipe shall have a co-extruded UV shield made from UV-resistant, high-density polyethylene, color blue. The UV shield shall resist exposure to natural sunlight for up to one year. Pipe shall be manufactured in accordance to AWWA C904, SDR9 and be certified to meet ASTM F876, F877 and F2023 standards and be NSF 61 approved.

Pipe shall carry manufacturer's name or trademark, nominal size, ASTM F876, F877, CSAB 137.5, NSF-PW, PEXa material designation, SDR9, 160 psi markings along with footage marks, manufacturing date and hour code plum machine number.

Section 609.05 Steel Casing Pipe

Steel casing pipe shall conform to A.S.T.M. Designation A-139, Grade B, electric fusion welded steel pipe. The pipe shall have a minimum tensile strength of 35,000 psi; both the exterior and interior of the pipe shall have a coal tar varnish coating.

Section 609.06 Pipe Fittings

All fittings shall be ductile iron furnished in accordance with ANSI Specifications A21.10 (AWWA C110) or ANSI A21.53 (AWWA C153), latest revision, and have a minimum of 250

psi pressure class rating. Joints shall be mechanical joints with ductile iron retainer glands conforming to ANSI Specification A21.11 (AWWA C111), latest revision. Ductile iron retainer gland shall be equal to EBAA Mega-Lug, MJ Field Lok gasket or approved equal. All fittings shall be furnished with a cement mortar lining.

Section 609.07 Fire Hydrants

- A. General – Hydrants shall be manufacturer’s current model design and construction. All hydrant units are to be complete including joint assemblies. Physical characteristics and compositions of various metal used in the hydrant components shall meet the requirements as specified in AWWA C-502 latest revision. Hydrants shall meet all test requirements, be Underwriters Laboratories Listed and be Factory Mutual Inc. approved. Hydrants shall be suitable for working pressure of 250 psi. Hydrants shall be M & H Valve and Fitting Co., Traffic Model Style 129, Mueller Co., Centurion A-423 or approved equal.
- B. Bonnet – Bonnet may have oil filled or dry reservoir. If oil filled, bonnet must have “O” ring packing so that all operating parts are enclosed in a sealed oil bath. Oil filter plug shall be provided in bonnet to permit checking of oil level and adding oil when required. If bonnet is the dry type, the hydrant top must have a lubricating hole or nut for ease of lubrication. All parts must be removed through top of hydrant without moving entire barrel section from safety flange.
- C. Nozzles and Caps – The hydrant shall have two (2) 2-1/2 inch connections and one (1) 4-1/2” steamer connection, National standard threads. Nozzles shall be bronze and have interlocking lugs to prevent blowout. Nozzle caps shall be secured to fire hydrant with non-kinking type chain with chain loop on cap ends to permit free turning of caps.
- D. Seat Ring – Seat ring shall be bronze.
- E. Drain Valves and Openings – Positive operating drain valves shall be provided to assure drainage of fire hydrant when the main valve is closed. Drain openings shall have bronze bushings.
- F. Main Valve – Valve shall be designed to close with the pressure and remain closed. Valve shall be made from material that will resist rocks or other foreign matter. Valve shall have a full 5-1/4-inch opening.
- G. Barrel and Safety Flanges – Hydrants shall have a safety-type vertical barrel with 4-1/2 foot bury and be designed with safety flanges and/or bolts to protect the barrel and stem from damage and to eliminate flooding when hydrant is struck. Bury depth shall be cast on barrel of hydrant. Hydrant shall be installed with a locked hydrant tee equal to American A-10180 and a locked hydrant adapter equal to American A-10895.

- H. Operating Stop and Nut – Hydrant shall have a positive stop feature to permit opening of hydrant without over travel of stem. Operating nut shall be bronze, 1-1/2", point to flat, pentagon.
- I. Bolts and Nuts – Bolts, washers and nuts shall be corrosion resistant.
- J. Inlet – Bottom inlet of hydrant shall be provided with mechanical joint connection as specified and shall be 6-inch nominal diameter.
- K. Direction of Opening – Hydrant shall be designed to close “right” or clockwise and open “left” or counter-clockwise.
- L. Coatings – All inside and outside portions of hydrant shall be coated in accordance with AWWA C-502. The exterior portion of hydrant above ground level shall be painted with two (2) coats of best grade zinc chromate primer paint and with two (2) coats of approved hydrant enamel. Color shall be Red unless otherwise designated by Owner.
- M. Joint Assemblies – Complete joint assemblies consisting of gland, gasket, bolts, and nut shall be furnished for mechanical joint inlets.

Section 609.08 Butterfly Valves

All butterfly valves shall be bubble-tight closing at the rated pressure with flow in either direction, and shall be satisfactory for applications involving throttling service and frequent operations or operations after long periods of inactivity. Valves shall meet the full requirements of AWWA Standard C504, latest revision for 150-psi working pressure and shall be suitable for above ground or buried service.

All interior ferrous surfaces of valves larger than 12 inches shall have a special epoxy coating meeting the requirements of AWWA C550.

Valve bodies shall be equipped with integrally cast mechanical joint ends meeting ANSI Specification A21.11 (AWWA C111), latest revision. Mechanical joints shall be fitted with ductile iron retainer glands with setscrews on ductile iron pipe.

Butterfly valves installed underground shall come equipped with the following manual operator. The required manual operators shall be of the traveling nut, self-locking type, designed to hold the valve in any intermediate position between fully open and fully closed without creeping or fluttering. Operators shall be equipped with mechanical stop-limiting devices to prevent over travel of the disc in the open and closed positions. Valves shall close with a clockwise rotation. Operators shall be fully enclosed and designed for buried operation.

Section 609.09 Gate Valves

Valves 16 inches and smaller shall be gate valves. These valves shall be non-rising stem design, cast iron or Ductile iron body, bronze mounted with a compression, resilient seat manufactured in accordance with AWWA Standard C509, latest revision. Valves shall be designed for a minimum working pressure of 200 psi and be tested to 400 psi. Gate valves

shall have two (2)-inch square operating nuts, except in meter vaults where hand wheels shall be installed. Valves shall have non-rising stems, shall open when turned counter-clockwise and shall meet AWWA Specifications for Class C valves. Where flange joints are used, flanges must meet the requirements of AWWA C115, latest revision. Valves sized 6" through 16" shall be Mueller Co. A-237020 with mechanical joints or approved equal. Mechanical joints shall be fitted with retainer glands and set screws on ductile iron pipe. Retainer glands shall be EBBA Mega-Lug, MJ Field Lok gasket or approved equal.

Section 609.10 Valve Boxes

Each valve shall be provided with a valve box. Valve boxes shall be approved standard cast iron, adjustable-shaft boxes having a minimum shaft diameter of 5-1/4 inches. The casting shall be coated with two (2) coats of coal tar pitch varnish. The lids of all boxes shall bear the word "Water" or the letter "W". Boxes shall be equal to Vulcan Pattern VVB-4.

Section 609.11 Air and Vacuum Relief Valve Assemblies

Air and vacuum relief valves shall be cast iron body and covers with bronze trim, stainless steel float, Buna-N-Seal, and shall be designed for a minimum working pressure of 150 psi.

The valve shall be designed to exhaust large quantities of air during the filling period and small quantities of air that collect in the line while operating under pressure. The valves shall be equal in all respects to Empire No. 950 combination air release valves.

Gate valves between water main and air relief valve shall be bronze, solid wedge with screw connection equal to Grinnel Company's Figure 103 or Jenkins Company Figure 370. Meter box shall be equal to DFW Style D-1200 or approved equal.

Section 609.12 Service Saddles

Service saddles shall be equal to ROMAC Style 202 double strap or approved equal. Taps in pipes larger than 3-inches shall be made with a tapping machine and a corporation stop shall be installed.

Section 609.13 Pipe Couplings

Pipe connections between new pipe and existing pipe shall be made with Dresser Style 90 long steel couplings for pipe sizes 2" and below; for pipe sizes above 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.

Section 609.14 Curb Stops and Wyes

All curb stops shall have locking devices. All metal parts of curb stops shall be made of bronze. The 3/4 -inch and 1-inch stops shall be FIPT x compression Ford Model B43-232W, full port, or approved equal. The cock shall be operated with a combined cap and tee and shall open when turned counter-clockwise. Wyes shall be Ford Model Wye44 or approved equal.

Section 609.15 Corporation Stops

Corporation stops shall have threaded inlet and compression outlet connection. Threaded ends of inlet shall conform to AWWA C800. All metal parts of the corporation stop assembly shall be made of bronze conforming to ASTM B61 or B62. The stop shall be operated with a tee head and shall open when turned counter-clockwise. The corporation stop shall be a Ford F1000 or approved equal.

Section 609.16 PVC Casing Pipe

PVC casing pipe used for long-side services shall be schedule 40, a minimum of 1 inch larger in diameter than the service line, but no less than 2 -inches in diameter.

Section 609.17 Tapping Sleeves and Valves

Tapping sleeves shall be equal to Mueller, H-615/715 with tapping valve attached or approved equal. The sleeve/cross shall be sized to fit the intercepted pipe without leaking.

Section 609.18 Water Meters

Water meters smaller than 2" shall be furnished and installed by the City. Meters 2" and larger shall be furnished and installed by the Developer. All meters must be capable of reading accurately at low flows and must be approved by the City prior to installation. All meters shall read in gallons. All meters shall come equipped with a touch-read or touchless sensor compatible with the City's meter reading equipment,

Water meters ¾"- 1" shall be Sensus SRII or approved equal, and meters 2"- 4" shall be a Sensus SRH compound meter or approved equal. For water meters requiring flows greater than 500 GPM, developers shall use Sensus Fireline meters or approved equal. For meters 2"-4", the bypass shall be located inside the vault. For meters larger than 4", a portion of the bypass piping may be installed outside of the vault, with the valve on the bypass located inside the vault. All water meters must be located on the right-of-way and not on private property.

Section 609.19 Meter Boxes

Meter boxes for house services shall be made of plastic, having a tensile strength rating of between 4,500 and 8,200 psi and a compressive strength rating of 4,000 to 6,500 psi. The box shall be approximately 19" long, 13" wide and 12" deep. The lid shall be made of gray cast iron, free from blow holes, warp, projections, shrinkage cracks, porosity and other defects harmful to their use. The lid shall be coated with asphaltic paint and have a hole precut for the AMR pit lid module. Meter boxes shall be DFW Style D-1200 or approved equal.

Section 609.20 Unions and Adapters

All ¾ - inch adapters shall be CTS plastic nonflare x Male IPT adapter Hays 5605 CF. All 1-inch adapters shall be Hays 5605 DF, or Mueller H-15428. All ¾ - inch and 1-inch plastic unions shall be CTS plastic x CTS plastic 3-part nonflare union, Hays 5615 DR or Mueller H-

15403. “Y” Branch connections (yokes) shall be McDonald #08yst, full port, Mueller Co. H-15347 or approved equal.

Section 609.21 Backflow Prevention

1. All water meters shall be provided with a backflow preventer downstream of the water meter in a small 5-inch diameter valve box. Backflow preventers shall be furnished and installed by the Developer and owned and maintained by the water customer.
2. Fire lines shall be provided with a detector meter or a factory mutual fire meter, in accordance with the Fire Line Requirements outlined in Article II of this ordinance. Fire line meters and detector meters shall be designed to meet site specific conditions. See the Standard Details for conceptual layouts.
3. Reduced pressure zone backflow preventers with relief vents are required for high risk situations as determined by the Development Department. All reduced pressure zone backflow preventers shall be installed in vaults set above the ground with drains.

Section 609.22 Valve Markers

Valve markers shall be made of 3,000 psi concrete and shall be four (4) feet long and four (4) inches on each side, with four No. 4 reinforcing bars. The markers shall be set with an even number of feet between the centerline of the valve and the centerline 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.

Section 609.23 Polyethylene Encasement

Polyethylene encasement shall be in tube form conforming to the requirements of ANSI/AWWA C105/A21.5 latest revision. The polyethylene film shall have the following characteristics:

Tensile Strength	1,200 psi minimum
Elongation	300 percent minimum
Dielectric Strength	800 V/mil thickness minimum
Thickness	Normal thickness of .0008 in. (8 mil.)

Polyethylene encasement shall be installed on ductile iron piping, fittings, and valves below grade whenever the water main crosses or is in close proximity to a steel gas main and where indicated on the drawings.

Section 609.24 Casing Spacers Steel Casing

Casing spacers shall be as manufactured by Cascade Waterworks Manufacturing Company, or approved equal. All casing spacers shall have a stainless steel shell with a PVC liner, minimum 0.09-inch thick having a hardness of 85-90 durometer. Casing Spacers shall be located within 5-feet of each end of the casing and there shall be two (2) spacers per joint

of pipe within the casing or per manufacturer's recommendations, whichever is more restrictive. The positioning of the casing spacers shall be centered for water mains.

Section 609.25 Retainer Glands

Retainer glands for mechanical joints shall utilize standard gaskets and bolts conforming to AWWA C111 and shall be EBAA Mega-Lug or approved equal.

Section 609.26 Pressure Reducing Valves

Pressure reducing valves shall be Watts Regulator 25 AUB or approved equal.

Section 609.27 Concrete for Thrust Blocks and Thrust Collars

Concrete for thrust blocks and thrust collars shall have a minimum compressive strength of 3,000 PSI at 28 days. They shall be used as a cradle or thrust blocking at all bends, fittings and at all changes in direction.

Section 609.28 Gaskets for Joint Restraint Inside Casings

Inside of casings, the D.I.P. water main joints shall be slip joint restrained by using U.S. Pipe "Field-Lok" gaskets or approved equal.

Section 609.29 Marking Tape

Marking Tape: All ductile iron and PVC water mains shall be marked by a plastic marking tape placed a minimum of 12" above the top of the pipe for its full length. The tape shall be similar to Reef Industries' Terra Tape Standard. It shall have sufficient thickness, tensile strength, elongation and resistance to alkalis, acids and other destructive agents to remain a permanent marker of the line buried below. The plastic tape shall be imprinted with a continuous message repeated every 16" to 36" "Caution: Water Line Buried Below". The message shall be in permanent blue ink. Marking tape shall be not less than 2" wide.

Section 609.30 Tracing Wire

Tracer wire shall be installed on all PVC and non-metallic pipelines and service lines in a continuous fashion. It shall be brought to the surface at each locator post. It shall be accessible from surface at all valve and meter boxes. At locations tracer wire surfaces between valves, regular valve box with plain lid and collar shall be installed between a pipeline marker pair. Tracer wire shall be 12 GA single strand or up to 7 stands, copper with insulation UL rated for direct bury underground service. Splices shall be UL rated for direct bury and shall be minimized. Wire for directionally drilled bores shall be a minimum of #8 gauge.

Section 609.31 Subgrade Stabilization

Stone Stabilizer for subgrade where needed shall be either approved crushed stone or gravel, uniformly graded from 3/4" to 1 1/4" in size.

Section 610: Water System Construction

Section 610.01 General

1. It shall be expressly understood that these specifications are for installation of all underground water mains and appurtenances.
2. All work shall conform to the applicable provisions of the AWWA C600 and/or AWWA 0605 Specifications of latest revision except as otherwise specified herein.

Section 610.02 Trench Excavation

1. Trenches shall have a minimum width of 12-inches plus the diameter of the outside of the bell of the water main and the depth thereof shall be such that there shall be a minimum of 48-inches of cover measured below the roadway surface, natural ground, or proposed grade to the top of the pipe whichever is more restrictive. Maximum trench width at the top of the pipe shall not be more than the outside diameter of the bell plus two (2) feet. In cases where water lines cross above sanitary sewers, there shall be a minimum of 18 inches vertical separation between the water and sewer mains, In cases where a sanitary sewer crosses above water main, the sanitary sewer shall be DIP and encased in concrete. In cases where water mains parallel sewer mains there shall be a minimum of ten (10) feet horizontal separation maintained between the mains.
2. Trenches shall be dug so 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 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 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. Trenches shall be free of water during the work.
3. 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. Not more than 100 feet of trench shall be opened on any line in advance of pipe laying.
4. All excavation shall be placed on one side of the trench, unless permission is given by the City 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. All shade trees, shrubs, etc. shall be protected.
5. The Contractor shall furnish, install and maintain such sheathing, bracing, etc. as may be required to support the sides of the excavation and to prevent any movement that might injure the pipe, or cause sloughing of the street or trench, or otherwise injure or delay the work or interfere with adjoining structures,
6. 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 subgrade, unless the casing or pipe is in solid rock, in which case the crossing shall be made by the open cut method or by tunneling.
7. 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.
 8. In excavation and backfilling and laying pipe, care must be taken not to remove or injure any existing water, sewer, gas or other pipes, conduits or other structures. When an obstruction is encountered, the Developer shall notify the Designer, who will 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 or replaced immediately.
 9. All materials shall be considered as rock which cannot be excavated except by drilling, blasting or wedging. It shall consist of undecomposed stone in solid layers or of boulders of not less than 1/2 cubic yard. Wherever rock is encountered in the excavation, it shall be removed by suitable means. If blasting is used for removal of rock, the contractor shall take all proper safety precautions. He shall comply with all rules and regulations for the protection of life and property that may be imposed by any public body having jurisdiction relative to the handling, storing and use of explosives. He is fully responsible for paying 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 City and property owner.
 10. 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 governing blasting and the use of explosives. Rock excavation near existing pipelines or other structures shall be conducted with the utmost care to avoid damage. The contractor, to the satisfaction of the City and property owner, shall promptly repair injury or damage to other structures and properties.
 11. Rock in trenches shall be excavated over the horizontal limits of excavation and to depths as shown in Table 6-2 below. The undercut space shall then be brought up to grade by backfilling with Size #57 crushed stone materials or approved equal.

TABLE 6-2
ROCK EXCAVATION DEPTHS

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
Over 30	12

12. In rock excavation, the backfill from the bottom of the trench to one foot 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 75% broken stone and the maximum sized stone placed in the trench shall not weigh over 50 pounds. Excess rock and fragments of rock weighing more than 50 pounds 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.
13. Sides of the trench shall be trimmed of projecting rock that will interfere with backfilling operations. Rock excavation by blasting shall be at least 75 feet in advance of pipe laying.
14. Water lines shall have a minimum cover of 48 inches. All changes in grade shall be made gradually. At points of interference with storm sewers and cross drains, pipe will be run under the conflicting utility if the minimum cover cannot be maintained by going over the top of the pipe. Where the water main crosses beneath a storm sewer, there shall be a minimum of 12 inches clearance between the main and the storm sewer. The water main shall be D.I.P. at all such crossings.
15. When laying pipe across watercourses, railroad crossings, or depressions of any kind, the minimum depth specified above shall be maintained at the bottom of the depression.
16. Where necessary, the line shall be lowered at valves so the top of the valve stem is approximately one (1) foot below the finished grade. The trench shall be deepened to provide a gradual approach to all low points of the line.
17. 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 12 inches above the top of the pipe shall be placed by hand in four (4)-inch layers for the full width of the trench and thoroughly compacted by hand with vibrating equipment. Care shall be taken so 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, foreign matter or corrosive materials, where not otherwise specified or indicated on the plans.

18. Backfill under permanent concrete or bituminous pavement or floors and as elsewhere specified or indicated on the plans shall be approved bank-run sand or gravel or crushed stone, free from large stones and containing no more than 10% by weight of loam or clay. This backfill shall be compacted to 100% as determined by the Modified Proctor test for the top two (2) feet of trench and 95% by the Modified Proctor test from pipe bedding to two (2) feet below trench top. Mechanical vibrating equipment shall be used to achieve the required compaction,
19. Backfill under gravel or crushed stone surfaced roadways and low-type bituminous surfaced roadways shall be the approved suitable excavated material placed in 6-inch layers thoroughly compacted for the full depth and width of the trench, conforming to the compacting, density compaction method and materials as specified above.
20. Backfill in unpaved areas shall be compacted with mechanical vibrating equipment to 90% as determined by the Modified Proctor Test. Backfill material from pipe bedding to ground surface shall be excavated earth free from large stones and other debris.
21. The 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.
22. 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 adjacent property, public or private.
23. All costs associated with the compaction tests shall be the responsibility of the Developer.

Section 610.03 Laying of Pipe

1. All pipes 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 dirt and debris will not be washed into the pipe in case of rain.
2. In making the joints with ductile iron pipe, 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.

Section 610.04 Thrust Restraint for Pressure Lines

1. Underground pipe laid around curves, at all unsupported changes of direction, and all tees, wyes, crosses, plugs and other similar fittings shall be solidly and properly blocked with concrete against solid earth. This blocking is designed to take the reaction of the main pressure and to prevent lateral movement of the pipe or fittings under pressure. Reaction blocking shall be installed at all locations requiring it and where tie rods and clamps are not called for in the plans. Concrete for reaction blocking shall have a minimum compressive strength of 3,000 psi at 28 days. The

blocking, unless otherwise shown, shall be placed so the pipe and fitting joints will be accessible for repair.

2. Reaction blocking shall be constructed in conformance with the Standard Detail Drawings for Thrust Blocking. 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 fitting, but that the load bearing capacity of the blocking will not be affected.
3. Mechanical joint fittings on Ductile Iron Pipe shall be installed with retainer glands in compliance with the requirements of AWWA C600.

Section 610.05 Setting Valves and Fittings

1. Hydrants and Valves shall be set plumb. Valves shall have cast iron valve boxes and their operating stems shall be oriented to allow proper operation. The valve boxes shall be placed directly over the valve and set plumb and fully supported, the top of the box being brought to the surface of the ground and the operating nut set \pm 1 foot below the finished grade. 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. Valve stem extensions shall be installed where valve operating nut is more than 3 feet below the finished grade.
2. Fittings shall be properly braced to ensure they will not be blown off or broken loose under the greatest possible working pressure. All fittings shall be mechanical joints unless specified otherwise. In situations where there is insufficient undisturbed earth to act as a bearing surface or where otherwise directed by the City, fittings shall be restrained by the use of threaded rods or other method acceptable to the City.
3. Prior to blocking any joint or fitting with concrete, the joint or fitting shall be wrapped with polyethylene film in such a manner that the concrete will not stick directly to the pipe but so the load bearing capacity of the blocking will not be affected. Polyethylene film shall be installed at other points along the water main where directed by the City.
4. Setting Hydrants, Valves, Valve Boxes and Fittings:
 - a. General: Hydrants, valves and pipe fittings shall be set and jointed to new pipe in the manner heretofore specified for cleaning, laying and jointing pipe. Hydrants and valves shall be installed plumb. Valve-operating stems shall be oriented in a manner to allow proper operation.
 - b. Setting Fire Hydrants: Fire hydrants shall be placed at the locations shown on the plans. Gate valves for the 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. Care shall be

exercised that retainer glands are tightened sufficiently to secure the hydrants before pressure is put on the main. Not less than four cubic feet of No. 5 or No 57 stone shall be placed around the base of the hydrants, as shown in the Standard Detail Drawings. 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 attaché to the fire hydrant, flags or collars 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 City immediately. It is the Contractors' responsibility to insure that all new facilities are maintained in new condition until final completion of the project and acceptance by the City. Fire hydrants with damaged operating nuts shall not be accepted.

- c. Valve Boxes: Cast iron valve boxes shall be firmly supported and maintained centered and plumb over the wrench nut of the gate or butterfly valve, with box cover. The top of the box shall be brought to grade. After the boxes are in place, earth shall be filled in around the valve box and thoroughly tamped. After settlement has taken place, a concrete collar shall be constructed for each valve box.
- d. Valve Stem Extensions: Valve stem extensions shall be installed where valve operations nut is more than 3 feet below finished grade and shall be of sufficient length to place the operating nut between 2 feet and 3 feet below finished grade.

Section 610.06 Placing Steel Casing Pipe

1. Unless directed otherwise by the City, the installation of steel casing pipe shall be by 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 hold shall be done simultaneously by jacking. Lengths of pipe are to be full circumference and welded to the preceding section installed. Excavation material shall be removed and placed at the top of the working pit. Backfill material and methods of backfilling and tamping shall be as required as stated in this

Article. Carrier pipe shall be inserted within the casing by use of stainless steel casing spacers. Intervals shall be as recommended by the manufacturer or as stated herein. Inside of the casings, the water main joints shall be slip joint restrained by using EBAA MegaLug, US Pipe "Field-Lok" gaskets or approved equal.

Section 610.07 Marking of Valve Locations

1. Each main line water valve shall be marked by cutting a letter "V" in the curb. The "V" shall be turned to point toward the valve that may be either in the street or in the grass behind the curb. The letter height shall be four (4) to six (6) inches.
2. 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 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.

Section 610.08 Tape and Tracing Wire

1. Detection Tape: Marking tape shall be buried a minimum of 12" and a maximum of 18" below finish grade above all PVC and ductile iron pipes. The tape shall be placed during backfill.
2. Tracing Wire: Tracer wire will be installed on the top of all PVC pipes and looped up to surface level in all valve boxes and at all service laterals. Tracer wire shall be taped to the top of pipelines at a minimum of 5 ft intervals in a uniform, continuous manner. This tracing wire system shall be checked and tested by the Contractor, in the presence of the Engineer or OWNER, prior to acceptance of the water main installation. All equipment, meters, detectors, etc., needed for testing shall be furnished by the Contractor.

Section 610.09 Water Meter/Backflow Installation

1. The backflow preventer shall be installed by the Developer or his/her representative. The backflow preventer shall be installed in a separate 5-inch diameter box
2. Once the meter and appurtenances are installed, the box lid is closed. Often, during construction, lids are tossed to the side. This can cause the meter to freeze and break during winter months. If this happens, the Developer shall be responsible for a new meter and installation costs.
3. At the request of the Developer and after payment for the water tap, the meter and appurtenances may be installed by the City. It is the responsibility of the Developer to ensure that the boxes remain intact and undisturbed. If grade changes or material delivery results in altered or broken boxes, the Developer will be charged for the materials and labor needed for restoration.

Section 610.10 Dewatering Trenches

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.

Section 610.11 Bracing, Sheeting and/or Shoring

Whenever the condition of the ground is such that it is necessary to protect the work, the street, the roadway or the workmen, the sides of the trench shall be supported with suitable bracing, sheeting and/or shoring to be furnished by the Contractor at his own expense.

Section 610.12 Locations and Protection of Existing Underground Utilities

It is the responsibility of the contractor to locate and protect the underground utilities. The contractor shall repair utility lines or services he damages at his own expense.

Section 610.13 Connection to Existing City Water System

1. Requirements for Fire Line Connections - All persons desiring a tap must make application at the City prior to the tap being made. The contractor shall furnish the following information when making application:
 - a. Approved plans for the project.
 - b. Copy of street or highway permit, if applicable.
 - c. Meter size including detector meter, if applicable (City may require installation of a master meter at the point of tie-in if it is determined that a substantial water loss in the development may occur).
 - d. Billing address and purchase order, if required.
 - e. Plan and profile of meter installation larger than two (2) inches.
2. City Installs the Connection - The contractor will be billed for the tap plus an hourly rate, plus overhead costs, for the City's operator, his helpers, truck and any other equipment used if made by City forces. The Contractor shall furnish the following at the site:
 - a. Tapping sleeve and valve installed on the line and ready for tapping.
 - b. Proper traffic control devices and person(s) to direct traffic if required.
 - c. Backhoe or lift capable of handling the tapping machine.
 - d. Minimum of three (3) men to assist with the work.
3. Private Contractor Installs the Connection
 - a. City personnel shall supervise the tap and associated work by private licensed utility contractor.
 - b. All taps shall be made on wet line under pressure. Water service must be maintained at all times to commercial and industrial businesses.
 - c. All taps to be made with saddles or tapping sleeves.

Section 610.14 Street Cuts

1. All paved roads will be bored and cased. A bore must be attempted before consideration will be given to cutting the street.
2. Existing roadways shall not be open cut unless written permission is granted by the governing authority or owner (e.g. City of Cornelia, Habersham County, GA DOT, etc.)
3. One lane of traffic shall be maintained open at all times. Lane closures shall be limited to time between 9 a.m. and 4 p.m.
4. The Contractor shall furnish traffic control devices and person(s) to direct traffic, if required. Traffic control per MUTCD, latest edition.
5. The above requirements may be altered with the written approval of the City in extenuating circumstances.
6. Assuming that a road bore has been attempted and failed, or that the Developer has received permission to open cut a road, pavement replacement shall adhere to the following guidelines:
 - a. Removing and replacing pavement shall consist of removing the type of pavement and base encountered and replacing same to its original shape, appearance and riding quality, in accordance with the detailed plans. Where possible, all pipe under existing paved driveways will be either free bored or installed in casing. Free bores under driveways will be made with D.I.P. Casing will be required where the installation is under any roadway. Carrier pipe shall be D.I.P.
 - b. Concrete pavement shall be replaced with pavement of a thickness equal to that removed, or 6" for driveways and 8" for roads, whichever is thicker. The concrete shall meet the specifications of the D.O.T. for concrete paving.
 - c. Where bitumastic paving is replaced, a base course of 3,000 psi concrete shall be placed over the ditch line. The concrete shall be 6" thick for driveways and parking lots and 8" thick for public roads. The top of this base course shall be left with a rough float finish 1 1/2" below the surface of the existing paving. After the concrete has attained its strength, a tack coat of AC-15 or equal shall be applied at the rate of 0.25 gallons per square yard, and a plant mix surface course applied over this, and finished off level with existing pavement.
 - d. Unless otherwise directed in writing, all pavement will be removed to a width of the trench plus 12" on each side as shown on the detailed drawings. Under normal circumstances, the maximum allowable trench width shall be the nominal diameter of the pipe plus 24 inches.

Section 610.15 Standard Drawings

Installation of fire hydrants, water valves, valve boxes, meters, long side services water lines, etc. shall be made in accordance with the applicable Standard Design Drawings in this Manual.

Section 610.16 Cleanup

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. If the Contractor fails to maintain clean-up responsibilities as directed by the City's designated representative, the City may choose to use their own staff to do so and then invoice the Developer for the work.
2. All trenches shall be backfilled and tamped before the end of each days work.
3. Prior to the final 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. Repair or replace any work damaged by the water line construction.
 - c. Regrade and smooth all shoulder areas disturbed by the construction.
 - d. Pour concrete collars around all valve boxes outside paved areas.
 - e. Ensure that all fire hydrants are set to grade and that all valves have been located and are fully open.
 - f. 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.
4. All shoulders, ditches, culverts and other areas impacted by the water main construction shall be at the proper grades and smooth in appearance.
5. A uniform stand of grass or mulch for erosion protection, as defined in the *Manual for Erosion and Sediment Control in Georgia*, is required over all road shoulders and water main easements prior to the City's acceptance of the water main.
6. If work is performed on a Georgia DOT or Habersham County Right of Way, a letter from the governing agency is required to be submitted after construction is complete stating that grassing, clean-up, drainage, etc, is acceptable.

Section 610.17 Interruption of Water Supply During Construction

A minimum of two (2) hours advance notice shall be given to any occupied building served by a water line that is required to be shut off. 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 City. For outages affecting several customers, notice shall be prepared and placed with local news media and to be coordinated with Development Department at least 24 hours (preferably 48 hour or more) prior to the interruption.

Section 611: Inspection and Tests

Section 611.01 Scope

This section pertains to the inspection and testing of installed water lines requiring testing to assure proper operation and service.

1. All lines designed to operate under pressure shall be successfully tested. Tests of installed piping shall consist of leakage and disinfection tests.
2. All piping to be tested must satisfactorily comply with the pressure tests before being eligible for acceptance.
3. Tests shall be conducted in accordance with AWWA Standard C-600 & C-651 except as otherwise herein specified,

Section 611.02 Leakage Testing

1. After all piping has been placed, but prior to the placement of pavement, the Contractor, in the presence of a City inspector or their representative, shall test each valved section of newly laid pipe. Tests shall be continued until all leaks have been made tight to the satisfaction of the inspector. The Contractor shall furnish all necessary meters, pumps, gauges, bulkheads and other materials and appliances necessary to conduct the required tests. Every precaution must be taken to valve-off or otherwise protect control equipment in or attached to the pipeline to prevent damage or injury thereto.
2. 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 after the test has been completed.
3. Prior to the pressure test, pipe laid in trenches shall be adequately backfilled to secure the pipe during the test. Any observed leakage shall require corrective measures to pipe lines and/or joints as to the satisfaction of the Inspector.
4. The City 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 minimum of 1.5 times the working pressure, but not less than a pressure of 200 psi (whichever is greater) for a minimum time of two (2) hours. Test pressure shall not vary by more than ± 5 psi for the duration of the test. This 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. Allowable leakage amounts are found in Table 6-3 below. Only the Administrative Officer with input from the City Engineer can allow any variances to the limits presented below.
 - a. Permissible Leakage: Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, of any valved section thereof, to maintain the specified leakage test pressure after the pipe has been filled with water and the

air in the pipeline has been expelled. No installation will be accepted if leakage is greater than that determined by the formula:

For PVC Installations:
$$L = \frac{ND(P)^{0.5}}{7,400}$$
 Where:

L is the allowable leakage, in gallons per hour; N is the number of joints in the length of pipeline tested; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge.

For Ductile Iron Installations:
$$L = \frac{ND(P)^{0.5}}{133,200}$$
 Where:

L is the allowable leakage in gallons per hour; N is the length of pipeline tested in feet; D is the nominal diameter of the pipe in inches; and P is the average test pressure during the leakage test in pounds per square inch gauge.

Leakage values determined by the above formulas are to be found in the following Table.

Allowable Leakage for Water Main Installation (Per 1,000 ft) in Gallons per Hour

Average Test Pressure in Pipeline

TABLE 6-3
Allowable Leakage Table (gph/1,000 LF of pipeline*)

Nominal Pipe Diameter, Inches	150 PSI		200 PSI	
	PVC	DI	PVC	DI
4"	0.33	0.37	0.38	0.43
6"	0.50	0.55	0.57	0.64
8"	0.66	0.74	0.76	0.85
10"	0.83	0.92	0.96	1.06
12"	0.99	1.10	1.15	1.28
14"	1.16	1.29	1.34	1.48
16"	1.32	1.47	1.53	1.70
18"	1.49	1.66	1.72	1.91
20"	1.66	1.84	1.91	2.12
24"	1.99	2.21	2.29	2.55

**If the pipe line under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage of each size.*

Section 611.03 Correction

Any section of the line not meeting the above test shall have the leaks found and corrected at once and retested until the leakage falls within the allowable limits. Leakage testing must be witnessed and approved by the City.

Section 611.04 Disinfection

After leakage testing and all necessary repairs have been made, all new water lines shall be flushed clean and then disinfected in accordance with AWWA Standard For Disinfecting Water Mains, C651 latest edition, subject to the following special conditions:

1. The method of disinfection shall be the Continuous — Feed Method in accordance with AWWA C651, Section 5.2. The Contractor shall furnish all labor, equipment and material necessary for the complete disinfection of the new water mains. The City will furnish the necessary water for flushing and disinfecting the new water main one (1) time. Any water lost from unnecessary or excessive flushing of lines, re-chlorinating and re-testing of water lines, or from failed bacteriological testing will be charged the contractor at the current residential rates.
2. Before the main is chlorinated, it shall be filled to eliminate air pockets and flushed to remove particulates. Potable water shall be supplied through a temporary connection that shall include an appropriate cross-connection device for backflow prevention to the active distribution system. The flushing velocity in the main shall not be less than 2.5 ft/s. Table 6-4 shows the rates of flow required to produce a velocity of 2.5 ft/s in commonly used sizes of pipes. For mains 24-inches and larger, an acceptable alternate to flushing is to broom sweep the main, carefully removing all sweeps prior to chlorination.

**Table 6-4
Required flow to flush pipelines
with a residual pressure of 40 psi**

Pipe Diameter <i>in.</i>	Flow Required to Produce ± 2.5 ft./s Velocity in Main <i>gpm</i>	Number of 2 ½-in Hydrant Outlets
4	100	1
6	200	1
8	400	1
10	600	1
12	900	2
16	1,600	2

3. The form of chlorine may be either: a one (1) percent solution made from either sodium hypochlorite or calcium hypochlorite which shall be measured and pumped into the pipeline. AWWA C651 requires the injection point be located at a point not more than 10 feet from the point of connection to the existing water supply. The

chlorine should be fed at a constant measured rate such that the water will have not less than 25 mg/L free chlorine. Table 6-5 gives the amount of chlorine required for each 100 feet of pipe of various diameters to produce a 25 mg/L, concentration. The chlorinating agent may be injected into the main through a corporation stop tapped into the newly laid main. The potable water shall be chlorinated so after a 24-hour holding period in the main, there will be a free chlorine residual of not less than 10 mg/L.

Table 6-5
Chlorine required to produce 25-mg/L
Concentration in 100 ft. of pipe by diameter

Pipe Diameter	100% Chlorine	100% Chlorine Solution
in.	lbs.	gal.
4	.013	.16
6	.030	.36
8	.054	.65
10	.085	1.02
12	.120	1.44
16	.217	2.60

4. During the 24-hour disinfection period, all valves and hydrants in the treated section shall be operated to ensure disinfection of the appurtenances. After 24-hours, the line, shall be flushed until the chlorine content is not more than 0.1 parts per million in excess of the residual in the water from the supplying main and in no event not less than 0.2 (ppm). Samples of the water shall be taken at various points along the line. The contractor should deliver the samples to an independent laboratory. The laboratory must be pre-approved by the City and hold appropriate certification from Georgia Environmental Protection Division.
5. The City must witness all flushing, disinfection, sampling and dechlorination work. The contractor shall outline his planned procedures for these tasks and obtain approval of the City before commencing this work. Documentation of the pressure tests, results, dates and method of disinfection and results of disinfection must be furnished to the City prior to any final acceptance of the new water main.
6. Dechlorination. - After the disinfection process has been completed and the contractor elects to dechlorinate, the heavily chlorinated water shall be flushed from the main until measurements show that the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the distribution system or is acceptable for domestic use. The area where the chlorinated water is to be discharged shall be inspected. If there is any possibility that the chlorinated discharge will cause damage to the environment, then a neutralizing chemical shall be applied to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water.
7. The chlorine residual of water being disposed may be neutralized by treating the water with one of the chemicals listed in Table 6-6 below:

**TABLE 6-6
Water Neutralizing Chemicals***

Chemical	Residual Chlorine Concentrations mg/l	Sulfur Dioxide lbs.	Sodium Bisulfite lbs.	Sodium Sulfite lbs.	Sodium Thiosulfate lbs.
Amounts	1	0.8	1.2	1.4	1.2
	2	1.7	2.5	2.9	2.4
	10	8.3	12.5	14.6	12.0
	50	41.7	62.6	73.0	60.0

❖ *Amounts of chemicals required to neutralize various residual chlorine concentrations in 100,000 gal. of water.*

Section 611.05 Contractor Qualifications

1. Licensing and Safety: All contractors who work on water systems that will be owned by the City must be licensed as a “Utility Contractor” in accordance with State of Georgia law and local ordinance. Compliance with applicable safety regulations is the responsibility of each company engaged in the work. The City shall assume no responsibility for the actions of others on the job site. It is the responsibility of those installing water mains and related appurtenances to conform to OSHA regulations, 29 CFR Part 1926, Subpart P, Paragraph 1926.650 through 1926.653 (publications from OSHA can be obtained by contacting OSHA Publications Distribution, Washington, D.C.).
2. Contractors performing water system installations must be approved by the City and shall be completely familiar with the procedures and contract requirements associated with this type project.
3. Unsatisfactory work may result in the loss of privilege for future work in the City of Cornelia.

Section 611.06 Construction Observer

1. Responsibility for Inspection: The Developer's contractor will be responsible for the quality, accuracy and workmanship of his completed work
2. The City may utilize their engineer to observe the project. If so, the City has the option of billing the developer at the same rate or amount that the City has been billed by their consulting engineer,
3. City personnel will visit the job site on a periodic basis and make spot checks, as they deem appropriate. The City shall have the right to review and observe all construction and may reject any work that does not meet quality control standards.
4. Project Access: Authorized representatives of the City, which may include employees, city engineering consultant, state or federal agencies shall have access to the site for observation at all times.

5. The Developer, contractor(s) and the Developer's design professional will be required to attend a pre-construction conference with the City. At the pre-construction conference, the contractor will submit to the city, in writing, the date they proposed to begin construction. The contractor shall provide notification by phone any time the work is to be vacated and will provide notice by phone prior to resuming work.
6. The Developer's professional shall request the final inspection.
7. The City inspector may have informal verbal communications with the contractor foreman or superintendent at any time during construction. The City inspector will not direct the actions of contractor's workmen.

Section 611.07 Communications During Construction

All written communications regarding construction shall be directed to:

City of Cornelia
Mailing address: P.O. Box 785
Cornelia, GA 30531
Located at: 181 Larkin Street
Cornelia, GA 30531

Phone: 706-778-8585
FAX: 706-778-2234

Section 611.08 Concealed Work

The City inspector may direct the contractor to notify the City and receive inspection approval prior to concealing certain work such as valves, tees, fire hydrants, pipe bedding, reaction blocking, lot services, or other appurtenances.

Section 611.09 Minimum Inspection

The following minimum inspections and tests will be performed and certified by the professional employed by the Developer to perform quality control checking on the construction work:

1. Horizontal location of the mains shall be checked by measuring distance from the back-of-curb to the main. Main sizes, valve, hydrant, service location and reaction blocking shall be checked.
2. Compaction testing shall be required for mains constructed in paved areas or where pavement is planned. A minimum of two (2) tests at each road crossing shall be conducted at varying depths. If any of these tests show failing results, then the failing backfill will be removed, re-compacted and re-tested and one additional area will be tested as well.
3. Pressure and disinfection tests shall be observed until each test is passed.

Section 611.10 Final Inspections and Conditional Acceptance

1. The Developer's design engineer shall furnish the City as-built drawings and easements. An affidavit shall be furnished to the City stating that all work on the project has been substantially completed in accordance with the approved plans and specifications. After receipt of this affidavit, the City will schedule a final inspection. A representative of the Developer's design professional and the contractor will be present during this final inspection. The final inspection will generally include spot checks of hydrants, valves and other appurtenances and a complete overview of the project. All valves shall be operated to ensure all valves are in the fully open position.
2. Once all discrepancies are corrected, the City will issue a letter certifying conditional acceptance of the water system. This letter shall commence the start of the 24-month warranty period, which is required of the contractor.
3. On projects having phased development, this letter will allow the developer to apply for a permit for the next phase of development.
4. At the end of 24 months, the subdivision inspection team will re-inspect the entire development. When all discrepancies have been corrected, the City will issue an acceptance letter and will begin perpetual maintenance and operation of the water system.

Section 611.11 Maintenance and Payment Bond

The Developer shall post a maintenance bond, on the facility for a two (2)-year period after completion and conditional acceptance of the facility by the City. In addition, the Developer shall post a payment bond on the facility for all subcontractor and material supplier work.

Section 611.12 Maintenance Until Final Acceptance

It shall be the Developer's obligation to provide all maintenance for a two (2)-year period after acceptance of the project by the City. The developer must notify the City three months prior to the end of the 2-year period to schedule the final inspection. The City shall then inspect the water system, and upon correction by the Developer of all deficiencies noted by the City, the City will accept the system for operation at the end of the 2-year period.

Section 611.13 Compliance with Other Agencies

No part of these specifications is intended to relieve the developer of his responsibility to comply with requirements of the Georgia DOT, the Georgia EPD or other appropriate agencies.

End Article VI