



CITY OF CUMMING DEPARTMENT OF UTILITIES

Water System Technical Standards Manual



Adopted November 1994

Revised July 5, 2017

TABLE OF CONTENTS

SECTION 100	GENERAL	1
101	USE OF THIS DOCUMENT	1
102	TRAFFIC CONTROL AND SAFETY.....	2
SECTION 200	DESIGN CRITERIA.....	3
201	GENERAL.....	3
202	WATER MAINS	3
203	LOCATION OF WATER SERVICES	6
204	FIRE HYDRANTS	7
205	WATER VALVES.....	7
206	AIR RELEASE VALVES.....	8
SECTION 300	MATERIALS SPECIFICATIONS	9
301	MATERIAL AND WORKMANSHIP	9
302	WATER MAINS	9
303	JOINTS.....	10
304	SERVICE LINES.....	11
305	FITTINGS	12
306	VALVES:	12
307	MARKER BALLS	14
308	FIRE HYDRANTS	14
309	TAPPING SADDLES	14
310	COUPLINGS.....	15
311	WATER METERS.....	15
SECTION 400	CONSTRUCTION STANDARDS	18
401	EARTH EXCAVATION	18
402	ROCK EXCAVATION	19
403	SUBSURFACE OBSTRUCTIONS	19
404	INTERRUPTION OF WATER SERVICE.....	20
405	PIPELINE INSTALLATION	20
406	BACKFILL.....	21
407	ROAD CROSSINGS	21
408	DRIVEWAY CROSSINGS	22
409	REPLACEMENT OF PAVEMENT AND STRUCTURES.....	23
410	THRUST RESTRAINT FOR PRESSURE LINES	24
411	FIRE HYDRANT INSTALLATION	25
412	VALVE INSTALLATION	25
413	WATER SERVICE LINE INSTALLATION	25
414	TESTING AND ACCEPTANCE	26
SECTION 500	INDEX OF STANDARD WATER DETAILS	29
SECTION 600	CITY OF CUMMING APPROVED MANUFACTURERS	31

LIST OF ABBREVIATIONS AND TERMS

ABC	Aggregate base course	FCWS	Forsyth County Water System
AC	Asphalt cement or concrete	FF	Finished Floor
ACB	Asphalt concrete base	FG	Finished Grade
ACI	American Concrete Institute	FH, F. Hyd	Fire hydrant
ACPA	American Concrete Pipe Association	FPS	Feet per second
AISC	American Institute of Steel Construction	GA	Gauge
ANSI	American National Standards Institute	GADOT	Georgia Department of Transportation
APWA	American Public Works Association	GALV	Galvanized
ASCE	American Society of Civil Engineers	GPM	Gallons per minute
ASME	American Society of Mechanical Engineers	HORIZ	Horizontal
ASTM	American Society for Testing Materials	ID	Inside diameter
AWWA	American Water Works Association	IE	Invert Elevation
BM	Bench Mark	INV	Invert
BOC	Back of Curb	IP, IPS	Iron Pipe Size
BST	Bituminous Surface Treatment	JCT	Junction
BTB	Bituminous Treated Base	LIN	Linear
CB	Catch Basin	MH	Manhole
C/C	Center to Center	MH F/C	Manhole frame and cover
FOC	Face of Curb	MJ	Mechanical Joint
CFS	Cubic Feet per second	MSL	Mean Sea Level
CIP	Cast Iron pipe	NIST	National Institute of Standards and Technology
CIPP	Cast-in-place concrete pipe	NEC	National Electric Code
CL	Centerline	NEMA	National Electrical Manufacturer's Assoc.
CLFMI	Chain Link Fence Manufacturers Institute	NFPA	National Fire Protection Association
CMP	Corrugated metal pipe	NSC	National Safety Council
CO	Clean out	NSF	Public Health and Safety Organization
COL	Column	OC	On Center
CONC	Concrete	OD	Outside diameter
CONSTR	Construction	OHP	Overhead Power
CP	Concrete pipe (non-reinforced)	OSHA	Occupational Safety & Health Administration
CTB	Cement Treated Base	PI	Point of intersection
DI	Drop Inlet	PL	Property line
DIP	Ductile Iron Pipe	POC	Point of Curve
DIPRA	Ductile Iron Pipe Research Association	PP	Power pole
EC	End of curve	PRC	Point of reverse curve
EG	Existing Grade	PSI	Pounds per square inch
ELEV	Elevation	PSF	Pounds per square foot
EVC	End of vertical curve	PT	Point of Tangent
EXIST	Existing	PVC	Polyvinyl Chloride
		PVMT	Pavement
		Q	Rate of flow
		R	Radius

RC	Reinforced concrete	SDL	Saddle
RCP	Reinforced concrete pipe	SECT	Section
RDWY	Roadway	SJ	Slip Joint
REINF	Reinforced / Reinforcing	TH	Test Hole
RET	Retaining Wall	TRANS	Transition
RPM	Revolutions Per Minute	UL	Underwriters' Laboratories LLC
R/W	Right-of-way (City, County, State Roadways)	UPC	Utility Protection Center, (Ga. 811)
SAN	Sanitary Sewer	V	Velocity of flow
SD	Storm Drain	VC	Vertical curve
		VERT	Vertical

"Authority" shall mean the City of Cumming Department of Utilities.

"Contractor" shall mean the individual, firm or corporation undertaking the execution of the Work under the terms of the contract and acting through its agents and employees.

"Standards" and/or "Specifications" shall refer to the Sanitary Sewer Technical Standards and Details for Cumming Utilities.

"Work" of the contractor shall include all labor, material, equipment, skills, transportation, tools, machinery, and other equipment and things useful and necessary to complete the contract.

"Owner" shall mean the project owner and/or developer and/or property owner as an individual or a collective.

SECTION 100 General

The City of Cumming Sewer System Technical Standards and Details provide standard design direction and construction standards for improvements within the City of Cumming Service Area. The standards herein govern improvements dedicated to the public and accepted by the City for maintenance and/or operation, and serves as coordinated development of those facilities to be used by and for the protection of the public. This includes certain private works, as well as improvements installed within existing City right-of-way and easements. The City shall interpret and apply these Standards in a manner which achieves their intent, but is not limited strictly to new construction.

These Standards shall apply to, regulate, and guide preparation/design of plans for construction of utilities, drainage, sewer system(s), site access, and related public improvements, and shall set guidelines for all private works which involve drainage, grading, trees, and related improvements. The result of these standards shall protect and promote the health, safety, and general welfare of the public as well as conserving and protecting the natural, economic, and scenic resources of the community.

Additionally, these standards align with the City's Comprehensive plans, including Cumming's Water, Sewer and Storm Water Master Plans which provide utility services to the community such as water supply, sewer systems, storm water management and flood control. This document and the related standard details are downloadable in electronic format at <http://www.cummingutilities.com> for developers, contractors, and engineers in preparing plans and construction of public improvements within the City Service Area.

This Manual is updated regularly to reflect current minimum and uniform requirements from the City of Cumming adopted Codes and Ordinances. They shall be applied jointly with the latest issue of federal and state regulations. When the provisions of any other statute, ordinance, or regulation are more restrictive than the provisions of this Manual, the provisions of the more restrictive regulation shall apply.

101 USE OF THIS DOCUMENT

These Standards are for the installation of all water system work within the City of Cumming Service Area and related underground water mains and appurtenances. All work shall conform to the applicable provisions of the AWWA Specifications of latest revision except as otherwise specified herein. All unsuitable excavated material must be properly disposed of in a manner acceptable to the Authority and in a manner that will not adversely affect the environment.

102 TRAFFIC CONTROL AND SAFETY

It is the responsibility of the General Contractor, any subcontractor, their employees, and inspectors of job sites to observe all safety regulations. Deficiencies in safety measures noted should be immediately reported to the Contractor's superintendent.

Traffic control within the state of Georgia right-of-way shall comply with Section 107.09 of the State of Georgia D.O.T. Standard Construction Specifications, or Sections 104.05 and 107.07 of the U.S. Manual on Uniform Traffic Control Devices for Streets and Highways, latest editions. Adequate temporary bridges or crossings shall be constructed and maintained where required to permit uninterrupted vehicular and pedestrian traffic. The Chief Inspector shall have the right to limit the amount of trench open at any one time.

SECTION 200 Design Criteria

201 GENERAL

Note: Developments requesting water service at elevations in excess of 1280 feet above Mean Sea Level (MSL) will be responsible for designing and constructing a pumping system which meets the approval of the City of Cumming Potable Water Booster Pumping Station Design Manual and the City Engineer.

202 WATER MAINS

1. Water Main Size

a. Type of Development

The size of water mains within the City of Cumming’s Water and Sewer Service Area shall be determined by the type of development being served and the quantity of water necessary for fire protection. Minimum water main size for dead end mains shall be 8 inches and 6 inches for loop connections. The minimum water flow necessary for fire protection for various types of developments are shown below in Table 3-1.

Table 1 - Minimum Water Flow Required for Fire Protection

Type of Development	Required Flow	Test Requirement
Residential	750 GPM	Test for 20 Minutes
Multi-Family, Patio Homes, and Developments with Greater than 3 Units Per Acres	1000 GPM	Test for 20 Minutes
Shopping Centers	1500 GPM	Test for 30 Minutes
Motels, Light Industry	1500 GPM	Test for 30 Minutes
Heavy Industry	1500 GPM	Test for 45 Minutes

b. Minimum Residual PSI

A minimum residual pressure of 20 psi shall be used when determining water main sizes. City water storage tanks shall be assumed to be one-half full (elevation 1401 MSL).

c. City of Cumming Water Master Plan

All developers and all new developments shall meet the requirements of the most current edition of the City of Cumming Water Master Plan.

d. Predevelopment Fire Flow Test

A predevelopment fire flow test must be conducted on the water main that will be used to supply water to the proposed development in addition to a 24-hour static pressure test. The results of the fire flow test shall be used to perform a water model of the proposed development. If the fire flow test and water model results do not meet the City requirements, then system-wide upgrades and improvements must be made at the expense of the developer. No new development will be permitted if in the opinion of the City, the new development will negatively impact the water supply, fire flow, or pressure of an existing or future development or customer.

e. Final Plat On-Site Fire Flow Test

An as-built fire flow test must be conducted at each new fire hydrant, at the expense of the developer, before the City will sign off on the final plat. The water system must be completed before the City will accept the results from an as-built fire flow test. The as-built fire flow test reports on each hydrant must be submitted to the City along with the final plat.

f. Impact On Subsequent Developments

A new development shall not diminish the water supply, fire flow, or water pressure of an existing or future development or customer. The Director of Utilities will make the determination as to whether or not a new development will or will not diminish the water supply, fire flow, or water pressure of an existing or future development or customer.

2. Water Main Location

NOTE: It shall be the policy of the City of Cumming to require developers to obtain, at their own expense, an easement located outside of the public right-of way, for all utilities that are to be installed along roadways. The purpose for this policy is to avoid unnecessary costs to the City that are associated with moving utilities for road-widening projects.

a. Within Georgia Department of Transportation Right-of-Way

For water mains or services that are to be located within the Georgia DOT right-of-way, an approved permit which meets the requirements of the Georgia DOT, shall be obtained prior to installation of the line. The developer shall provide to the City, all supporting maps, drawings, and details necessary to complete the Georgia DOT permit application. The City shall submit the application to the Georgia DOT for approval and will receive the permit from the State. The utility contractor will be responsible for posting the necessary permit documentation at the job site.

b. Along City of Cumming Roads

- i. Water mains that are to be located along existing City roads shall be located as far off the edge of the roadways as practicable. If the water main is to be covered by concrete (sidewalks, driveways, etc., the water main shall be Ductile Iron Pipe (DIP).
- ii. When water mains are to be located along new streets, they shall be located a minimum of five (5) feet behind the back of the curb. If the water main is to be covered by concrete (sidewalks, driveways, etc., the water main must be Ductile Iron Pipe (DIP).

c. At Existing Culverts and Streams

Water mains shall be deflected around all existing cross drains and headwalls. When the water main crosses a stream, a minimum of 3-foot cover shall be provided (see drawing W-58). Water mains shall not be placed over existing cross drains unless approved by the Department of Utilities. When water mains are placed over cross drains or around catch basins (see drawing W-47), a minimum of three joints of ductile iron pipe shall be used.

d. Along County Roads

When water mains are to be located along existing County roads, the location shall be as far off the edge of the roadway as practicable, utilizing the back five feet of right-of-way, whenever possible. Any utility work that is proposed within the right-of-way of a County road will require a Utility Permit from the Forsyth County Department of Engineering. The utility contractor will be responsible for obtaining such permit.

e. Water Main Cover

Water mains 6-inches through 10-inches in diameter shall be installed with a minimum-cover of 3-feet. Water mains that are 12-inches in diameter and larger shall be installed with a minimum-cover of 4-feet. In rock cuts, a minimum of 6-inches of earth cushion below and along the side of the mains shall be provided.

3. Roadway Crossings

a. City/County Streets Under Control of Georgia Department of Transportation

When water mains are to cross roads under the control of the Georgia DOT, an approved permit which meets the requirements of the Georgia DOT shall be completed and approved by Georgia DOT prior to installation. The City of Cumming shall make application for all Georgia DOT Utility Permits. The developer shall provide all required data for the permit to the City including but not limited to, maps, surveys, legal descriptions, and other pertinent data.

b. Paved Streets

- i. Water mains crossing existing paved City/County streets shall be installed in steel casing. For internal subdivision roads (non-thoroughfares), the size casing for water main shall be 6-inches larger in diameter than the nominal diameter of the water main. For all other roads, the size casing for water main shall be 8-inches larger in diameter than the nominal diameter of the water main. Any deviation must be approved by the DOU.
- ii. The open cutting of any paved street or driveway within the City of Cumming's Service Area is prohibited, unless approved by the DOU.

c. Unpaved Streets

Water mains crossing existing unpaved City or County streets may be installed by the open-cut method, if approved by the DOU. Water-main street-crossings in new developments are required to be ductile iron pipe. No steel casing is required if the water main is installed prior to street paving.

203 LOCATION OF WATER SERVICES

1. Water service lines for residential areas shall be a minimum of 1-inch in size (type “K” soft copper tubing) from the double-strap saddle up to the ball valve. From the ball valve (which is 18-24-inches below grade) up to the meter, the residential service line shall be ¾-inch, type “K” soft copper tubing. Water meters for residential areas shall be a minimum of three quarter (3/4) inch. (See Drawings W-42 and W-61).
2. Required water service sizes and water meter sizes for businesses and other commercial establishments shall be as required by the City of Cumming.
3. Service connections to the main line shall incorporate double-strap tapping saddles. Direct taps to the water main will not be allowed.
4. Water service lines which cross paved streets shall not be installed by the open-cut method. All water service lines shall be installed by boring under all paved streets. Steel casings are not required for bored service lines. In subdivisions, long side service shall be cased in PVC pipe. The casing shall be installed from back-of-curb to back-of-curb (See Drawing W-43).
5. Water service lines shall not be installed by the open-cut method across unpaved roadways, unless permission is given, in writing, for the permitting authority (City, County, or State road departments).
6. A minimum of 3-feet of cover shall be provided for bored water service lines. The minimum cover at the water meter box shall be fourteen (14) inches.

7. Water meter and boxes shall be installed at the right-of-way line of the roadway, unless the proposed installation is in a more recent development. More recent developments have curbed streets and the water-main is located five (5) feet behind the curb. Therefore, the location of the water-meter and meter-boxes in more recent developments shall be at the curb. In addition, the location of new water meters and meter boxes shall be consistent with the existing installations in the immediate are. THE STREET CURB SHALL BE MARKED WITH A SAW-CUT “W” AND THE “W” SHALL BE PAINTED BLUE AT EACH METER BOX LOCATION.

204 FIRE HYDRANTS

1. Spacing/Maximum Hose Lay

The distance between fire hydrants shall be such that a maximum hose lay of 500 feet will reach all portions of the buildings which are to be serviced. Hydrant spacing requirements for various types of developments are listed below in Table 3-2:

Note: a maximum hose lay of 500 ft for residential developments and 300 ft for commercial may be more restrictive than the City’s maximum allowable distance between hydrants. In any case, the more restrictive of the two shall apply.

Table 2 - Fire Hydrant Spacing

Type of Development	Distance Between Hydrants
Residential	500 FEET
Multi-Family	500 FEET
Shopping Centers	300 FEET
Motels, Light Industry	400 FEET

205 WATER VALVES

1. Valve Type

The type of valve required for a given water-main size is shown in the following table.

Table 3 - Water Valve Type Required Given Water Main Size

Water Main Size	Water Valve Type
6, 8, & 10 - Inch	Gate Valve
12-Inch and Larger	Butterfly Valve

2. Spacing and Location of Valves

- a. Valves shall be located such that minimal sections of the water distribution system would be taken out of service during repair work.
- b. When a water line branches off from the main, a valve shall be placed at the branch of the tee.
- c. Valves are to be placed at all intersections of water mains. Valves shall be located at not more than 500-foot intervals in commercial districts and at not more than one block or 800-ft intervals in other districts. Where systems serve widely scattered customers, the valve spacing should not exceed 2,000 feet. See Drawing No. W-1 for guidance in placing valves in subdivisions.
- d. Valves shall be provided at both ends of water crossings (creek, river, lake, etc. crossings) so that the section can be isolated for testing or repair (valves shall be easily accessible and not subject to flooding); the valve closest to the supply source shall be in a manhole.
- e. On a one-way feed water main, which has branch lines from the main, main-line valves shall be placed at each branch of the tee. The valves shall be placed on the run of the tee which is furthest from the water supply source.
- f. When a water main is looped, or there is a possibility that it will be looped, a valve shall be placed on each run and branch of all tees.
- g. A valve shall be placed at the dead-end of each water main.
- h. Refer to Standard Drawings for typical valve placement details.

206 AIR RELEASE VALVES

1. At high points in water mains where air can accumulate, provisions shall be made to remove the air by means of hydrants or air relief valves. Automatic air relief valves shall not be used in areas where flooding of the manhole or chamber may occur.
2. Refer to the Standard Drawings for typical water service details. (Drawing Nos. W-2, w-23, W-41, W-42, W-44, W-45, W-46, W-47, W-59, W-60, W-61 W-62 and W-63)

SECTION 300 **Materials Specifications**

301 MATERIAL AND WORKMANSHIP

1. Furnish materials which are new, and unused, or if not particularized herein, which are the best of their respective kind, free of defects and imperfections, and suitable for the service intended.
2. Provide workmanship which is first-class in every respect. Have installation performed by workmen thoroughly experienced in such work. A neat and workmanlike appearance in the finished work will be required.

302 WATER MAINS

1. All ductile iron pipe (DIP) shall conform to the latest requirements of AWWA C151. Ductile iron pipe material shall have a minimum tensile strength of 60,000 psi, a minimum yield-strength of 42,000 psi, and a minimum elongation of 10 percent.
2. All polyvinyl chloride (PVC) pipe shall meet the latest requirements of AWWA C900. PVC 1120 pressure pipe shall be made from Class 12454-A or Class 12454-B material conforming to ASTM D1784.
3. As a minimum, based on hydrostatic pressures at storage tank overflow elevation 1420, the following minimum pipe classes, listed below in Table 4-1, shall be used for ductile iron pipe and polyvinyl chloride pipe.

Table 4 - Pipe Classifications

Elevation	6-Inch and 8-Inch	10-Inch thru 24-Inch
960 and above	Ductile Iron-Class 50 or Pressure Class 350; PVC-DR 14, Class 200	Ductile Iron-Class 50 or Pressure Class 350
Below 960	Ductile Iron-Class 51 or Pressure Class 350	Ductile Iron-Class 51 or Pressure Class 350

The above stated pressure classes are suitable for normal depths of cover. For other conditions, the pipe shall be designed in accordance with standard engineering practices, to withstand the expected live and dead loads.

4. When PVC pipe is used for water mains, detector wire shall be used. Follow procedures on Drawing No. W-10. In general, a minimum of two turns around each joint of PVC is required. The wire shall be No. 12 solid copper wire and shall be stripped and connected to a tee-bolt on each side of all fittings and valves. A looped wire shall also be stripped and connected to the same tee-bolt as the underground locate wire. This looped “locator connection wire” shall be extended up the valve box and terminate at the lid of the valve box. This “locate connection wire” will provide a positive-connection for the City’s locate device so that an electrical current can be placed on the underground locate wire. The electrical current will help the City determine the absolute location of the PVC water main.

303 JOINTS

1. Joints for ductile iron pipe shall be mechanical joint or push-on joint in accordance with AWWA C111 (latest revision).
2. All joints for PVC pipe shall be made with elastomeric gaskets. Bell-end pipe using elastomeric gaskets shall meet the requirements of ASTM D2122. Elastomeric gasket couplings shall meet the requirements of AWWA C900 (latest revision).
3. Solvent-cemented joints are not allowed for buried pipes.
4. Coating: Ductile iron pipe shall be lined with an approved cement lining sealed with an approved bituminous seal coat in accordance with AWWA C104 (latest revision). A standard pipe outside coating shall be used in accordance with AWWA C108 (latest revision).
5. Casing Pipe: Jacked casing pipe shall be a smooth steel pipe with a minimum tensile strength of 35,000 psi, or as approved by Georgia DOT. The minimum wall thickness shall be as indicated in the Table below.

Table 5 - Minimum Wall Thickness of Casing Pipe

Nominal Diameter (Inches)	Nominal Thickness (Inches)
Under 14	0.188
14	0.219
16	0.219
18	0.250
20	0.281
22	0.312
24	0.344
26	0.375
28	0.406
30	0.406

32	0.438
34	0.469
36	0.469
42	0.500
48	0.625
54	0.750

304 SERVICE LINES

1. Both ¾-inch and 1-inch water service lines shall be type “K” soft copper tubing. Copper tubing shall be Type K, DHP soft or hard copper pipe conforming to ASTM B88.
2. All 2-inch water service lines shall be Type K, DHP soft or hard copper pipe, and shall conform to ASTM B88.
3. Brass Fittings
 - a. Curb Stops: Curb stops for copper service lines shall be Ford 90o c.t.s. pack-joint x meter swivel or equivalent as approved by the City of Cumming Utility Inspector.
 - b. Corporation Stops: Corporation stops for copper service outlets shall be Ford model F-1000-4 c.t.s. pack-joint or equivalent as approved by the City of Cumming Utility Inspector.
 - c. Adapters
 - i. Copper female iron pipe adapters shall be Ford c.t.s. pack joint x f.i.p. or equivalent as approved by the City of Cumming Utility Inspector.
 - ii. Copper by copper unions shall be Ford c.t.s. x c.t.s. pack joint or equivalent. All proposed equivalent brands must be approved by the City of Cumming Utility Inspector.
 - iii. Copper by male iron pipe adapters shall be Ford shall be Ford c.t.s. pack joint x m.i.p. or equivalent. All proposed equivalent brands must be approved by the City of Cumming Utility Inspector.

305 FITTINGS

1. Cast Iron and Ductile Iron Fittings

Cast and ductile iron fittings for 6-inch pipe and larger shall conform to ASA 21.10 and AWWA C110, or AWWA C153 (latest revision). Fittings shall have minimum classification of Class 350 type of joints, and fittings shall be mechanical joints only. All mechanical joint fittings shall include accessories. All fittings shall be cement lined with tar coated outside.

2. Fittings

Plastic, or galvanized, fittings on any size pipe will not be allowed.

306 VALVES:

1. Gate Valves

- a. Gate valves are required for all 6-inch through 10-inch water mains.
- b. Gate valves for 6, 8, and 10-inch water mains shall conform to the latest requirement of AWWA C500. Gate valves shall be designed for 200 psi working pressure and 400 psi hydrostatic test pressure. Gate valves will be of the iron body, bronze mounted, resilient seat type and shall have a non-rising bronze stem, and shall be wrench operated. All valves shall open by turning counterclockwise. Operating nuts shall be standard 2-inches square. Where required, suitable extension stem guides shall be provided. Gate valves will be furnished with mechanical joint ends except 2-inch service valves which shall be supplied with f.i.p. ends. Valves shall be Mueller, M and H, American or equivalent. All proposed equivalent brands must be approved by the City of Cumming Utility Inspector.

2. Butterfly Valves

Butterfly valves will be required for water mains 12-inches in size and larger in size. Butterfly valves shall have a cast iron valve body for buried service, of the stainless steel-to rubber seated, tight closing type, suitable for two-way flow, Class 150B, with manual operators sized for actual line pressure and velocities, and shall have 2-inch square operating nut and extension stems and guides as required. The valves shall open in the counterclockwise direction as with the gate valves. Butterfly valves shall comply with the latest requirements of AWWA C504. Butterfly valves shall be Henry Pratt, BIF, Allis Chalmers, or approved equal.

3. Tapping Valves

Tapping sleeves shall be properly sized to fit the existing pipe and shall be of the fabricated s.s. with wrap-around gasket type with ends suitable for connection into the pipe line into which it will be installed. The valves furnished with the sleeves shall conform to the requirements for gate valves, except for modifications required to permit the use of full size cutters through the valves. The outlet of the valves shall be mechanical joint for joining with the water mains. All 2-inch tapping valves shall be furnished with f.i.p. ends. All proposed brands must be approved by the City of Cumming Utility Inspector.

4. Valve Markers

Valve markers shall be furnished and installed with each valve installed, with exception of fire hydrant valves. The markers shall be of Class A concrete Georgia DOT (highway specifications) four (4) inches square by five (5) feet long, same construction as that of highway right-of-way marker, with the letter "V" firmly made into the marker six (6) inches below the top with a 1-1/4 inch brass plug one (1) inch below the letter "V", which shall be imprinted with the distance between the valve and marker. The markers shall be set opposite the valves in such a location as they would not be destroyed by traffic. The top of the marker should be set about eighteen (18) inches above ground. The street curb shall also be marked with a saw-cut letter "V" and the "V" shall be painted blue.

5. Valve Boxes

Valve boxes and covers shall be provided with all valves, shall be of the adjustable slide type, of the length required, and installed as shown on Drawings W-5 and W-6. The shaft will be 5-1/2 inch diameter with the base to be a minimum of 8-3/4 inch diameter by 9 inches height inside. The covers for valve boxes shall be of the stay-put or drop type, with the word "Water" cast on top in raised letters. Base size and extension piece shall be as required for each individual size of valve and depth.

6. Valve Pad

Valve Pads shall be furnished and installed with each valve installed. The pads shall be 2 foot squares of 3,000 psi concrete.

307 MARKER BALLS

1. Marker balls shall be placed every 200 feet of straight line pipe and at all fittings and casing ends.

308 FIRE HYDRANTS

1. Fire hydrants shall conform to the latest requirements of AWWA C502, be the traffic type, dry top, 5-1/4 inch valve opening with O-ring seals, three-way only. The three-way hydrants are to have two, 2-1/2-inch NST hose nozzles and one, 4-1/2-inch NST hose nozzle. The main valve shall be rubber faced, shall seat against a bronze seat and shall open against pressure. Hydrants shall range from 3-foot to 5-foot bury with 6-inch mechanical joint inlet connection. Operating nuts shall be pentagon (1-1/2 inch point to flat) and shall open by turning counterclockwise. All fire hydrant laterals shall have 6-inch gate valves and valve boxes. Fire hydrants shall be as manufactured by Clow or M & H.
2. All fire hydrants shall be painted in accordance with AWWA C502, Section 2.22 and Section 4.5. The color shall be silver and red (silver with a red top). Use Sanders Paint, Product No. A400 Aluminum, Metal Bright, or equal.
3. All fire hydrants shall be connected to the water main with a 6-inch ductile iron lead. PVC pipe will not be allowed for fire hydrant leads.

309 TAPPING SADDLES

1. All service connections to the water main shall use 1-inch CC Tap Thread Saddles.
2. 3-inch and 4-inch PVC pipe shall use Ford Style (S70) Brass Saddle with 1" CC Tap Threads. Connections of 2-inch copper shall be accomplished with a pack joint x 1-inch f.i.p. tee.
3. 6-inch through 30-inch PVC and DI Class 50 or 350 shall use double strap Smith Blair Style (313) or Ford Style (202) with 1-inch CC Tap Threaded Saddles.

Table 6 - Part Numbers Tapping Saddles

Smith Blair	S.B. Part Number	Ford	Ford Part Number
4 X 1	313-056309-000	4 X 1	F202-526-CC4
4 X 2	313-048014000	4 X 2	F202-526-IP7
6 X 1	313-076009-000	6 X 1	F202-760-CC4
6 X 2	313-076014-000	6 X 2	F202-760-IP7
8 X 1	313-101009-000	8 X 1	F202-979-CC4
8 X 2	313-101014-000	8 X 2	F202-979-IP7
10 X 1	313-121209-000	10 X 1	F202-1212-CC4

10 X 2	313-121214-000	10 X 2	F202-1212-IP7
12 X 1	313-143209-000	12 X 1	F202-1438-CC4
12 X 2	313-143214-000	12 X 2	F202-1438-IP7
16 X 1	313-188809-000	16 X 1	F202-1840-CC4
16 X 2	313-188814-000	16 X 2	F202-1840-IP7
18 X 1	313-195009-000	18 X 1	F202-2050-CC4
18 X 2	313-195014-000	18 X 2	F202-2050-IP7
24 X 1	313-258009-000	24 X 1	F202-2650-CC4
24 X 2	313-258014-000	10 X 1	F202-2650-IP7
30 X 1	-----	30 X 1	F202-3274-CC4
30 X 2	-----	30 X 2	F202-3274-IP7

310 COUPLINGS

Repair, transition and bolted couplings to be used for water line installation shall be as shown on Table 4-4.

Table 7 - Pipe Couplings

Water Line Size	Specification	Coupling
3/4 "	Type "K" Soft Copper	Ford brass "Pack- Joint" or A.Y. McDonald Brass "Mac-Pak"
1 "	Type "K" Soft Copper	Ford brass "Pack- Joint" or A.Y. McDonald Brass "Mac-Pak"
2"	Type "K" Soft & Hard Copper	Ford brass "Pack- Joint" or A.Y. McDonald Brass "Mac-Pak"
6"	C900 Ductile iron pipe	M.J. Ductile Iron Solid Sleeve
8"	C900 Ductile iron pipe	M.J. Ductile Iron Solid Sleeve
10"	C900 Ductile iron pipe	M.J. Ductile Iron Solid Sleeve
12" And Larger	C900 Ductile iron pipe	M.J. Ductile Iron Solid Sleeve

311 WATER METERS

1. General

- a. Service Line Meters Water meters for normal residential service shall be three-quarter (3/4)-inch in size. Water services requiring meters up to and including 2-inch size shall be installed by the City of Cumming.

- b. Master Meters (And Other Large Meters): Water meters 3-inches and larger, shall be compound type meters. These meters shall have a cast bronze main-case, measure in gallons per minute, and have a hermetically sealed register with a magnetic coupling drive, as manufactured by Neptune. The general arrangement of the meter pit shall include locking by-pass lines, valves, double check valves, strainers, etc., as may be required by the City's Engineer for the specific application. There are two options available for water meters larger than 2- inches:
- Option 1 – The owner or contractor may purchase and install a meter that meets the specifications of the City of Cumming. A fee of eight dollars per gallon per minute (\$8.00 per gpm) must be paid to the City of Cumming before the installation of the meter will be permitted. (Note: this rate is subject to change without notice. Please contact the Utility Billing Department for a current rate).
 - Option 2 – The City of Cumming will purchase and install the meter. The City will then charge the owner or contractor the eight dollars per gallon per minute (\$8.00 per gpm) fee plus the cost of materials and labor. (Note: this rate is subject to change without notice. Please contact the Utility Billing Department for a current rate).

2. Meter Boxes For 3/4 Inch Water Service

- a. Typical residential water meter boxes shall be composed of cast iron and shall be approximately 14-1/2-inches long with an approximate 7 1/8-inch wide oval top opening. The meter box shall be approximately 11-inches deep. A cast iron locking lid shall be provided with all meter boxes. Each lid shall be supplied with a hole with the following diameter: 1 27/32 inches (see Drawing W-56 and W-57). Accepted brands include Ford cast iron long yoke-boxes and A.Y. McDonald cast iron long-boxes.
- b. Meter box inlets shall be configured as follows:
- i. 3/4-inch cts angle locking type ball valve with Ford Pack Joint or McDonald Mac-Pac compression fittings for dual meter service lines.
 - ii. 3/4-inch angle locking-type ball valve with Ford Pack Joint or McDonald Mac-Pac compression fittings for single meter service lines.

NOTE: Dual meter service lines use a ball valve and “Y” fitting with 1-inch inlet X two 3/4-inch outlets. All single meters use a 1” X 3/4” adapter in place of the “Y” fitting.

- c. Meter box outlets shall be configured as follows:
- i. All outlets will be 3/4-inch iron pipe threads

- ii. A 3/4-inch brass nipple and 3/4-inch brass ball valve are to be installed at the outlet of the meter box.

3. Backflow Preventer

All residential services shall have backflow preventers installed in series with the water meter in the meter box. The City of Cumming will install the backflow preventer with each water meter for sizes 3/4-inch – 2-inch. For sizes 3/4-inch through 1-inch, the backflow preventer shall be Watts No. 7 Residential Dual Check Backflow Preventer with bronze body, or approved equal. For sizes larger than 1-inch, or for services other than residential, backflow preventer shall be designed for the specific application and shall be approved by the City of Cumming Utility Inspector.

The City of Cumming is responsible for protecting the public potable water distribution system from contamination or pollution due to the backflow of contaminants or pollutants through a water service connection. A cross-connection is a connection or potential connection between any part of a potable water system and any other environment containing other substances in a manner that, under any circumstances would allow such substances to enter the potable water system. Other substances may be gases, liquids, or solids, such as chemicals, waste products, steam, water from other sources (potable or nonpotable), or any matter that may change the color or add odor to the water.

In certain cases, the City will require a reduced pressure backflow prevention assembly. The City will dictate when these type backflow preventers are to be installed. Examples of businesses that will require an RPZ include but are not limited to mortuaries, industrial facilities, wastewater pumping systems, chemical plants, wastewater treatment facilities, commercial facilities, agricultural facilities, etc. An approved RPZ and “hotbox” will be required so that the backflow preventer is elevated above the ground level and heated during freezing weather. Elevating an RPZ is required so that the appropriate “air-gap” is provided at all times. An RPZ below grade could become submerged in water and thereby be rendered inoperable and ineffective. See Drawing W-67 for details on the required configuration for a RPZ and hotbox. Please note that the hotbox must be supplied with electrical power and a heating element.

SECTION 400 Construction Standards

401 EARTH EXCAVATION

1. Clearing and Grubbing

Areas for water line installation must be cleared and grubbed. All trees, stumps, brush, paving and other waste material must be removed from the site. No large trees located within the right-of-ways shall be removed without the approval of the City of Cumming.

2. Protection of Existing Structures and Landscape

- a. No trees or shrubs will be removed without the approval of the Owner and the City of Cumming. All trees, shrubs, fences, mail boxes or other personal property damaged or removed, shall be replaced.
- b. Upon completion of the water line installation, all disturbed areas shall be seeded, fertilized and mulched with hay. All seeding shall be approved by the City of Cumming. Care must be taken to ensure proper drainage of the area as approved by the City.

3. Excavation Methods

- a. When excavation is in open cut, the sides of the trench should be sloped as necessary to maintain stability and meet OSHA standards.
- b. When sheeting is used, it shall be left in place until the backfilling is completed no less than twelve (12) inches above the top of the pipe. Then, the upper section of the sheeting may be removed. When the removal of sheeting endangers adjoining improvements, it will be left in place.
- c. All water shall be removed from trenches by pumping, bailing or draining. Groundwater encountered in the excavation shall be depressed to an elevation twelve (12) inches below the bottom of the excavation before pipe-laying may continue.

4. Disposal of Material

All excess material and waste material should be disposed of immediately after the backfill operation has been completed.

5. Borrow

When excavated material cannot be used as a suitable backfill, an approved borrow material shall be used.

402 ROCK EXCAVATION

1. Blasting

When blasting is necessary for rock excavation, the explosives must be used, handled, and stored as prescribed by the laws and regulations of the State of Georgia and all local laws applicable. The blasting work must be done by an experienced person. Any damage occurring to persons or personal property due to blasting will be repaired at the Contractor's expense.

2. Disposal

All rock larger than two (2) inches in diameter must be removed from the site and disposed of in a manner approved by the City of Cumming.

403 SUBSURFACE OBSTRUCTIONS

1. General

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 that utility company. Any damage caused by water line installation to any utility or structure shall be immediately reported to the City, and repaired at the Contractor's expense. The Contractor shall be responsible for any expenses incurred as a result of damage to existing utilities. Contractors must adhere to all state laws and the rules of the Georgia Utility Protection Center (UPC).

2. Existing Underground Utilities and Obstructions

Where known or unforeseen underground utilities or obstructions are encountered, minimum depth of cover, or the location and alignment may be changed, upon written approval of the City of Cumming.

3. Relocation of Services

The City of Cumming shall have the right to determine the services which are to remain in place and the services which shall be relocated as best suits conditions as found, in accordance with the following:

- a. **Services to Remain in Place:** Where the City of Cumming determines the services shall remain in place, minimum specified depths of cover for the pipe lines may be changed to avoid interference with such services.
- b. **Services to be Relocated:** Where the City of Cumming determines the services shall be relocated, the Utility will make the necessary changes at its expense.

404 INTERRUPTION OF WATER SERVICE

1. No interruption of water service for connections will be allowed without the permission and supervision of the City of Cumming. Proposed interruptions to water service shall be coordinated with the City. Customer notification prior to water service interruption is mandatory and must be given at least 24 hours prior to the interruption. Contractors shall make every effort to minimize the impact of the interruption. For example, when possible, thrust blocks should be poured in advance of the interruption so that concrete curing time is not a factor.

405 PIPELINE INSTALLATION

1. Trench Excavation

Trenches shall be excavated to their required depth and width to provide for an efficient and safe working environment.

2. Material Handling

Proper and suitable tools and equipment for the safe and convenient handling and laying of pipe shall be used, and great care shall be taken to prevent the pipe from being damaged, particularly the cement lining on the interior of the ductile iron pipe. All pipe and fittings shall be carefully examined for cracks and other defects; if any pipe or other casting is discovered to be cracked, broken, or defective after being laid, it shall be removed and replaced with new material. All pipe and fittings shall be thoroughly cleaned before being laid, and shall be kept clean until completion of the work.

3. Bedding in Earth Trenches

Where pipe is laid in earth excavated trenches, the bottom of such trenches shall be fine graded to a true line, the pipe lines shall not be laid on loose rock or other hard material. Over excavation in the bottom of trenches shall be filled to grade with compacted graded aggregate or suitable earth material.

4. Bedding in Rock Trenches

Where pipe is laid in rock trenches, it must be bedded with a minimum of six (6) inches of compacted graded aggregate. The trench must be backfilled with graded aggregate backfill material to a level at least one (1) foot over the top of the pipe.

5. Distance From Existing or Proposed Sanitary Sewer Lines

Water mains shall be laid at least ten (10) feet horizontally from any existing or proposed sanitary sewer, storm sewer or sewer manhole. The distance shall be measured edge-to-edge. When local conditions prevent a horizontal separation of 10 feet, the water main may be laid closer to a sewer (on a case-by-case basis) provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer. It is advised that the sewer be constructed of materials and with joints that are equivalent to water main standards of construction and be pressure tested to assure water-tightness prior to backfilling.

406 BACKFILL

1. Paved Roadways

Backfill under permanent concrete or bituminous pavement shall be compacted graded aggregate. Compaction shall be 100% of the dry rodded unit weight in accordance with AASHTO T99. Compaction shall be accomplished by using a hand vibratory compactor.

2. Unpaved Roadways

Backfill under gravel surfaced roadways and surface treated type bituminous roadways shall be backfilled using select material placed in six (6) inch layers thoroughly compacted for the full depth and width of the trench. Compaction shall be to 95% as determined by AASHTO T99. Compaction shall be accomplished by using a hand vibratory compactor.

3. Unpaved Areas

- a. Backfill in unpaved areas shall be select material compacted to 90% as determined by AASHTO T99, or compatible with the surrounding area.
- b. The type bedding to be used in water line installation shall be determined by design pressures and depth of cover. For a design pressure of 150 psi and for depths up to 8 feet, Type III bedding shall be used. Refer to the Standard Drawings for typical details. (Drawing No.W-3)

407 ROAD CROSSINGS

1. Street Cuts

When open street cuts have been approved by the City of Cumming, the following rules must be adhered to:

- a. Construction work allowed between 9 A.M. and 4 P.M. on weekdays only, unless otherwise approved by the City of Cumming.
- b. One (1) lane of traffic must be open at all times.
- c. Traffic control devices, as required by Georgia DOT, must be used to direct traffic.
- d. Repair of the street cut shall be in accordance with the Standard Drawing.
- e. If an open ditch is left unattended for any length of time, a 3/4 inch steel plate must be used to cover the ditch.

2. Tunneling

When tunneling under roadways, the methods used must be in accordance with the rules and regulations of the Georgia DOT.

3. Boring and Casing

Water lines crossing all paved streets shall be installed by boring and casing unless otherwise approved by the City of Cumming. The boring and casing methods used must be in accordance with requirements of the Georgia DOT.

Note: Whenever a state route or heavily traveled off-system road or a rail-road is crossed, the agency that has jurisdiction over the road or the rail-road must be notified, prior to the installation of the mains. At the crossing, a steel casing with sufficient diameter must be jacked and bored to accommodate the carrier pipe. Any free boring at low traffic city streets and county roads must conform to the applicable local and/or state requirements.

408 DRIVEWAY CROSSINGS

1. Water lines must be bored under existing asphalt or concrete driveways. Paved driveways shall not be open-cut without prior permission of the owner and the City.
2. When water lines are installed by the open-cut method, smooth, even saw cuts shall be made across the paved area before any material is removed. Ripping up pavement using a backhoe, without saw cuts, will not be allowed.
3. When water lines are bored under driveways, a minimum of three (3) foot cover is required. Steel casing under driveways is not required.

409 REPLACEMENT OF PAVEMENT AND STRUCTURES

1. Asphalt Pavement

- a. Asphalt pavement replacement for water lines installed under paved roadway surfaces shall be type "A" as detailed in the Standard Drawings (Drawing No. W-48). Base course shall be placed and compacted immediately after backfilling and made level with adjacent existing paving.
- b. If compaction is sufficient after the base course is placed, the base course shall be removed to a sufficient depth to provide no less than two (2) inches of wearing course level with adjacent grade. A bituminous priming treatment shall be applied to the base course prior to the placing of the two (2) inch type "E", or "F" surface course.
- c. Asphalt pavement replacement for transverse street cuts shall be of type "B" pavement, as detailed in the Standard Drawings. (Drawing No. W-48)

2. Gravel Roadway Replacement

The material used in restoring gravel roadways shall be the same as those which composed the wearing and base courses of the existing roadway. As a minimum, roadway material shall be equal to crusher run stone conforming to the Georgia DOT Standard Specification.

3. Driveway Replacement

- a. Concrete driveways shall be constructed to the thickness of the adjoining wearing surface and base course shall be constructed of similar materials and dimensions as the original base course. As a minimum, 3,000 psi concrete shall be used as a wearing course, as detailed in the Standard Drawings. (Drawing No. W-50)
- b. Asphalt driveways shall be repaired as detailed in the Standard Drawings. (Drawing No. W-50)
- c. Gravel driveways shall be restored to their original condition and dimensions using materials similar to those already in place. As a minimum, gravel driveways shall be six (6) inches of No. 57 crushed stone or graded aggregated base (G.A.B.), conforming to the Georgia DOT Standard Specifications as detailed in the Standard Drawings. (Drawing No. W-50)

4. Curb and Gutter Replacement

- a. All curbs and combination curbs and gutters, which have been removed or disturbed in the progress of the work, shall be replaced at the Contractor's expense. Curbing shall be made to conform accurately in size, line, grade and materials with that adjoining. In restoring curbs, the subsoil and foundation material shall be well compacted so as to prevent any settlement. (Drawing No. W-4)
- b. All granite curb shall be restored with material equal to that already in place.
- c. All concrete curbing shall have minimum 28 days compressive strength of 2,500 psi.

5. Sidewalk Replacement

- a. All sidewalks, disturbed in the process of the work, shall be constructed to the same grade, dimensions and materials as were originally in place.
- b. Where necessary to cut a sidewalk, entire slabs or squares shall be removed and replaced.
- c. The sub-base shall be thoroughly rolled or tamped and shall be set just before, if necessary, the concrete is placed, but shall show no pools of water.

410 THRUST RESTRAINT FOR PRESSURE LINES

Water pipe installed 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 concrete against solid earth to take the reaction of the main pressure and to prevent lateral movement of the pipe or fitting when under pressure. Concrete for reaction blocking shall have a minimum compressive strength of 3,000 psi at 28 days. The blocking, unless otherwise shown, shall be so placed that the pipe and fitting joints will be accessible for repair. Refer to the Standard Drawings for typical details (Drawing No. W-24). Concrete collars and thrust rods may be required by the City where concrete blocking is inadequate or where the interruption of service is not permissible.

411 FIRE HYDRANT INSTALLATION

Hydrants shall be set plumb and the hydrant lateral shall have at least 36 inches cover over the pipe. The bottom flange of the hydrant shall be set 1-1/2 inches above the finished ground level. Backfill shall be carefully placed in six (6) inch layers and carefully tamped. Concrete thrust blocks shall be poured at each hydrant tee. The hydrant shall be properly anchored to the hydrant tee by the use of anchoring pipe. Not less than seven (7) cubic feet of crushed or broken stone shall be placed around the base of the hydrant to insure drainage. The interior of the hydrant shall be thoroughly cleaned of all foreign matter prior to installation. After installation, each hydrant and valve shall be inspected in both opened and closed positions to assure that all parts are in satisfactory working condition. Refer to the Standard Drawings for typical details (Drawing Nos. W-37 and W-38). All hydrants shall be marked on the top layer of asphalt of each street by a blue reflective marker. (Astro Optics Corporation TPM-2B or equivalent). The marker shall be set in the middle of the lane nearest to the fire hydrant and shall be made to adhere to the asphalt with the appropriate epoxy-type glue or cement.

412 VALVE INSTALLATION

1. Valve boxes and covers shall be provided with all valves, shall be of the adjustable slide type, of the length required, and installed as detailed in the Standard Drawings. The valve boxes shall be centered over the operating nut of the valve. (Drawing No. W-6)
2. Valve Pads shall be furnished and installed with each valve installed. The pads shall be 2 foot squares of 3,000 psi concrete.
3. The markers shall be set opposite the valves in such a location as they would not be destroyed by traffic. The top of the marker should be set about 18 inches above ground.
4. Valve locations shall be marked on the street curb with a saw-cut letter “V”. The saw-cut letter “V” shall be painted blue.

413 WATER SERVICE LINE INSTALLATION

Service line installation shall have a minimum cover of 18 inches. The service line shall be continuous from the water meter to the corporation stop. Refer to typical detail in the Standard Drawings.

414 TESTING AND ACCEPTANCE

1. Pressure and Leakage Tests

- a. After pipe has been laid and backfilled, it shall be subjected to a hydrostatic pressure of 150% of the working pressure at point of test, but not less than 125% of normal working pressure at highest elevation for two (2) hours. Before applying the specified test pressure, all air must be expelled from the line. The City Utility Inspector must witness all tests. Any cracked or defective pipe, fittings, valves, or hydrants discovered during this pressure test, shall be removed and replaced with sound material. The test shall be repeated until satisfactory.
- b. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof, after the air has been expelled and the pipe has been filled with water to the 150 psi test pressure. No pipe installation will be accepted until the leakage is less than the number of gallons per hour, as determined by the formula below and by following Table 5-1:

$$L = \frac{ND \sqrt{P}}{7400}$$

L = Allowable leakage in gallons per hour.

N = Number of joints in the section of pipe tested.

D = Nominal diameter of pipe in inches.

P = Average test pressure during the leakage test in pounds per square inch gauge.

- c. The following table is based on the above leakage formula. Allowable leakage is shown in gallons per 1,000 feet of pipeline for a two (2) hour pressure test at 150 psi.

Table 8 - Allowable Leakage During Water Test

Pipe Size	Allowable Leakage Per 1000 feet During Test
6	1.1 Gallon
8	1.5 Gallon
10	1.8 Gallon
12	2.2 Gallon

2. Flushing And Disinfection

- a. All piping, complete with fittings and appurtenances, shall be flushed until clean and sterilized as specified in AWWA C601 (latest revision) "Disinfecting Water Mains", except that the tablet method, Section 7.3, shall not be allowed. The requirements of this paragraph apply equally to new pipe and fittings and to existing pipe-lines into which connections have been made, or which may have been otherwise disturbed to the extent that contamination may have occurred.
- b. Chlorine shall be added and a residual of 50 mg/l shall be maintained in the portion of line to be disinfected for a 24-hour period. After 24 hours, a sample shall be taken by the City Utility Inspector and tested at the City Laboratory at the City's Water Treatment Facility (770) 781-2026. The test shall show a residual chlorine level of at least 25 mg/l.
- c. When it has been determined that a residual chlorine concentration of 25 mg/l exists after a 24-hour period, the heavy chlorinated water shall be flushed from the water line. After flushing, the chlorine residual shall be less than or equal to 1.0 mg/l.
- d. After the water line has been flushed, the City Utility Inspector shall take two (2) samples from the water line. One (1) sample shall be tested and show a chlorine residual less than or equal to 1.0 mg/l. The other sample shall be tested for bacteriologic quality and show the absence of coliform organisms. If chlorine residual tests exceed 1.0 mg/l, the water line must be flushed until chlorine residual is equal to or less than 1.0 mg/l. The chlorine residual must be 1.0 mg/l or less before samples can be taken and tested for bacteriologic quality.
- e. The "tablet method" of disinfection, which consists of placing calcium hypochlorite granules or tablets in the water main as it is being installed and then filling the main with potable water when installation is complete, is not allowed.
- f. Before the main is chlorinated, it shall be filled to eliminate air pockets and shall be flushed to remove particulates. A flushing velocity of not less than 2.5 feet/second is usually maintained in pipe sizes less than 24 inches in diameter. For larger diameter mains, an alternative to flushing, such as broom sweeping of the main, is acceptable prior to chlorinating the main.
- g. The chlorine solution used for disinfection of water mains shall have a free chlorine residual concentration not less than 25 mg/L. This heavily chlorinated water shall be retained in the main for at least 24 hours, during which time all valves and hydrants shall be operated to ensure disinfection of the appurtenances.

- h. After the applicable retention period, the heavily chlorinated water must not be disposed in a manner that will harm the environment. Neutralizing chemicals, such as Sulfur Dioxide, Sodium Bisulfite, Sodium Sulfite or Sodium Thiosulfate can be used to neutralize the chlorine residual remaining in the water to be wasted.
- i. Flush all lines until residual is equal to existing system. After final flushing and before the water main is placed into service, water samples shall be collected from the main and tested for microbiological quality in accordance with the Georgia Rules for Safe Drinking Water, Chapter 391-3-5.

NOTE: The highly chlorinated water that is generated during the disinfection of any water line shall not be allowed in any way to enter the City's distribution system. If the City discovers that any person has allowed highly chlorinated water to enter the City's distribution system, the City shall hold that person in violation of the City's Utility Ordinance. In addition, chlorinated water shall not be allowed to enter the City's Municipal Separate Storm Sewer System (MS4). A fine of not less than \$1000 per day shall be levied against those individuals and/or companies who violate these requirements.

3. Final Acceptance, As-Built Drawings, Spare Parts, O&M

As-built drawings shall be submitted to the City of Cumming for every project governed by this book of specifications. The City of Cumming will not permit the issuance of any certificate of occupancy or the approval of any final plat until appropriate as-built drawings are received. This includes both hard copies and electronic copy in AutoCAD format on CD ROM

SECTION 500 Index of Standard Water Details

W-1	Typical Valve Location
W-2A	Water Service Line Location Detail
W-2B	Water Line Construction Detail
W-3A	Bedding Details Water Mains
W-3B	Allowable Trench Width Chart
W-4	Curb and Gutter Details
W-5	Butterfly Valve Installation Detail
W-6	Gate Valve Installation Detail
W-7A	Utility Locations in Right-Of-Way
W-7B	Utility Locations Intersection
W-7C	Utility Locations Intersection GA DOT-County
W-8A	Tapping Sleeve and Valve
W-8B	Tapping Saddle and Corporation Stop
W-9	Stub Out Detail
W-10A	Blow Off Valve Detail 4-Inch and Larger
W-10B	Blow Off Valve Detail Three Quarter – 2 Inch
W-11	Pipe Joining: Use of Solid Sleeve
W-12	Water Main Termination Subdivision Only
W-13	Thrust Restraint Horizontal Thrust
W-14A	Thrust Restraint Upward Thrust
W-14B	Thrust Restraint Size Chart Upward Thrust
W-15	Thrust Restraint Downward Thrust
W-16	Thrust Restraint Concrete Collar
W-17	Thrust Restraint Dead Man Concrete Type
W-18	Thrust Restraint Ties Rod Installation
W-19	Fire Hydrant Install GA DOT and County Roads
W-20	Fire Hydrant Install Subdivisions
W-21	Air Valve Installation
W-22	Casing Details
W-23A	Water Main and Service Line Locations
W-23B	Water Meter Locations Three Quarter -2 Inch
W-23C	1 Inch Meter Settings Short and Long Sides DOT and County Roads

W-24	Service Line Conduit Subdivisions
W-25	2 Inch Meter Setting
W-26	Pavement Cut Repairs Type A B C
W-27	Driveway Cut Repairs
W-28	Sidewalk Curb and Gutter Repairs
W-29	Stream Crossing
W-30	Irrigation Service Line Detail
W-31	Commercial / Industrial RPZ Backflow Preventer
W-32	Concrete Encasement Detail
W-33	Fire Line Valve Vault
W-34	Master Meter with Bypass Detail for 6 and 8 Inch
W-35	Double Detector Check Valve Configuration 6 Inch
W-36	Double Detector Check Valve Configuration 8 Inch
W-37	Water Service Meter Box
W-38	Valve Marker Detail
W-39	Marker Balls

SECTION 600 City of Cumming Approved Manufacturers