

SECTION 200  
WATER SYSTEM SPECIFICATIONS

201. PRECONSTRUCTION REQUIREMENTS

201.01 Water Pressure Flow Test

- 1) A water pressure flow test must be run on any existing water line to determine the adequacy of water supply for the project. The test shall consist of fire hydrant flow test and a twenty-four (24) hour pressure test. (See Section 102.01.2) The tests shall be run by the BLW or a representative of the BLW.

Test information shall consist of:

- A) Static Pressure and Elevation of Static Gauge
- B) Recorded Flow in GPM and Residual Pressure
- C) Maximum Elevation in Development
- D) Available Flow at Maximum Elevation with 20 PSI Residual Pressure
- E) Twenty-four (24) hour pressure chart

An adequate supply of water for the proposed project must be available prior to the approval of any plans unless an exception is granted by the BLW. The results of any flow test are valid for one year.

- 2) All projects which have flow test / pressure chart test results showing static pressures of less than 35 PSI or a residual pressure of less than 20 PSI will require a special design study to be completed and submitted to the BLW for approval to insure that no problems are to be encountered during peak demand periods. This study must be approved by the BLW before any construction plans will be approved.
- 3) If the fire flow test indicates an insufficient available flow (See Section 202.05), a second test may be conducted following a search by the BLW for closed valves, partially closed valves, or other restrictions. If, once these valves have been opened and restrictions removed, the second test also fails, the developer shall provide the BLW with a detailed special design study by a Georgia Registered Professional Engineer which outlines the water system improvements necessary to achieve the required minimum available flow.

The BLW will review the proposed solutions for all developments where the existing water supply fails to provide the required minimum available flow for the proposed development on a case by case basis.

- 4) A special water distribution study will be required for all proposed developments located above an elevation of 1150 feet M.S.L. which are not located within a high service boundary.

#### 201.02 Plan Requirements

- 1) Construction Plans shall consist of the following:
  - A) Site plan showing the water layout only with project name, streets, street names, storm drains, topography with contour lines at two foot intervals, location map, lot layout (if subdivision) or building location (multi-family, commercial or industrial site), land lots, district and north arrow. Note if any other utilities are existing. Plan scale shall be a minimum of 1"=100'. Sheet size shall be 22" x 34".
  - B) Proposed pipe sizes and service stub-out locations.
  - C) Location and size of water valves, and air release valves (to be installed at highest points of system).
  - D) Thrust blocks where used.
  - E) Fire hydrant locations.
  - F) Water system materials.
  - G) Location and sizes of existing water lines surrounding project, with nearest line valve in each direction from proposed connection, and nearest fire hydrant locations.
  - H) Detail of connection to existing lines.
  - I) Location power lines, poles, and transformer pedestals.
  - J) Proposed meter sizes and locations.
  - K) Detailed plan of fire line meters, detector meters, compound meters, backflow preventers, etc. if applicable.
  - L) Any other items incidental to the proposed system.
  - M) Details of special water line installations such as stream crossings, elevated lines on piers, bridges, pipe bedding, special highway crossings, railroad crossings, etc.
  - N) Plan and profile sheets shall be prepared with a horizontal scale of 1"=50' and a vertical scale of 1"=10'. These scales also apply to any profile view of sewers.
  - O) The General Notes for Water System Construction shown on the following page shall be included in each set of plans.
  - P) Each set of construction plans shall include a reproduction of the standard Utilities Protection Center "Call Before You Dig" symbol.
  - Q) The Soil and Erosion Control plan must be shown in relation to the proposed water system. (See Section 201.04)

BOARD OF LIGHTS AND WATER  
WATER SYSTEM CONSTRUCTION  
GENERAL NOTES

1. All water system construction must follow the current BLW water system specifications.
2. Class 50 Ductile Iron Pipe (D.I.P.) is required for all water mains.
3. All line valves shall be marked by concrete valve markers.
4. A concrete valve marker is to be placed directly above the plug on all dead-end water mains.
5. Information regarding underground utilities on these plans is not guaranteed as to accuracy or completeness. Prior to beginning work, the Contractor shall request a field location through the utilities protection center and any utility owners thought to have facilities in the area. The Contractor shall promptly compare these field-marked locations with the project plans and then notify the Designer of any anticipated problems or need for contract changes. It is the Contractor's responsibility to excavate or cause the utility owner to excavate for the purpose of determining exact elevations or locations at utility crossings and other critical locations well in advance of the work under this contract. Damage to existing utilities resulting from the Contractor's negligence shall be repaired at the Contractor's expense. The Developer and/or the Developer's Contractor is responsible for verifying the exact location, size, and material of any existing water or sanitary sewer facility proposed for connection or use by this project.
6. All water service lines under pavement shall be encased in PVC casing with a minimum diameter of 2", extending a minimum of 3 feet beyond the pavement on each side of the road.
7. All bends, tees, and plugs shall be properly constrained for thrust restraint.
8. The developer shall obtain a permit from the City of Marietta Public Works Department or Cobb County and notify the Public Works Department Inspector 48 hours before beginning construction.
9. The developer shall install water services up to and including meter boxes and curb stops. Meters will be set by the BLW after the building permit is issued.
10. Water mains shall be installed with a minimum of 48" cover (Section 202.07)
11. Water meters, double-check backflow preventers and detector check valves with bypass detector check meters will be installed by the BLW. Developer must pay all fees before meters will be set.
12. Flow Test Information:  
Static Pressure: \_\_\_\_\_ psi at \_\_\_\_\_ ft.  
Recorded Flow: \_\_\_\_\_ GPM with \_\_\_\_\_ psi residual pressure.  
Maximum Elevation in Development \_\_\_\_\_ m.s.l. (to be determined by developer.)  
Flow Available at Max. Elevation: \_\_\_\_\_ GPM with 20 psi residual pressure.  
Size of water main at point of connection to project: \_\_\_\_\_ inches  
Date of flow test: \_\_\_\_\_

- 2) The approved water plan shall not be changed except by written approval of the BLW.
- 3) As-Built Drawings:
  - a. As-Built drawings will be the same format as the original construction plans.
  - b. Road names and lot numbers should be on plans.
  - c. "Record Drawings" is to be stamped in large clear print on plans.
  - d. Sheet size shall be 22" x 34".
  - e. Mains including size and type of meter should be shown.
  - f. Service and meter locations shall be shown.
  - g. Fire hydrants, gate valves, and air release valves should be shown and tied down with distances from permanent objects adjacent to water system.
  - h. Plan of fire meters or detector meters should be shown if applicable.

#### 201.03 Contractor Qualifications

Contractors performing water line installations must be licensed in accordance with State of Georgia law and local ordinances and approved by the BLW. They should be completely familiar with the procedures and contract requirements associated with this type project. Unsatisfactory work will cause a contractor not to be approved for future work. Any and all subcontractors must be approved by the BLW.

#### 201.04 Erosion And Sedimentation Control Plan

- A. The Georgia Soil and Water Conservation Commission has taken provisions of ACT 599 and published a **MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA**, 1997 Edition (or any more current edition as they are published). Water construction plans and specifications shall include appropriate segments of this manual. Developers, Engineers, Design Professionals and Contractors performing work within the BLW service boundary are responsible for acquiring a copy of this manual and using the best management practices contained therein to control the erosion and sedimentation of the construction site in conformance with the intent of ACT 599. Copies may be purchased from the Georgia Soil And Water Conservation Commission, P.O. Box 8024, Athens, Georgia 30603. For additional information, call the Commission at 706-542-3065.
- B. Plan: An erosion and sediment control plan, meeting the requirements of applicable state regulations, shall be provided as part of the overall construction drawings.
- C. Erosion Control Details: Erosion Control Details and Symbols may be taken directly from the **Manual For Erosion and Sediment Control In Georgia**, 1997 Edition as referenced above.

201.05 Easement Acquisition

- A. It shall be the responsibility of the developer to obtain any off-site easements required to connect the project to the existing water system. Easements will be conveyed to the BLW for all facilities which are to be conveyed to the BLW. This process must be started early enough to allow construction of the water mains before any building construction is to begin. No building permits, water meter or sewer tap applications shall be issued until off-site water mains and sewers have been constructed and accepted. A sample water main easement agreement is included at the end of Section 201.
  
- B. All easements shall allow adequate room to construct the water main and appurtenances. Permanent easements shall be a minimum of 20 feet wide, 10 feet on each side of the line.
  
- C. Easement drawings shall be prepared for work outside the development prior to approval of the water system plans. The drawings shall be of a size suitable for legal recording and shall be prepared by a Registered Land Surveyor. The drawing will show property lines, the name of property owners with the length of line encroaching on each property owner, size of line, width of permanent and construction easement, scale of drawing, north arrow, land lot and district numbers, and a tie to the nearest land lot corner. Any streets or other existing easements shall also be shown. Easement agreements referencing these drawings shall be prepared and attached to the drawings, signed by the property owners, and recorded at the Cobb County Clerk of Superior Court's office. A copy of the recorded easement agreement shall be provided to the BLW prior to the construction of off-site facilities.

The title block shall be shown as follows:

Marietta Board of Lights and Water  
NAME OF OUTFALL OR SUBDIVISION  
EASEMENT FOR PROPOSED  
WATER MAIN  
CROSSING PROPERTY OF  
John Doe

LL:      District:      Section:      Date:      Revised Date:

## 201.06 Construction Permitting

The preparation and cost of all required permit applications shall be the responsibility of the Developer. Permit applications shall be submitted to the BLW and the BLW will submit the applications to the governing authority. Required permits may include but are not limited to USACOE Wetlands Permits, EPD, EPA, D.O.T. Utility Encroachment Permits, Cobb D.O.T., NRCS (Soil and Erosion Control), Railroad Crossing Permits, Utility Crossings, etc.

Construction permits will not be issued until the utility encroachment permit has been obtained and until any special conditions such as insurance requirements have been complied with.

State of Georgia  
County of Cobb

**Grant of Easement  
Water**

This Easement Agreement is made and entered into this \_\_\_\_\_ day of \_\_\_\_\_  
20\_\_\_\_, by and between \_\_\_\_\_

Of the aforementioned State and County as party of the first part, hereinafter referred to as  
“Grantor,” and Marietta Board of Lights and Water, a political subdivision of the State of  
Georgia, as a party of the second part hereinafter referred to as “Grantee”:

W I T N E S S E T H

That Grantor for in consideration of the sum of ONE & 0/100 dollar(s) (\$ 1.00) and other good  
and valuable consideration the receipt and sufficiency of which are hereby acknowledged, does  
hereby grant, bargain, sell, and convey unto Grantee, a perpetual water easement over and under  
Grantor’s property being more particular described as follows:

All that tract or parcel of land lying and being in Land Lot \_\_\_\_\_ of the  
\_\_\_\_\_ District, 2<sup>nd</sup> Section of Cobb County, Georgia, and being a strip of land  
more particularly described on the attached plat shown as Exhibit “A”.

The actual water easement area may differ from the description shown on Exhibit "A." The  
actual water easement shall be a strip of land \_\_\_\_\_ feet wide, being \_\_\_\_\_ feet on  
either side of the water line as actually installed, together with a  
construction/installation easement up to \_\_\_\_\_ feet in width, as shown on the  
attached plat Exhibit “A”.

The water easement conveyed herein by Grantor is for the purpose of a water line and includes  
the rights to enter upon Grantor’s property to install, inspect, maintain, replace, or repair the  
same, as may from time to time be necessary, or whenever Grantee deems fit, with all rights,  
members and appurtenances to said easement and right-of-way in anywise appertaining or  
belonging thereto.

Grantor for both itself and its heirs and assigns understands and agrees in connection with this  
conveyance that any and all construction, digging, grubbing, clearing, filling, or other earth  
moving or construction activities within or in the easement area conveyed herein are specifically  
in violation of the rights conveyed herein and are, therefore, prohibited without written  
permission from the Marietta Board of Lights and Water.

Grantor hereby covenants with Grantee that it is lawfully seized and possessed of the real estate previously described herein and that it has good and lawful right to convey the easement covered by this document, or any part thereof, and that the said easement is free from all encumbrances. The easement herein granted shall bind the herein granted shall bind the heirs and assigns of Grantor and shall inure to the benefit of the successors in title of Grantee.

**Additional Stipulations:**

IN WITNESS WHEREOF, Grantor has hereunto set its hand and seal the day and year above first written.

\_\_\_\_\_  
Witness (printed name)

\_\_\_\_\_  
Grantor (printed name)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Signature) SEAL

\_\_\_\_\_  
Grantor (Printed Name)

\_\_\_\_\_  
(Signature) SEAL

Sworn to and subscribed before me \_\_\_\_\_  
this the \_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_\_. Grantee: Board  
Manager

\_\_\_\_\_  
(SEAL)  
Notary Public

Return To:  
Marietta Water  
627 B. North Marietta Parkway  
Marietta, GA 30060  
Attn: Kim Holland

**\*\*Attach an 8 1/2" x 11" Plat – Exhibit "A".\*\***

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202. DESIGN CRITERIA

202.01 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 BLW.

202.02 Water Supply (All Water Supply Systems)

Single-family and two-family residential water supply for domestic use shall be in accordance with the following table plus 1000 gpm and provide a minimum pressure of twenty psi:

INSTANTANEOUS WATER DEMANDS FOR RESIDENTIAL AREAS

<u>TOTAL NUMBER OF RESIDENTIAL UNITS SERVED</u>	<u>GPM PER RESIDENTIAL UNIT</u>	<u>TOTAL NUMBER OF RESIDENTIAL UNITS SERVED</u>	<u>GPM PER RESIDENTIAL UNIT</u>
5	8.0	90	2.1
10	5.0	100	2.0
20	4.3	150	1.6
30	3.8	200	1.3
40	3.4	300	1.2
50	3.0	400	0.9
60	2.7	500	0.8
70	2.5	750	0.7
80	2.2	1,000	0.6

The minimum water supply for other than single-family and two-family residential developments shall be 1000 gpm with a minimum residual pressure of 20 psi. The Fire Marshall shall determine additional flow requirements for such developments.

202.03 Minimum Water Main Sizes and Fire Hydrant Requirements

- 1) **Any system, whether served from an existing BLW water main or otherwise, shall have a minimum size of 8-inch pipe installed. Actual sizes may be larger depending on the size required to meet the demand of the proposed development. Six (6) inch pipe is allowed to be used in cul-de-sacs, in accordance with Section 202.05.6f.**

- 2) Where a water main extension from an existing BLW water main is required along an existing public right-of-way or future supply route, the size of pipe to be used will be either 8" or the size required to meet the demand of the development, whichever is largest. The BLW may require a larger pipe size to be installed than is required by this standard, and the cost of this oversizing may be funded by the BLW, in accordance with the Line Extension Policy (Section 202.04).
- 3) Fire hydrants will be required as set forth in these specifications where a proposed system is to be served from an existing BLW water main or in any case where the BLW is to accept a new system for ownership and operation. The Fire Marshall may also require additional fire hydrants where deemed necessary.

#### 202.04 Water Main Extension Requirements

- 1) Developers are required to extend existing water mains to serve their property. The size of the main will be set in accordance with Section 202.03.
- 2) Developers are required to extend all mains along their entire property frontage if the existing main is adjacent to the proposed development. The size of the main will be set in accordance with Section 202.03.
- 3) In certain circumstances, the BLW may require a larger pipe size to be installed than is required by these standards, and the cost of this oversizing may be funded by the BLW. The developer may be required to pay all of the initial costs.

#### 202.05 Fire Protection

- 1) Minimum flows in GPM with 20 psi residual pressure shall be in accordance with Section 202.02.

The BLW may require provision of required flows prior to development of property.

- 2) Fire Protection - Hose Lay

Hose lay distance is defined as being measured along the route a piece of fire apparatus must travel in laying a fire line from the fire to the fire hydrant.

- 3) All plans for development must meet all applicable fire protection codes.
- 4) All requirements for design criteria and material and construction specifications must be met to secure a permit from the Department of Natural Resources for construction.

- 5) Spacing of fire hydrants where required shall be as follows:
- a. Multi-family: Fire hydrants shall be spaced not more than 500 feet apart with additional fire hydrants located as necessary to permit all portions of buildings to be reached by hose lays of not more than 300 feet in length. (Spacing as traffic travels.)
  - b. Shopping Centers, Malls, etc: Fire hydrants spaced not more than 300 feet or so all portions of buildings can be reached by hose lays of not more than 300 feet in length.
  - c. Motels, Light Industry and Schools: Fire hydrants spaced not more than 300 feet or so all portions of buildings can be reached by hose lays of not more than 300 feet in length.
  - d. Heavy Industry, Large/Tall Buildings: Fire hydrants spaced not more than 300 feet apart or so any portion of the building can be reached by hose lays of not more than 300 feet in length.
  - e. Single Family: Single family residential developments shall have a maximum hose lay distance of 300 feet from the hydrant to the most distant building served by that hydrant. Normally 500 feet spacing will be maximum. Fire hydrants shall normally be located at all intersections.
  - f. No installation requiring fire hydrants shall have a spacing greater than 1000 feet apart as measured along the main supply line, except in large tract developments where spacing may be either 1000 feet or the distance from center of lot to center of lot, whichever is greater.
  - g. Fire hydrants shall be required at the end of all dead-end lines such as those installed in cul-de-sacs.
- 6) Fire Main Size
- a. Multi-Family: Water mains to be no less than 8" in diameter.
  - b. Shopping Centers, Malls, etc.: Water mains to be no less than 8" in diameter.
  - c. Commercial Areas With Less Than 200,000 Sq. Ft.: Water mains to be no less than 8" in diameter.
  - d. Motels, Light Industry & Schools: Water mains to be no less than 8" diameter.
  - e. Commercial areas with 200,000 sq.ft. or more, Heavy Industry, Large/Tall Buildings: Water mains to be no less than 10" in diameter.
  - f. Single Family: Single family residential developments shall use a minimum of 8 inch water mains, except in cul-de-sacs where 6" mains are acceptable. With regards to the sizing of water mains, cul-de-sacs are hereby defined as dead end streets no longer than 500' in length. Larger size mains may be required in accordance with demand.
- 7) Water mains and fire hydrants, under water pressure and ready for fire fighting, shall be installed by the developer and approved by the BLW before any construction framing may be installed.

## 202.06 Backflow Prevention

- 1) When directed by the BLW, residential water meters shall be provided with a backflow preventer. Meters for all other types of developments shall be provided with a backflow preventer.
- 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 Section 202.08. Fire line meters and detector meters shall be designed to meet site-specific conditions and shall be provided with double check valve backflow preventers. See the Standard Detailed Drawings for conceptual layouts.
- 3) Reduced pressure zone backflow preventers with relief vents are required for high risk situations as determined by the BLW. All reduced pressure zone backflow preventers shall be installed in vaults set above the ground with drains. Reduced pressure zone backflow preventers shall be installed by the Developer.
- 4) The type of backflow preventer required for each of the situations listed above is described in Section 203.03.7.

## 202.07 Location of Water Lines and Fixtures

### 1) Existing Roads

On existing roads, water mains shall be located five feet from the edge of the right-of-way whenever possible with a minimum cover of 48 inches and/or with a minimum cover of 48" below the level of the roadway, whichever is lower. Permission must be granted by the BLW to vary from this requirement. Fire hydrants on existing roads shall be located as near to the right-of-way as practical or as required by the Georgia Department of Transportation.

### 2) New Streets

Water mains on new streets shall be located five feet from the edge of the right-of-way whenever possible with a minimum cover of 48 inches and/or with a minimum cover of 48" below the level of the roadway, whichever is lower. Permission must be granted by the BLW to vary from this requirement. Fire hydrants on new streets shall be located as near to the right-of-way as practical or as required by the Georgia Department of Transportation. **The construction of the water main shall not begin until the rough grading is completed and all curbing is installed.**

### 3) Service Laterals

Service laterals shall be located with a minimum bury equal to that of the main line

within the right-of-way and shallowing to a bury of 18 inches at the water meter location. Service line size shall be 1" for single and double residential service. Contractor to install appropriate size corporation stop at the main, service laterals and 3/4" curb stops in meter boxes. For double residential services, contractor to provide wyes and 3/4" curb stops in a meter boxes.

Any portion of service lateral located under pavement shall be encased in 2" diameter P.V.C. pipe, extending a minimum of 3' beyond the edge of pavement on both sides of the road. Copper tubing shall be used for all services. Flair joints shall be used. Splices of copper tubing are not allowed under any roadway pavement. A "W" shall be sawed into the curb where each service tap is made for permanent location. Direct taps are allowed for 3/4" to 1" service taps. Service saddles are required for taps larger than 1" in diameter.

#### 4) Water Meters and Boxes

Water meters smaller than 3" will be furnished and installed by the BLW in boxes located at the edge of the street right-of-way. Water meters 3" and larger will be furnished and installed by the BLW and set in vaults. The developer is to clearly mark the lot number inside of each meter box. No meters will be set until all meter fees are paid and a building permit issued for the lot requesting service. Services shall be sized and located as shown in the Standard Detailed Drawings.

All water meters shall be installed at an easily accessible location on or near the property line of the premises being served adjacent to the public right-of-way. (See exception for condominium developments).

All individual lots or buildings served by the BLW shall have an individual water meter installed. An integrated complex of buildings may elect to have all buildings served by master meter.

In condominium developments, where the buildings and/or units are individually owned and the buildings do not front on public right-of-way, individual meters may be set within the complex in place of a master meter. A 20-foot wide utility easement must be provided where the water line is not installed in public right-of-way. The easement shall include a provision that any property (including landscaping, pavement, etc.) disturbed during maintenance and repair activities shall be restored by the property owner. The water line design and installation shall meet BLW standards and the BLW shall own and maintain the water line up to the water meters.

Existing condominium developments, which want to change from a master meter to individual meters, must have the existing water mains approved or replaced to meet BLW standards. A 20-foot wide utility easement must also be granted to the BLW for maintenance of the water main up to the water meters.

## 5) Water Valves

Valves 12" and smaller shall be gate valves. Valves larger than 12" shall be butterfly valves.

Water valves at intersections shall be located behind the curb or edge of pavement. As a general rule, the number of valves shall equal the number of streets in the intersection minus one. The BLW may require valves in excess of this requirement if the water system layout warrants additional valves.

The maximum spacing of line valves shall be 1000 feet. The BLW may allow greater spacing in low-density rural areas, and may require closer spacing in high-density urban areas and subdivisions. Generally, the BLW will require a main line valve at every other fire hydrant as a minimum. The required spacing shall be at the discretion of the BLW based on individual development circumstances. Unless at an intersection, line valves shall be located at fire hydrants. Concrete valve markers are required at all line valves and at the end of every dead-end line.

All valves shall be provided with valve boxes. Each valve box shall have a concrete collar. These collars must be a minimum of 3 1/2" thick. They may be round (24" diameter min.) or square (24" x 24"). Precast collars may be used, provided that they are grouted in place to the valve box. The collar is to be flush with or a maximum of 1" above the finished grade. The edge of the valve box is to be 1/2" above the edge of the concrete collar. If settlement occurs, the collar will be reset or repoured.

## 6) Gate Valves and Line Plug

A gate valve and a minimum of 36 feet of ductile iron 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 M.J. plug and thrust collar. A 1" tap for chlorination / dechlorination purposes shall be provided. A valve marker will be placed directly above the plug.

## 7) Dead End Line

At any dead end line, install a joint of D.I. Pipe, a fire hydrant, a M.J. plug, and thrust restraint. (See Section 204.05)

## 8) Ductile Iron Pipe

**Class 50 ductile iron pipe shall be required for all water mains.**

9) Air and Vacuum Relief Valve Assemblies

A&V assemblies shall be located where appropriate as determined by the design professional responsible for the water system design. All A&V assembly locations are subject to the approval of the BLW. In general, within subdivisions, A&V assemblies are not necessary as long as services are located at the water main high points. Concrete valve markers are required at each A&V assembly.

10) Polyethylene Encasement

Where crossing a Gas Company easement or right-of-way, the water main shall be encased in polyethylene tubing from beginning to end of the easement or R/W. Otherwise, the water main shall be encased in accordance with the Ductile Iron Pipe Research Association's (DIPRA) recommendations. The Developer shall submit a report prepared by DIPRA, detailing their recommendations regarding the pipe, cathodic protection, and polyethylene encasement, to the BLW for review.

11) Easements

Water mains that are located off the right-of-way (R/W) shall have a 20 foot wide permanent easement. No permanent structures shall be constructed within a permanent easement and access to the easement shall be provided to a public R/W.

12) Acceleration / Deceleration Lanes

Where applicable, if an acceleration lane or a deceleration lane is to be constructed and will cover or encroach over existing water mains, it is the Developer's responsibility to relocate the existing main out from under the proposed pavement.

13) Joint Restraint Inside Casing

Inside of casings, the D.I.P. water main joints shall be slip joint restrained by using American "Fast-Grip" gaskets or approved equal. The water main shall be set on spacers inside the casing. (See Section 203.03.17)

14) Separation between Water Main and Sanitary Sewer

A horizontal separation of at least 10 feet is required between water mains and existing or proposed sanitary sewer mains (measured edge to edge). Where water mains cross existing or proposed sewer lines, 18" vertical separation is required between the two mains (measured edge to edge).

#### 202.08 Fire Line Metering Requirements

- 1) Persons making applications for new fire service connections with private fire hydrants, hand hose connections, or sprinkler heads will be required to have an underwriter approved detector meter or a factory mutual fire line meter installed as a part of the fire service system. If the normal usage of the development is such that the service meter required to serve the development is larger than 2", the BLW shall require that the Developer install a 6" or larger compound meter and vault to serve both the normal usage and the fire line needs of the development. If the normal usage of the development is such that a 2" meter or smaller can be used to serve the development, the Developer will be allowed to use a 2" or smaller meter for the normal usage and a detector meter assembly on the fire line.
- 2) When unauthorized water is used through a detector meter in three or more consecutive months, it shall be replaced with a factory mutual fire line meter. Unauthorized use of water is defined as non-fire fighting water and/or water use without prior notification and approval of the BLW. The water that is measured by the detector meter will be billed at five times the normal water charge.
- 3) All domestic water supply must be metered with a proper meter.
- 4) Installation of detector meters or factory mutual fire line meters as required will be provided by the BLW. All meter fees must be paid by the Developer before meters will be set.
- 5) The BLW shall have the right to cut off water service to buildings whose owners refuse to comply with these provisions upon proper notification of sixty (60) days.

#### 202.09 Water Mains on Private Roads

The BLW will not accept for ownership water mains that are not installed along public right-of-ways or accepted utility easements. The BLW will not extend water mains along private roadways that do not have a dedicated, recorded right-of-way or utility maintenance easement.

## 203. MATERIALS

All materials used in the work including equipment shall be new and unused materials of a reputable U.S. Manufacturer conforming to the applicable requirements of the Specifications, and no materials shall be used in the work until they have been approved by the BLW. Any reference to a AWWA, ANSI or other such specification shall mean the latest revision published.

### 203.01 Water Main

#### 1) Ductile Iron Pipe

**Class 50 Ductile Iron Pipe shall be required for all water mains.** Pipe shall be designed in accordance with AWWA C150, latest revision. Pipe shall be manufactured in accordance with AWWA C151, latest revision. Pipe shall have an outside asphaltic coating per AWWA C151, latest revision. Joints shall be push-on joints, conforming to 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.

Pipe shall be lined with standard cement mortar lining at the point of manufacture, in accordance with AWWA C104, with the following modifications. Cement mortar shall be composed of 100% Portland cement Type II and Type V, sand and water. Cement-mortar lined pipe shall have smooth dense interior surfaces and shall be free from fractures, excessive interior surface crazing, disbondment and roughness. Linings shall be manufactured using equipment capable of sufficient rotational speed to sustain 60 G's to 100 G's of compaction force. Simultaneous application of controlled vibration shall be applied to the pipe during rotation to produce a dense and highly compacted lining. After the mortar has been distributed to a uniform thickness, the rotational speed and vibration shall be increased to produce a mortar lining with a uniform smooth surface. Immediately after lining, the surface of the lining shall be flushed with a large volume of water to remove excess latence. Cracks in mortar lining greater than 0.016 inches in width are unacceptable. Linings shall have no "looseness" or disbondment from the inner surface of the pipe. The lining shall be manufactured without a seal coat. The lining shall be cured in a facility with controlled temperature and humidity.

Where river crossing pipe is required, the pipe shall be "Flex-Lok Boltless Ball Joint Pipe" as manufactured by American Pipe or approved equal. Where specified, flanged pipe shall meet AWWA C151 specifications and be used with fittings meeting AWWA C110 or AWWA C153.

## 2) Copper Tubing For Services

House water service pipe shall be copper service pipe, type K, soft temper, seamless copper tubing, conforming to ASTM B-88. Flair joints shall be used.

## 3) Casing Pipe

Casing pipe, where required under the street, shall be steel pipe conforming to A.S.T.M. Designation A-139, Grade B, electric fusion welded steel pipe. The pipe shall have a minimum yield strength of 35,000 psi. The exterior and interior of the pipe shall have a coal tar varnish coating. Minimum wall thickness: 0.250".

## 4) Ductile Iron Pipe Fittings

Fittings shall be furnished in accordance with AWWA C110 or AWWA C153, latest revisions, and shall be a minimum of 250 psi pressure class rating. Joints shall be push-on joints with American "Fast-Grip" gaskets or approved equal gasket. Push-On joints shall conform to AWWA C111, latest revision. Either fusion-bonded epoxy coating or standard cement mortar lining, conforming to AWWA C104, latest revision, shall be furnished for fittings. The "Fast-Grip" Gaskets are only available for fittings up to 24" in diameter. Fittings larger than 24" in diameter shall be mechanical joint with retainer glands.

## 5) PVC Casing for Services

PVC casing pipe used for long-side services shall be schedule 40 and a minimum of 2" in diameter.

### 203.02 Fire Hydrants

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

Hydrants shall be equipped with one 4-1/2" pumper nozzle and two 2-1/2" diameter hose connections, which shall have threads meeting the latest requirements of the State Fire Insurance Commission. Hydrants shall have a safety flange on the barrel and a safety coupling on the valve stem, to prevent damage to barrel and stem in case of traffic accident. Hydrants shall be M&H Valve and Fitting Co., Traffic Model Style 129 or approved equal.

The connection at the base of the hydrant shall be mechanical joint with ductile iron

retainer gland for 6" ductile iron pipe. The valve opening shall meet the requirements of the AWWA Specifications for a 4-1/2" hydrant. The valve, valve seat and inner working parts shall be easily accessible. The height from the surface of the ground to the bottom of the pumper nozzle shall be no less than 18". Each hydrant shall be neatly painted with a silver reflecting paint.

Each hydrant shall be tested to 150 psi. The first test shall be made with the valve closed. The second test shall be made with the main valve open but all nozzles closed. While the test is being carried on, the hydrant shall be subjected to a hammer test. Any hydrant showing defects by leakage, sweating, or otherwise shall be rejected. The barrel and all parts shall withstand these tests. These tests shall be made in the field after the hydrants are installed.

Leads from the main line to the fire hydrant shall use 6" ductile iron pipe and shall have a 6" gate valve between the main line and fire hydrant. The valve shall be connected to the main line by using a locked hydrant tee. Whenever possible, the hydrant shall be connected to the valve by using a locked hydrant adapter.

### 203.03 Valves and Accessories

#### 1) Gate Valves

Valves 12" and smaller shall be gate valves. The valves shall be of non-rising stem design, and have an iron body, bronze mounted, resilient seated, meeting all requirements of AWWA C509. Valves shall be designed for a minimum working pressure of 200 psi and shall have 2" square operating nuts, except in meter vaults where handwheels shall be installed. Valves shall open when turned counter-clockwise.

Valves sized 6" through 12" shall be Mueller Co. A-2360 with mechanical joints or approved equal. Where flange joints are used, flanges must meet the requirements of AWWA C115, latest revision.

#### 2) 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 C504, latest revision, for 150 psi working pressure and shall be suitable for above ground or direct buried service.

All interior ferrous surfaces of valves larger than 12" shall have a special epoxy coating meeting the requirements of AWWA C550. Valve bodies shall be equipped with integrally cast mechanical joint ends meeting AWWA C111.

Butterfly valves installed underground shall come equipped with a manual operator. This manual operator shall be of the traveling nut, self-locking type and shall be 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 open when turned counter-clockwise. Operators shall be fully enclosed and designed for direct buried operation.

### 3) Valve Boxes

Valves boxes shall be provided for buried valves. Valve boxes shall be one complete assembled unit composed of the valve box and extension stem. All moving parts of the extension stem shall be enclosed in a housing to prevent contact with the soil. Valve box assembly shall be adjustable to accommodate variable trench depths. The entire assembly shall be made of heavy wall high density polyethylene. All exterior components shall be joined with stainless steel screws. The valve box top section shall be adaptable to fit inside a valve box upper section.

The stem assembly shall be of a telescoping design that allows for variable adjustment length. The stem material shall be of plated steel square tubing. The stem assembly shall have a built in device that keeps the stem assembly from disengaging at its fully extended length. The extension stem must be torque tested to 1000 foot pounds. The lids of all boxes shall bear the word "Water" or the letter "W". Valve boxes shall be American Flow Control's Trench Adapter or approved equal.

### 4) Air and Vacuum Relief Valve Assemblies

The air release and vacuum break valve shall be of the compact single chamber design with solid cylindrical HDPE control floats housed in a tubular stainless steel body with epoxy powder coated cast iron or steel ends secured by stainless steel tie rods. The valve shall have an integral orifice mechanism which shall operate automatically to limit transient pressure rise induced by closure to twice valve rated working pressure. The intake orifice shall be equal to the nominal size of the valve. Large orifice sealing shall be effected by the flat face or the control float seating against a nitrate rubber o-ring housed in a dovetail groove circumferentially surrounding the orifice. Discharge of the pressurized air shall be controlled by the seating and unseating of a small orifice nozzle on a natural rubber seal affixed into a control float. The nozzle shall have a flat seating land surrounding the orifice so that damage to the rubber seat is prevented. All components shall be easily replaced. Connection to valve inlet shall be NPT.

The valve shall be Vent-O-Mat series RBX or approved equal. Gate valves between water main and air release valve shall be bronze, solid wedge with screw connection

equal to Jenkins Company Figure 370. Meter box shall be equal to the DFW Style D-1200 or approved equal..

5) Tapping Sleeves

Tapping sleeves shall be Mueller, mechanical joint, 200 psi, H-615 or approved equal.

6) Tapping Valves

Tapping valves shall be Mueller, mechanical joint, 200 psi, T-2360, or approved equal.

7) Backflow Preventers

In accordance with the BLW's Cross Connection Control Program, water service customers may be required to have a backflow prevention device selected on the basis of the customer's risk categorization as determined by the BLW. The backflow preventers listed below meet the current BLW requirements; Other manufacturer's devices that meet the requirements listed in parentheses are acceptable if approved by the BLW. The Developer must contact the BLW to acquire the most current list of approved backflow preventers.

1" - 2" Lines

Low Risk -	Ford Model HHS31-323 or approved equal. (ASSE 1024)
Medium Risk -	Hersey Model FDC or approved equal. (ASSE 1015, AWWA C510, USC)
High Risk -	Hersey Model FRP II or approved equal. (ASSE 1013, AWWA C511, USC)

2 1/2" - 10" Lines

Low Risk -	Wilkins Model 950 or approved equal. (ASSE 1015, AWWA C510, USC)
Medium Risk	Wilkins Model 950 or approved equal. (ASSE 1015, AWWA C510, USC)
High Risk	Wilkins Model 975 or approved equal. (ASSE 1013, AWWA C511, USC)

The initials of specification-issuing agencies shall be understood to mean the organization listed below:

ASSE	American Society of Sanitary Engineering
AWWA	American Water Works Association
USC	University of Southern California Foundation of Cross Connection

## Control and Hydraulic Research

### 8) Pipe Connection 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.

### 9) Curb Stops and Wyes

All metal parts of curb stops shall be made of bronze. The stops shall be approved by the BLW. The cock shall be operated with a combined cap and tee and shall open when turned counter-clockwise. All curb stops shall have locking device and be a flair connection. Curb Stops shall be Ford Model B21-343W or approved equal.

Wyes shall be Ford model Y44-243, Hayes Model 5561, or approved equal.

### 10) Corporation Cocks

Corporation cocks shall have threaded inlet and flair outlet connection. All metal parts of the cock assembly shall be made of bronze. The cock shall be operated with a tee head and shall open when turned counter-clockwise. The cock shall be a Ford model F600, Hayes Model 5200, or approved equal.

### 11) Meter Boxes

Meter boxes for house services shall be made of plastic having a tensile strength rating of between 4500 and 8200 psi and a compressive strength rating of 4000 to 6500 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. Meter boxes shall be 01200 Century or approved equal.

### 12) Service Saddles

Service saddles shall be equal to Smith-Blair 313 double strap clamps suitable for use with ductile iron or PVC pipe. Service saddles are required for taps larger than 1" in diameter.

### 13) Meters

Water meters shall be furnished and installed by the BLW. All meters must be capable of reading accurately at low flows. All meters shall read in gallons. All

meters shall come equipped with a touch-read or touchless sensor compatible with the BLW's meter reading equipment. The bypass shall be located inside the vault.

14) 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.

15) Pressure Reducing Valve

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

16) Valve Markers

One concrete valve marker shall be furnished and set at each line valve. The marker shall be made of 3,000 PSI concrete, and shall be four feet (4') long and 4" on each side, with four #4 reinforcing bars as shown on the detailed drawings. The markers shall be set with an even number of feet between the center line of the valve and the center line of the valve marker, and the distance in feet between the valve and marker shall be stamped in the aluminum disc on the marker at the time of setting.

17) Casing Spacers

Casing spacers shall be Model CCS stainless steel as manufactured by Cascade Waterworks Mfg. Co. of Yorkville, Illinois, or approved equal. Spacers shall be sized and spaced as recommended by the manufacturer.

18) 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.

19) Subgrade Stabilizer Stone

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

20) Gaskets for Joint Restraint Inside Casings

Inside of casings, the D.I.P. water main joints shall be slip joint restrained by using American "Fast-Grip" gaskets or approved equal.

## 21) Polyethylene Tubing for Ductile Iron Pipe

Polyethylene tubing shall be manufactured of virgin polyethylene material conforming to the requirements specified in AWWA C105, Section 4.1.2 for high density, cross-laminated polyethylene film. The polyethylene film shall have a minimum thickness of 8 mil. The polyethylene encasement material shall be provided in tube sizes adequate for the various sizes of pipe.

### 203.04 General Requirements

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.

## 204. EXCAVATION AND CONSTRUCTION

### 204.01 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 Specifications of latest revision except as otherwise specified herein.
- 3) Compliance with applicable safety regulations is the responsibility of each company engaged in the work. The BLW assumes no responsibility for the actions of others on the job site. It is the responsibility of those installing water mains and appurtenances to conform to OSHA regulations.

### 204.02 Trench Excavation

- 1) Trenches shall have a minimum width of twelve (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. Maximum trench width at the top of the pipe shall not be more than the outside diameter of the bell plus two feet. In cases where water lines cross sanitary sewers, there shall be a minimum of 18 inches vertical separation between the water and sewer mains. Both mains shall be D.I.P. At crossings, one full length of water pipe must be located so that both joints are as far from the sanitary sewer as possible. In cases where water mains parallel sewer mains there shall be a minimum of ten (10) feet horizontal separation maintained between the mains. These distances are measured edge to edge.

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

All changes in grade shall be made gradually. At points of interference with storm sewers and cross drains on D.O.T. right-of-way, the pipe will be run under the conflicting utility. Where the water main crosses beneath a storm sewer, there shall be a minimum of 12" clearance between the main and the storm sewer. Where necessary, the line shall be lowered at valves so that the top of the valve stem is approximately one foot below the finished grade. The trench shall be deepened to provide a gradual approach to all low points of the line.

In laying pipe across water courses, railroad crossings, or depressions of any kind, the minimum depth here specified shall be maintained at the bottom of the depression. Railroad crossings shall be installed according to American Railway Engineering Association requirements.

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.

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.

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.

In excavation and backfilling and laying pipe, care must be taken not to remove or injure any water, sewer, gas or other pipes, conduits or other structures without an order from the Designer. When an obstruction is encountered, the Contractor shall notify the Designer who will have the Owners of the obstruction adjust same or make necessary changes in grade and/or alignment to avoid such obstruction. Any house connection, drains or other structures damaged by the Contractor shall be repaired or replaced immediately.

All excavation shall be placed on one side of the trench, unless permission is given by the BLW 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.

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.

- 2) 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 one-half 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 filing for and acquiring any blasting permits which may be required by those agencies with such jurisdiction. Before blasting, the Contractor shall cover the excavation with heavy timbers and mats in such a manner as to prevent damage to persons or the adjacent property. Rock excavation near existing pipelines or other structures shall be conducted with the utmost care to avoid damage. The Contractor shall be wholly responsible for any damage resulting from blasting, and any injury or damage to structures or property shall be promptly repaired by the Contractor to the satisfaction of the BLW and property owner.

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

<u>Size of Pipeline Inches</u>	<u>Depth of Excavation Below Bottom of Pipe, Inches</u>
6	6
8 to 18	8
18 to 30	10
Over 30	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.

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.

#### 204.03 Backfilling

- 1) After the pipe has been laid, backfilling shall be done in two (2) distinct operations. In general, all backfill beneath, around and to a depth of twelve (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 vibratory equipment. The remainder of the backfill shall be placed in 6" layers and compacted to the top of the trench, either by pneumatic hand tamps, hydro-tamps, or other approved methods.

Care shall be taken so that the pipe is not laterally displaced during backfilling operations. The backfill lifts shall be placed by an approved method in accordance with that hereinafter specified. Backfill materials shall be the excavated materials without bricks, stone, foreign matter or corrosive materials, where not otherwise specified or indicated on the plans.

- 2) Backfill under permanent concrete or bituminous pavement 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 not more than ten percent (10%) by weight of loam or clay. This backfill shall be compacted to one hundred percent (100%) as determined by the Standard Proctor test for the top two (2) feet of trench and ninety-five percent (95%) by the Standard Proctor test from pipe bedding to two (2) feet below trench top. Mechanical vibrating equipment shall be used to achieve the required compaction. Pavement shall be replaced immediately after the backfilling is completed.
- 3) Backfill under gravel or crushed stone surfaced roadways shall be the approved suitable excavated material placed in six (6) inch layers thoroughly compacted for the full depth and width of the trench, conforming to the compaction, density compaction method and materials as specified in "2" above.
- 4) Backfill in unpaved areas shall be compacted with mechanical vibrating equipment to ninety-five percent (95%) as determined by the Standard Proctor Test. Backfill material from pipe bedding to ground surface by shall be excavated earth free from large stones and other debris.
- 5) 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.
- 6) 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.
- 7) All costs of compaction testing shall be the responsibility of the Developer.

#### 204.04 Laying Pipe

- 1) All pipe shall be laid straight, true to line and grade. No shimming or blocking up of the pipe shall be allowed. All pipe must be backfilled to the top of the pipe and the backfill tamped on each side simultaneously to develop a bed for the pipe. When the work is not going on, all pipe openings shall be securely closed by the insertion of the proper size plug and caulking so that dirt and debris will not be washed into the pipe in case of rain.

- 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.

#### 204.05 Thrust Restraint for Pressure Lines - Reaction Blocking

1. Underground piping laid around curves and at all unsupported changes of direction, all tees, wyes, crosses, plugs and other like fittings shall be solidly and properly blocked with concrete against solid earth to take the reaction of the main pressure and to prevent lateral movement of the pipe or fittings when under pressure. Reaction blocking shall be installed at all locations requiring same 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 twenty-eight (28) days. The blocking, unless otherwise shown, shall be so placed that the pipe and fitting joints will be accessible for repair.
2. Reaction blocking shall be constructed in conformance with the Standard Detailed Drawings for Reaction 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.

#### 204.06 Setting Fire Hydrants

Fire hydrants shall be placed at the locations shown on the plans. Gate valves for fire hydrants shall be connected directly to the main by means of a "Locked Hydrant Tee". All other connections between the main and the fire hydrant shall be mechanical joint. Fittings shall be restrained by a "Locked Hydrant Adapter" whenever the fire hydrant is located close enough to the main to allow its use. Not less than 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 401.02. Before placing the hydrants, care shall be taken to see that all foreign material is removed from within the body. The stuffing boxes shall be tightened and the hydrant valve opened and closed to see that all parts are in first class working condition. All hydrant openings shall be kept capped, except when hydrant is being worked on.

When a fire hydrant has been constructed but is not yet in service, the Contractor shall provide and attach to the fire hydrant, 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 BLW 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 BLW. Fire hydrants with damaged operating nuts shall not be accepted.

#### 204.07 Setting Valves and Fittings

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

Fittings shall be properly braced to insure that they will not be blown off or broken loose under the greatest possible working pressure. All fittings shall be mechanical joint unless specified otherwise. In situations where there is insufficient undisturbed earth to act as a bearing surface or where otherwise directed by the Authority, fittings shall be restrained by the use of threaded rods or other method acceptable to the Authority. Prior to blocking any joint or fitting with concrete, that joint or fitting shall be wrapped with polyethylene film in such a manner that the concrete will not stick directly to the pipe but that the load bearing capacity of the blocking will not be affected.

#### 204.08 Placing of Steel Casing Pipe

Casing pipe shall be installed at the locations shown on the plans. Unless directed otherwise, the installation procedure shall be the dry bore method. The hole is to be mechanically bored and cased through the soil by a cutting head on a continuous auger mounted inside the casing pipe. The installation of the casing and boring of the hole shall be done simultaneously by jacking. Lengths of pipe are to be full circumference butt-welded to the preceding section installed. Excavation material will be removed and placed at the top of the working pit. Backfill material and methods of backfilling and tamping shall be as required under Section 204.03. Carrier pipe shall be D.I.P. and inserted within the casing by use of stainless steel casing spacers. Intervals shall be as recommended by the manufacturer. Inside of casings, the water main joints shall be slip joint restrained by using American "Fast-Grip" gaskets or approved equal.

#### 204.09 Marking Location of Valves

- 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. The letter height shall be 6".

- 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.

#### 204.10 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. No structure shall be built or pipe shall be laid in water, and water shall not be allowed to flow over or rise upon any concrete, masonry or pipe until the same has been inspected and the concrete or joint material has thoroughly set. All water pumped, bailed or otherwise removed from the trench or other excavation shall be conveyed in a proper manner to a suitable place of discharge where it will not cause injury to the public health or to public or private property or to work completed or in progress, or to the surface of the streets or cause any interference with the use of same by the public. All soil and erosion control standards must be followed during dewatering operations. Best management practices must be used.

#### 204.11 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.

#### 204.12 Location and Protection of Existing Underground Utilities

It is the responsibility of the Contractor to locate the underground utilities and to protect same. Utility lines or services damaged by the Contractor shall be repaired by the Contractor at his own expense.

#### 204.13 Connection to the Existing BLW Water System

- 1) The developer's private contractor shall make all required connections and taps to the BLW's water system. The BLW's Inspector will supervise the tap and all associated work. The contractor shall give the BLW a minimum of 48 hours notice prior to any water system work.
- 2) The Contractor will provide proper traffic control devices and certified personnel to direct traffic if required.
- 3) All taps shall be wet taps (on pressurized water mains in service). All taps to be made with saddles or tapping sleeves or tees with sleeves and valves as required by the BLW.

#### 204.14 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 permission is granted by the Georgia D.O.T. and/or the Marietta Public Works Department or Cobb County DOT. Submittal of an authorization letter from the appropriate governing agency is required.
- 3) One lane of traffic shall be maintained open at all times. Construction work shall be limited to time between 9 A.M. and 4 P.M.
- 4) The Contractor shall furnish traffic control devices and certified personnel to direct traffic, if required.
- 5) The above requirements may be altered with the written approval of the BLW 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. Casing will be required where the installation is under any roadway.
  - 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 3000 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.

#### 204.15 Standard Detailed Drawings

Installation of fire hydrants, water valves, valve boxes, meters, long side services water lines, etc. shall be made in accordance with the Standard Detail Drawings in these specifications (Section 400).

#### 204.16 Clean-Up

- 1) The Contractor shall remove all unused material, excess rock and earth, and all other debris from the construction site as closely behind the work as practical. If the Contractor fails to maintain clean-up responsibilities as directed by the BLW's representative, the BLW may choose to use their own forces to do so, followed by an invoice to the Developer for the BLW's work.
- 2) All trenches shall be backfilled and tamped before the end of each days work.
- 3) Prior to requesting 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 water line construction.
  - d. Pour concrete collars around all valve boxes outside paved areas.
  - e. Insure 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.
  - g. All shoulders, ditches, culverts, and other areas impacted by the water main construction shall be at the proper grades and smooth in appearance.
  - h. 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 BLW's acceptance of the water main.
  - i. If work is performed on a Georgia D.O.T., City of Marietta, or Cobb 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.

#### 204.17 Interruption of Water Supply During Construction

A minimum of 24 hours advance notice shall be given to any occupied building served by a water line which 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 BLW's Office. For outages affecting several customers, 24 hours notice shall be prepared and given to the affected customers and must be coordinated with the BLW.

#### 204.18 Barricades

The Contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient red lights, danger signals and necessary precautions for the protection of the work and the safety of the public. Street closures must be approved by Marietta Public Works. Streets closed to traffic shall be protected by effective barricades on which shall be placed acceptable warning signs. Barricades shall extend completely across the street which is to be closed, and shall be illuminated at night by lights not farther than (5) feet apart, and lights shall be kept burning from sunset to sunrise.

#### 204.19 Grassing

All areas outside structures and along pipelines where the earth is disturbed shall be grassed. After the soil has been properly prepared, the seed shall be planted. After the seeds have been planted, the moisture content of the soil shall be maintained at the optimum amount to insure germination of the seed and growth of the grass.

Immediately after the initial watering of seeded areas, the contractor shall apply a mat of hay or rye, wheat or oat straw over the area at a uniform rate of not less than 1-1/2 ton of mat to the acre. The minimum depth of the straw shall be 2 inches and the maximum depth 3 inches. After placing mat or hay or straw, emulsified asphalt shall be sprayed over the mat at a uniform rate of 0.15 gallon per square yard. After the grass has shown a satisfactory growth (approximately 30 days after planting), nitrate of soda shall be applied at a uniform rate of 100 pounds per acre, followed by sufficient water to dissolve the fertilizer.

The Contractor shall do all maintenance work necessary to keep all planted areas in satisfactory condition until the work is finally accepted. This shall include mowing, repairing washes that occur, reseeding, and water as required to produce a healthy and growing stand of grass. Mowing will be required to remove tall and obnoxious weeds before they go to seed.

It is the intent of these specifications to produce a stand of grass that is alive and growing, without any bare spots larger than one square foot. The Contractor shall repeat all work, including plowing, fertilizing, watering, and seeding as necessary to produce a satisfactory stand.

## 205. INSPECTION AND TESTS

### 205.01 General

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

### 205.02 Pressure and Leakage Testing

- 1) After all piping has been placed, each section between line valves shall be tested by the Contractor in the presence of the BLW's inspector and 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 test as herein required. Every precaution must be taken to valve-off or otherwise protect control equipment in or attached to the pipe line to prevent damage thereto.
- 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 before the test has been completed.
- 3) Prior to the pressure test, pipe laid in trenches shall be backfilled adequately to secure the pipe during the test. Any observed leakage shall require corrective measures to pipe lines and/or joints to the satisfaction of the Inspector.
- 4) The BLW will furnish the necessary water for testing and disinfection of the lines; however, any water lost through breakage of lines or unnecessary or excessive flushing of lines will be charged to the Contractor at the current residential rate. All lines shall be tested to a pressure of 200 psi for a minimum time of 2 hours. Test pressure shall not vary by more than  $\pm 5$  psi for the duration of the test which may require periodic pumping (in which case the added water will be counted as part of the leakage). Lines shall be tested in sections between the valves. The rate of leakage shall not exceed 25 gallons per 24 hours per inch diameter per mile of water main. (See table on the following page.)

LEAKAGE TABULATION

<u>SIZE OF PIPE</u>	<u>GALLONS/HOUR/100 FT.</u>	<u>GALLONS/DAY/100 FT.</u>
12"	.237	5.688
10"	.197	4.728
8"	.158	3.792
6"	.118	2.832

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

205.03 Disinfection

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

- 1) The method of disinfection shall be the Continuous - Feed Method as per AWWA C651, latest revision, Section 5.2. The potable water shall be chlorinated so that after a 24 hour holding period in the main, there will be a free chlorine residual of not less than 10 mg/L.
- 2) The form of chlorine shall be a 1 percent solution made from either sodium hypochlorite or calcium hypochlorite which shall be measured and pumped into the pipeline. Water must be flowing during the feeding operation and the injection point must be located so that the flow of water will disperse the chlorine throughout the pipeline. AWWA C651 requires the injection point be located at a point not more than 10 feet from the point of connection to the existing water supply. The chlorine should be fed at a constant rate such that the water will have not less than 25 mg/L free chlorine. The table on the following page gives the amount of chlorine required for each 100 feet (30.5 m) of pipe of various diameters to produce a 25 mg/L concentration.

Chlorination Tabulation

<u>Pipe Diameter</u> <u>(in.)</u>	<u>100% Chlorine</u> <u>(lb.)</u>	<u>1% Chlorine Solution</u> <u>(gal.)</u>
6	0.030	0.36
8	0.054	0.65
10	0.085	1.02
12	0.120	1.44
16	0.217	2.60

- 3) After 24 hours, the line shall be flushed until the chlorine content is not more than 2.0 parts per million. When this step is completed, the Developer will notify the BLW and the Cobb County-Marietta Water Authority will be responsible for bacteriological sampling and testing water from the disinfected water line. If the samples show evidence of contamination upon testing, the above procedure of disinfection shall be repeated until approved samples are obtained. No connections shall be made to the existing system until all of the samples have been tested and approved by the Cobb County-Marietta Water Authority.
- 4) The Contractor has the option of discharging the highly-chlorinated water being flushed from the pipeline to the existing sewers (if available) or to open areas where the discharge will not damage the roadbed or adjacent property. All soil and erosion control standards must be followed during dewatering operations. Best management practices must be used.

Dechlorinating this water prior to discharge may be required. 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. The highly chlorinated water shall not be discharged near any streams, ponds, lakes or other bodies of water without being dechlorinated.

The chlorine residual of water being disposed may be neutralized by treating the water with one of the chemicals listed in the table on the following page:

### Chemical Required

Residual Chlorine Concentration mg/L	Sulfur Dioxide (SO <sub>2</sub> )		Sodium Bisulfite (NaHSO <sub>3</sub> )		Sodium Sulfite (Na <sub>2</sub> SO <sub>3</sub> )		Sodium Thiosulfate (Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> ·5H <sub>2</sub> O)	
	lb	(kg)	lb	(kg)	lb	(kg)	lb	(kg)
1	0.8	(.36)	1.2	(.54)	1.4	(.64)	1.2	(.54)
2	1.7	(.77)	2.5	(1.13)	2.9	(1.32)	2.4	(1.09)
10	8.3	(3.76)	12.5	(5.67)	14.6	(6.62)	2.0	(5.44)
50	41.7	(18.91)	62.6	(28.39)	73.0	(33.11)	60.0	(27.22)

Amounts of chemicals required to neutralize various residual chlorine concentrations in 100,000 gal (378.5 m<sup>3</sup>) of water.

#### 206. OTHER REQUIREMENTS

No part of these specifications is intended to relieve the developer of his responsibility to comply with requirements of the Georgia D.O.T., the Georgia DNR, the NRCS, the USACOE, the EPA, the EPD, Cobb County, City of Marietta or other appropriate regulatory agency.