

***DIVISION II***  
**SECTION 1: DESIGN AND PLAN PREPARATION**

***DESIGN REQUIREMENTS***

**1.01 General**

The design and plan preparation of water distribution systems and sanitary sewer systems shall conform to the specifications herein.

**1.02 Licensed Professionals**

- A. Water distribution system and/or gravity flow sanitary sewer system design and plan preparation for a residential subdivision or parts thereof on a Developer's property shall be performed by a Georgia Licensed Professional Engineer or Georgia Licensed Registered Land Surveyor who has sufficient knowledge to properly perform the design.
- B. Water distribution system and/or gravity flow sanitary sewer system design and plan preparation for property off-site of a Developer's property shall be performed by a Georgia Licensed Professional Engineer who has sufficient knowledge to properly perform the design.
- C. Water distribution system and/or gravity flow sanitary sewer system design and plan preparation for commercial/industrial property shall be performed by a Georgia Licensed Professional Engineer who has sufficient knowledge to properly perform the design.
- D. Force main and sanitary sewer lift station design and plan preparation shall be performed by a Georgia Licensed Professional Engineer who has sufficient knowledge to properly perform the design.
- E. The professional performing the design and preparing the plans shall seal each plan sheet with their stamp and sign their name across the stamp.

## **DIVISION II**

## **DESIGN REQUIREMENTS**

### **SECTION 1: DESIGN AND PLAN PREPARATION**

Page II-1.2

#### **1.03 Reference Documents and Standards**

General methods of design and construction shall conform to the specifications herein and the following. When standards conflict with one another, the WCW&SA Executive Director shall determine the applicable standard.

- A. Georgia EPD, Minimum Standards for Public Water Systems, May 2000.
- B. Georgia EPD, Rules and Regulations for Water Quality Control, Chapter 391-3-6, latest effective date.
- C. Water Environment Federation, Regulation of Sewer Use, WEF Manual of Practice No. 3, latest edition.
- D. Mississippi River Board of State Public Health and Environmental Managers, generally referred to as the "Ten (10) States Standards for Sewage Works".
- E. Gravity Sanitary Sewer Design and Construction, American Society of Civil Engineers Manuals and Reports on Engineering Practice No. 60, Water Environment Federal Manual of Practice No. FD-5, revised April 1982.
- F. Utility Accommodations Policy and Standards, Georgia Department of Transportation, Office of Utilities, latest edition.
- G. American Water Works Association Standards, latest editions.
- H. Soil Surveys of White County, Georgia, by the United States Department of Agriculture, Soil Conservation Service.
- I. American National Standards Institute Standards, latest editions.
- J. American Society for Testing and Materials Standards, latest editions.
- K. Occupational Safety and Health Administration regulations, latest editions.

**DIVISION II** **DESIGN REQUIREMENTS**

**SECTION 1: DESIGN AND PLAN PREPARATION**

Page II-1.3

- L. Georgia Department of Transportation specifications and regulations, latest editions.
- M. American Society of Mechanical Engineers standards, latest editions.
- N. National Electrical Manufacturer's Association standards, latest editions.
- O. American Concrete Institute standards, latest editions.

***DIVISION II***

***DESIGN REQUIREMENTS***

**SECTION 1: DESIGN AND PLAN PREPARATION**

**1.04 Plan Requirements**

- A. Water distribution system and/or sanitary sewer system plans shall be comprised of the following sheets as required. Each sheet should be 24 inches by 36 inches in size.
1. Cover Sheet.
  2. Site Plan Sheet.
  1. Grading Plan Sheet.
  2. Storm Water System Plan Sheet.
  5. Water Distribution System Plan Sheet.
  6. Water Distribution System Details and Construction Notes Sheet.
  7. Booster Pump Station Details and Construction Notes Sheet.
  8. Booster Pump Station Plan and Cross-Section Sheet.
  9. Booster Pump Station Details with Generator and Construction Notes.
  10. Sanitary Sewer System Plan Sheet.
  11. Sanitary Sewer System Profile Sheet.
  12. Sanitary Sewer System Details and Construction Notes Sheet.
  13. Sanitary Sewer Lift Station Plan and Cross-Section Sheet.
  14. Sanitary Sewer Lift Station Details with Generator and Construction Notes.
  15. Soil Erosion and Sedimentation Control Plan Sheet.
  16. Soil Erosion and Sedimentation Control Detail Sheet.
- B. Water distribution and/or sanitary sewer system plan sheets shall be prepared and include as a minimum the information detailed on the Technical Review Checklist included in Appendix D.
- C. Concurrent with the initial submittal of water distribution system and/or sanitary sewer system plans to the WCW&SA, a completed Water Distribution/Sanitary Sewer Addition Submittal form shall be submitted. The WCW&SA plan review process shall not commence until the Water Distribution/Sanitary Sewer Addition Submittal form is received. The Water Distribution/Sanitary Sewer Addition Submittal form is included in Appendix C.

- D. When a state hwy., railroad, or heavily traveled road is crossed, the agency with jurisdiction must be notified, prior to installation of water main or sewer main. Steel casing must be jacked and bored with carrier pipe. Free bores must conform to the applicable local and/or state requirements.

#### **1.05 Modifications to Plans**

Water distribution system and/or sanitary sewer system plans approved by the WCW&SA shall not be modified or deviated from during construction unless the WCW&SA Executive Director approve modifications or deviations in writing.

## **DIVISION II**

## **DESIGN REQUIREMENTS**

### **SECTION 1: DESIGN AND PLAN PREPARATION**

Page II-1.6

#### **1.06 As-Built Drawings**

- A. As-Built Drawings of the installed water distribution system and/or sanitary sewer system shall be prepared and sealed in accordance with Division II, Section 1.01.
- B. As-Built Drawings shall be completed upon connecting the development's water distribution system and/or sanitary sewer system to the WCW&SA system.
- C. As-Built Drawings shall show all street names, right-of-way widths, related easements, lot number, location, size and material of all water distribution system and/or sanitary sewer system components.
- D. As-Built Drawings shall be prepared using a survey that ties the development's water distribution system and/or sanitary sewer systems horizontally and vertically to the following state plane coordinate system or as amended by the WCW&SA.

Horizontal Control: North American Datum 83/94.

Vertical Control: National Geodetic Vertical Data 29.

Grid Zone: Georgia West 1002.

- E. The following certification shall be included on the As-Built Drawings and signed by the Design Engineer:

***“I certify that the water distribution system and/or sanitary sewer system depicted by this As-Built Drawing was constructed in accordance with the plans approved by the WCW&SA. The information submitted on this As-Built Drawing is to the best of my knowledge and belief, true, accurate and complete.”***

- F. The Developer's water distribution system and/or sanitary sewer system shall not be considered complete until the As-Built Drawings have been reviewed and approved by the WCW&SA Executive Director. Note that one (1) reproducible set of the approved As-Built Drawings shall be submitted to the WCW&SA Executive Director. The approved As-Built Drawings shall also be submitted to the WCW&SA Executive Director in digital format (AUTOCAD Version 14 or newer version).

**DIVISION II**

**DESIGN REQUIREMENTS**

**SECTION 2: WATER DISTRIBUTION**

**2.1 General**

- A. The following section shall be used as a guideline for the design of water mains and service lines that will supply residential, apartment, commercial and industrial complexes.
- B. The WCW&SA may require the above referenced complexes to have multiple connection points to existing force mains or water mains.
- C. The following certification shall be made by the Design Engineer and included with Water Distribution System construction notes:

*"I certify that the proposed water distribution system has been designed in accordance with the WCW&SA Specification document titled "Standard Specifications for Water Distribution Systems and Sanitary Sewer Systems", including all amendments.*

**2.2 Hydraulics**

- A. WCW&SA only provide pressure to an elevation of 1600 feet above sea level.
- B. Design flow shall be based on the following fire flow demands.
  - 1. Residential Area: 750 gallons per minute.
  - 2. Commercial/Industrial Area: 1,000 gallons per minute.
- C. The following range of supply pressures shall be assumed when sizing system components:
  - Pressure (min.): 20 psi.
  - Pressure (max.): 150 psi.

**2.3 Water Line Material and Size**

- A. Water mains and associated fittings shall be ductile iron with a minimum diameter of eight (8) inches.
- B. Water main pipe assembly shall be push-on joint unless indicated otherwise.
- C. Water main pipe assembly in a bore casing shall be restrained joint unless indicated otherwise.

***DIVISION II***  
**SECTION 2: WATER DISTRIBUTION**

***DESIGN REQUIREMENTS***

- D. Service line supplying a single fire hydrant within the right-of way shall be ductile iron with a minimum diameter of six (6) inches.
- E. Service line serving one (1) residential lot shall be copper with a minimum diameter of three-quarter ( $\frac{3}{4}$ ) inch.
- F. Service line serving two (2) residential lots shall be copper with a minimum diameter of one (1) inch. The service line shall be fitted with a copper wye. The wye and service lines, coming from the wye, shall have a minimum diameter of three-quarter ( $\frac{3}{4}$ ) inch.
- G. Service line serving commercial/industrial buildings shall be copper with a minimum diameter of three-quarter ( $\frac{3}{4}$ ) inch and a maximum diameter of three (3) inches or ductile iron sized as necessary for the demand.
- H. All materials that come into contact with drinking water during its treatment, storage, transmission or distribution shall not adversely affect drinking water quality and public health and must be certified for conformance with American National Standards Institute and National Sanitation Foundation Standard 61 (ANSI/NSF Standard 61).

**2.4 Water Line Location**

- A. Situate water mains outside of pavement, within street right-of-way when possible, at five (5) feet beyond the back of curb or edge of pavement or at location approved by the WCW&SA Executive Director.
- B. Situate water mains on the north and east sides of streets when possible.
- C. Water mains shall have a minimum ten (10) foot horizontal separation from any sewer. When conditions prevent a horizontal separation of 10 feet, the water may be laid with Inspector or Executive Directors approval closer to a sewer line provided the water main is laid in a separate ditch or on a undisturbed earth shelf located on one side of the sewer and the bottom of the water main is at least 18 inches above the top of the sewer main.



**SECTION 2: WATER DISTRIBUTION**

- D. Water mains constructed parallel to streams shall be located such that the nearest area of disturbed soil is greater than 25 feet from the stream bank.
- E. All water mains should be looped where possible.
  - F. A service line supplying a single lot shall be located nearest a respective property boundary as practical.
- G. A service line serving two (2) lots, from the water main to the meter, shall be located in-line with the lots' common property boundary.
- H. No water main or service line shall be constructed on solid waste landfills.
- I. No water main or service line shall be constructed to serve a structure that is constructed on or to be constructed on a solid waste landfill.
- J. Each water main and service line shall be locatable.
- K. Use Detail Nos. 1.1, 2.1 and 2.2 when applicable.

**2.05 Fire Hydrant Location and Spacing**

- A. Hydrants shall be situated within the street's right-of-way adjacent to the right-of-way boundary.
- B. A hydrant shall be situated at the end of each cul-de-sac or dead end street with a Hydro Guard Automatic Flusher or Equal with a 2" meter to measure flushing. Meter to be at Developers expense to WCW&SA.
- C. Fire hydrants servicing residential areas shall be spaced a maximum of 400 feet as measured along the edge of pavement. No lot shall be greater than 400 feet from a fire hydrant.

- D. Fire hydrants servicing commercial and industrial areas shall be spaced a maximum of 250 feet as measured along the edge of pavement.
- E. Use Detail Nos. 3.1, 4.1 and 5.1 when applicable.
- F. At high points provisions shall be made to remove trapped air by means of fire hydrant or air release valve that complies with Section 7.6.4 Minimum Standards for Public Water Systems.

## **2.06 Valve Size and Location**

- A. Gate valves shall be of the same size as the pipe in which the valve is situated, unless noted otherwise.
- B. Gate valves shall not be spaced more than 3000 feet apart.
- C. A corporation valve shall be situated at the tap location into a water main of a three-quarter (3/4) inch or one (1) inch service line.
- D. A ball valve shall be situated downstream of tapping saddle or tapping sleeve when tapping into a water main or force main with a 1-1/2 inch or two (2) inch service line. The ball valve shall be situated within a meter vault.

***DIVISION II***

***DESIGN REQUIREMENTS***

**SECTION 2: WATER DISTRIBUTION**

- A. Gate valves shall be situated in-line with water mains as follows, unless noted otherwise. The placement of gate valves under pavement shall be allowed, unless noted otherwise.
1. Attach tapping gate valve immediately downstream of tapping saddle or tapping sleeve when tapping into water main or force main with a smaller water main or service line.
  2. Situate gate valve immediately downstream of a tee when connecting into a water main.
  3. Situate gate valve on each immediate side of a three (3)-way connection or four (4)-way connection.
  4. Situate gate valve immediately upstream of a fire hydrant when hydrant is situated within street right-of-way.
  5. Situate gate valve within street right-of-way when fire service extends beyond right-of-way.
  6. Situate gate valve in water mains at a maximum spacing of 3,000 feet.
  7. Gate valve shall be situated outside of vault immediately upstream and downstream of three (3) inch and larger water meter/check valve assemblies.
  8. A screw type valve box shall be situated over a gate valve.
- B. A curb stop shall be situated inside of meter box immediately upstream of three quarts (3/4) inch through two (2) inch water meter/check valve assemblies.
- C. Use Detail No. 6.1 when applicable.

***DIVISION II***

***DESIGN REQUIREMENTS***

**SECTION 2: WATER DISTRIBUTION**

**2.07 Water Line Depth**

- A. Water mains and service lines to fire hydrants shall have a minimum suitable soil cover of four (4) feet. The depth of four (4) feet from finish grade to top of pipe shall be determined as follows.
  - 1. As measured from edge of pavement (top back-of-curb) when the finish grade elevation of the pipe route is equal to or greater than adjacent pavement elevation.
  - 2. As measured from finish grade elevation of the pipe route when the pipe route elevation is less than the adjacent pavement elevation.
  - 3. Other depth approved by the WCW&SA Executive Director or Inspector.
- B. Water mains crossing under a creek or ditch shall have a minimum suitable soil cover of two (2) feet. When crossing creeks with greater than 15 feet in width, only flexible, watertight joints shall be installed. Gate valves shall be installed on both sides of the creek crossing so that the creek crossing can be isolated. The gate valve closest to the water supply source shall be in a manhole. Sampling taps shall be installed at each end of the crossing, and permanent taps shall be made for testing and determining leaks.
- C. Water mains shall have a minimum 18-inch vertical separation from any sewer.
- D. Service lines under pavement shall have a minimum suitable soil cover of 2.5 feet as measured from top of curb or top of pavement.
- E. Service lines outside of pavement shall have a minimum suitable soil cover of 1.5 feet as measured from the meter.
- F. Water mains 18 inches in diameter and larger shall be checked for buoyancy when submerged in groundwater or situated within the 100-year flood zone.
- G. Use Detail Nos. 1.1, 7.1 and 8.1 when applicable.

***DIVISION II***  
**SECTION 2: WATER DISTRIBUTION**

***DESIGN REQUIREMENTS***

**2.08 Thrust Restraint**

- A. Thrust restraint shall be installed at all fittings, hydrants, valves and other locations deemed necessary by the WCW&SA Executive Director or Inspector.
- B. Thrust restraints at hydrants and valves shall be accomplished by installing a minimum of two (2) eyebolts on the hydrant or valve and tying to an adjacent fitting or concrete tie-back using three-quarter (3/4) inch stainless steel threaded rod.
- C. Thrust restraint at fittings shall be accomplished by using one of the following methods.
  - 1. Cast-in-place concrete blocking installed to dimensions as shown on thrust block detail.
  - 2. Restrained joint pipe and fittings installed upon approval by WCW&SA Executive Director or Inspector.
- D. Use Detail Nos. 3.1, 4.1, 9.1 and 10.1 when applicable.

**2.09 Booster Pump Stations**

- A. Each pump shall with 2 "Toshiba Brand " or equal motors utilizing three-phase power. Each pumping unit shall be capable of carrying peak demand. If more than 2 units are installed, they shall have sufficient capacity so that any one pump can be taken out of service and the remaining pumps are capable of carrying the peak demand. Single phase power supply to pump motors shall be prohibited.
- B. Motors having a 20-horse power rating or larger shall be equipped with soft start.
- C. Pump motors shall have the following features:
  - 1. Power control electrical enclosure: NEMA 3R stainless steel. Enclosure to house motor starters and circuit breakers, 3-inch main entrance conduit, and two (2) spare 1-inch conduits to ground and to generator.
  - 2. Hand-Off-Auto switch to control mode of each pump.

**DIVISION II**

**DESIGN REQUIREMENTS**

**SECTION 2: WATER DISTRIBUTION**

**Booster Pump Stations (cont.)**

3. All pump stations must adhere to all standards in Section 9.3.0 of the Minimum Standards for Public Water Systems.
4. Pump run lights to indicate which pump is in operation.
5. Elapse time indicator on each motor to indicate total run time in hours and tenths of hours.
6. Motor overload reset buttons to permit resetting of each motor without opening control panel door.
7. All Booster Pump Stations shall be installed in an enclosure (see Division II Section 6.05).
8. A bond will be granted to WCW&SA for 5 years after WCW&SA except installation of the station. A maintenance fee and a prorated power fee will be charged to all homeowners within the proposed development once a service account is established with WCW&SA.
9. All Booster Pump Stations shall have a backup power system (see Division II Section 6.08).
10. The pumping units shall:
  - a. have ample capacity to supply the peak demand without dangerous overloading;
  - b. be driven by a prime mover able to operate against the maximum head and air temperature which may be encountered;
11. Booster pumps shall be located or controlled so that:
  - a. they will not produce negative pressure anywhere in the distribution system.

- b. the pressure in the suction line shall be maintained at or above 20 psi by the use of a pressure sustaining valve or low pressure cutoff device.
- c. Automatic or remote control devices shall have a range between the start or remote control devices shall have a range between the start and cutoff pressure which will prevent excessive cycling

## ***DIVISION II***

## ***DESIGN REQUIREMENTS***

### **SECTION 2: WATER DISTRIBUTION**

Page II-2.8

#### **Booster Pump Stations (cont.)**

- 12. In- Line Booster Pumps must meet all requirements of a Booster Pump and shall be accessible for servicing and repairs.
- 13. Fire Pumps follow same criteria as all other pumps.
- 14. Each pump shall have a standard pressure gauge on the discharge line, a compound gauge on the suction line, a sampling tap, a recording gauge, a measuring gauge on discharge.
- 15. Stations should be equipped with totalizing and recording metering of the total water pumped.
- 16. Pump controls, their prime movers and accessories, shall be controlled in such a manner that they will operate at rated capacity without dangerous overload. Where two or more pumps are installed, provision shall be made for proper alternation. Provision shall be made to prevent operation of the pump during the backspin cycle. Electrical controls shall be located above ground.
- 17. All Booster Pump stations will have telemetry installed that is radio or land line and is compatible with all other systems at WCW&SA.

#### **2.10 Water Meters and Backflow Prevention**

- A. All water usage including fire and irrigation shall be metered and have backflow prevention devices.

- B. All water usage shall be metered using a single meter when possible.
- C. Meters shall be sized according to the anticipated demand and Division III, Section 7 of this document.
- D. Each meter shall have a backflow device consisting of double check valve assembly.
- E. Water meters and backflow devices shall be housed in boxes or vaults.
- F. Water meters and backflow devices shall be situated within the street right-of-way or in an easement area.
- G. Use Detail Nos. 11.1, 12.1, 13.1, 14.1, 15.1, 16.1 and 17.1 when applicable.

***DIVISION II***

***DESIGN REQUIREMENTS***

**SECTION 3: GRAVITY FLOW SEWERS**

Page II-3.1

**3.1 General**

- A. The following section shall be used as a guideline for the design of gravity flow sanitary sewer systems; pipe diameter not to exceed 36 inches.
- B. Sanitary sewer system design shall incorporate the following WCW&SA Sewer Use Ordinances:
  - 1. Section 98-7 (F) – Grease Management Program.
  - 2. Section 98-7 (G) – Oil/Water and Sand/Grit Interceptors.
- C. The following certification shall be made by the Design Engineer and included with Sanitary Sewer System construction notes:



***“I certify that the proposed sanitary sewer system has been designed in accordance with the WCW&SA Specification document titled “Standard Specifications for Water Distribution Systems and Sanitary Sewer Systems”, including all amendments.***

### **3.2 Design Flow Rates**

- A. Average residential flow rates, single-family and multi-family shall be as follows. Developer’s Engineer shall use most stringent flow rate.
  - 1. 100 gallons per capita per day.
  - 2. 280 gallons per day per connection.
  - 3. 1,500 gallons per day per acre (based on 15 persons per acre), multi-family.
- B. Industrial and commercial sanitary sewer flow rates shall be a minimum of 1.5 times that of the design water usage or as approved by the WCW&SA Executive Director.

**DIVISION II**  
**SECTION 3: GRAVITY FLOW SEWERS**

**DESIGN REQUIREMENTS**

**3.3 Hydraulics**

- A. Gravity sewer pipe should be designed to carry peak design flow at one-half full.
- B. Gravity sewer pipe shall have straight alignment and consistent grade change between manholes.
- C. Sewers shall yield mean velocities of not less than 2.0 feet per second based on the Manning Formula using an "n" value of 0.013.
- D. Recommended and absolute minimum pipe slopes for gravity sewer based on the size of pipe to be installed are summarized in the following table.

**Slope Requirements**

<u>Diameter</u>	<u>Absolute Minimum</u>	<u>Recommended Minimum</u>
6-inch	0.40%	0.70%
8-inch	0.40%	0.70%
10-inch	0.29%	0.50%
12-inch	0.22%	0.40%
14-inch	0.22%	0.40%
15-inch	0.15%	0.30%
16-inch	0.15%	0.30%
18-inch	0.12%	0.24%
20-inch	0.12%	0.24%
21-inch	0.10%	0.20%
24-inch	0.08%	0.16%
27-inch	0.07%	0.14%
30-inch	0.06%	0.12%
36-inch	0.05%	0.10%

- E. Sewers with slopes less than the recommended minimum may be accepted on a site by site basis.
- F. The over sizing of pipe to meet minimum grade requirements shall be prohibited.

***DIVISION II***

***DESIGN REQUIREMENTS***

**SECTION 3: GRAVITY FLOW SEWERS**

- G. A tangent at a terminal manhole shall have a minimum slope of 1.00 %.
- H. The maximum slope of a gravity sewer shall be 15.0%. When approved by the WCW&SA Executive Director, slopes between 15.0% and 20.0% may be used with the addition of concrete anchors (dead man). The Developer's Engineer shall determine the size and spacing of anchors. The WCW&SA Executive Director shall approve all anchor designs.
- I. When increasing the size of gravity sewer pipe, pipe crowns shall be matched at manholes.
- J. Angle formed by alignment of influent and effluent sewer pipe at manhole shall be greater than (>) or equal (=) to 90° and less than (<) or = to 270°.
- K. The surcharging of manholes shall be prohibited.

**3.4 Sewer Material and Size**

- A. Sewer outfall, sewer main and lateral pipe and associated fittings shall be ductile iron or PVC.
- B. Sewer pipe assembly shall be push-on joint unless indicated otherwise.
- C. Transition couplings used to connect pipe of differing material shall be ductile iron or other coupling approved by the WCW&SA Executive Director.
- D. Sewer outfalls and sewer mains shall have a minimum diameter of eight (8) inches.
- E. Laterals shall have a minimum diameter of six (6) inches.
- F. Sewers of PVC shall not exceed eighteen (18) inches in diameter.
- G. Sewers eighteen (18) inches in diameter and larger shall be checked for buoyancy when submerged in groundwater or situated within the 100-year flood zone.

***DIVISION II***  
**SECTION 3: GRAVITY FLOW SEWERS**

***DESIGN REQUIREMENTS***

**3.05 Sewer Location**

- A. Situate sewer outfalls and mains at the centerline of a right-of-way when possible or at the centerline of an easement.
- B. Sewer outfalls and mains shall have a minimum ten (10) foot horizontal separation from any water main.
- C. Lateral from the sewer main to the structure being served shall be located nearest the center of the property as practical. A separate lateral shall service each property.
- D. When possible, route laterals to manholes rather than direct connection into sewer main and as follows.
  - 1. Lateral connections into an in-line manhole shall be limited to two (2).
  - 2. Lateral connections into a terminal manhole shall be limited to three (3).
  - 3. Invert of a lateral connection at a manhole shall be installed at an elevation not greater than (2) two feet above the invert of the manhole.
- E. Sewer outfalls, mains and laterals constructed parallel to streams shall be located such that the nearest area of disturbed soil is greater than 25 feet from the stream bank.
- F. Sewers shall not be installed under or over any lake, reservoir or detention pond.
- G. No sewer system component shall be constructed on solid waste landfills.
- H. No sewer system component shall be constructed to serve a structure that is constructed on or to be constructed on a solid waste landfill.
- I. Each sewer outfall, sewer main and lateral shall be locatable by means of mylar tape, wire or other method approved by the WCW&SA Executive Director.
- J. Use Detail No. 1.1, 2.2 and 2.3 when applicable.

***DIVISION II***

***DESIGN REQUIREMENTS***

**SECTION 3: GRAVITY FLOW SEWERS**

**3.06 Sewer Depth and Structural Integrity**

- A. Sewer outfalls and mains shall have a minimum suitable soil cover of four (4) feet or other depth approved by the WCW&SA Executive Director.
- B. Sewer main shall be situated at a depth as to allow lateral to be constructed at a minimum two (2) percent slope from sewer main to probable structure location on each lot to be served assuming lateral is three (3) feet in depth at probable structure location.
- C. Vertical connection of a lateral into a sewer main shall be prohibited.
- D. Top of pipe shall be two (2) feet below any stream or ditch when crossed or paralleled.
- E. DIP shall be used for the following conditions:
  - 1. Where depth of soil cover is less than four (4) feet before or after sewer installation.
  - 2. Where depth of soil cover is greater than fifteen (15) feet before or after sewer installation.
  - 3. Where sewer crosses over or under a storm drain pipe.
  - 4. Where sewer crosses over or under a water main.
  - 5. Where sewer crosses under a stream or ditch.
  - 6. Other locations deemed necessary by the WCW&SA Executive Director.
- F. When a sewer crosses under a stream, a minimum of two (2) cast-in-place concrete collars shall be installed on the pipe, down gradient from the stream.
- G. Sewers shall have a minimum 18-inch vertical separation from any water main.

***DIVISION II***  
**SECTION 3: GRAVITY FLOW SEWERS**

***DESIGN REQUIREMENTS***

**3.07 Manhole Location and Spacing**

- A. Provide a manhole at each change in grade, pipe size, alignment, intersection and at terminal point of sewer.
- B. Space manholes a maximum of 400 feet of continuous run for pipes 16 inches in diameter and smaller.
- C. Space manholes a maximum of 500 feet of continuous run for pipes 18 inches in diameter and larger.
- D. Manholes situated within the 100-year flood elevation zone shall have top of cover elevation 2 feet above the 100-year flood elevation and cover shall be with gasket and bolted down.
- E. Manholes situated within the 100-year flood elevation zone and/or the groundwater table shall be checked for buoyancy.
- F. Manhole inverts shall be constructed to provide a smooth transition between influent and effluent piping.
- G. Manholes situated in pavement shall have top of covers level with finished grade.
- H. Manholes situated in non-paved areas shall have top of covers a minimum of twelve (12) inches above finished grade.
- I. Use Detail No. 21.1 when applicable.

***DIVISION II***  
**SECTION 4: FORCE MAINS**

***DESIGN REQUIREMENTS***

**4.01 General**

The following section shall be used as a guideline for the design of force mains where the pipe diameter does not exceed 36 inches.

**4.02 Hydraulics**

- A. Force mains shall be sized to allow for a minimum velocity of 2 ft/s and a maximum velocity of 5 ft/s.
- B. Sanitary sewer force mains shall not flow down grade into a receiving manhole.
- C. Combination air release/vacuum valves shall be installed in force mains at all high points of elevation and spaced along apparent flat routes as determined by the WCW&SA Executive Director.

**4.03 Force Main Material and Size**

- A. Force mains and associated fittings shall be ductile iron with a minimum diameter of four (4) inches.
- B. Water main pipe assembly shall be push-on joint unless indicated otherwise.
- C. Water main pipe assembly in a bore casing shall be restrained joint unless indicated otherwise.

**4.04 Force Main Location**

- A. Force mains shall be situated outside of pavement within a street right-of-way near the boundary of the right-of-way or centered within an easement.
- B. Water distribution and raw water force mains shall be located on the opposite side of pavement from a sewer when possible and/or shall have a minimum ten (10) foot horizontal separation from any sewer.
- C. Force mains constructed parallel to streams shall be located such that the nearest area of disturbed soil is greater than 25 feet from the stream bank.

***DIVISION II***

***DESIGN REQUIREMENTS***

**SECTION 4: FORCE MAINS**

Page II-4.2

- D. No force main shall be constructed on solid waste landfills.
- E. No force main shall be constructed to serve a component that is constructed on or to be constructed on a solid waste landfill.
- F. Each force main shall be locatable by means of detection tape or wire as approved by the WCW&SA Executive Director or Inspector.

**4.05 Force Main Depth**

- A. Force mains shall have a minimum suitable soil cover of four (4) feet. Depth from finish grade to top of pipe shall be determined as follows.
  - 1. As measured from edge of pavement when pipe route existing/finish grade elevation is equal to or greater than adjacent pavement elevation.
  - 2. As measured from pipe route existing/finish grade elevation when the route elevation is less than the adjacent pavement.
  - 3. Other depth approved by the WCW&SA Executive Director.
- B. Force main crossing under a creek or ditch shall have a minimum suitable soil cover of two (2) feet.
- C. Water distribution force mains shall have a minimum eighteen (18) inch vertical separation from any sewer.
- D. Force mains eighteen (18) inches in diameter and larger shall be checked for buoyancy when submerged in groundwater or situated within the 100-year flood zone.
- E. Use Detail Nos. 7.1 and 8.1 when applicable.



**4.06 Thrust Restraint**

- A. Thrust restraint shall be installed at all fittings and other locations deemed necessary by the WCW&SA Executive Director or Inspector.
- B. Thrust restraint at fittings shall be accomplished by using one of the following methods:
  - 1. Cast-in-place concrete blocking installed to dimensions as shown on thrust block detail.
  - 2. Restrained joint pipe and fittings installed upon approval by WCW&SA Executive Director or Inspector.
- C. Use Detail No. 9.1 when applicable.

**4.07 Combination Air Vacuum/Release Valves**

- A. Combination air vacuum/release valves shall be sized according to the manufacturer's recommendations.
- B. Valves designated for use with water or sewage shall be used on the respective system.
- C. Valve shall be housed in a "dog house" style manhole.
- D. Use Detail No. 22.1 when applicable.

***DIVISION II***

***DESIGN REQUIREMENTS***

**SECTION 5: AERIAL PIPE**

**5.01 General**

- A. This section shall be used as a guideline for the design of aerial pipe that pertains to water distribution piping and sanitary sewers.
- B.
- C. Requirements of Division II, Sections 2, 3 and 4, where applicable, shall apply to the design of aerial piping.
- D.
- C. A pipe that crosses over a perennial or annual stream must not cause an impedence to navigation or cause water to pool upstream of the pipe.

**5.2 Aerial Pipe Material**

- A. Aerial pipe shall be ductile iron or steel.
- B.
- C. Aerial pipe assembly shall comply with manufacturers' recommendations.
- D.
- E. Aerial pipe fittings shall comply with manufacturers' recommendations and specifications herein.

**5.03 Aerial Pipe Support**

- A. Aerial pipe supports shall be situated on suitable soils. Prior to support design, soils beneath proposed aerial pipe route shall be examined by a soils testing company for bearing capacity and suitability for construction. A soils report shall accompany the proposed aerial route.
- B. Aerial pipe support spacing shall not exceed 40 feet. Aerial pipe support spacing shall be based on results of the soil's bearing capacity and spacing recommendations of the pipe and fitting manufacturers.
- C. Aerial pipe supports shall be comprised of concrete piers set atop concrete spread footings. Spread footing size shall be based on results of the soil's bearing capacity and reactive forces within the aerial pipe.

F. Minimum pier diameters and footing sizes shall be as summarized in Detail No. 23.1.

G. Pipe shall be secured to piers as indicated on Detail No. 23.1.

F. Use Detail No. 23.1 when applicable.

***DIVISION II***

***DESIGN REQUIREMENTS***

**SECTION 6: LIFT STATIONS or BOOSTER PUMP STATIONS**

**6.01 General**

- A. This section shall be used as a guideline for the design of lift stations capable of pumping up to 700 gallons per minute.
- B. Lift stations and associated components shall be manufactured and/or supplied by Gorman Rupp or other manufacturer approved by the WCW&SA Executive Director.
- E. Material requirements specific to lift stations are included in this section. An operational manual and equipment manuals for each component shall accompany each lift station.
- F.
- G. Lift station electrical and mechanical components shall be situated above the 100-year flood elevation.

**6.02 Pumps**

- A. Lift stations shall be equipped with a minimum of two (2) above ground centrifugal pumps of the same size. Each pump shall be capable of passing a three (3) inch diameter sphere. The pumps shall be belt driven, "Super T"-series type.
- B.
- B. Pumps shall be sized so that the system curve intersects the middle one-third portion of the pump operational curve. Each pump shall have the discharge capacity to overcome the development's discharge and have run times ranging from two (2) to five (5) minutes. The following calculations and data shall be submitted for the lift station design:
  - 1. Total Dynamic Head (friction loss through force main, static head, friction loss through pumps and suction piping).
  - 2. Net Positive Suction Head available and required.
  - 3. Operating system curve plotted onto manufactures' pump curve.
- 3 Pump cycle time.

- C. Each pump shall be equipped with an automatic air release valve assembly. Valves shall open automatically during pump priming or re-priming cycle and shall close automatically at pump full flow to eliminate re-circulation of liquid to the wet well.

***DIVISION II***

***DESIGN REQUIREMENTS***

**SECTION 6: LIFT STATIONS or BOOSTER PUMP STATIONS**

Page II-6.2

- D. Each pump shall be equipped with suction and discharge pressure gauges mounted on a resilient panel. Pressure gauges shall be as follows.
  - 1. Four (4) inches in diameter.
  - 2. Glycerin filled for “no shock”.
  - 3. Graduate from a 0-inch to 70-inch water column.
  - 4.
  - 5. Equipped with brass shut off valves and fittings.
  
- E. The following list of spare pump parts shall be provided for each lift station.
  - 1. One (1) cover plate O-ring.
  - 2. One (1) rotating assembly O-ring.
  - 3. One (1) mechanical seal.
  - 4. One (1) set of rotating assembly shims.

**6.03 Pump Motors**

- A. Each pump shall be equipped with a “Toshiba Brand” motor utilizing three-phase power. Single phase power supply to pump motors shall be prohibited.
  
- B. Motors having a 20-horse power rating or larger shall be equipped with soft start.
  
- C. Motors shall be sized so that each pump may overcome peak discharge from the development.
  
- D. Pump motors shall have the following features.
  - 1. Power control electrical enclosure: NEMA 3R stainless steel. Enclosure to house motor starters and circuit breakers, 3-inch main entrance conduit, and two (2) spare 1-inch conduits to ground and to generator.

2. Alternator to select each pump/motor to be lead pump. Contacts transfer upon de-energizing, alternating pumps at end of pump cycle.
3. Three position pump sequence selector switch for automatic alternation or manual selection of lead pump.

## ***DIVISION II***

## ***DESIGN REQUIREMENTS***

### **SECTION 6: LIFT STATIONS or BOOSTER PUMP STATIONS**

Page II-6.3

4. Hand-Off-Auto switch to control mode of each pump selected.
5. High temperature protection circuitry to override level control system and turn off pump motors to protect against excessive temperatures. An indicator light shall be located on front of control panel. Pump shall remain locked out until pump motor is manually reset.
6. Pump run lights to indicate which pump is in operation.
7. Elapse time indicator on each motor to indicate total run time in hours and tenths of hours.
8. Motor overload reset buttons to permit resetting of each motor without opening control panel door.

#### **6.04 Suction and Discharge Piping**

- A. Piping shall be minimum 4-inch diameter, flanged, ductile iron.
- B. The following shall be provided on the suction side.
  1. Provide a flanged customer connection on each suction line drilled to a standard 125# template.
  2. Provide long radius 90° reducing elbow at each pump. Elbow shall be no smaller than 4-inch diameter.

3. Provide long radius 90° reducing elbow at intake of each suction line. Elbow shall be 2-inches in diameter larger than the suction line. The elbow shall be aligned to the center of the wet well.
- C. The following shall be provided on the discharge side.
1. Provide a flanged customer connection on discharge side drilled to a standard 125# template.
  2. Provide a stainless steel swing check valve at each pump.

***DIVISION II***

***DESIGN REQUIREMENTS***

**SECTION 6: LIFT STATIONS or BOOSTER PUMP STATIONS**

Page II-6.4

3. Provide a 3-way non-lubricated, taper type, plug valve providing drip tight shutoff.
4. Provide globe valve in force main no more than 20 feet from pumps.
5. Provide equivalent sized 2-way plug valve and tee at header pipe to permit emergency access to discharge force main after isolation of pumps. Valve body shall be cast iron with flanged end connections drilled to a standard 125# template. Valve shall be of the non-lubricated type, furnished with a drip-tight shutoff plug mounted in stainless steel or Teflon over phenolic bearings and shall have a resilient facing bonded to the sealing surface. Bypass connection shall be accessible behind the hinged access panel on the wet well side of the station enclosure and shall terminate with a male OPW type quick connect fitting.

**6.05 Enclosure**

Lift station pumps and motors shall be housed in a reinforced fiberglass enclosure having the following features.

- A. Enclosure shall consist of panels comprised of fiberglass reinforced orthophthalic polyester resin, containing no fillers, with a minimum of 30% glass fibers approximately 1-1/4 inch long and a maximum of 70% resin.
- B. Panels shall be a minimum of 3/16-inch thick and have exterior side coated with Gorman Rupp “green” pigmented resin.
- C. Interior of panels shall be coated with a polyester-rich resin.

- D. Enclosure shall consist of four (4) vertical corner panels, one (1) roof panel and four (4) hinged access panels.
- E. Hinged panels shall be secured by key lockable handle operating a two-point latch. Locks shall be keyed to the standard WCW&SA configuration.
- F. Enclosure shall be equipped with louvered vent with sliding door for ventilation.
- G. Enclosure shall be equipped with a roof mounted ventilation fan, thermostatically controlled to operate above the temperatures of 70°F. Fan motor and control circuit shall be protected by a thermal-magnetic air circuit breaker.

***DIVISION II***

***DESIGN REQUIREMENTS***

**SECTION 6: LIFT STATIONS or BOOSTER PUMP STATIONS**

Page II-6.5

- H. Enclosure shall be equipped with a duplex GFI utility receptacle providing 115 volt, AC-current. Receptacle shall be protected by a 15-amp thermal-magnetic circuit breaker.
- I. Enclosure shall be equipped with a space heater (1300/1500 watt) AC-current with chord and grounding plug.
- J. Enclosure shall be equipped with a 200-watt light. Fixture shall be vapor tight and centrally located to provide light to all components within enclosure. Light circuit shall be protected by a thermal-magnetic air circuit breaker.

**6.06 Liquid Level Control**

- A. Pump motors shall be controlled by a 4-20MA Transducer.
- B. The control shall be “Electronic Pressure Switch 2000” (EPS-2000 controller) and shall include integral components to sense pressure conditions. The controller shall be equipped as follows.
  - 1. Level control electrical enclosure: NEMA 1 stainless steel.
  - 2. EMI and RFI suppression.
  - 3. DC-current power supply and 108 – 132/60/1 AC-current.
  - 4. Function in temperature range of 0° F through 131° F.
- 4 Control range from zero (0) to twelve (12) feet with a repeat capacity of +/- 0.1 feet.
- 5 High water alarm visible indicator on control panel. Maintain alarm signal until manual reset.



- 6 High water alarm audio indicator. Maintain alarm signal until manual reset of silence circuit.

***DIVISION II***

***DESIGN REQUIREMENTS***

**SECTION 6: LIFT STATIONS or BOOSTER PUMP STATIONS**

**6.07 Telemetry**

- A. Lift stations or booster pump station shall be capable of being monitored from remote location via SCADA.
- B. Discrete output signal wiring shall be installed on pre-wired terminal blocks for future SCADA monitor. The signal output shall be for wet well high level, pump motor temperature and pump operation status.

**6.08 Backup Power System**

- A. Each lift station or booster pump station shall be equipped with one (1) prefabricated, skid-mounted, weatherproof, backup power system as manufactured by Precision Systems, Inc.
  - 1. The system shall monitor the incoming electrical utility and, should power from the utility be interrupted, supply the power required to operate one pump motor and required controllers.
  - 2. Power system within 50 feet of an occupied structure shall be equipped with a sound attenuation device to reduce noise levels to less than 80 decibels.
- B. The power system shall supply three-phase power and be equipped as follows.
  - 1. Onan/Cummings diesel engine generator set: minimum 20 kw generator: performance rated at 70% capacity of calculated load for single pump motor.
  - 2. Fabricated steel base structure.
  - 3. One-piece seamless fiberglass enclosure.
  - 4. Intake and exhaust louvers.
  - 5. Insulated exhaust.
  - 6. Internal fuel tank to supply generator for 24-hour continuous operation with fuel fill basin.

***DIVISION II***

***DESIGN REQUIREMENTS***

**SECTION 6: LIFT STATIONS or BOOSTER PUMP STATIONS**

7. Engine control and generator control.
8. Automatic transfer switch.
9. Discrete outputs for the following alarm conditions: Over crank; Over speed; High engine temperature; Low engine temperature; Low oil pressure; Switch off; Low fuel.

**6.09 Slabs and Wet Well**

- A. Lift station pumps, booster pumps and controllers shall be mounted to a monolithically poured 4,000 psi reinforced concrete slab. The slab shall have a minimum depth of eight (8) inches. The slab shall extend two (2) feet beyond the outside edges of the wet well and three (3) feet beyond the edges of the lift station enclosure.
- B. Backup power systems shall be mounted to a monolithically poured 4,000 psi reinforced concrete slab. The slab shall have a minimum depth of eight (8) inches. The slab shall extend six (6) inches beyond all sides of fiberglass enclosure.
- C. Lift station wet well shall be as follows:
  1. Wet well shall be a minimum 6-foot in diameter (or equivalent rectangular area).
  2. Wet well shall be sized to provide storage above the high-level alarm equal to four (4) hours at design flow.
  3. Wet well shall resist floatation during construction. Submit wet well buoyancy calculation.
  4. Access to the wet well shall be provided via a 2-foot diameter manhole ring and cover situated two (2) feet centered from inside edge of wet well.
- D. Use Detail Nos. 24.1 and 25.1 when applicable.

***DIVISION II***

***DESIGN REQUIREMENTS***

**SECTION 6: LIFT STATIONS or BOOSTER PUMP STATIONS**

**6.10 Electrical Service and Area Lighting**

- A. Electrical service to the lift or booster pump station shall be 3-phase power.
- B. Service wire from the access entrance to all components of the lift station shall be stranded copper cable sized to meet NEC code.
- C. Lift or booster pump station components shall be grounded to a common copper grounding rod in accordance with NEC code.
- D. Area security lighting shall be installed at each lift station and consist of a photocell having a minimum 150 watt metal halide fixture. The light shall be installed at a minimum height of 15 feet above finished grade. The light pole shall be tubular steel and factory finished with a dark bronze color coating. The light pole shall be anchored in accordance with the manufacturer's recommendations.

**6.11 Site Area**

A lift or booster pump station shall be provided a minimum 40-foot by 40-foot site area; a larger site area may be required. The lift station shall intersect a public right-of-way via an access road situated on the Developer's property.

- A. Site area shall be situated no closer than fifty (50) feet from the nearest structure.
- B. Lift station or booster pump station site areas shall be sloped away from the wet well at a minimum 1.0% slope.
- C. That portion of the lift station site area not in concrete shall be covered with stone (size R2) at a minimum depth of six (6) inches. Stone shall be placed atop a geofabric liner.
- D. Potable water and a non-freeze yard hydrant shall be provided at each lift station.

***DIVISION II***

***DESIGN REQUIREMENTS***

**SECTION 6: LIFT STATIONS and BOOSTER PUMP STATIONS**

- E. The site area shall be fenced as follows.
    - 1. Fence shall have height of six (6) feet with three (3) stands of galvanized barbed wire atop posts.
    - 2. Fence mesh shall be 9-gauge wire (galvanized).
    - 3. Top rail shall be 1-5/8 inch diameter schedule SS40.
    - 4. Intermediate post shall be 2-inch diameter schedule SS40.
    - 5. Corner and gate posts shall be 3-inch minimum diameter schedule SS40.
    - 6. Gate shall have a width of twelve (12) feet, two 6-foot swing gates positioned in location approved by the WCW&SA.
    - 7. The fenced area shall provide a minimum 5-foot clearance from all lift station components.
  - 7 The gate shall be secured by the WCW&SA with a keyed lock conforming to the WCW&SA standard; and
  - 8 “No Trespassing” signs to include lift station name, address and emergency phone numbers shall be installed on all fenced sides by the WCW&SA conforming to the WCW&SA standard.
- F. Site area shall be provided a twelve (12) foot wide concrete access road. Road material may be changed as approved by the WCW&SA Executive Director.
- G . Use Detail Nos. 26.1 and 27.1.