

# **BARTOW COUNTY UTILITY DETAILS AND SPECIFICATIONS**

Bartow County Water Department



**Date:**

**5/15/2023**



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## 1 POLICIES AND PROCEDURES

### 1.1 Purpose Statement

#### 1.1.1 Authority and Title

These Design and Construction Standards are adopted by the Bartow County Water Department under the authority of the Constitution of the State of Georgia. These regulations shall be known as “Bartow County Water Department (BCWD) Design and Construction Standards,” and may be referred to generally as “Design and Construction Standards.”

#### 1.1.2 Purpose and Intent

The purpose of this document is to set forth the policies, procedures, design requirements, material requirements, and construction requirements of the Bartow County Water Department for the design, installation, and construction of water distribution and sanitary sewerage systems.

#### 1.1.3 Amendments and Revisions

The Bartow County Water Department reserves the right to amend and/or revise these “Design and Construction Standards” whenever it is determined to be necessary to improve the performance and integrity of the water distribution and sanitary sewerage systems.

## 1.2 Definitions

**ACI:** American Concrete Institute

**ANSI:** American National Standards Institute

**ASTM:** American Society for Testing and Materials

**AWWA:** American Water Works Association

**BCWD:** Bartow County Water Department

**BCWD Engineer:** The Bartow County Water Department’s engineer or authorized representative.

**Contractor:** Any individual, firm, or corporation with whom a contract is made by the developer or the BCWD for the purpose of constructing the water distribution and/or sanitary sewerage systems described herein.

**Developer:** Any individual, firm, or corporation who contracts with a contractor to construct a

water distribution and/or sanitary sewerage system.

**Developer’s Engineer:** The engineer who is hired by the Developer and is in responsible charge of the water distribution and/or sanitary sewerage system design. Developer’s engineer must be licensed by the Georgia State Board of Registration for Professional Engineers and Land Surveyors.

**DIP:** Ductile Iron Pipe

**DIPRA:** Ductile Iron Pipe Research Association

**Domestic Wastewater:** Wastewater from sanitary fixtures such as toilets and urinals.

**Food Service Facility:** Any facility which cuts, cooks, bakes, prepares, or serves food, or which disposes of food related wastes.



**Flow Sensor:** An inline device installed at or near the supply point of the landscape irrigation system that produces a repeatable signal proportional to flow rate.

**GIS:** Geographic Information System

**GPD:** Gallons per day

**GPM:** Gallons per minute

**Grease:** A material composed primarily of fats, oil, and grease from animal or vegetable sources. The terms fats, oil, and grease shall be deemed as Grease by definition. Grease may also include petroleum-based products.

**Landscape Irrigation System:** An assembly of component parts that is permanently installed for the controlled distribution of water to irrigate landscapes.

**Large Landscapes:** All landscapes other than those in the yards of one and two-family dwellings.

**MGD:** Million Gallons per Day

**Master Shut-Off Valve:** An automatic valve installed at the irrigation supply point which controls water flow into the landscape irrigation system. When this valve is closed, water will not be supplied to the landscape irrigation system.

**PCF:** Pounds per cubic foot

**PSI:** Pounds per square inch

**PVC:** Polyvinyl chloride

**Rain Sensor Shut-Off Valve:** An electric device that detects and measures rainfall amounts and overrides the cycle of a landscape irrigation system so as to turn off such system when a pre-determined amount of rain has fallen.

**Sanitary Sewer Lateral:** A pipe that extends from a sanitary sewer main to the public street right-of-way or easement for the purpose of providing sewer service to a parcel.

**Sanitary Sewer Main:** A gravity sewer line which has one or more sanitary sewer laterals connected to it.

**Sanitary Sewerage Systems:** A network of pipes, pumps, and force mains for the collection and conveyance of wastewater, or sewage, from a community.

**Service Line:** the pipe from the public water main to the primary service of a customer

**Sewage:** refuse liquids or waste matter usually carried off by sewers.

**Sewerage:** the removal and disposal of sewage and surface water by sewers.

**Sewers:** an artificial, usually subterranean conduit to carry off sewage.

**SCADA:** Supervisory Control and Data Acquisition System

**Water Distribution System:** A network of pipes, valves, and fittings that convey potable water from a water treatment plant to the customers. **Water Main:** An underground pipe greater than 6 inches that is designed to deliver water to multiple customer service lines.

**WaterSense Controller:** Weather-based irrigation controllers, labeled under the U.S. Environmental Protection Agency's WaterSense Program, which includes stand-alone controllers, add-on devices, and plug-in devices that use current weather data as a basis for scheduling irrigation.

## 1.3 Development Procedures and Approval Process

### 1.3.1 Design Phase and Plan Submittal Process

The planning, design and construction of residential, commercial, and industrial developments must be reviewed, approved, and inspected by Bartow County Water Department (BCWD) to verify their accordance with established development procedures, specifications, requirements, local ordinances, and all

other applicable local guidelines prior to final approval and acceptance into the Bartow County Water & Sewer Systems.

### 1.3.2 Requirements for Plan Presentation

Engineering plans shall be prepared on a minimum of 22-inch x 34-inch sheets of paper. All drawing sheets shall be sealed, signed, and dated by a design professional licensed by the Georgia State Board of Registration for Professional Engineers and Land Surveyors. Sealing of documents shall be in accordance with the current Rules and Regulations of the State of Georgia, Chapter 180-12: Sealing of Documents. Engineering plans shall contain the following drawings and information as applicable:


#### A. Cover Sheet

1. Show project name.
2. Show location map with street names, north arrow, and scale (minimum scale shall be 1 inch = 2000 feet).
3. Show Developer/Owner's name, address, email address, and telephone number.
4. Show Engineer's name, address, email address, and telephone number
5. Show the name and telephone number of a 24-hour contact person.
6. State land lot number(s) and district number(s) and physical address of proposed development location.
7. The following notes:

*Approval is based on the information supplied on these drawings. If unknown conditions are encountered or site conditions change, and/or these plans are found to be not representative of site conditions, contact BCWD engineering Department. A design revision and plan re-submittal may be required.*

*Bartow County Water Department requires that every service connection be equipped with a backflow prevention device. Facilities that, in the opinion of BCWD, may potentially introduce hazardous or toxic substances into the water supply will be required to install a reduced pressure assembly that vents to the atmosphere.*

*Any modifications and/or changes to an existing or additions to a portion of the water and sanitary sewer systems is required to be inspected and/or reviewed by BCWD (BCWD Engineering Department Phone # 770-387-5170).*





*Plan approval does not release the Owner, Developer, or Contractor from responsibility for environmental damage, property damage, or endangerment of public health. Responsible parties shall mitigate impacts, repair damage, and compensate affected parties as required by local and state law.*

*All construction and materials shall be in full accordance with current Ordinances and Design Standards and Specifications published by Bartow County and Bartow County Water Department. It is the responsibility of each Developer and Contractor to familiarize himself/herself with all current rules and standards.*

*BCWD will obtain road bore permits and road cut permits at the State level for all approved projects. Road bore and/or cut work shall not begin until permits are obtained.*

## **B. Overall Site Plan Sheet(s)**

1. Show north arrow and scale (minimum scale shall be 1 inch = 500 feet).
  2. Show property lines with bearings and distances.
  3. Show land lot lines and district lines.
  4. Show any jurisdictional (city or county) boundary lines.
  5. Show names of adjacent property owners.
  6. Show all existing and proposed structures, roads, etc.
  7. Show all roads adjacent to and within the proposed development.
  8. Show all streams, lakes, and wetland areas.
  9. Show all State waters located within 200 feet of the project site.
  10. Show all undisturbed buffers.
  11. Show a minimum of two (2) benchmarks referenced to BCWD GIS for horizontal and vertical control.
  12. Coordinate system shall be per GA WEST NAD 83.
  13. State the total acreage of the development.
  14. State the total disturbed acreage.
  15. State the acreage of contributing drainage basins to the proposed development.
  16. State the total number of lots or units in the proposed development.
- 



### C. Grading Plan Sheet(s)

1. Show north arrow and scale (minimum scale shall be 1 inch = 50 feet).
2. Show existing topography (in gray scale) and proposed topography with contour intervals in accordance with the following:

Ground Slope	Contour Interval
Flat (0% to 2%)	0.5 foot or 1 foot
Rolling (2% to 8%)	1 foot or 2- foot
Steep (greater than 8%)	2-foot, 5-foot, or 10-foot

3. Show existing and proposed spot elevations as required.
4. Show clearing limits.

### D. Water Distribution System Plan Sheet(s)

1. Show north arrow and scale (minimum scale shall be 1 inch = 50 feet). If Minimum scale does not capture entire water system layout, create a separate plan sheet to illustrate an overall utility layout for water system proposed (minimum scale 1 inch = 500 feet).
2. Show proposed water line location with staking information (include water line size and material).
3. Show grading plan in gray scale.
4. Show all existing utilities (in gray scale) and proposed utilities.
5. Show all stormwater drain lines and structures in gray scale (include line size, material, and invert data).
6. Show all property lines, right-of-way lines, permanent easement lines and temporary easement lines.
7. Show names of property owners and/or Parcel ID numbers.
8. Show all State water buffers, wetland areas, and 100-year flood plain elevation.
9. Show the following standard construction notes:

*a) Pre-construction conference is required with the Bartow County Water Department prior to water/sewer line construction.*

*b) Contractor for the water/sewer line MUST have a state approved license and be on the approved list for Bartow County Water Department.*

*c) Water service shall not be activated until all lines, meters, and backflow prevention devices are pressure tested, disinfected, and certified with all public lines and meters being deeded over to BCWD. This includes both fire and domestic water service.*

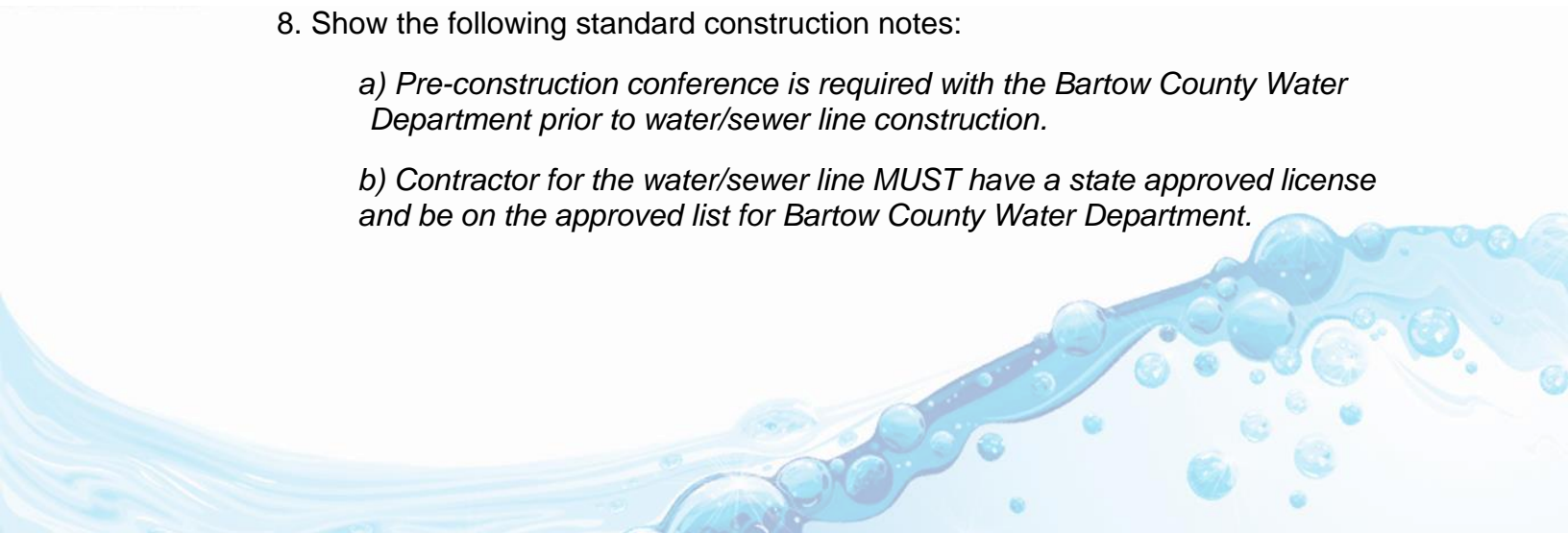
*d) Water and Sewer Utility Easements shall be recorded and executed prior to as-built approval.*

#### **E. Water Distribution System Detail Sheet(s)**

1. Use BCWD standard details located at [www.bartowcountyga.gov](http://www.bartowcountyga.gov) under the Development tab/Design and Construction Standards where applicable.

#### **F. Sanitary Sewer System Plan Sheet(s)**

1. Show north arrow and scale (minimum scale shall be 1 inch = 50 feet). If Minimum scale does not capture entire sewer system layout, create a separate plan sheet to illustrate an overall utility layout for sewer system proposed (minimum scale 1 inch = 500 feet). Provide a sheet index key for more than 2 sheets.
2. Show proposed sewer line and manhole locations with staking information (include sewer line size and material).
3. Show grading plan in gray scale.
4. Show all existing utilities (in gray scale) and proposed utilities Bartow County Water Department Standards and Specifications.
5. Show all stormwater drain lines and structures in gray scale (include line size, material, and invert data).
6. Show all property lines, right-of-way lines, permanent easement lines, and temporary easement lines.
7. Show names of property owners and/or Parcel ID numbers.
8. Show the following standard construction notes:
  - a) Pre-construction conference is required with the Bartow County Water Department prior to water/sewer line construction.*
  - b) Contractor for the water/sewer line MUST have a state approved license and be on the approved list for Bartow County Water Department.*



- c) All fire line meters shall be new, Badger brand, and installed per BCWD standards. (Refer to BCWD Design and Construction Standards for approved models).*
- d) Water service shall not be activated until all lines, meters, and backflow prevention devices are pressure tested, disinfected, and certified with all public lines and meters being deeded over to BCWD. This includes both fire and domestic water service.*

### **G. Sanitary Sewer System Profile Sheet(s)**

1. Show horizontal and vertical scale (minimum horizontal scale shall be 1 inch= 50 feet; minimum vertical scale shall be 1 inch = 10 feet).
2. Show proposed sanitary sewer profile (include sanitary sewer size and material).
3. Show slope of each section of sanitary sewer.
4. Show location of existing utilities that are crossing proposed sanitary sewer.
5. Show “invert in,” “invert out,” and “rim” elevations for each proposed and existing manhole in profile.
6. Show existing and proposed ground surface profile.
7. Show approximate creek bottom elevation when lines are running adjacent to a creek.
8. As necessary, show 5ft and 15ft cover depth offset lines (in gray scale, dashed or dot line-type) from the proposed finished grade along the sewer profile.

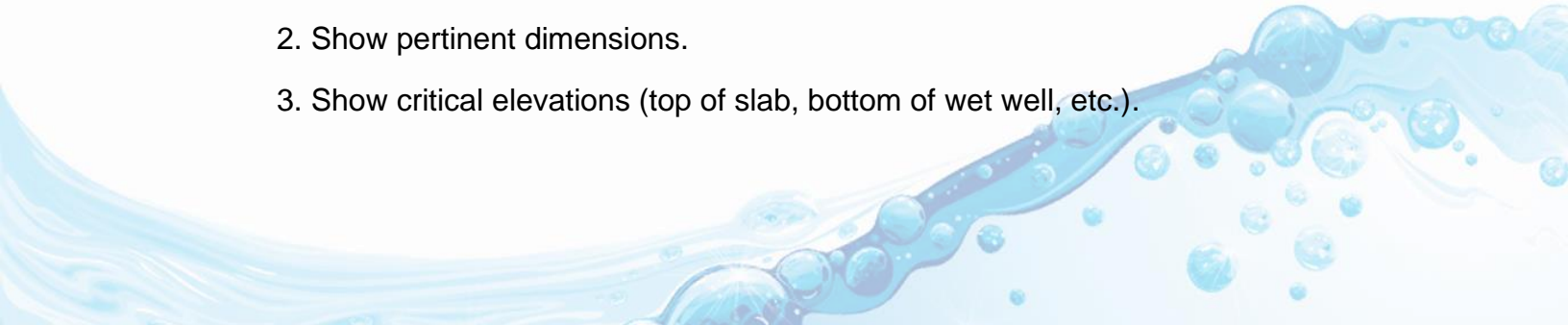
### **H. Sanitary Sewer System Detail Sheet(s)**

Use BCWD standard details where applicable.

### **I. Sanitary Sewage Lift Station Plan Sheet(s)**

1. Show north arrow and scale.
2. Show Top View of lift station with appropriate dimensions.
3. Show Bottom View of lift station with appropriate dimensions.

### **J. Sanitary Sewage Lift Station Section Sheet(s)**

1. Show pertinent elevation sections.
  2. Show pertinent dimensions.
  3. Show critical elevations (top of slab, bottom of wet well, etc.).
- 

4. Show pump control points (high level alarm, pump on, pump off, low level alarm, etc.).
5. Show pump curve and system head curve.
6. Show pump design point.

#### **K. Sanitary Sewer Force Main Plan Sheet(s)**

1. Show north arrow and scale (minimum scale shall be 1 inch = 50 feet).
2. Show proposed sanitary sewer force main location with staking information (include force main size and material).
3. Show grading plan (in gray scale).
4. Show all existing utilities (in gray scale) and proposed utilities.
5. Show all stormwater drain lines and structures in gray scale (include line size, material, and invert data).
6. Show all property lines, right-of-way lines, permanent easement lines, temporary easement lines.
7. Show names of property owners and/or Parcel ID numbers.
8. Show all State water buffers, wetland areas, and 100-year flood plain elevation.

#### **L. Sanitary Sewer Force Main Profile Sheet(s)**

1. Show horizontal and vertical scale (minimum horizontal scale shall be 1 inch = 50 feet; minimum vertical scale shall be 1 inch = 20 feet).
2. Show proposed sanitary sewer force main profile (include force main size and material).
3. Show location of all existing utilities (in gray scale) that are crossing proposed sanitary sewer force main.
4. Show existing and proposed ground surface profile.
5. Show approximate creek bottom elevation when lines are running adjacent to a creek. As necessary, show 5ft and 15ft cover offset lines (in gray scale, dashed or dot line type).

#### **1.3.3 Plan Review Checklist**

##### **A. Permit Fees**

- a. BCWD charges an initial review fee along with an additional review fee charged for all subsequent resubmittals for review. Payment of the Permit

Fee is due at the time of plan re-submittal. If a re-submittal is not required, the Permit Fee shall be due prior to final approval. The current Permit Fee Schedule is located at [www.bartowcountygov.gov](http://www.bartowcountygov.gov) under the Development tab.

- b. Plats and As-builts are subject to a Review Fee due at the time of submittal.
- c. All Plan Review Fees shall be submitted using the standard form included in Appendix D of this document.

#### B. Connection fees

- a. BCWD has adopted connection fees to ensure that adequate public facilities are available to serve new growth and development in Bartow County and to provide that new growth and development bears a proportionate share of the cost of new public facilities needed to serve them. Connection fees are due at the time of meter purchase/sale.

#### C. Construction Process

- a. Plan approval shall be valid for a period of one (1) year. If construction is not substantially underway within one (1) year of approval date, plan re-submission may be required. BCWD review and approval does not relieve the owner, developer, and/or contractor from any responsibility or liability.

#### D. Expiration of Plan Approval

- a. Plan approval is valid for one (1) year or twelve (12) consecutive months. Projects with approved plans that are not initiated within one (1) year of plan approval, or projects that are initiated and then become inactive for a period, shall become invalid. If an approved plan becomes invalid, BCWD shall determine if the plan can be revalidated, or if a new design and plan submittal is required.

#### E. Plan Modifications

- a. Approved plans shall not be modified or deviated from unless approved in writing by BCWD.

### 1.4 Easements and Deeded Property

#### 1.4.1 General

All water distribution and/or sanitary sewerage system appurtenances that will be owned by the BCWD and are not located in a public street right-of-way, shall be



located in a permanent easement or deeded property that has been conveyed to the BCWD.

All water and sanitary sewer that shall be owned by BCWD shall be summarized in a quantity summary table equal or similar to the example below:

SPEC NO.	CLASS OF WORK	QUANTITY	UNIT
636	INSPECTION MANHOLE (4')	7	EACH
636	MANHOLE (4') WATERTIGHT	1	EACH
636	10"Ø P.V.C. PIPE C900	123	LF
205	TRENCH EXCAVATION	1,500	CUY

All sanitary sewage lift stations shall be located on property that is platted and deeded to the BCWD. Any roads required to access the sanitary sewage lift station from the public street right-of-way shall be included as part of the platted and deeded property or given as an access easement at the discretion of BCWD.

BCWD will not approve any water distribution and/or sanitary sewerage system construction until all off-site easements and/or deeded property is acquired by the Developer/Owner. A design must be submitted and approved before easement acquisition can begin.

#### 1.4.2 Permanent Easements

A permanent easement is a right granted by an underlying property owner that entitles its holder to a specific use of the property in perpetuity.

##### A. "On-Site" Permanent Easements

- a. "On-site" permanent easements are permanent easements which fall within the boundaries of the current phase of the development and are shown on the final plat. Permanent easements are conveyed by recording the Deed of Conveyance and final plat.
- b. The Developer/Owner shall grant to the BCWD, the exclusive right to construct, re-construct, operate, maintain, repair, replace, improve, alter, remove, relocate, and inspect water distribution and/or sanitary sewerage systems that are situated over, across, and under the land wherein the water distribution system and/or sanitary sewerage system lies on the Developer/Owner's property.

##### B. "Off-Site" Permanent Easements

- a. "Off-site" permanent easements are permanent easements which fall outside the boundaries of the current phase of the development and are shown on final the final plat must be provided by the Developer/Owner on

an BCWD easement document for each property where an easement is required to install the water distribution and/or sanitary sewerage system. Plans must be submitted and approved along with an easement plat for each property where an easement is required before the Developer/Owner obtains an easement from the property owner.

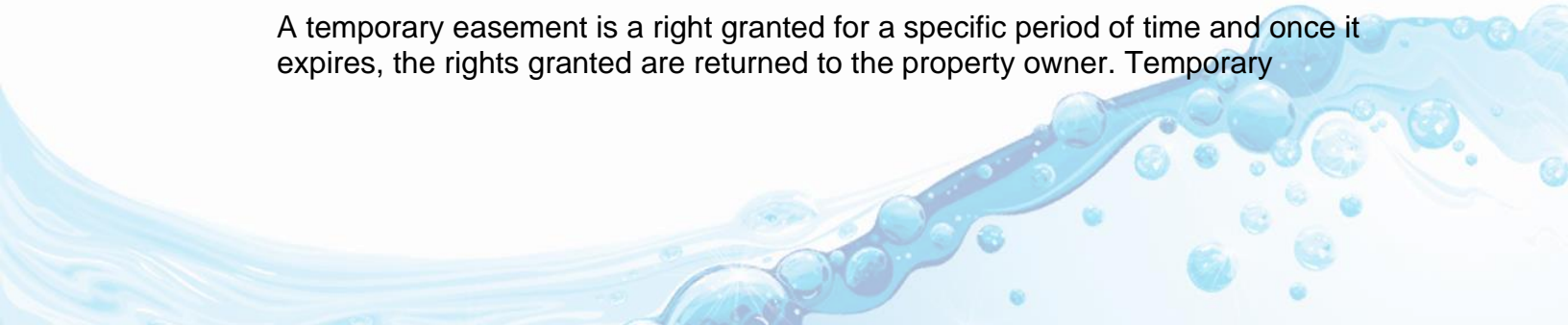
- b. Permanent easements through property owned by the Developer/Owner, including water and sewer lines that will be included in later phases of the same project, shall be treated as routine “off-site” permanent easements. “Off-site” permanent easements shall be negotiated and acquired by the Developer/Owner.
- c. Water distribution and/or sanitary sewerage system plans shall not receive final approval until all “off-site” permanent easements required for system completion are approved and acquired.

#### C. Permanent Easements Requirements

- a. Permanent easements for water distribution systems and sanitary sewage force mains shall have a minimum width of 20 feet. Permanent easements for gravity sewer systems shall have a minimum width of 20 feet.
- b. The water line or sanitary sewage line shall be located in the center of the permanent easement. Permanent easements shall be accessible from the public street right-of-way. If access from a public street right-of-way is not available, permanent ingress/egress easement(s) shall be provided, as required, to provide BCWD access to the water and/or sewer easement. A sufficient number of permanent ingress/egress easements shall be provided so that all portions of the water and/or sewer easement is accessible by the BCWD from the public right-of-way. BCWD will review all proposed easements and deeded property and determine the number and location, if any, of permanent ingress/egress easements required. In some cases, deeded property may be required for ingress/egress in lieu of a permanent easement. BCWD will determine what is required.
- c. Permanent easements for water meters and appurtenances shall extend a minimum of 10 feet beyond the outside of the structure on each side.
- d. The size and/or width of permanent easements may be increased or decreased at the discretion of BCWD.

#### 1.4.3 Temporary Easements

A temporary easement is a right granted for a specific period of time and once it expires, the rights granted are returned to the property owner. Temporary



easements are typically used for the stockpiling of dirt, the maneuvering of equipment, or the storage of materials. BCWD will determine when necessary.

#### A. Deeded Property Requirements

- a. Deeded property is property that is platted and deeded to the BCWD. Deeded property must be provided by the Developer/Owner. The minimum size of deeded property associated with a sanitary sewage lift station is 100-feet by 100-feet square. Sanitary sewage lift station plans shall not receive final approval until the deeded property is approved and acquired. The required size of the deeded property may be modified at the discretion of BCWD.


### 1.5 Installation

#### 1.5.1 General

Water distribution and sanitary sewerage systems shall be constructed in accordance with BCWD approved plans and specifications. A set of BCWD approved plans shall be present on the job site whenever work is being performed on the water distribution and/or sanitary sewerage system, and the plans shall be made available to the BCWD Inspector upon request. Installation of water distribution and/or sanitary sewerage systems shall not commence until BCWD has granted final approval of the construction plans and specifications and the appropriate agency has issued a Development/Land Disturbance Permit. Water distribution and sanitary sewerage systems shall be constructed by a BCWD approved utility contractor.

#### 1.5.2 Approved Utility Contractors

Utility contractors must be licensed by the state of GA and approved by the BCWD prior to performing any work on the BCWD water distribution and sanitary sewerage system. Utility Contractors can obtain an Approved Contractor Application form at the BCWD or by visiting the Development page on the BCWD website at [www.bartowcountygga.gov](http://www.bartowcountygga.gov). The Approved Contractor Application requires that the Utility Contractor submit copies of their State Utility Contractor's License, insurance information, and references. When the application and references have been reviewed and found satisfactory, the Utility Contractor will be placed on probationary status. Should any issues arise, the Contractor will be removed from the list. Approved Contractors will be re-evaluated as determined by BCWD. Approved Contractors will be re-evaluated as determined by BCWD (typically this is performed on an annual basis). During re-evaluation, if the contractor, in the opinion of the BCWD, has not consistently performed up to the standards required for an "Approved Contractor", that Utility Contractor may be removed from the Approved Contractors List. At BCWD discretion, BCWD may choose to remove a contractor.





### 1.5.3 Inspections

A BCWD Inspector, under the direction of BCWD, will inspect the installation of the water distribution and/or sanitary sewerage system on a regular basis during all phases of construction to ensure that the system is being constructed in accordance with the BCWD approved plans and specifications.

All work shall be inspected prior to backfill. It is the Developer/Owner's and/or Utility Contractor's responsibility to schedule inspections and verify that work has been inspected before it is backfilled. Any work that is backfilled prior to inspection shall be exposed when directed by the BCWD Inspector.

The BCWD Inspector will inform the Developer/Owner and/or Contractor when there are deficiencies in workmanship, or when there are deviations from the approved plans and specifications. Developer/Owner and/or Utility Contractor shall address the deficiencies in a timely manner as determined by the BCWD Inspector. Failure to address deficiencies in a timely manner may result in the BCWD issuing a Stop Work order. Failure to address deficiencies and/or disregarding a Stop Work order may result in additional fees and the water distribution and/or sanitary sewerage system will not be permitted to connect to the BCWD system.

Inspection by BCWD does not relieve the Developer/Owner and/or Utility Contractor of their responsibility for constructing the water distribution and/or sanitary sewerage system in accordance with the approved construction plans and specifications herein. The presence of a BCWD Inspector, or BCWD, on the site of work shall not be construed, in any manner, to relieve the Developer/Utility Contractor of their responsibility for strict compliance with the approved development plans, and specifications herein.

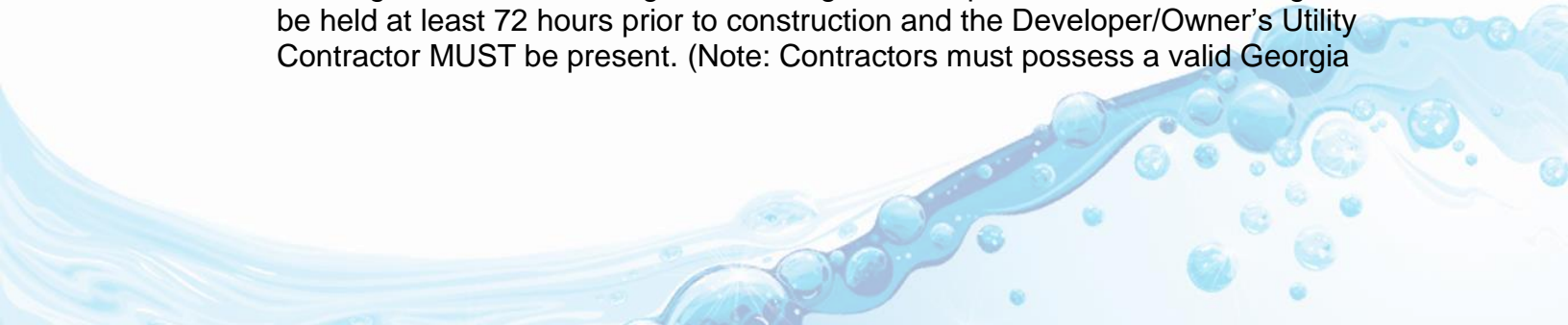
The BCWD Inspector shall not change or modify the approved water distribution and/or sanitary sewer system plans, or specifications herein, without written approval from BCWD.

### 1.5.4 Pre-Construction Meetings

Prior to beginning construction of any water distribution and/or sanitary sewerage system, there is a required pre-construction meeting with BCWD.

#### A. Office Meeting

Developer/Owner and/or Utility Contractor shall arrange a pre-construction meeting with BCWD, or Engineer's Designee. The pre-construction meeting shall be held at least 72 hours prior to construction and the Developer/Owner's Utility Contractor MUST be present. (Note: Contractors must possess a valid Georgia



Utilities Contractor License and be formally approved by the Bartow County Water Department.

### **1.5.5 Testing**

Water distribution and sanitary sewerage systems shall be tested at the expense of the Developer/Owner. Testing methods and practices shall be as specified in these Design and Construction Standards, Division Four – Construction Standards, Section 7 - Testing.

### **1.5.6 Warranty**

The Developer/Owner shall provide a warranty for the water distribution and/or sanitary sewerage system against all defects in materials and workmanship for a period of one (1) year after Final Acceptance. This warranty shall be backed by a one (1) year Letter of Credit, Maintenance Bond, or Escrow Agreement with BCWD.

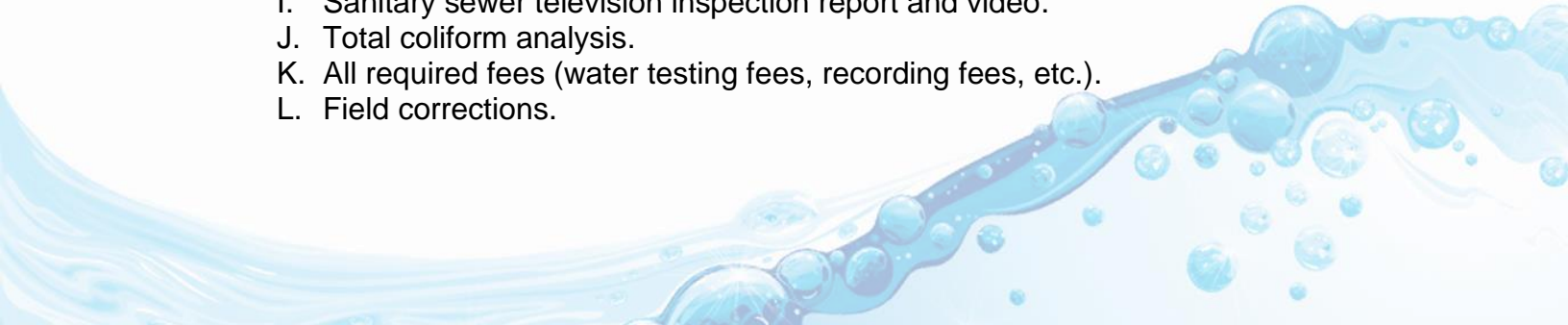
A warranty inspection with the owner or appointed designee shall be scheduled approximately nine (9) months from the date of acceptance. If a punch list is necessary, the owner or designee shall work in coordination with BCWD to facilitate resolution of the list items.

During the warranty period, the Developer/Owner shall be responsible for any damage to the water distribution and/or sanitary sewerage system.

## **1.6 Final Acceptance**

### **1.6.1 General**

Prior to Final Acceptance of the water distribution and/or sanitary sewerage system for meter sales and final platting, the BCWD will make a final inspection after all pavement is installed and the Developer/Owner shall provide the following items to the BCWD:

- A. Deed of Conveyance.
  - B. Contribution of Fixed Assets form.
  - C. Lien waiver(s).
  - D. Corporate Owner's Affidavit.
  - E. Corporate Contractor's Affidavit.
  - F. Two (2)-year Letter of Credit/Bond/Escrow Agreement with BCWD.
  - G. Two (2) hard copies of the Record Drawings and one (1) digital copy of the Record Drawings.
  - H. Two (2) hard copies of Final Plat and one (1) digital copy of the Final Plat.
  - I. Sanitary sewer television inspection report and video.
  - J. Total coliform analysis.
  - K. All required fees (water testing fees, recording fees, etc.).
  - L. Field corrections.
- 

M. Water will not be left on, and meters will not be set, until all required documents and information are delivered to the BCWD.

### **1.6.2 Deed of Conveyance**

A Deed of Conveyance is a legal document signed, sealed, and delivered to effect a transfer of property, and to show the legal right to possess it. A Deed of Conveyance shall be provided for all easements and property to be dedicated to the BCWD.

### **1.6.3 Contribution of Fixed Assets Form**

The Contribution of Fixed Assets form itemizes the public assets that are being dedicated to the BCWD. This form shall only include “public” materials and appurtenances. “Private” materials and appurtenances shall not be included on the form. The Contribution of Fixed Assets form can be obtained by visiting the Development page on the BCWD website at [www.bartowcountyga.gov](http://www.bartowcountyga.gov).

#### **A. Lien Waivers**

- a. The BCWD must ensure that all materials being dedicated as public assets have been paid for; therefore, a lien waiver shall be secured from each supplier where materials and/or equipment were purchased.

#### **B. Owner's Affidavit**

- a. The BCWD must ensure that all labor and materials required to construct a project have been paid for and that there are no liens on the property; therefore, the Developer/Owner shall prepare a Corporate Owner's Affidavit and submit it to the BCWD. A Corporate Owner's Affidavit form can be obtained by visiting the Development page on the BCWD website at [www.bartowcountyga.gov](http://www.bartowcountyga.gov).

#### **C. Contractor's Affidavit**

- a. The BCWD must ensure that the utility contractor has been paid in full and that there are no liens on the property; therefore, the utility contractor shall prepare a Corporate Contractor's Affidavit and submit it to the BCWD. A Corporate Contractor's Affidavit form can be obtained by visiting the Development page on the BCWD website at [www.bartowcountyga.gov](http://www.bartowcountyga.gov).

#### **D. One-Year Letter of Credit/Bond/Escrow Agreement**

- a. A Letter of Credit, Bond or Escrow Agreement shall be provided to the BCWD as a warranty for the materials and workmanship for the water distribution and/or sanitary sewerage system. The term of the Letter of

Credit, Bond or Escrow Agreement shall be one (1) year and the amount of shall be determined by BCWD and based on the amount of infrastructure installed.

- b. Prior to the expiration of the Letter of Credit, Bond or Escrow Agreement, a warranty inspection will be conducted by the BCWD. The Developer/Owner will be required to correct any deficiencies that are found. Upon satisfactory repair of any deficiencies that are found, the BCWD will release the Letter of Credit, Bond or Escrow Agreement. A sample Letter of Credit can be obtained by visiting the Development page on the BCWD website at [www.bartowcountygga.gov](http://www.bartowcountygga.gov) under Conveyance Package.

#### E. As-built Drawings

- a. As-Built (Final) Drawings shall be submitted to the Bartow County Water Department along with appropriate Plan Review Fee detailing the exact location of all Water and/or Sewer Utility System infrastructure including service mains, service taps, valves, manholes and fire hydrants. These As-Built (Final) Drawings shall be produced by the Engineer of Record for the Development and presented on two (2) complete sets of fresh drawings, along with electronic As-builts on state plane coordinate system, USA, GA, NAD 1983 West Foot.
- b. The Engineer of Record must also certify upon the As-Built (Final) Drawings that they (or his/her designated representative under their direct supervision) have made sufficient visits to the development confirming that the said development was constructed in accordance with Bartow County Water Department Plans and Specifications as approved.
  - i. *I certify that the plans and specifications of this project were designed in accordance with all applicable standards. I have reviewed the as-built survey for this project and have found the facilities, structures, and utilities as shown on that survey to be in conformance with the design drawings for this project.*
- c. The Developer must provide printed name, signature, and certification that the project has been constructed in accordance with BCWD Design and Construction Standards and Bartow County Ordinances and that the project has been built as shown on the “As-Built” drawings. The following standard certification language shall appear on each sheet of the “As-Built” drawings, accompanied by the signature of the owner/developer, prior to approval of the drawings by BCWD.

- i. I certify that this project has been constructed in accordance with Bartow County Water Department's Design and Construction Standards and Ordinances, latest editions.*
  - ii. I certify that this project has been built as shown on the "As-Built" drawings. I further certify that I have field verified all elevations, volumes, and locations as appropriate for the potable water and sanitary sewer infrastructure depicted on these drawings.*
- d. Each Certification statement, as listed in this section, shall be accompanied by the appropriate signature and name typed or written legibly below each signature along with the date.
- e. The As-Built Drawings must be sealed, signed, and dated by a design professional licensed by the Georgia State Board of Registration for Professional Engineers and Land Surveyors.
  - i. Shall show all street names, right-of-way widths, easements, lot numbers and addresses, and location, size, and material of all water distribution and/or sanitary sewerage system components. Plan and Profile information shall be provided for gravity sewers and sanitary sewer force mains; and*
  - ii. Shall be checked and signed by BCWD Engineering Inspector prior to final submittal. Submit two (2) full-size sets of Record Drawings and one (1) digital file.*

#### F. Digital Data Submission Standards

- a. Digital Record Drawings shall be prepared in accordance with BCWD "Digital As-Built CAD Standards" which can be obtained by visiting the Development page on the BCWD website at:  
[www.bartowcountygga.gov](http://www.bartowcountygga.gov).

#### G. Final Plat

- a. Submit two (2) hard copies and one (1) digital file of the Final Plat. A digital file shall be prepared in accordance with BCWD CAD standards.

Final Plat shall contact the following note:

- iii. "Approval of this plat and acceptance of the project represented herein shall be deemed to be an acceptance by Bartow County Water Department of all dedicated water and sanitary sewer mains, pump stations, and lift stations that serve more than one (1)*



*property owner. As a condition of approval of this plat and acceptance of this project by BCWD, the developer and owner hereby covenant that any future deed conveying all or any portion of the property or lots shown herein shall specifically refer to this plat and incorporate this plat by reference."*

#### H. Maintenance Requirements

- a. The Owner must maintain all water and sanitary sewer infrastructure accepted by BCWD for a period of one (1) year after acceptance. BCWD will own and provide maintenance on all accepted infrastructure in perpetuity after this one (1) year period.

#### I. Fees

- a. Inspection fee sheet will be provided by BCWD, and all fees shall be paid prior to the issuance of an Acceptance Letter from BCWD.
- b. Water usage for filling and flushing will be billed at \$7.41 per thousand (1,000) Gallons based upon a minimum of four (4) times the volume of the pipe. {Example: 5,000 LF 8" Pipe X 2.61 Gallons/ft X \$7.41/Thousand (1,000) Gallons X 4=\$386.80} The Contractor must adhere to Bartow County Water & Sewer System Specifications per materials used and methods of installation (Note: Please see "Bartow County Water & Sewer System Construction Procedures & Specifications").
- c. All fees due to the BCWD shall be paid in full. A current fee schedule can be obtained by visiting the Development page on the BCWD website at [www.bartowcountyga.gov](http://www.bartowcountyga.gov).

#### J. Field Corrections

- a. A final inspection shall then be conducted by the Bartow County Water Department to assure that these As-Built (Final) Drawings are accurate and that all meter setters, meter boxes, sewer taps, sewer manholes and all other Water and/or Sewer Utility System infrastructure has been properly installed.
- b. Prior to Final Acceptance, Developer/Owner and/or Contractor shall make all corrections to the water distribution and/or sanitary sewerage system as directed by the BCWD Inspector.



## 2 POTABLE WATER DESIGN STANDARDS

All water distribution systems that will be connected to the BCWD water system shall be designed in accordance with these standards. Any deviation from these standards shall be approved in writing by BCWD.

Marker balls shall be installed every 200-ft along force mains and water mains, and at all fittings & casing ends.

### 2.1 Water Line Size

- A. Minimum Water Main Size: 8-inch Diameter.
- B. Service laterals shall be ¾-inch Diameter.

### 2.2 Pressure

Pressure at Residential Meters: Min 30 psi – Maximum 160 psi

### 2.3 Fire Flow Requirements\*

A pre-development fire flow test shall be conducted on the water main that will be used to supply water to the proposed development in addition to a 24-hour static pressure test. Flow tests must be performed by BCWD. (Fire Flow requirements are determined by FM).

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

\*Determined by the Fire Marshall

Fire flow test must be performed by BCWD. No third-party test will be accepted.

## **2.4 Location**

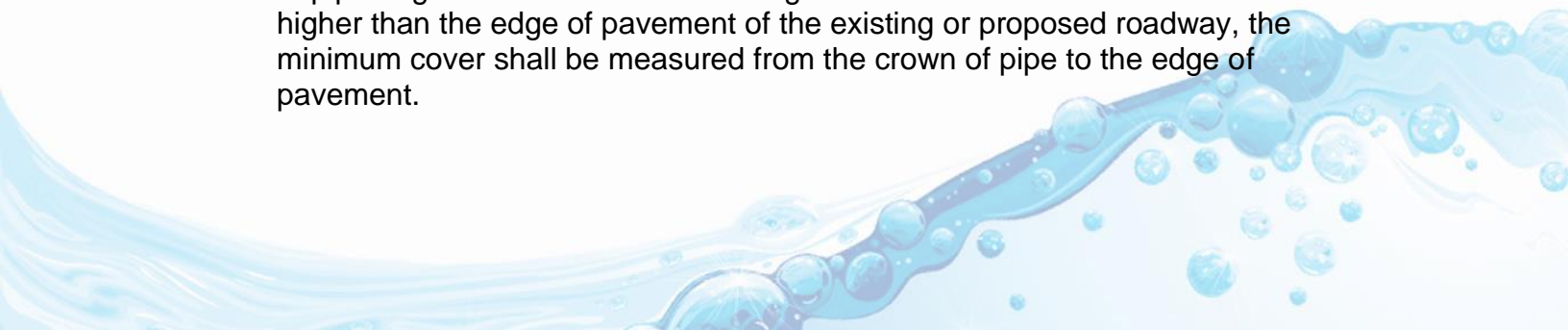
- A. Locate in right-of-way or in a permanent easement specifically designated for the water line.
- B. The proposed water main shall be located on the south and west side of street and nine (9) feet behind back of curb or edge of pavement, unless otherwise approved by BCWD.
- C. Use Details W-17 to W-19B located at: [www.bartowcountyga.gov](http://www.bartowcountyga.gov) when applicable.
- D. Maximum spacing between valves shall be 1,000 feet or as directed by BCWD.
- E. Maximum spacing between hydrants is 500 feet.

## **2.5 Backflow Prevention**

- A. Backflow preventers shall be installed on all service connections.
- B. Residential Service Connections: backflow preventers shall be provided by the Developer on all residential service connections.
- C. Commercial Service Connections: backflow preventers shall be provided by the Developer/Owner on all commercial connections.
- D. A double check backflow preventer shall be provided on all medium risk commercial and fire service lines with meters. Commercial accounts servicing multi-unit outparcels with a 2" or smaller meter require a Reduced Pressure Zone assembly?
- E. A Reduced Pressure Zone Assembly is required for high-risk customers.
- F. A Reduced Pressure Zone Assembly is required on all commercial irrigation systems.
- G. Use Detail W-12 When applicable located at: [www.bartowcountyga.gov](http://www.bartowcountyga.gov).

## **2.6 Depth and Material**

- A. Water lines shall have a minimum of 42" inch of cover as measured from crown of pipe to ground surface. Where the ground surface above the water line is higher than the edge of pavement of the existing or proposed roadway, the minimum cover shall be measured from the crown of pipe to the edge of pavement.





- B. All watermain shall be, at a minimum, PR 350 Ductile Iron Piping (DIP) or as specified for special conditions as determined by BCWD Engineering which shall be addressed on a per-development basis. Note: The BCWD will instruct contractors as to any special provisions regarding these conditions.

## **2.7 Valves**

### **2.7.1 Blow-Off Valves**

- A. Blow-off valves, when required by BCWD, shall be located at critical high points and low points along the water line.
- B. Fire hydrants may be provided in lieu of blow-off valves.
- C. Blow-off valves at high points shall be tapped into the top of the water line.
- D. Blow-off valves at low points shall be tapped into the bottom of the water line.
- E. Blow-off valves shall be a minimum of 2 inches in diameter and must be capable of providing a minimum flushing velocity of 2.5 feet per second in the water line.
- F. Blow-off valves shall not be directly connected to any sanitary sewerage line or storm drainage line nor shall the blow-off be subject to flooding.

### **2.7.2 Isolation Valves**

- A. Type
  - a. Gate valves shall be used on water lines with nominal diameters less than or equal to 24 inches.
  - b. Butterfly valves shall be used on water lines with nominal diameters greater than 24-inches.
- B. Location and Spacing
  - a. Locate isolation valves immediately downstream of all 3-way and 4-way connections. No crosses are allowed. Additional valves may be required at the discretion of BCWD.
  - b. Maximum spacing for isolation valves shall be 1,000 feet.

### **2.7.3 Air Release Valves**

- A. Air release valves shall be provided at all locations along the water main deemed appropriate as determined by the design engineer or as directed by BCWD.



- B. Air release valve locations are subject to review by the BCWD.
- C. Air release valves shall be sized in accordance with the manufacturer's recommendations.

## **2.8 Crossing and Parallel**

- A. Water mains shall be laid at least 10 feet horizontally from any existing or proposed sanitary sewer or sewer manhole unless otherwise approved by BCWD. Distances shall be measured from outside of pipe to outside of pipe/structure.
- B. Water lines that cross an existing or proposed sanitary sewer or storm drain line shall have a minimum clearance of 18 inches vertically, preferably above the top of the sewer line being crossed unless otherwise approved by BCWD.
- C. At crossings, one (1) full length of water line shall be located so that both pipe joints will be as far from the sanitary sewer line or storm drain line as possible. Pipes should be restrained as determined by BCWD.

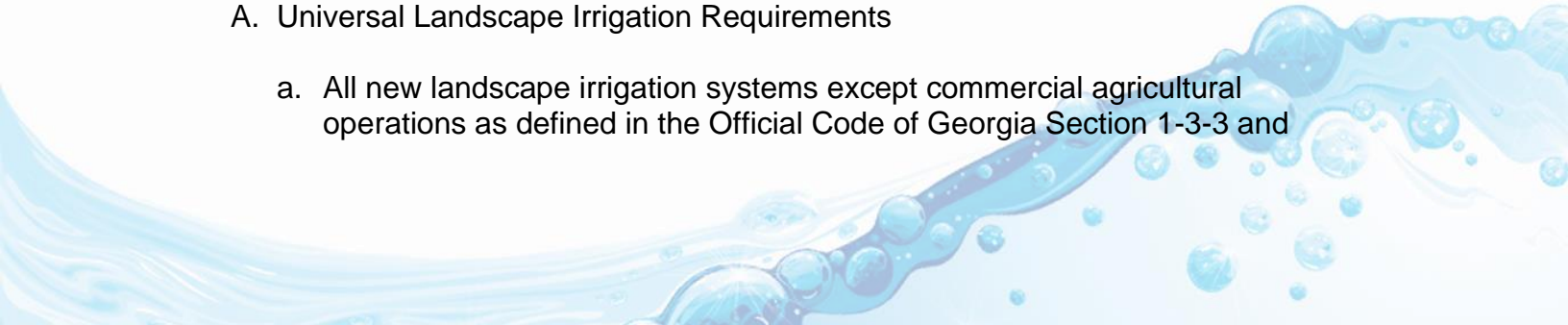
## **2.9 Jack and Bore Installations**

- A. Unless otherwise approved, water mains that cross a GDOT roadway, Bartow County DOT roadway, or railroad right-of-way shall be installed with cased jack and bores.

## **2.10 Surface Water Crossings**

- A. Surface water crossings, both over and under water shall be approved by BCWD before final plans are accepted.
- B. Above water crossings are discouraged and only allowed upon BCWD approval. At above water crossings, the pipes shall be adequately supported and anchored, protected from damage, freezing, and accessible for repairs or replacement.
- C. A minimum cover of 2 feet shall be provided.
- D. Valves shall be required at both ends of pipe at water crossings. The valve closest to the supply source shall be in a manhole. Valves shall be located outside of the 100-year flood plain.

## **2.11 Irrigation Systems**

- A. Universal Landscape Irrigation Requirements
    - a. All new landscape irrigation systems except commercial agricultural operations as defined in the Official Code of Georgia Section 1-3-3 and
- 

athletic fields, golf courses or public turf grass recreational areas must include:

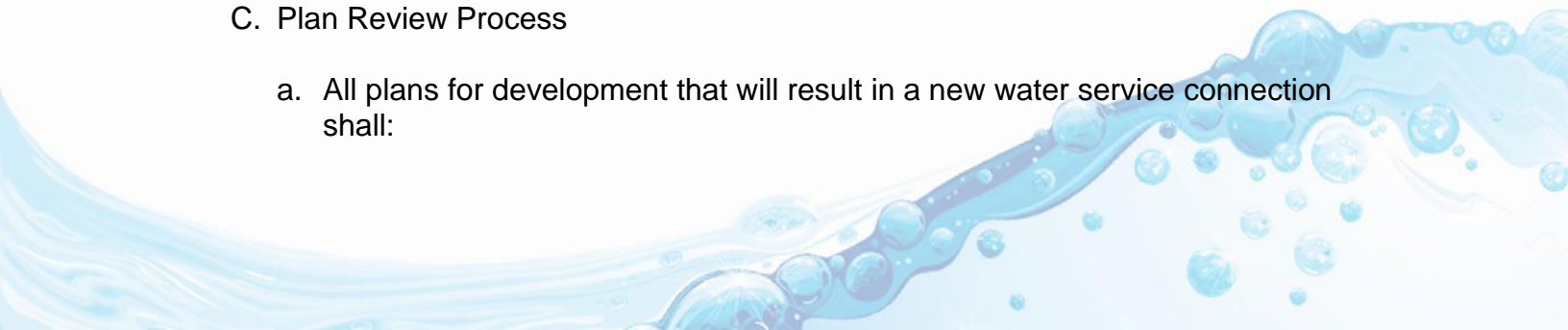
- i. A backflow prevention assembly in accordance with the applicable plumbing code requirements.
- ii. A WaterSense controller.
- iii. A rain sensor shutoff device installed in an area that is unobstructed by trees, roof overhangs, or anything else that might block rain from triggering the rain sensor shutoff device.

#### B. Large Landscape Irrigation Requirements

- a. As of January 1, 2019, all new large irrigations systems, (greater than one acre or 43,560 sq. ft. and excluding single-family homes) must include:
  - i. All of the items in Part A of the Universal Landscape Irrigation Requirements.
  - ii. A master shut-off valve (such as a gate valve, ball valve, or butterfly valve) installed as close as possible to the point of connection of the water but downstream of the backflow prevention assembly.
  - iii. Pressure-regulating devices such as valve pressure regulators, sprinkler head pressure regulators, inline pressure regulators, or other devices shall be installed as needed to achieve the manufacturer's recommended pressure range at the emission devices for optimal performance.
  - iv. At least one flow sensor connected to the WaterSense controller that will detect and report high flow conditions and shut master valves above.
- b. Homeowner's Associations should add together all of their owned irrigated property to determine if it is a large landscape (greater than one acre).
- c. Irrigation systems that use water withdrawn from private wells or surface water by an owner or operator of a property do not apply if solely on their property.
- d. The landscape irrigation system shall be designed, installed, and maintained to prevent runoff from leaving the target landscape due to low-head drainage, overspray, or other similar conditions were water flows onto adjacent property, non-irrigated areas, walks, roadways, parking lots, or structures.

#### C. Plan Review Process

- a. All plans for development that will result in a new water service connection shall:



- i. Include clear language specifying if such development will or will not include any landscape irrigation systems.
- ii. Include sufficient detail through written statements or drawings showing that all landscape irrigation system requirements will be met.
- iii. Before initiating service to a new connection, all plans must be in compliance with all landscape irrigation system requirements.

## **2.12 Fire Hydrants**

### **A. Location**

- a. Locate fire hydrants within the street right-of-way or in a permanent easement.
- b. Locate 2 feet inside right-of-way when possible.
- c. A fire Hydrant shall be placed at the end of all cul-de-sacs and dead-end streets.
- d. Fire Hydrants shall be M&H, American Darling or a BCWD approved equal.
- e. Bollards may be required per BCWD discretion.

### **B. Orientation**

- a. Pumper nozzle shall be oriented toward the street unless otherwise approved the BCWD.

### **C. Spacing – Unless otherwise determined by the Bartow County Fire Marshall.**

- a. Residential: Maximum 500 feet as measured along the edge of pavement
- b. Within 250 feet from the furthest property located within a low-density residential development.
- c. Rural/Cross Country Spacing: Maximum 1000 feet as measured along the edge of pavement.

### **D. All new waterlines shall have a “I-hydrant” every 2,500 and at the end of every line.**

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

the final plat. The test report shall include the information with sample data described in Table 1 below.

*Table 1 Sample Fire Flow Data*

Unique Hydrant ID	FH 1	FH 2
Latitude	34.11223344	34.11223344
Longitude	-84.11223344	-84.11223344
Elevation	1192.45	1192.64
Static Pressure (PSI) adjusted to 24 Hour Minimum	96	97
Residual Pressure or Pitot (PSI) adjusted to 24-Hour Minimum	65	68
Flow at 20 PSI 9 (GPM)	2,219	2,330
Date of Test	10/22/2021	10/22/2021

### 2.13 Dead Ends

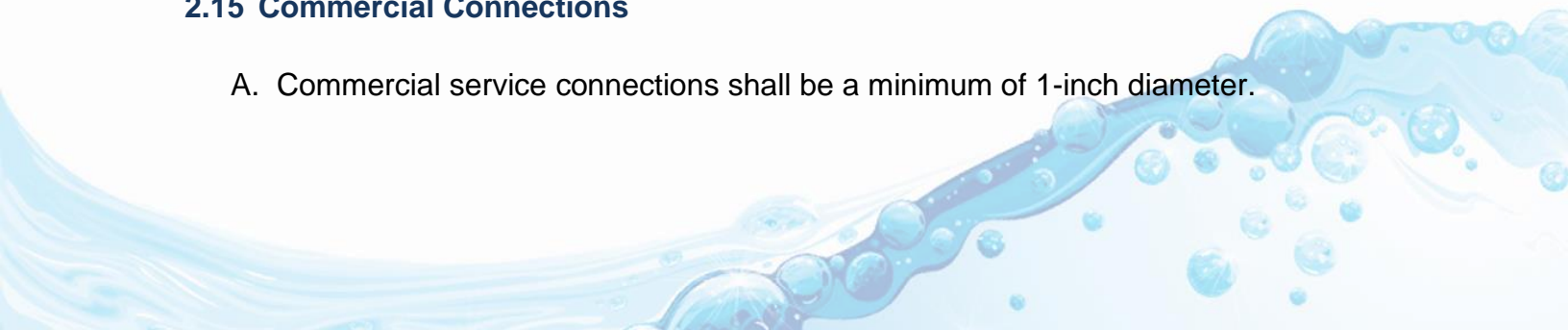
- A. Dead ends shall be minimized by making appropriate tie-ins whenever practical, to provide increased reliability of service and reduce head loss.
- B. Dead end mains shall be equipped with a means to provide adequate flushing. Flushing devices shall be sized to provide flows which will give a velocity of 2.5 feet per second in the water main being flushed. They may be provided with a fire hydrant if flow and pressure are sufficient. No flushing device shall be directly connected to any sewer.

### 2.14 Thrust Restraint

- A. All fittings, valves, and dead ends shall have two (2) forms of thrust restraint.
- B. Acceptable thrust restraint includes restrained joint glands, field lock gaskets, threaded rods, and concrete blocking. The design engineer shall be responsible for calculating the thrust strength requirements. Calculations shall be submitted to BCWD.

### 2.15 Commercial Connections

- A. Commercial service connections shall be a minimum of 1-inch diameter.



- B. There shall be one (1) service connection per parcel.
- C. A minimum 2-inch PVC or 2½ inch HDPE casing pipe shall be provided under the street on all long side service connections.

## 2.16 Water Meters

### A. Residential

- a. Residential water meters will be provided and installed by BCWD (meter fees apply). Assembly and appurtenances to be provided and installed by contractor for all new development.

### B. Commercial

- a. Commercial water meters 2-inch size and smaller will be provided and installed by BCWD (meter fees apply). Assembly and appurtenances to be provided and installed by contractor.

- C. Water meters greater than 2-inch size shall be provided by and installed by a Utility Contractor on BCWD's Approved Contractor's List.

### D. Sub-Unit Metering

- a. All multi-family buildings (apartments, town homes, condominiums, etc.) and multi-tenant commercial buildings shall have a private sub-unit meter installed at each individual unit.
- b. Sub-unit meters shall be provided by and installed by the Developer/Owner.

### E. Fire Flow

- a. All new fire flow lines shall be metered with a full flow fire meter. A meter must also be installed when there are substantial renovations to any existing facility with an unmetered fire line. Meter size shall be determined by required fire line size (i.e. 8" fire line requires an 8" meter).
- b. Fire flow meters shall be installed by a Utility Contractor on BCWD's Approved Contractor List. Fire Meters shall be purchased through BWD.
- c. Existing fire flow lines that are unmetered and have more than three consecutive months of usage shall be required to install a fire line meter at the Owner's expense in accordance with the BCWD Fire Line Meter policy.





## 2.17 Marker Balls

- A. Locator balls shall be 3M DYNA TEL Series EMS ID Ball Markers. The model number shall be 1423-XR/iD.
  - a. Marker balls shall be located every 200-LF along straight sections of pipe, every fitting and ends of casing.
  - b. Contractor shall coordinate with Owner's Representative to program marker balls and provide data on Construction Record drawings.

## 3 GRAVITY SEWER DESIGN STANDARDS

### 3.1 General

All gravity flow sanitary sewer systems that will be connected to the BCWD sanitary sewage system shall be designed in accordance with these standards. Any deviation from these standards shall be approved in writing by BCWD.

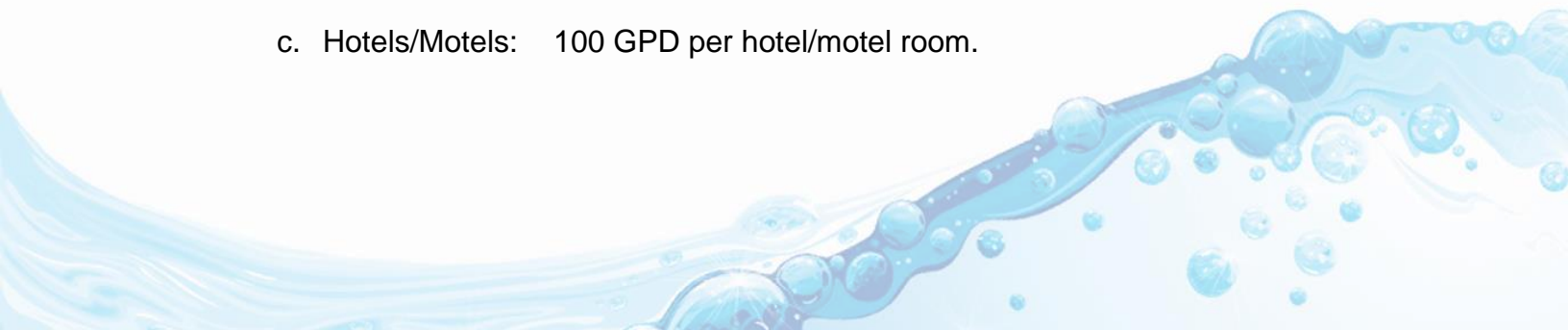
### 3.2 Flow Monitoring

#### 3.2.1 General

- A. Maximum daily sewage flow based on accepted peaking factors, as provided in the Ten States Standards. If these peaking factors are not used, a peak factor of 4.0 will be used.
- B. Sanitary sewer systems shall be designed and installed, and/or extended, to the uppermost property line of the development being served, as deemed necessary by BCWD.

#### 3.2.2 Average Daily Flow Rates

- A. Flows and Loadings shall be as listed in Table JT-1 of the Rules of Georgia Department of Human Resources, Public Health, Manual for On Site Sewage Management Systems.
- B. The following average daily flow rates shall be used in the design of sanitary sewerage systems.
  - a. Residential: 300 GPD per residential unit.
  - b. Apartments: 400 GPD per apartment unit.
  - c. Hotels/Motels: 100 GPD per hotel/motel room.



- d. Commercial/Manufacturing/Industrial: As required by use (provide justification to the BCWD for the average daily flow rate used).

C. The projected Average Daily Flow Rate for areas outside of the proposed development shall be calculated using the following typical flow rates.

- a. Low Density Residential: 100 GPD/acre
- b. Medium Density Residential: 600 GPD/acre
- c. High Density Residential: 1,200 GPD/acre
- d. Open/Park Areas: 100 GPD/acre
- e. Commercial/Manufacturing/Industrial: 2,000 GPD/acre

### 3.2.3 Peak Hour Flow Rates

- A. The peak hour flow rate for new residential developments shall be calculated using a peaking factor of 3.0.
- B. The peak hour flow rate for new commercial developments shall be calculated using a peaking factor based upon the proposed use of the development. The minimum peaking factor shall be 2.0.
- C. The peak hour flow rate for undeveloped areas shall be calculated using the following equation.

$$Q_{phf} = Q_{adf} \times \frac{18 + \sqrt{P}}{4 + \sqrt{P}}$$

Where:

$Q_{phf}$  = Peak Hourly Flow Rate

$Q_{adf}$  = Average Daily Flow Rate

P = Population in Thousands Based on 100 GPD/Capita

### 3.2.4 Marker Balls

- A. Locator balls shall be 3M DYNA TEL Series EMS ID Ball Markers. The model number shall be 1423-XR/iD or approved equal.
  - a. Marker balls shall be located every 200-LF along straight sections of pipe, every fitting and ends of casing.
  - b. Contractor shall coordinate with Owner's Representative to program marker balls and provide data on Construction Record drawings.



### 3.3 Sanitary Sewer location and Manholes

### 3.4 Hydraulics

- A. Sanitary sewer systems shall be designed using Manning's equation.

$$Q = \frac{1.49}{n} (A)(r_h)^{2/3} \sqrt{S}$$

Where:

Q = Flow Rate, ft<sup>3</sup>/s

n = Manning's Coefficient

A = Pipe Cross-Sectional Area, ft<sup>2</sup>

$r_h$  = Hydraulic Radius

S = Slope, ft/ft

- B. The value of the Manning's Coefficient, n, shall be 0.013 for all pipe materials.
- C. Sanitary sewer systems shall be designed to carry the Peak Hourly Flow rate at 75 percent of the full depth (d/dFULL = 0.75).
- D. Sanitary sewers shall be designed with a minimum velocity of 2 ft/s, flowing full, based on the Manning's equation, and using a Manning's Coefficient of 0.013.
- E. The following table presents the minimum allowable slopes for sanitary sewer mains; however, slopes greater than these are desirable.

Nominal Sewer Size	Minimum Slope in Feet per 100 Feet
8 inch	0.50
10 inch	0.28
12 inch	0.22
15 inch	0.15
16 inch	0.14
18 inch	0.12
20 inch	0.11
21 inch	0.10
24 inch	0.08
27 inch	0.07
30 inch	0.06

36 inch	0.05
42 inch	0.04
48 inch	0.04

- F. The maximum slope of a gravity flow sanitary sewer shall be 15 percent unless approved by BCWD.
- G. Sanitary sewer mains with slopes greater than 15 percent shall be anchored with concrete anchors (dead-mans). The Developer's design professional shall be responsible for calculating the size and spacing of the concrete anchors. Calculations shall be submitted to BCWD.
- H. Sanitary sewer laterals must have consistent positive flow to the main (minimum of 1% slope typical for 6-inch diameter laterals).
- I. The angle formed between the inlet sewer line and outlet sewer line in a manhole shall be greater-than or equal to 90° and less-than or equal to 270°.
- J. Surcharging of manholes shall be prohibited.

### 3.5 Materials

- A. Minimum sanitary sewer size
  - a. Sanitary sewer outfalls and mains: 8-inch Diameter.
  - b. Sanitary sewer laterals: 6-inch Diameter.
- B. Acceptable Sanitary Sewer Materials
  - a. PVC – DR 18 AWWA C900.
  - b. PVC – SDR 26 OR SDR 35.
- C. All creek crossings shall be steel cased.
- D. All water lines and storm water line crossings with less than 2-feet of clearance shall have Steel casing shall be extended 10' either side or at centerline of pipe. For crossings with more than 2' clearance, steel casing required as above or certified compaction tests @ 95% compaction provided in 2-foot lifts. Tests must be performed and certified by P.E. or soils scientists.



### 3.6 Sanitary Sewer Location

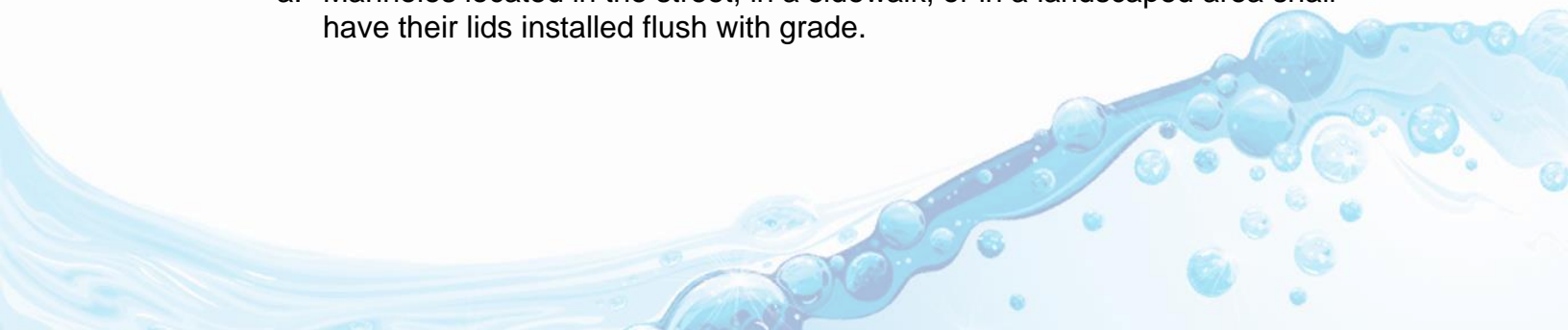
- A. Sanitary sewer lines and specifically manhole lids, located in the right-of-way, under pavement, shall be located as close to the center of the road as possible.
- B. Sanitary sewer lines located in sanitary sewer easements shall be located in the center of the easement.
- C. Sanitary sewer lines running parallel to an existing or proposed water line shall be located a minimum of 10 feet horizontally from the water line unless otherwise approved by BCWD. Distances shall be measured from outside of pipe to outside of pipe.
- D. Sanitary sewer lines that cross an existing or proposed water line shall have a minimum clearance of 18 inches vertically above or below the water line unless otherwise approved by BCWD. At water line crossings, the sanitary sewer line shall cross in the middle of one (1) full length of water line so that both pipe joints on the water line will be as far from the sanitary sewer line as possible. In cases where BCWD allows a vertical clearance of less than 18 inches, the first two joints on each side of the crossing shall be restrained and the pipe shall be protected as required by BCWD.

### 3.7 Sanitary Sewer Bury Depth

- A. Sanitary sewer lines shall have a minimum of 4 feet of cover as measured from crown of pipe to ground surface. Where the ground surface above the sanitary sewer line is higher than the edge of pavement of the existing or proposed roadway, the minimum cover shall be measured from the crown of pipe to the edge of pavement, existing or proposed, whichever is lower.

### 3.8 Sanitary Sewer Manholes

- A. Location and Spacing
  - a. Manholes shall be installed at the end of each line; at all changes in grade, size, or alignment; at all intersections; and at material changes in pipe. Material changes mid-run are not allowed.
  - b. Maximum distance between manholes shall be 400 linear feet.
- B. Rim Elevation
  - a. Manholes located in the street, in a sidewalk, or in a landscaped area shall have their lids installed flush with grade.



- b. Manholes located outside of streets and sidewalks in non-landscaped areas shall have their lids installed a minimum of 2 feet above grade, unless otherwise approved by BCWD.

### C. Manhole Lids

- a. Manhole lids shall have a minimum clear opening of 22 inches.
- b. All manholes located outside of the pavement that do not require adjustment to grade shall have the frame cast into the cone section by the manufacturer with bolt down, watertight lids.
- c. Manholes that are 2' above grade shall have rotating lids.

## 3.9 Sewer Laterals.

- a. Tracer wire shall be installed on all sewer laterals regardless of size.

## Corrosion Protection for Sanitary Sewer Systems

- A. Manholes that have a sanitary sewage force main discharging into them and manholes that are subject to corrosion shall be lined with Epoxytech or a BCWD approved equal.
- B. The manhole that the sanitary sewage force main discharges into, plus all manholes located within 1,600 feet downstream of the discharge manhole, shall be lined with the above-described system.
- C. Existing manholes that exhibit corrosion and leakage shall be repaired using polyurethane grouts to stop infiltration and repair mortars to repair the structure prior to coating with an elastomeric polyurethane lining system or BCWD approved equal.
- D. The sanitary sewer lines that connect these lined manholes shall be PVC.

## 3.10 Sanitary Sewer Flow Meters

- A. All developments, both residential and non-residential, that generate an average daily flow rate of 100,000 GPD or more shall provide a sanitary sewer flow meter in the last manhole before the flow leaves the development. The type of flow meter that is used shall be approved by BCWD.

## 3.11 Jack and Bore Installations

- A. Unless otherwise approved, sanitary sewer lines that cross a GDOT roadway, Bartow County roadway, or railroad right-of-way shall be installed with cased jack and bores.

### 3.12 Creek Crossings

- A. All crossings shall be perpendicular to the creek unless otherwise approved.
- B. Jacked casing pipe is required for all creek crossings. The casing shall extend to a minimum of 10 feet beyond the top of the bank.
- C. The minimum depth of cover above the casing pipe shall be 12 inches.

### 3.13 Aerial Crossings

- A. Aerial crossings shall be avoided whenever possible. All aerial crossings shall be preapproved by BCWD.
- B. Any piping system that crosses a perennial or annual stream shall not cause an impedance to navigation or cause water to pool upstream of the pipe.
- C. All pipes used in aerial crossings shall be cased.
- D. Aerial pipe supports shall be designed by a structural engineer licensed by the Georgia State Board of Registration for Professional Engineers and Land Surveyors.
- E. Aerial pipe supports shall be situated on suitable soils. The soil on which an aerial support will be placed shall be tested by a soil testing company for bearing capacity and suitability for construction. A soils report shall be submitted with the construction plans and specifications.
- F. The bottom of the casing shall be no lower than the 50-year Flood Elevation.

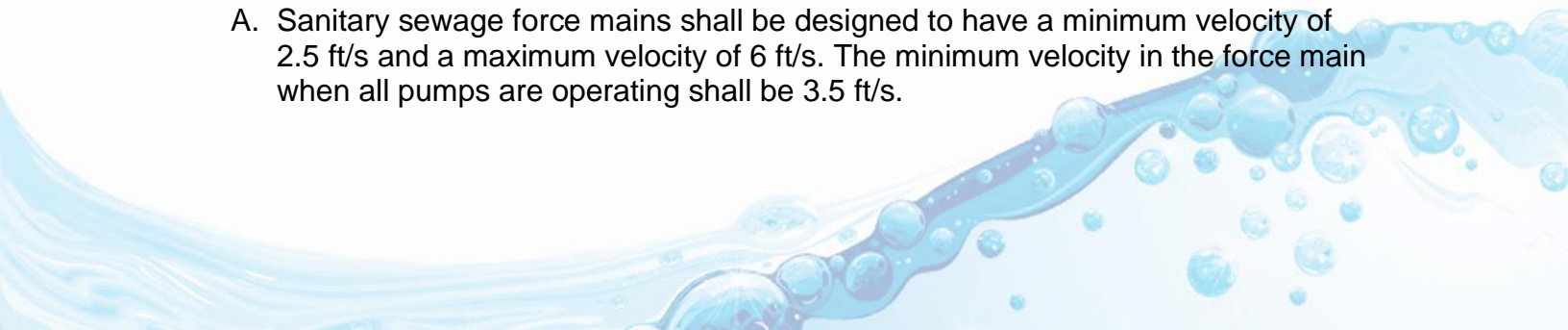
## 4 Sanitary Sewer Force Mains

### 4.1 General

- A. All sanitary sewer force mains that will be connected to the BCWD sanitary sewer system shall be designed in accordance with these standards. Any deviation from these standards shall be approved in writing by BCWD.
- B. All sewers deeper than 8' must be Low Pressure Sewer unless approved by BCWD.

### 4.2 Hydraulics

- A. Sanitary sewage force mains shall be designed to have a minimum velocity of 2.5 ft/s and a maximum velocity of 6 ft/s. The minimum velocity in the force main when all pumps are operating shall be 3.5 ft/s.



### 4.3 Force Main Size and Material

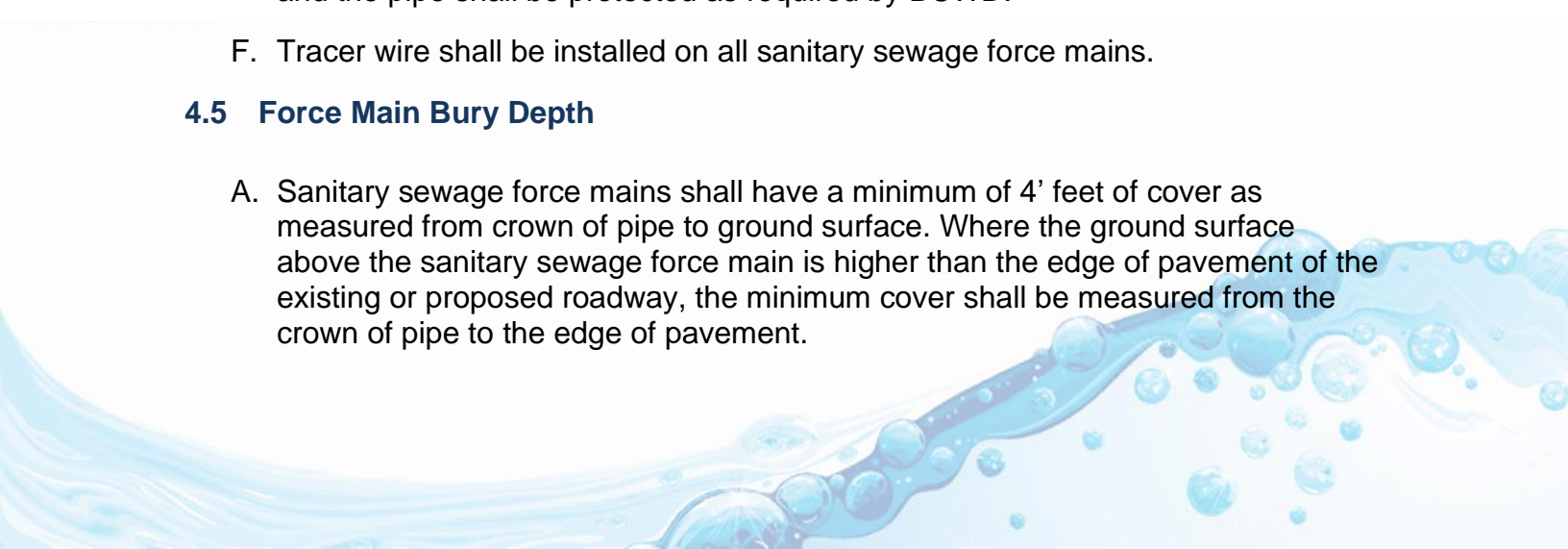
- A. Minimum Sanitary Sewer Force Main Size: 4-inch Diameter, unless otherwise approved by BCWD.
- B. Acceptable Sanitary Sewer Force Main Materials:
  - a. C900 PVC Pipe (C905 or C909). Pressure Class of pipe shall be specified to fit application.

### 4.4 Force Main Location

- A. Sanitary sewer force mains located in the right-of-way shall be located 5 feet inside the right-of-way and on the opposite side of the road as the water line whenever possible.
- B. Sanitary sewage force mains located in sanitary sewer easements shall be located in the center of the easement.
- C. Sanitary sewage force mains shall be located a minimum of 10 feet horizontally from any existing or proposed water main and 18 inches vertically below any existing or proposed water main. Distances shall be measured from outside of pipe to outside of pipe.
- D. Sanitary sewage force mains running parallel to an existing or proposed water line shall be located a minimum of 10 feet horizontally from the water line unless otherwise approved by BCWD. Distances shall be measured from outside of pipe to outside of pipe.
- E. Sanitary sewage force mains that cross an existing or proposed water line shall have a minimum clearance of 18 inches vertically above or below the water line unless otherwise approved by BCWD. At water line crossings, the sanitary sewage force main shall cross in the middle of one (1) full length of water line so that both pipe joints on the water line will be as far from the sanitary sewage force main as possible. In cases where BCWD allows a vertical clearance of less than 18 inches, the first two joints on each side of the crossing shall be restrained and the pipe shall be protected as required by BCWD.
- F. Tracer wire shall be installed on all sanitary sewage force mains.

### 4.5 Force Main Bury Depth

- A. Sanitary sewage force mains shall have a minimum of 4' feet of cover as measured from crown of pipe to ground surface. Where the ground surface above the sanitary sewage force main is higher than the edge of pavement of the existing or proposed roadway, the minimum cover shall be measured from the crown of pipe to the edge of pavement.





#### **4.6 Isolation Valves**

- A. All valves on sanitary sewage force mains shall be eccentric plug valves.

#### **4.7 Combination Air/Vacuum Valves**

- A. Combination air/vacuum valves shall be provided at all locations along the sanitary sewage force main deemed appropriate as determined by the design engineer.
- B. Combination air/vacuum valve locations are subject to review by BCWD.
- C. Combination air/vacuum valves shall be sized in accordance with the manufacturer's recommendations.


#### **4.8 Thrust Restraint**

- A. All fittings, valves, and dead-ends shall have two (2) forms of thrust restraint.
- B. Acceptable thrust restraint includes restrained joint glands, field lock gaskets, threaded rods, and concrete blocking. The design engineer shall be responsible for calculating the thrust restraint requirements.

#### **4.9 Jack and Bore Installations**

- A. Unless otherwise approved, sanitary sewage force mains that cross a GDOT roadway, Bartow County DOT roadway, or railroad right-of-way shall be installed with cased jack and bores.

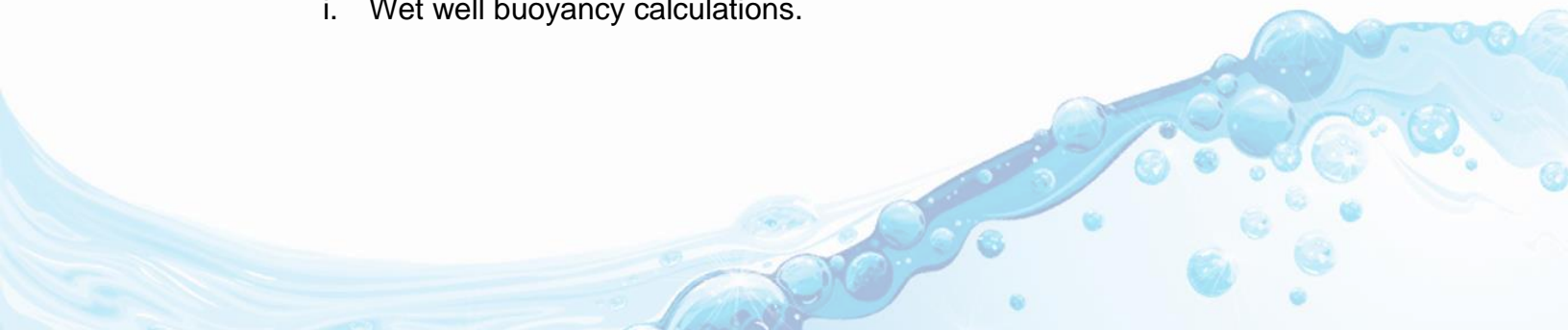
#### **4.10 Creek Crossings**

- A. All pipes used in creek crossings shall be cased. Casing shall run from 25' to 25' buffer.
  - B. All crossings shall be perpendicular to the creek unless otherwise approved.
  - C. BCWD required casing at all state waters and creek crossings. The casing shall extend to the 25' State buffer line as measure from wrested vegetation.
  - D. The minimum depth of cover above the casing pipe shall be 12-inches.
- 

## 5 SANITARY SEWER LIFT STATIONS

### 5.1 General

- A. This section shall be used as a guideline for the design of sanitary sewage lift stations capable of pumping up to 700 GPM. Pump stations greater than 700 GPM may require additional BCWD guidelines and will require GA EPD approval.
- B. Lift stations are to be avoided whenever possible. The preferred conveyance method for sewage is gravity. Pump stations will not be permitted unless the Developer can demonstrate that the development cannot be served solely by gravity sewer or low-pressure sewer.
- C. Lift stations will only be allowed when pre-approved by the BCWD.
- D. When sanitary sewage lift stations are allowed/required, the BCWD reserves the right to design and construct the necessary lift station(s), with appropriate charges being made to the Developer/Owner. Where feasible, the lift station shall serve the overall drainage basin, rather than just sizing it to serve the development proposed. The station shall be located at the nearest downstream confluence. If another station can be abandoned, developer shall remove lift station and install gravity to new lift station. Lift Station cannot be located upstream of another lift station. The developer shall install gravity to existing lift station and make any necessary upgrades.
- E. Pumps, motors, and associated lift station appurtenances shall be furnished as a package from Xylem (Flygt).
- F. The sanitary sewage lift station shall include a standby power system and remote monitoring system described in Section 5.5.12.
- G. In addition to complete construction plans and specifications, the following information shall be submitted to BCWD as part of the sanitary sewage lift station design package:
  - a. Average and peak hour design flow rate calculations.
  - b. Total head calculations.
  - c. System head curve plotted on the manufacturer's pump curve.
  - d. Brake Horsepower (BHP) calculations.
  - e. 100-year flood elevation at the proposed sanitary sewage lift station site.
  - f. Minimum wet well volume calculations/pump cycle time calculations.
  - g. Pump cycle time calculations.
  - h. Force main surge calculations.
  - i. Wet well buoyancy calculations.



## 5.2 Hydraulics

Total head shall be calculated using the following equation.

$$TH = h_s + h_f + h_m + h_p + \frac{V^2}{2g}$$

Where:

$h_s$  = Static Head, ft

$h_f$  = Head Loss due to Friction, ft

$h_m$  = Minor Head Losses, ft

$h_p$  = Pressure Head, ft

$\frac{V^2}{2g}$  = Velocity Head, ft

V = Velocity of the fluid in the piping system, ft/s

g = Acceleration due to Gravity, 32.2 ft/s<sup>2</sup>

Friction losses shall be calculated using the Hazen-Williams equation.

$$h_f = 10.44 \times \frac{Q^{1.85} \times L}{C^{1.85} \times d^{4.8655}}$$

Where:

$h_f$  = Head Loss due to Friction, ft

Q = Flow Rate, GPM

L = Length of Pipe, ft

C = Hazen-Williams Coefficient

d = Inside Diameter of Force Main, inches

Minor head losses shall be calculated as a fraction of the velocity head.

$$h_m = K \times \frac{V^2}{2g}$$

Where:

$h_m$  = Minor Head Loss, ft



K = Minor Loss Coefficient. The minor loss coefficient is the sum of the head loss coefficients for all the minor loss elements in the piping system. Use standard published values for “K.”

V = Velocity of the fluid in the piping system, ft/s

g = Acceleration due to Gravity, 32.2 ft/s<sup>2</sup>

Force main surge shall be calculated using the following equation.

$$\Delta H = a\Delta V / g$$

$$\Delta P = (\Delta H + TH) / 2.31$$

Where:

a=Pressure wave velocity (ft/s)

Pipe Material"	4"	6"	8"	10"	12"	16"
HDPE	921.5	921.5	921.5	921.5	921.5	921.5
C900 PVC	1,106	1,106	1,106	1,106	1,106	1,106

$\Delta V$ =Change in velocity of the fluid (ft/s)

g=acceleration due to gravity

$\Delta P$ =Pressure rise (psi)

### 5.3 Location of Sanitary Sewer Lift Stations

- A. The location of all sanitary sewage lift stations shall be coordinated with and approved by the BCWD prior to beginning design.
- B. Sanitary sewage lift stations shall be accessible during a 100-year storm event.
- C. All mechanical components of the sanitary sewage lift station shall be located above the 100-year flood elevation.
- D. All electrical components shall be located a minimum of 3 feet above the 100-year flood elevation.

### 5.4 Sanitary Sewer Lift Station Property and Access

- A. Sanitary sewage lift stations shall be located on a minimum 100-foot by 100-foot piece of property. This property shall be platted and deeded to the BCWD at no cost. BCWD may require a larger piece of property depending on site conditions.

- B. Any roads required to access the sanitary sewage lift station from the public street right-of-way shall be included as part of the platted and deeded property. The minimum width of the access property shall be 30 feet.

## **5.5 Lift Station Components**

### **5.5.1 General**

Sanitary sewage lift stations shall be Xylem Flygt submersible, heavy duty sewage pump or approved equal by BCWD.

### **5.5.2 Pumps**

- A. Pumps shall be Xylem Flygt submersible, close-coupled wastewater pumps or pre-approved equal.
- B. The hydraulic of the pump shall be equipped with a semi open multi vane impeller designed to transport wastewater and municipal sludge up to 8% DS.
- C. The impeller blades shall be self-cleaning upon each rotation as they pass across a sharp relief groove in the Insert ring and shall keep the impeller blades clear of debris. The clearance between the insert ring and the impeller leading edges shall be adjustable.
- D. The impeller shall be wear-resistant and made of high chromium cast iron with at least 24% chrome against sand and grit which is expected to enter the pump station with the sewage or the storm water. Impellers that have surface hardening (by thermal, coating, etc.) will not be allowed.
- E. The pump shall be capable of operating without any limitation between 50% and 125% of the best efficiency point (B.E.P) of the performance curve.
- F. It shall be possible to lift and lower the pumps on parallel guide bars and connect them to wet well mounted discharge connection. There shall be no need for personnel to enter the wet well when removing or reinstalling the pumps.
- G. A minimum of three (3) pumps shall be provided, two operational, one spare.
- H. The sanitary sewage lift station shall be capable of pumping the peak hour flow rate with the largest pump out-of-service.
- I. One (1) complete spare parts kit shall be provided with each pump.

### **5.5.3 Motors**

- A. The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. It shall be permanently submersible according to standard IEC 60034 and protection class IP 68.



- B. Motors shall operate on 480 Volt, 3 phase, 60 Hz power, and shall have a 1.15 service factor unless otherwise approved by BCWD.
- C. Motor shall be non-overloading at all points along the pump curve.

#### **5.5.4 Piping**

- A. Piping shall be appropriately sized ductile iron pipe. Inside wetwell minimum diameter shall be 4 inches. All fasteners shall be stainless steel.
- B. A bypass connection shall be provided on the discharge header of the pump station. The size of the discharge connection shall be equal in size to the discharge connection of the pump, but no less than 4 inches.

#### **5.5.5 Valves**

##### **5.5.6 Check Valves**

- A. A lever and weight type check valve or lever and spring type check valve shall be provided on the discharge of each pump and at other locations as required.

##### **5.5.7 Plug Valves**

- A. An eccentric plug valve shall be provided on the discharge of each pump.
- B. An eccentric plug valve shall be installed on the force main within the lift station property. Location to be coordinated with BCWD.

##### **5.5.8 Surge Valve**

- A. If the pressure rise calculated in section 5.2 is greater than 250psi, provide a surge relief valve.
- B. Surge Relief Angle Valves shall be normally closed against the system pressure by external spring(s) in compression and shall open quickly to relieve pressure when the system pressure exceeds the pressure relief setting. The pressure relief setting shall be factory set and field adjustable by adjusting the spring compression. The valve will begin to close when the system pressure subsides below the pressure relief setting. The closing speed shall be adjustable to suit the application by means of infinitely adjustable, lockable flow control valve.
- C. All valves shall be APCO model SRA-3000A Surge Relief Angle Valves as manufactured by DeZURIK or approved equal.

##### **5.5.9 Pressure Gauge**

- A. A pressure gauge shall be installed on the discharge header of the sanitary sewage lift station.






- B. Pressure gauges shall be liquid filled and shall be provided with a diaphragm seal and isolation ball valve.

### **5.5.10 Electrical Requirements**

- A. All wiring shall be in accordance with NEC standards.
- B. All electrical components shall be mounted in NEMA 4X enclosure(s).
- C. Power shall be 480 V, 3-phase, 60 HZ unless otherwise approved by BCWD.

### **5.5.11 Controls**

- A. Pump Controls
    - a. Pump controls shall be designed and provided by the pump manufacturer.
    - b. Control panels located in non-hazardous locations shall be NEMA 4X, Type 304 stainless steel. Control panels located in hazardous locations shall be NEMA 7, Type 304 stainless steel.
    - c. Controls shall be provided which will allow the pumps to be operated either manually or automatically.
  - B. Level Control
    - a. A submersible pressure transducer shall be used to measure the water level in the wet well and turn the pumps on and off.
    - b. Float Switch - A low-level float switch and high-level float switch shall be provided as an emergency backup to the submersible level transducer. A cable weight shall be provided with each float switch.
  - C. Level Controller
    - a. MultiSmart controller: 84-8000084 MSU3MP with PumpView communication package,
  - D. Provide Xylem PumpView CloudGate modem+ Verizon/ATT R/B 14-500145
  - E. Pumps shall be interlocked to prevent the simultaneous start of two pumps.
  - F. Provide the following 10amp. 120vac dry contacts for connection to SCADA system:
    - a. Pump no.1 running.
    - b. Pump no.1 fault.
    - c. Pump no.2 running.
    - d. Pump no.2 fault.
    - e. Control power on.
    - f. Phase monitor alarm.
- 

- g. High-high level.
- h. Low-low level.
- i. Continuous level (4-20ma).
- j. Ats normal and emergency position.
- k. Generator fails and running.

### **5.5.12 Backup Power System**

All sanitary sewage lift stations shall be provided with a backup power system.

#### **A. Submersible Lift Stations**

- a. Backup power system for submersible lift stations shall be a diesel fuel driven generator. Diesel fuel driven generators shall be provided with a fuel storage tank that provides a minimum of 24 hours of operation.
- b. Generator shall be sized to operate all pumps and appurtenances without exceeding 85 percent of the generator's full capacity.
- c. Generator shall have an acoustical enclosure that reduces the noise level to at least 75 dB at 3 feet.
- d. Generators shall be provided with a platform that provides access to all entry points to the enclosure.
- e. Generators shall be Caterpillar or BCWD approved equal.
- f. Generator shall have the manufacturer's standard equipment plus the following additional equipment:
  - i. Insulated fiberglass enclosure.
  - ii. Exterior flashing alarm light.
  - iii. Critical exhaust silencer.
  - iv. Inside insulated exhaust.
  - v. Sound attenuation.
  - vi. Heater.



### 5.5.13 Wet Well

- A. Circular wet wells shall have a minimum inside diameter of 72 inches.
- B. Rectangular wet wells shall be minimum 72 inches by 72 inches square.
- C. The volume between the “Lead Pump On” elevation and the “Pump Off” elevation shall be calculated using the following equation:

$$V_{\min} = Q \times t \times 4$$

Where:

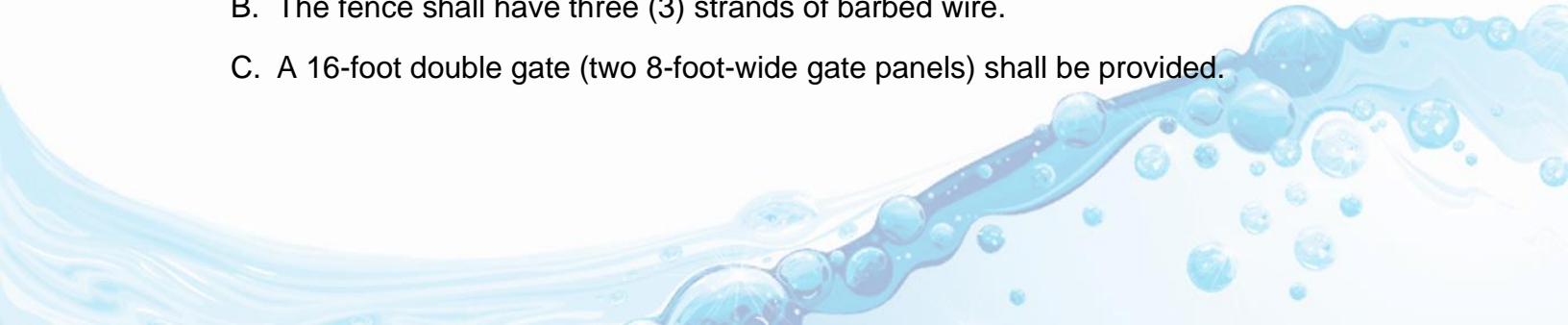
$V_{\min}$  = Minimum Wet Well Volume, gallons

$Q$  = Flow Rate of Largest Pump, GPM

$t$  = Pump Cycle Time, minutes

- D. The minimum pump cycle time,  $t$ , shall be 10 minutes (6 starts per hour). A longer pump cycle time,  $t$ , shall be used if required by the pump manufacturer.
- E. The gravity sewer line that is connected to the sanitary sewage lift station shall not be included in the minimum wet well volume.
- F. The distance from the bottom of the wet well to the “Pump Off” level shall be per the pump manufacturer’s recommendation.
- G. The distance between the “Lead Pump On” elevation and the “Lag Pump On” elevation shall be a minimum of 6 inches.
- H. The distance between the “Lag Pump On” elevation and the “High Level Alarm” shall be a minimum of 6 inches.
- I. The distance between the “High Level Alarm” and the invert of the gravity sewer line entering the wet well shall be a minimum of 6 inches.
- J. Wet well walls and piping shall be coated with a corrosion resistant coating system (SprayRoq, Epoxytec CPP or BCWD approved equal).
- K. Wet well buoyancy calculations shall be prepared by the design engineer and submitted to BCWD.
- L. Wet well volume shall be sized to hold a minimum of 3 hours of storage for peak demand flows in the event of power loss.

### 5.5.14 Fence and Gate

- A. A 6-foot-tall chain link fence shall be installed around the lift station.
  - B. The fence shall have three (3) strands of barbed wire.
  - C. A 16-foot double gate (two 8-foot-wide gate panels) shall be provided.
- 

- D. The fence shall be black vinyl coated.

#### **5.5.15 Security Light**

- A. A security light and light pole shall be provided by the local electrical service provider.

#### **5.5.16 Potable Water Service Line**

- A. A potable water service line shall be provided to the lift station property that terminates at a frost proof yard hydrant.
- B. A reduced pressure zone (RPZ) backflow preventer shall be provided on the potable water line. RPZ backflow preventer shall be protected from freezing.

#### **5.5.17 Landscape**

- A. Property outside of the fenced area shall be landscaped.
- B. A landscape plan shall be provided and appropriately designed to screen lift stations in all-weather seasons.

### **5.6 Supervisory Control and Data Acquisition (SCADA) System**

#### **5.6.1 General Description**

The Supervisory Control and Data Acquisition (SCADA) operates as an autonomous system, monitoring sensors, displaying data, operating controls, activating alarms and logging information to facilitate and optimize the plant processes and on-going operations. It shall be capable of polling, transmitting and receiving data, at high rates of speed, using secure protocols and error avoidance methods. The SCADA shall be capable of remote interrogation and re-configuration, while providing access for remote viewing and control of screens, logs, and files. The Remote Telemetry Unit (RTU) shall be the controller responsible for acquiring and executing the data.

#### **5.6.2 Scope**

- A. The work covered by this section includes furnishing all labor, materials, and equipment required to install, test and place into satisfactory operation SCADA equipment required for the project.

#### **5.6.3 Submittals**

- A. At minimum, the submittals shall contain, but not limited to, the following information to establish compliance with these specifications:
  - a. Drawings showing plan, elevations, appropriate cross sections, critical dimensions, connections, fasteners, and anchors of the equipment being provided.

- b. Complete engineering data including, but not limited to, descriptive data and material specifications to support the design of the equipment being provided.
- c. Manufacturer's installation instructions:
  - i. All SCADA documentation and test results must be approved by the BCWD SCADA Department prior to purchase and installation of materials and equipment.

#### **5.6.4 Storage and Protection**

- A. RTU and other electrical components shall be securely stored indoors until installation.
  - a. Antenna cable shall have both ends protected from water intrusion at all times.
  - b. Tower shall be protected from damage.

#### **5.6.5 Project Closeout Submittals**

- A. The BCWD shall receive, in electronic format and 2 printed copies, all final documentation including as-builts. This includes, but not limited to:
  - a. Site drawings.
  - b. Panel drawings.
  - c. Loop drawing and electrical schematics of I/O wiring.
  - d. Test results of radio path study.
  - e. Test results of coax cable sweep.
  - f. Programs installed on RTUs.

#### **5.6.6 Products – Approved System Integrators**

- A. A BCWD approved System Integrator shall be used to integrate the various process controls, instrumentation, SCADA system, HMI (Human Machine Interface) system, local area network, improvements/upgrade of the HMI system and programming of the existing SCADA system. This requirement is to ensure continuity and point source responsibility for total system operation.
- B. The System Integrator must be certified by Emerson Process Management (Bristol). The contractor shall provide written evidence to the owner that the Integrator has current certification from Emerson for the specified systems and software for no less than 1 year. Failure to provide this certification will result in disqualification of the system integrator by the owner.
- C. Evidence of certification from Emerson shall consist of a letter to the Authority or a copy of a certificate of completion that the System Integrator is well qualified by training and has successfully completed classes offered by Emerson to certify

individuals on the IEC-61131 software Control Wave hardware and Bristol Open Enterprise.

- D. The approved System Integrator shall provide evidence of an OE installation of similar or greater scope with no less than 2 references. The System Integrator shall also provide references and phone numbers of successful projects completed within the past 3 years using Bristol hardware and software. These letters shall be delivered to the owner via the consulting Engineer prior to execution of the contract and issuance of the Notice to Proceed.
- E. Failure to provide evidence of certification and work experience will result in disqualification of the System Integrator. Should the System Integrator be disqualified, the General Contractor shall offer another System Integrator with proper certification and work experience at no additional cost to the BCWD.
- F. Work performed on the SCADA system shall conform to the standards set by the SCADA Dept. This shall include but not limited to:
  - a. All IP addresses will be assigned by the SCADA Dept.
  - b. All tags shall conform to a set nomenclature which shall be approved by the SCADA Dept.
  - c. All programs shall utilize function blocks.
  - d. All screens shall be similar in design and approved.
  - e. PLC/RTU Guidelines Any device that performs a logical function in the operation of equipment must be approved by the BCWD SCADA Department. The currently specified RTU has the ability and functions of a PLC and shall be utilized for this feature. This will entail the removal of unneeded equipment and passing their operation down to the RTU control, which will reduce the number of devices required to run and monitor equipment.

#### **5.6.7 RTU Specification Guidelines**

- A. The Programmable Logic Controller (PLC) shall be a Bristol Babcock Control Wave Micro (CWM) with the following requirements:
- B. The PLC base unit shall be a minimum size of 4 slots. There shall be a minimum of 2 spare card slots unused.
- C. CPU shall be a minimum of 150MHz, 1M SR, 4M SD, 16M Flash.
- D. PLC shall support 10/100 Mbps Ethernet 802.3/u compliant data port.
- E. There shall be a minimum of 1 ethernet port, 2 RS232 port, and 1 RS485 port.
- F. PLC shall be capable of operating at 12vdc and 24vdc. 24vdc will be utilized to power all new installations.



- G. The following I/O boards shall be utilized first to maintain consistency in the system. Any other I/O boards required for the job shall be analog isolated or digital cards with LEDs. a) 16DI/4DO Card w/LEDs b) 4AO Card, isolated c) 8AI Card, internally, externally sourced
- H. A display shall be provided for each PLC/RTU to monitor local data. The display shall be no less than 4 lines X 20 characters and shall be mounted to the external front door of the panel. The display shall be sealed to prevent moisture intrusion.
- I. No Serial MODBUS communications to the RTU will be allowed. All communications shall conform to the TCP/IP Standard.

#### **5.6.8 Enclosure Specification Guidelines**

- A. A NEMA rated stainless steel enclosure shall be installed for each Remote Telemetry Unit (RTU). For indoor applications, a NEMA 12 rating and for outdoor applications a NEMA 4x stainless steel 316 enclosure. All PLC/RTU enclosures must contain a ventilation system, to prevent equipment malfunction due to heat build-up. The ventilation system shall be designed to minimize foreign object intrusion without hindering proper air flow. All PLC/RTU enclosure shall contain, at minimum, the following items:
- B. Power for the RTU enclosure and equipment breaker shall be obtained from a dedicated breaker per current NEC and local electrical codes.
- C. AC surge protection shall be installed in the enclosure.
- D. All I/O wires from PLC shall be terminated on a terminal block which will be mounted on a DIN rail.
- E. 110vAc GFI outlet shall be provided inside the enclosure and installed per current NEC and local electrical codes.
- F. The enclosure shall be capable of being secured with a 3/16" diameter shackle padlock.
- G. Power supply(s) rated for the RTU equipment and radio shall be installed. The power supply(s) shall provide a battery charging circuit to maintain the proper voltage on the battery. The following power supplies are approved for this project:
  - a. Phoenix Contact Quint-PS/1AC/24vDC/5amp.
  - b. Phoenix Contact Quint-PS/1AC/24vDC/10amp.
  - c. The following UPS is approved for this project.
  - d. Phoenix Contact Quint-UPS 24vDC/20amp.
- H. A minimum of 2-7AH batteries shall be provided. These batteries shall be located at the bottom of the RTU box to prevent leakage to any other equipment. The

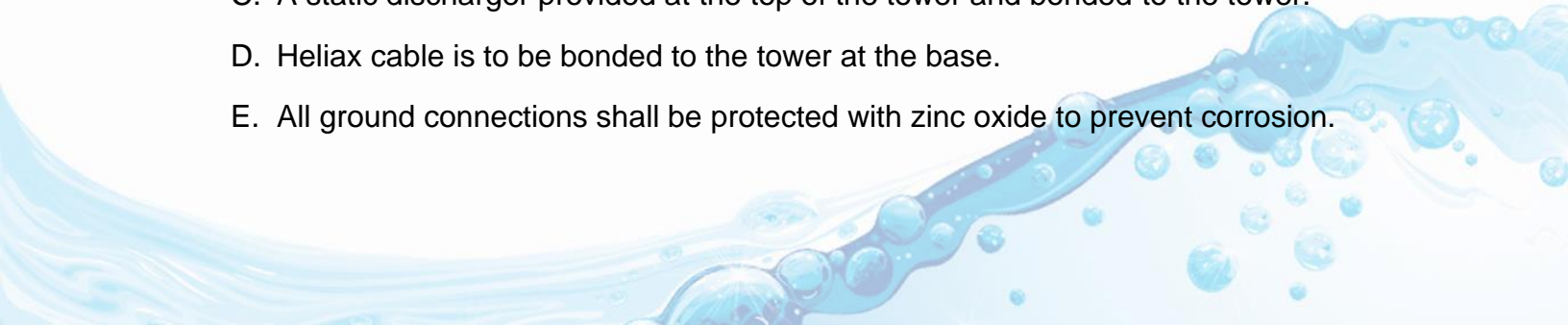
batteries shall be capable of maintaining equipment for no less than 3 hrs. And shall be tested to ensure proper operation.

- I. There shall be a network switch installed on each panel with a minimum of 2 spare ports available. The following switches are approved for this project:
  - a. N-Tron 106FX2-SC.
  - b. N-Tron 110FX2-SC.
  - c. Phoenix Contact FL Switch SFNB 5TX.

#### **5.6.9 Antenna Tower**

- A. The antenna tower shall be self-supporting and set in concrete caisson bases. The tower will be designed for a basic wind speed of 71 mph with ½" of radial ice in accordance with ANSI/TIA/EIA-222-F-1996. If soil tests are not performed, the dimensions of the base shall conform to poor soil conditions. Poor soil conditions shall consist of soil capacity of 2 ksf, water table 4' below surface, and dry density of 100pcf. The required height will be determined by the RF Study. Tower must be capable of future extension up to 20% higher or per prior arrangements made by BCWD SCADA Dept. This additional height shall be obtained by adding sections to the top of the existing tower as needed.
- B. If caisson bases are not possible due to underground piping, utilities, or inadequate footprint requirements, then a concrete base will be the only other option. In either case the tower base design documents shall be strictly adhered to, no exceptions.
- C. The following Tower Manufacturer has been pre-approved for this project. a) Sabre Towers & Poles Model S3TL.
- D. Antenna The antenna(s) shall be installed once the tower has been erected. The number of antennas shall be determined by the RF study. The vertical and directional antennas shall use Type N connectors rated for the required frequency. The antenna shall have a minimum of 10db gain and shall be tuned for the frequency required. The antenna shall be mounted per manufacturer installation instructions and proper vertical separation maintained.

#### **5.6.10 Grounding**

- A. Grounding shall be installed per local and NEC code. This shall include:
  - B. A delta ground system installed at the base of the tower. The tower shall be bonded to this ground system.
  - C. A static discharger provided at the top of the tower and bonded to the tower.
  - D. Helix cable is to be bonded to the tower at the base.
  - E. All ground connections shall be protected with zinc oxide to prevent corrosion.
- 

- F. The RTU chassis and polyphaser shall be bonded to the building and electrical ground.

#### **5.6.11 Heliax Cable**

- A. Heliax cable shall be installed to obtain the least amount of db loss for the required frequencies. The size of the cable shall be determined based upon the RF study. The cable shall be installed with Type N connectors and secured to the tower to prevent movement. The cable connections shall be sealed to prevent moisture intrusion and corrosion. A polyphaser lightning protection shall be installed at the point the coax cable enters the RTU box. Upon completion of the cable installation, a sweep test of the cable shall be performed and turned over to the owner before acceptance.
- B. The following cable has been pre-approved for this project:
  - a. Andrew 1/2" Foam Heliax Cable – LDF4-50A.
  - b. Andrew 7/8" Foam Heliax Cable – LDF5-50A.

#### **5.6.12 Radios**

- A. Radio selection for any site will be based on the results of a Radio Path Study. The study will determine at what frequency a particular sight must communicate. The following radios are approved for this project:
- B. The Dataradio ViPR SC-900 from Cal Amp Corp.
- C. The Dataradio ViPR SC-400 from Cal Amp. Corp.

#### **5.6.13 Radio Path Study**

- A. An RF Engineer shall perform a radio path study. This study shall include terrain, trees, buildings, and foliage for the different seasons. This study will determine the proper height of the antennas, type of cable required and direction of antenna. The study shall obtain a clear radio line of sight. If a clear radio line of sight cannot be obtained, then an alternative radio path will be considered. A minimum fade margin of 20db above the receiver sensitivity threshold must be obtained.

#### **5.6.14 FCC Licenses**

- A. The contractor, working with the integrator and BCWD SCADA, shall be responsible for ensuring that the radio is covered under a current frequency license or apply for a new/corrected license if required.

#### **5.6.15 Testing**

- A. The Contractor shall field test all SCADA related equipment in the presence of a representative from the BCWD SCADA Department to demonstrate that the

instrumentation and controls operate as specified. This test includes but is not limited to:

- a. Proper I/O signals.
- b. Program operation.
- c. Communication with all equipment.
- d. Battery backup operation.
- e. Verification of all RTU voltages.

## **6 MATERIAL SPECIFICATIONS**

### **6.1 General**

- A. All materials and equipment used on water distribution and sanitary sewerage systems shall be new.

### **6.2 C900 PVC DR 18 Pipes for Gravity Sanitary Sewers**

- A. All gravity Sanitary Sewer shall be DR 18 or an approved equal by BCWD.

### **6.3 HDPE Pipe for Sanitary Sewer Force Mains**

- A. High Density Polyethylene (HDPE) pipe shall be used in force main applications to protect against corrosion by hydrogen sulfide gases. HDPE pipe shall be DIPS sizing with a minimum pressure rating of 200 psi (DR 11).

### **6.4 DIP Pipe and Fittings**

#### **6.4.1 Ductile Iron Pipe (Water Only)**

- A. Ductile Iron Pipe shall meet the following specifications:
  - a. Ductile iron pipe shall be designed and manufactured in accordance with ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51.
- B. Ductile iron used to manufacture ductile iron pipe shall meet the following minimum physical properties:
  - a. Minimum Tensile Strength – 60,000 PSI.
  - b. Minimum Yield Strength – 42,000 PSI.
  - c. Minimum Elongation – 10 percent.



C. Ductile iron pipe thickness shall be in accordance with ANSI/AWWA C150/A21.50:

- a. 4-inch through 12-inch ductile iron pipe shall be Pressure Class 350.
- b. Greater than 12-inch ductile iron pipe shall be minimum Pressure Class 250.

#### 6.4.2 Joints

A. Buried Pipe:

- a. Push-on joints in accordance with ANSI/AWWA C111/A21.11.

B. Above Grade (Non-Buried) Pipe:

- a. Flanged joints in accordance with ANSI/AWWA C115/A21.15.

#### 6.4.3 Gaskets

A. Standard Push-on Joints:

- a. Plain rubber gasket in accordance with ANSI/AWWA C111/A21.11.

B. Restrained Push-on Joints:

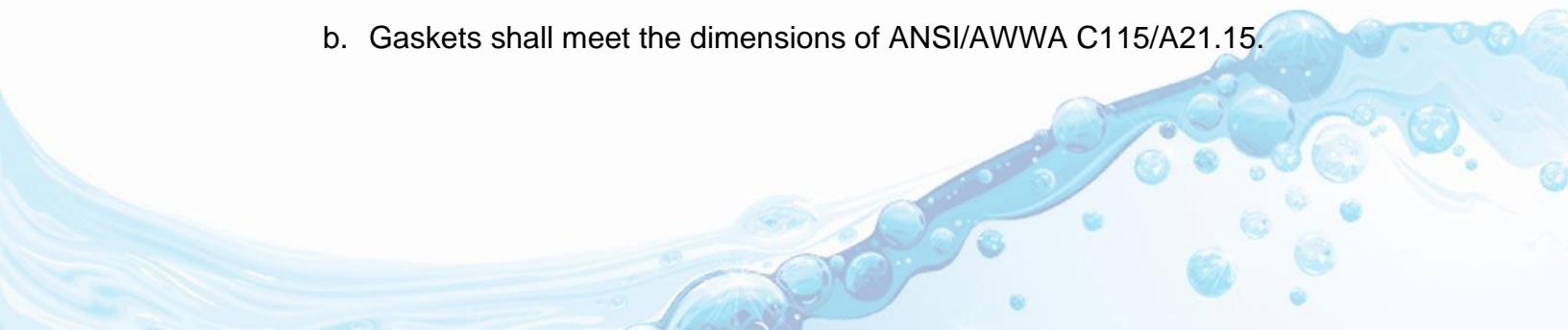
- a. Plain rubber gasket with restraining teeth meeting the requirements of ANSI/AWWA C111/A21.11.

C. Acceptable manufacturers of restrained joint gaskets:

- a. American Ductile Iron Pipe Company Fast-Grip Gasket.
- b. Griffin TALON RJ Gasket.
- c. McWane SURE STOP 350 Gasket.
- d. U.S. Pipe FIELD LOK 350 Gasket.
- e. BCWD Approved Equal.

D. Flanged Joints:

- a. Full face, 1/8-inch thick, red styrene-butadiene rubber (SBR) with a Durometer "Shore A" hardness of 65, a tensile strength of 1,000 PSI in accordance with ASTM F152, and an elongation of 400%.
- b. Gaskets shall meet the dimensions of ANSI/AWWA C115/A21.15.



#### 6.4.4 Hardware

##### A. Flanged Joints:

- a. Bolts shall be heavy hex type, low carbon steel, zinc plated in accordance with ASTM A307, Grade B.
- b. Nuts shall be heavy hex type, low carbon steel, zinc plated in accordance with ASTM A563, Grade A.
- c. Washers shall be SAE flat washers, low carbon steel, zinc plated in accordance with ASTM F844.

#### 6.4.5 Coatings

##### A. Buried Pipe:

- a. Interior:
  - i. Non-corrosive conditions: Standard thickness cement-mortar in accordance with ANSI/AWWA C104/A21.4.
  - ii. Corrosive conditions: PROTECTO 401 Ceramic Epoxy or approved equal.
- b. Exterior:
  - i. Asphaltic coating in accordance with ANSI/AWWA C151/A21.51.

##### B. Above Grade (Non-Buried) Pipe:

- a. Interior:
  - i. Non-corrosive conditions: Standard thickness cement-mortar in accordance with ANSI/AWWA C104/A21.4.
  - ii. Corrosive conditions: PROTECTO 401 Ceramic Epoxy or approved equal.
- b. Exterior:
  - i. Universal primer.





### 6.4.6 Ductile Iron Fittings

- A. Ductile Iron Fittings shall meet the following specifications:
  - a. Standard ductile iron fittings shall be designed and manufactured in accordance with ANSI/AWWA C110/A21.10.
  - b. Compact ductile iron fittings shall be designed and manufactured in accordance with ANSI/AWWA C153/A21.53.
  - c. Ductile iron used to manufacture ductile iron fittings shall meet the following minimum physical properties:
    - i. Minimum Tensile Strength – 70,000 PSI.
    - ii. Minimum Yield Strength – 50,000 PSI.
    - iii. Minimum Elongation – 5 percent.

### 6.4.7 Joints

- A. Buried Fittings:
  - a. Mechanical joints in accordance with ANSI/AWWA C111/A21.11.
  - b. Mechanical joints that require restraining shall be restrained with wedge type mechanical joint retainer glands for ductile iron pipe. Retainer glands shall be manufactured from high strength ductile iron in accordance with ASTM A536, Grade 65-45-12. Retainer gland dimensions shall be in accordance with ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53.
  - c. Acceptable manufacturers of retainer glands:
    - i. EBBA Mega-Lug Series 1100.
    - ii. Sigma ONE-LOK Series D-SLDE.
    - iii. Romac Romagrip.
    - iv. BCWD Approved Equal.
- B. Above Grade (Non-Buried) Fittings:
  - a. Flanged joints in accordance with ANSI/AWWA C110/A21.10.

### 6.4.8 Gaskets

- A. Mechanical Joints:



- a. Plain rubber mechanical joint gasket in accordance with ANSI/AWWA C111/A21.11.

**B. Flanged Joints:**

- a. Full face, 1/8-inch thick, red styrene-butadiene rubber (SBR) with a Durometer “Shore A” hardness of 65, a tensile strength of 1,000 PSI in accordance with ASTM F152, and an elongation of 400%.
- b. Gaskets shall meet the dimensions of ANSI/AWWA C115/A21.15.

#### **6.4.9 Hardware**

**A. Mechanical Joints:**

- a. Bolts shall be low carbon steel, zinc plated, tee-head bolts in accordance with ANSI/AWWA C111/A21.11.
- b. Nuts shall be low carbon steel, zinc plated in accordance with ANSI/AWWA C111/A21.11.

**B. Flanged Joints:**

- a. Bolts shall be heavy hex type, low carbon steel, zinc plated in accordance with ASTM A307, Grade B.
- b. Nuts shall be heavy hex type, low carbon steel, zinc plated in accordance with ASTM A563, Grade A
- c. Washers shall be SAE flat washers, low carbon steel, zinc plated in accordance with ASTM F844.

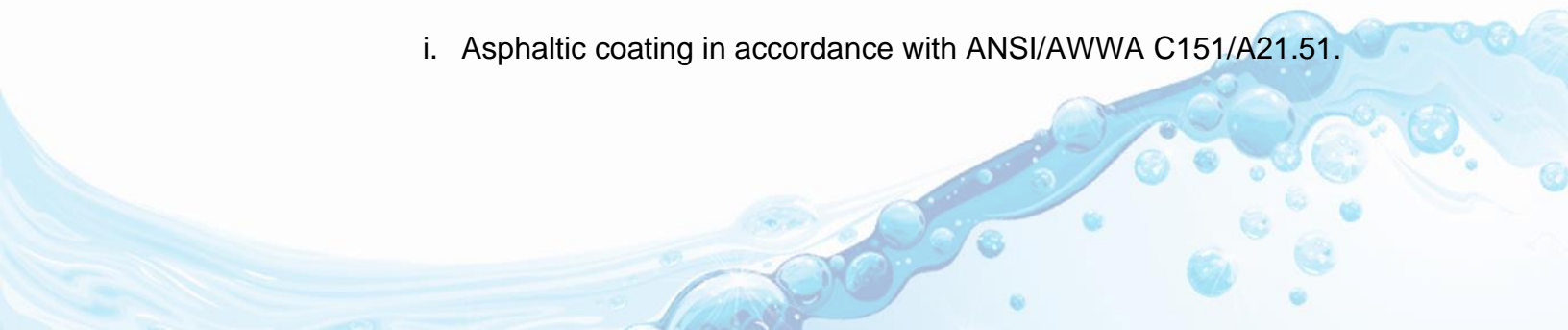
#### **6.4.10 Coatings**

**A. Buried Fittings:**

- a. Interior:
  - i. Non-corrosive conditions: Double thickness cement-mortar in accordance with ANSI/AWWA C104/A21.4.
  - ii. Corrosive conditions: PROTECTO 401 Ceramic Epoxy.

**b. Exterior:**

- i. Asphaltic coating in accordance with ANSI/AWWA C151/A21.51.



B. Above Grade (Non-Buried) Fittings:

- a. Interior:
  - i. Non-corrosive conditions: Double thickness cement-mortar in accordance with ANSI/AWWA C104/A21.4.
  - ii. Corrosive conditions: PROTECTO 401 Ceramic Epoxy.
- b. Exterior:
  - i. Universal primer

**6.4.11 Manufacturer**

All ductile iron pipe and fittings used on a project shall be new and shall be the product of a single manufacturer, unless otherwise approved by BCWD.

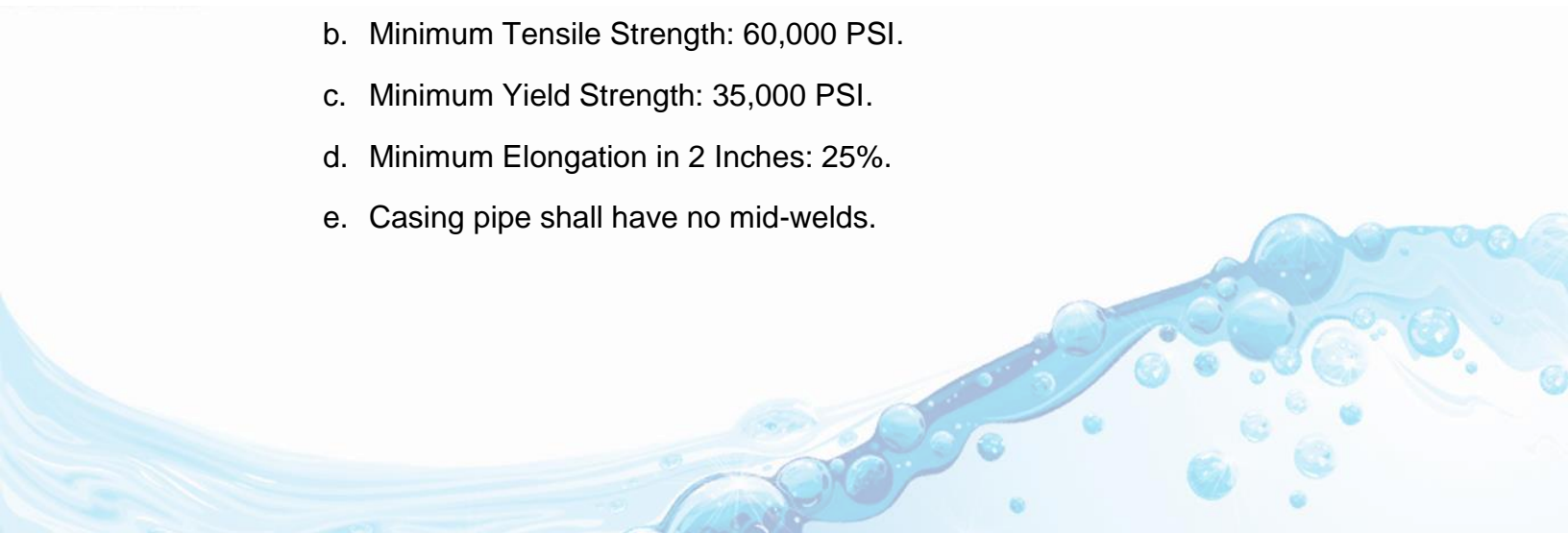
A. Acceptable manufacturers of ductile iron pipe and fittings:

- a. American Cast Iron Pipe Company.
- b. Griffin Pipe Products.
- c. U.S. Pipe and Foundry Company.
- d. BCWD Approved Equal.

**6.5 Casing Pipe**

**6.5.1 Steel Casing Pipe for Road and Railroad Crossings**

- A. Steel casing pipe shall be new, seamless steel pipe in accordance with ASTM A252, Grade 2.
  - a. Minimum Thickness: ¼ inch.
  - b. Minimum Tensile Strength: 60,000 PSI.
  - c. Minimum Yield Strength: 35,000 PSI.
  - d. Minimum Elongation in 2 Inches: 25%.
  - e. Casing pipe shall have no mid-welds.



Pipe Size	Pipe O.D.	Bell O.D.	Casing O.D.	Casing I.D.
6"	6.3"	9.54"	12"	11.62"
8"	9.05"	11.78"	16"	15.56"
10"	11.1"	14.05"	18"	17.50"
12"	13.20"	16.34"	20"	19.44"
16"	17.40"	20.72"	24"	23.31"
20"	21.60"	25.5"	30"	29.12"
24"	25.80"	30.7"	34"	33.12"

### 6.5.2 PVC Casing Pipe for Water Service Lines

- A. Polyvinyl chloride (PVC) casing pipe for service lines shall be new Schedule 40 PVC in accordance with ASTM D1784.

### 6.5.3 HDPE Casing Pipe for Water Service Lines

- A. High Density Polyethylene (HDPE) casing pipe for service lines shall be new DR 17 HDPE in accordance with ASTM D3035 or ASTM F714. HDPE pipe materials shall be in accordance with ASTM D3350.

## 6.6 Polyethylene Encasement

### 6.6.1 Polyethylene Encasement (Wrapping)

- A. Polyethylene encasement material shall be minimum 8-mil, linear low density, flat tube, virgin polyethylene film in accordance with ANSI/AWWA C105/A21.5.
- B. Polyethylene encasement shall have the following properties.
  - a. Tensile Strength: Minimum 3,600 PSI.
  - b. Elongation: Minimum 800%.
  - c. Dielectric Strength: Minimum 800 V/mil.
  - d. Impact Resistance: Minimum 600 grams.
  - e. Propagation Tear Resistance: Minimum 2,550 grams-force.

C. Polyethylene encasement shall be marked with the following information.

- a. Year of manufacture.
- b. Type of resin.
- c. Specification conformance.
- d. Applicable pipe sizes.

D. Polyethylene encasement shall be the following color.

- a. Water Service – Blue.
- b. Sanitary Sewage Service – Green.
- c. Securing tape shall be 2-inch-wide PVC pipe tape, minimum 10-mil thickness, 245- percent elongation, and 30 PSI tensile strength.

## **6.7 Copper Tubing**

### **6.7.1 Copper Tubing for Water Service Lines**

- A. Buried services line shall be Type K, seamless soft copper tubing in accordance with ASTM B88.
- B. All above grade (non-buried) service lines shall be Type K, copper pipe in accordance with ASTM B88.

## **6.8 Valves**

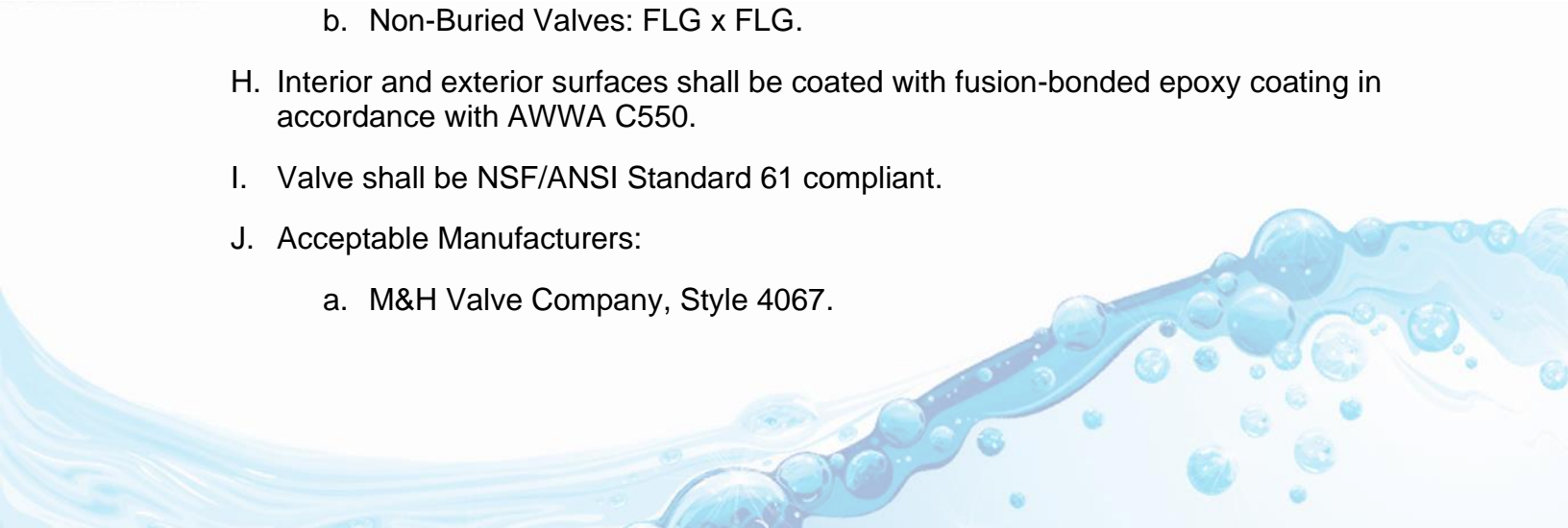
### **6.8.1 Butterfly Valves**

- A. Resilient seated butterfly valves in accordance with AWWA C504.
- B. Valve body shall be ASTM A126, Class B ductile iron.
- C. Valve disc shall be ASTM A126, Class B ductile iron with Type 316 stainless steel edge.
- D. Valve stem shall be Type 304 stainless steel in accordance with ASTM A276.
- E. Minimum 150 PSI working pressure.
- F. Valves shall open counter-clockwise (left).
- G. End Connections:
  - a. Buried Valves: MJ x MJ.
  - b. Non-Buried Valves: FLG x FLG.



- H. Interior and exterior surfaces shall be coated with fusion-bonded epoxy coating in accordance with ANSI/AWWA C550.
- I. Valve shall be NSF/ANSI Standard 61 compliant.
- J. Acceptable Manufacturers:
  - a. Henry Pratt Company.
  - b. Val-Matic Valve & Manufacturing Corporation.
  - c. DeZurik.
  - d. M & H Valve.
  - e. BCWD Approved Equal.

### **6.8.2 Gate Valves**

- A. Resilient-seated gate valves for water supply service in accordance with AWWA C509.
  - B. Valve body and bonnet shall be ASTM A126, Class B ductile iron.
  - C. Disc shall be cast iron and shall be encapsulated in rubber.
  - D. Valve stem shall be cast bronze.
  - E. Minimum 200 PSI working pressure.
  - F. Operators:
    - a. Buried Valves: Non-Rising Stem (NRS).
    - b. Non-Buried Valves: Outside Stem and Yoke (OS&Y).
    - c. Valves shall open counter-clockwise (left).
  - G. End Connections:
    - a. Buried Valves: MJ x MJ.
    - b. Non-Buried Valves: FLG x FLG.
  - H. Interior and exterior surfaces shall be coated with fusion-bonded epoxy coating in accordance with AWWA C550.
  - I. Valve shall be NSF/ANSI Standard 61 compliant.
  - J. Acceptable Manufacturers:
    - a. M&H Valve Company, Style 4067.
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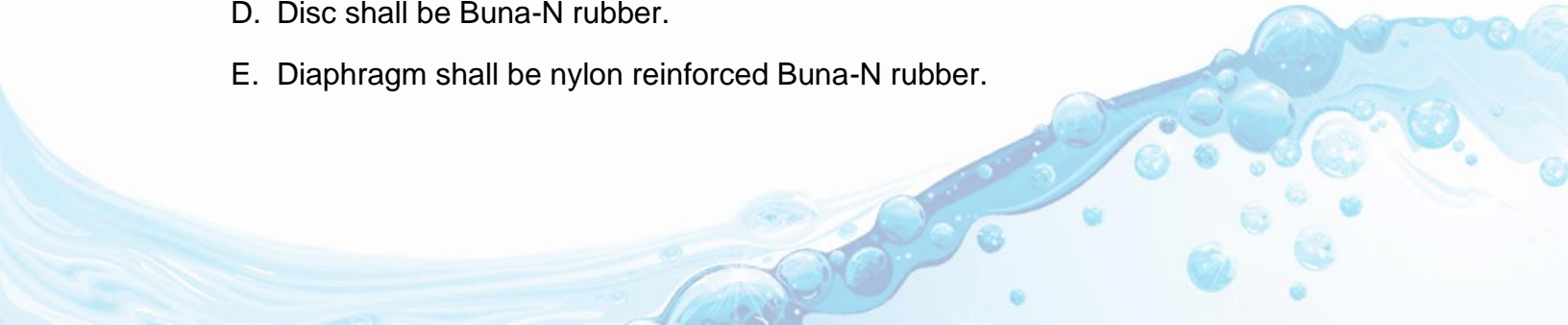


- b. Mueller Company, 2360 Series.
- c. U.S. Pipe Valve and Hydrant Division, A-USP0-20.
- d. East Jordan Iron Works.
- e. BCWD Approved Equal.

### **6.8.3 Plug Valves**

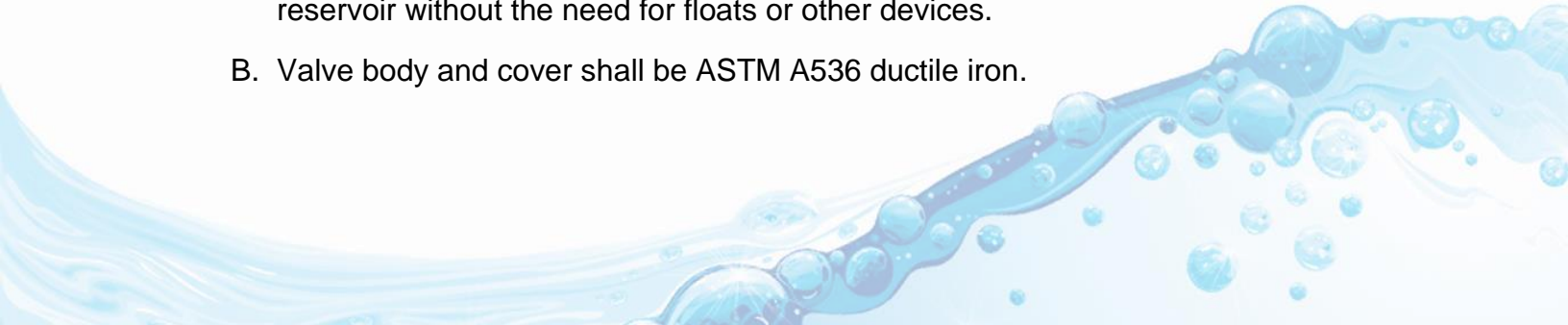
- A. Plug valves shall be eccentric.
- B. Valve body shall be ASTM A126, Class B cast iron in accordance with the latest revision of AWWA C517.
- C. Plug valve shall be cast iron with resilient coating and stainless-steel bearings.
- D. Minimum 175 PSI working pressure for valves less than or equal to 12 inch in size. Minimum 150 PSI working pressure for valves greater than 12 inch in size.
- E. Operators:
  - a. Rotary type actuator.
- F. End Connections:
  - a. Buried Valves: MJ x MJ.
  - b. Non-Buried Valves: FLG x FLG.
- G. Interior and exterior surfaces shall be coated with fusion-bonded epoxy coating.
- H. Acceptable Manufacturers:
  - a. M&H Valve Company.
  - b. Val-Matic Valve & Manufacturing Corporation.
  - c. BCWD Approved Equal.

### **6.8.4 Pressure Reducing Valves**

- A. Pressure reducing valves shall be hydraulically operated, single diaphragm-actuated, globe pattern valve that maintains a constant downstream pressure regardless of changing flow rate and/or inlet pressure.
  - B. Valve body and cover shall be ASTM A536 ductile iron.
  - C. Disc guide, seat, cover bearing, stem, nut, and spring shall be Type 303 stainless steel.
  - D. Disc shall be Buna-N rubber.
  - E. Diaphragm shall be nylon reinforced Buna-N rubber.
- 

- F. Minimum 250 PSI working pressure.
- G. End connections shall be FLG x FLG.
- H. Interior and exterior surfaces shall be coated with fusion-bonded epoxy coating.
- I. Valve shall be NSF/ANSI Standard 61 compliant.
- J. Pressure reducing valves shall have the following added options.
  - a. Opening speed control.
  - b. X101 visual valve position indicator.
  - c. Inlet and outlet pressure gauge pre-piped with pilot tubing.
  - d. Wye-strainer on pilot tubing.
  - e. Check valve on pilot tubing.
- K. Pilot Control Valve
  - a. Pressure reducing pilot control valve shall be direct-acting, adjustable, spring-loaded, normally open, diaphragm valve with fixed orifice.
  - b. Valve body shall be ASTM B62 bronze.
  - c. Valve trim shall be Type 303 stainless steel.
  - d. Diaphragm shall be Buna-N rubber.
  - e. Minimum 400 PSI working pressure.
  - f. Spring settings shall range from 0 to 450 PSI.
- L. Pilot system shall include an opening speed control and shall be connected to main valve with copper tubing and fittings.
- M. Acceptable Manufacturers:
  - a. Cla-Val Model 90-01.
  - b. BCWD Approved Equal.

#### **6.8.5 Altitude Valves**

- A. Altitude valves shall be hydraulically operated, single diaphragm-actuated, globe or angle pattern, non-throttling type valve that controls the high-water level in a reservoir without the need for floats or other devices.
  - B. Valve body and cover shall be ASTM A536 ductile iron.
- 

- C. Disc guide, seat, cover bearing, stem, nut, and spring shall be Type 303 stainless steel.
- D. Disc shall be Buna-N rubber.
- E. Diaphragm shall be nylon reinforced Buna-N rubber.
- F. Minimum 250 PSI working pressure.
- G. End connections shall be FLG x FLG.
- H. Interior and exterior surfaces shall be coated with fusion-bonded epoxy coating.
- I. Valve shall be NSF/ANSI Standard 61 compliant.
- J. Altitude valve shall have the following added options.
  - a. X101 visual valve position indicator.
  - b. Inlet and outlet gauges.
  - c. Wye-strainer in pilot piping.
- K. Pilot Control Valve
  - a. Pilot control valve shall be diaphragm-actuated, three-way type valve that operates on the differential pressure between the valve and the water surface elevation in the reservoir and an adjustable spring load.
  - b. Valve body shall be ASTM B62 bronze.
  - c. Valve trim shall be Type 303 stainless steel.
  - d. Diaphragm shall be Buna-N rubber.
  - e. Minimum 150 PSI working pressure.
  - f. Spring settings shall range from 5 to 200 feet.
  - g. Pilot valve shall have valve position indicator.
- L. Pilot system shall be connected to main valve with copper tubing and fittings.
- M. Acceptable Manufacturers:
  - a. Cla-Val Model 610-16.
  - b. BCWD Approved Equal.

#### **6.8.6 Check Valves for Submersible Sanitary Sewage Lift Stations**

- A. Swing Check Valves shall be per AWWA C508 and include bottom mounted buffer

to permit free opening, but positive non-slam closure of the disc. The oil hydraulic buffer shall make contact with the disc during the final 10% of closure to control the disc until shut-off in a manner to prevent slam and water hammer.

- B. The buffer rod shall be 303 stainless steel per ASTM A582. The final closure is to be adjustable by means of a color-coded micrometer type control valve. Control valve to have a locking set screw to secure final setting.
- C. The oil reservoir shall be 316 stainless steel per ASTM A240. Hydraulic hoses are to be S.A.E. certified.
- D. The body shall be ASTM A126 Class B cast iron. End connections shall be flanged class 125/150 per ANSI B16.1. Valves 8" and larger shall have a drain plug located on the bottom of the valve.
- E. The body seat shall be 316 stainless steel per ASTM A276 with an o-ring seal and locked into place with stainless screws.
- F. The disc and arm shall be ASTM A536 ductile iron. The disc shall be attached to the disc arm with a double clevis hinge to assure self-leveling and even load distribution upon closure, minimizing seat wear. Disc shall have an independent adjustable full open disc stop. Disc seat shall be nitrile butadiene (NBR) and field replaceable without the use of special tools.
- G. The pivot shaft shall be one-piece 303 stainless steel per ASTM A582, protruding through the valve body with a lever and weight mounted on one side. The pivot shaft shall have a integral retainer to prevent axial shaft movement. The pivot shaft shall have O-ring seals on both sides of the shaft. Braided type packing is not acceptable.
- H. Valve is to be tested by the manufacturer as a complete assembly, including the bottom buffer, per AWWA C508.
- I. Check Valves to be APCO Model CVS-6000B as manufactured by DeZurik, or BCWD approved equal.

### **6.8.7 Check valves**

- A. Swing Type Metal Check Valves (4-Inches and Larger)
  - a. Rubber flapper type swing check valves in accordance with ANSI/AWWA C508 with spring assisted closure to minimize surge and water hammer. Check valve shall be of the full body type with a domed access cover, flexible disc, spring, mechanical position indicator, and screw-type backflow actuator.
  - b. Valve Body and Cover: ASTM A536 Grade 65-45-12 ductile iron.
  - c. Valve Disc: Buna-N (NBR) rubber.
  - d. Spring shall be stainless steel.
  - e. Working Pressure: Minimum 250 PSI.
  - f. Interior and exterior of valves shall be coated with an ANSI/NSF 61 approved epoxy coating.

g. Acceptable Manufacturers:

- i. Series 7200 Surgebuster manufactured by Val-Matic Valve and Manufacturing Corporation.
- ii. Figure SB200D Slaminator manufactured by GA Industries.
- iii. Pratt Model PSI Surge Inhibitor Check Valve.
- iv. BCWD approved equal.

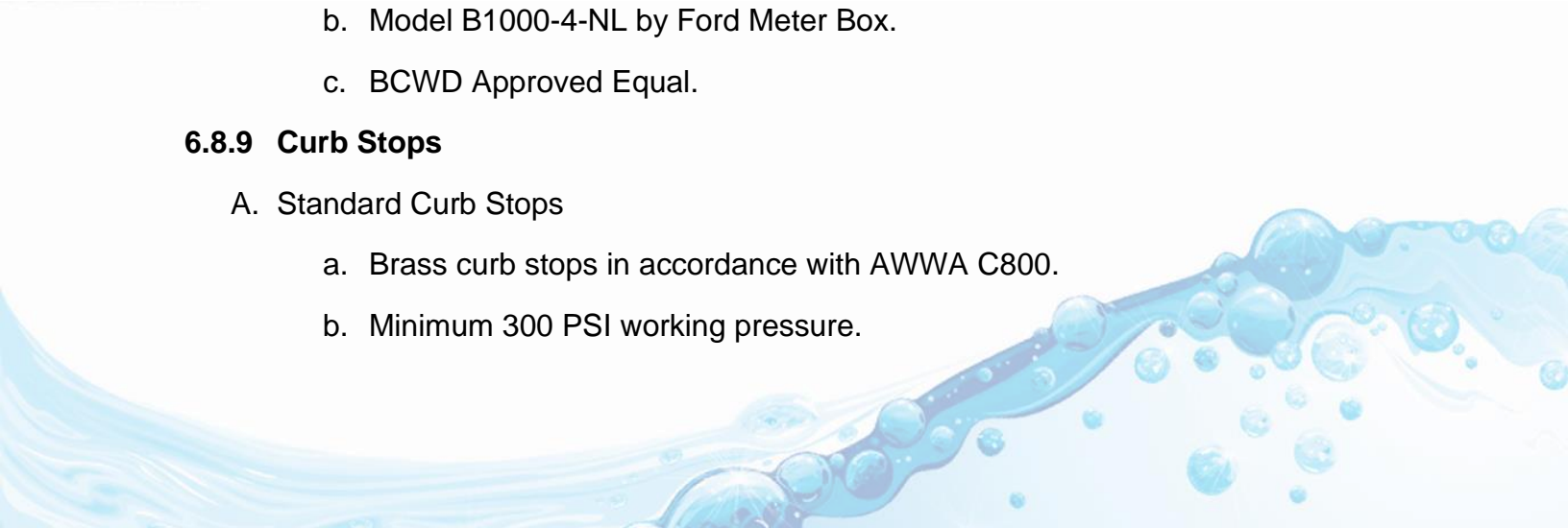
B. Bronze Check Valves (3" and Smaller)

- a. Bronze check valves with renewable seats conforming to MSS SP-139.
- b. Body: Lead-Free Bronze (ASTM B584).
- c. Cold Working Pressure: Minimum 200 PSI.
- d. End Connections: FNPT x FNPT.
- e. Manufacturers:
  - i. Conbraco Industries, Apollo Valves.
  - ii. Nibco, Inc.
  - iii. BCWD approved equal.

### 6.8.8 Corporation Stops

- A. Brass corporation stops in accordance with AWWA C900
- B. Minimum 300 PSI working pressure.
- C. Connections: AWWA Standard Thread (CC) x Copper Tube Size (CTS) Compression.
- D. Acceptable Models:
  - a. Model 74101B-22 by A. Y. McDonald Company.
  - b. Model B1000-4-NL by Ford Meter Box.
  - c. BCWD Approved Equal.

### 6.8.9 Curb Stops

- A. Standard Curb Stops
    - a. Brass curb stops in accordance with AWWA C800.
    - b. Minimum 300 PSI working pressure.
- 

- c. Connections: Copper Tube Size (CTS) Compression x FNPT.
- d. Acceptable Models:
  - i. Model 76102W-22 by A. Y. McDonald Company.
  - ii. Model B43-344W-NL by Ford Meter Box.
  - iii. BCWD Approved Equal.

**B. Angled Curb Stops**

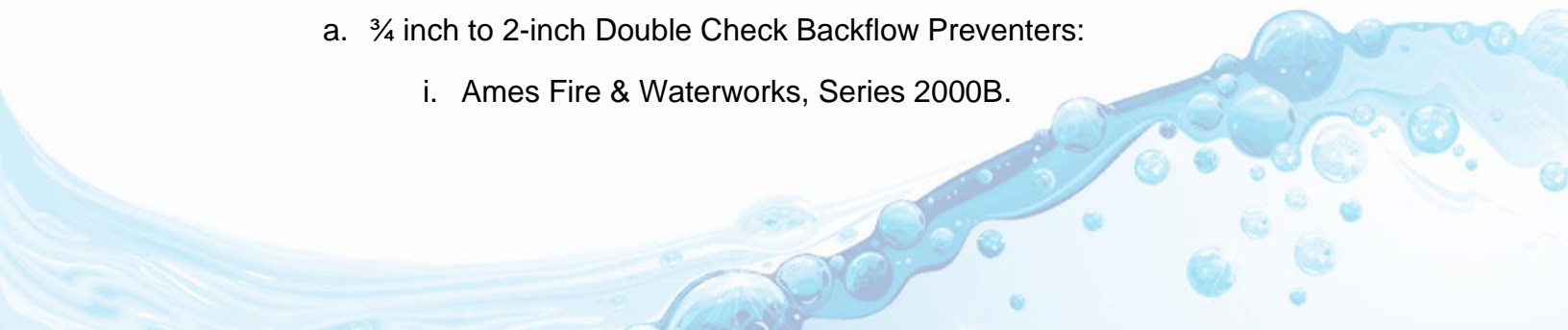
- a. Brass curb stops in accordance with AWWA C800.
- b. Minimum 300 PSI working pressure.
- c. Connections: Copper Tube Size (CTS) Compression x CTS Compression.
- d. Acceptable Models:
  - i. Model 74640B-22 by A. Y. McDonald Company.
  - ii. BA43-344WNL by Ford Meter Box.
  - iii. BCWD Approved Equal.

**6.8.10 Dual Check Backflow Preventers**

- A. Dual check backflow preventers shall be in-line accessible, straight cartridge style dual check valve. No lead brass.
- B. Acceptable Models:
  - a. Model HHCH31NL-323 by Ford Meter Box Company—  $\frac{3}{4}$  inch.
  - b. Model HHCH31NL-344 by Ford Meter Box Company – 1 inch.
  - c. Model 7111-3JE-43 by A.Y.McDonald –  $\frac{3}{4}$  inch.
  - d. Model 7111-4JF-54 by A.Y.McDonald – 1 inch.
  - e. BCWD Approved Equal.

**6.8.11 Double Check Backflow Preventers**

- A. Double Check Backflow Preventers shall be in accordance with ASTM C510.
- B. Acceptable Manufacturers:
  - a.  $\frac{3}{4}$  inch to 2-inch Double Check Backflow Preventers:
    - i. Ames Fire & Waterworks, Series 2000B.



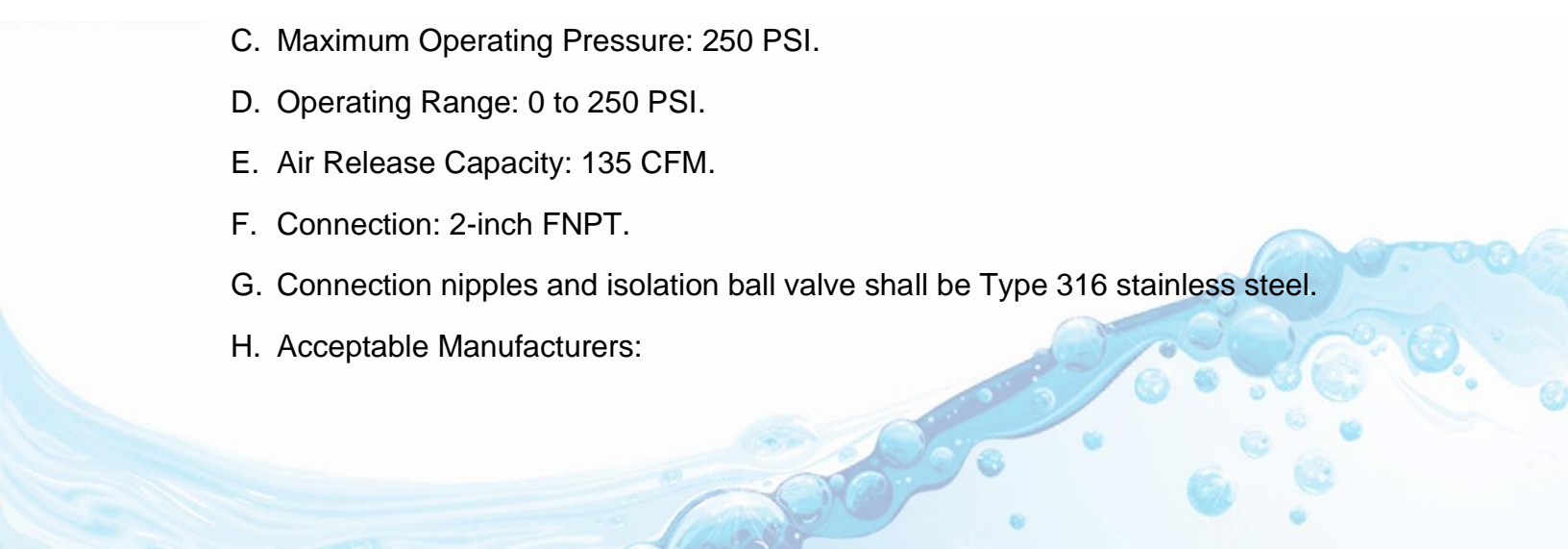


- ii. Watts Water Technologies, Series 007.
  - iii. Wilkens/Zurn, Model 350.
  - iv. BCWD Approved Equal.
- b. 2 ½ inch to 10-inch Double Check Backflow Preventers:
- i. Ames Fire & Waterworks, Series 2000SS-OSY.
  - ii. Watts Water Technologies, Series 774-OSY.
  - iii. Wilkens/Zurn, Model 350-OSY.
  - iv. BCWD Approved Equal.

#### **6.8.12 Reduced Pressure Zone (RPZ) Backflow Preventers**

- A. Reduced Pressure Zone (RPZ) Backflow Preventers shall be in accordance with ASTM C511.
- B. All commercial accounts serving multi-unit outparcels with a meter 2" or smaller require a Reduced Pressure Zone Assembly.
- C. Acceptable Manufacturers:
- a. ¾ inch to 2-inch RPZ Backflow Preventers:
    - i. Ames Fire & Waterworks, Series 4000B.
    - ii. Watts Water Technologies, Series 009.
    - iii. Wilkens/Zurn, Model 375.
    - iv. BCWD Approved Equal.

#### **6.8.13 Air Release Valves**

- A. Air release valves shall be suitable for potable water or sanitary sewage service.
- B. Valve body shall be stainless steel.
- C. Maximum Operating Pressure: 250 PSI.
- D. Operating Range: 0 to 250 PSI.
- E. Air Release Capacity: 135 CFM.
- F. Connection: 2-inch FNPT.
- G. Connection nipples and isolation ball valve shall be Type 316 stainless steel.
- H. Acceptable Manufacturers:
- 


- a. H-Tec Model 984.
- b. A.R.I.
- c. BCWD Approved Equal.

#### **6.8.14 Combination Air/Vacuum Valves**

- A. Combination air/vacuum valve shall be suitable for potable water or sanitary sewage service.
- B. Valve body shall be stainless steel.
- C. Maximum Operating Pressure: 250 PSI.
- D. Operating Range: 0 to 250 PSI.
- E. Air Release Capacity: 135 CFM.
- F. Connection:
  - a. 2-inch to 3-inch: FNPT.
  - b. 4-inch and larger: AWWA C115/ANSI B16.1
- G. 2-inch to 3-inch connection nipples and isolation ball valves shall be Type 316 stainless steel.
- H. Interior and exterior of 4 inch and larger valves shall be fusion bonded epoxy coated.
- I. Acceptable Manufacturers:
  - a. A.R.I.
  - b. H-Tec Model 986.
  - c. BCWD Approved Equal.

### **6.9 Valve Boxes**

#### **6.9.1 Valve Boxes**

- A. Two-piece, adjustable, ductile iron valve box screw type with water lid, 24x36 (foreign acceptable).
  - B. Two-piece, adjustable, ductile iron valve box screw type with water lid, 36x48 (foreign acceptable).
  - C. BCWD Approved Equal.
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- D. The word “WATER” shall be cast into the lid on valve boxes used for water service.
- E. The word “SEWER” shall be cast into the lid on valve boxes used for sanitary sewage service.

## **6.10 Water Tapping Sleeves**

### **6.10.1 Water Tapping Sleeves**

- A. Tapping sleeves shall meet requirements of AWWA C223 and shall be NSF/ANSI Standard 61 certified.
- B. Tapping sleeve for water mains up to 10” diameter shall be Stainless Steel.
- C. Tapping sleeve for water mains 12” diameter or greater shall be fabricated carbon steel epoxy coated.
- D. Body shall be carbon steel in accordance with ASTM A283, Grade C and neck shall be carbon steel in accordance with ASTM A53.
- E. Flange shall be carbon steel in accordance with ASTM A36 and shall accept a tapping valve.
- F. Fabricated tapping sleeve gasket shall be NSF/ANSI Standard 61 certified, heavy duty, Buna-N (Nitrile) rubber.
- G. Bolts shall be heavy hex type, low carbon steel, zinc plated in accordance with ASTM A307, Grade B.
- H. Nuts shall be heavy hex type, low carbon steel, zinc plated in accordance with ASTM A563, Grade A.
- I. Washers shall be SAE flat washers, low carbon steel, zinc plated in accordance with ASTM F844.
- J. Carbon steel tapping sleeve shall be epoxy coated in accordance with AWWA C213.
- K. Flange Gaskets: 1. Full face, plain rubber, 1/8” thickness, in accordance with ANSI/AWWA C110/A21.10 and ANSI/AWWA C115/A21.15 (Ductile Iron Fittings)
- L. Acceptable Manufacturers:
  - a. Ford Meter Box Style FTSC.
  - b. Smith-Blair Style 622.
  - c. JCM 462.



- d. BCWD Approved Equal.

## **6.11 Water Service Saddles**

### **6.11.1 Water Service Saddles**

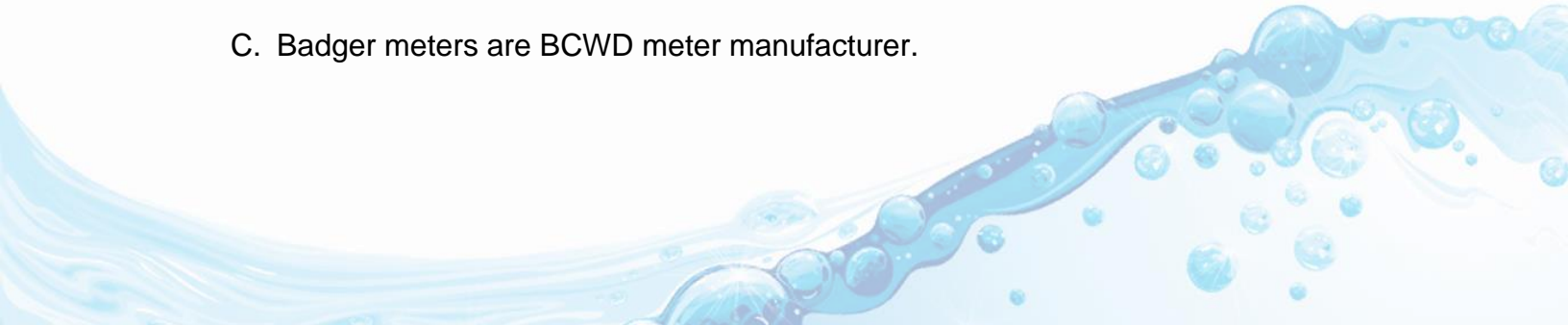
- A. Double strap service saddle in accordance with AWWA C800.
- B. Ductile iron body in accordance with ASTM A536.
- C. AWWA Standard Thread (CC) outlet.
- D. Carbon steel straps in accordance with ASTM A108.
- E. Nuts shall be heavy hex type, low carbon steel, zinc plated in accordance with ASTM A563, Grade A.
- F. Washers shall be SAE flat washers, low carbon steel, zinc plated in accordance with ASTM F844.
- G. NSF/ANSI Standard 61 certified, heavy duty, Buna N outlet gasket
- H. Acceptable Manufacturers:
  - a. Ford Meter Box Style F202.
  - b. Smith-Blair Style 313.
  - c. JCM 402.
  - d. Power Seal 3413.
  - e. BCWD Approved Equal.

## **6.12 Water Meters**

### **6.12.1 Residential**

- A. All water meters are provided by BCWD (meter fees apply).

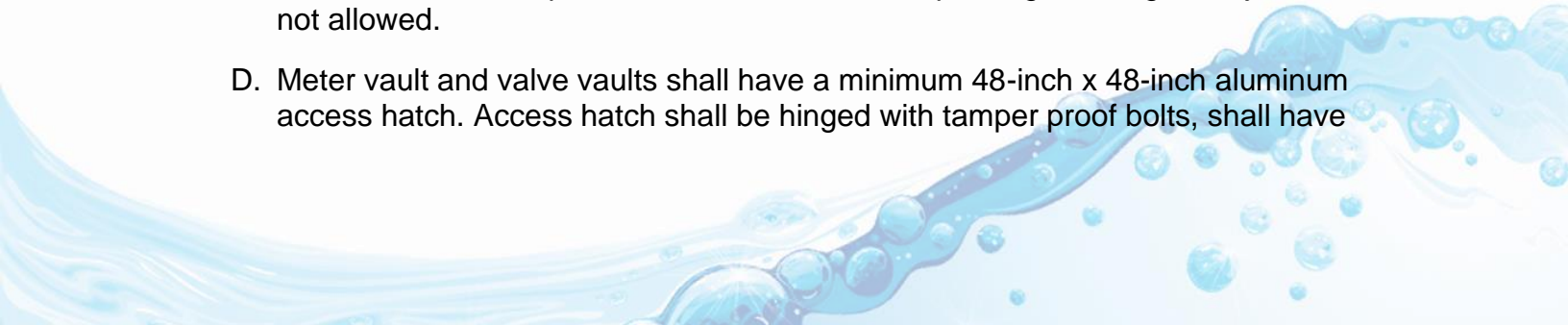
### **6.12.2 Commercial and Industrial**

- A. All commercial water meters 2-inches and less in size are installed by BCWD (meter fees apply).
  - B. Developer/Contractor shall provide and install all water meters greater than 2-inches in size.
  - C. Badger meters are BCWD meter manufacturer.
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### 6.12.3 Water Meter Boxes

- A. Water meter box shall be high density polyethylene or fiber reinforced plastic.
- B. Water meter boxes for  $\frac{3}{4}$  inch and 1-inch services shall be a jumbo meter box with base measurements of 12 inch deep by 19  $\frac{1}{2}$  inch wide by 25  $\frac{1}{2}$  inch long.
- C. Water meter boxes for 1 $\frac{1}{2}$  inch to 2-inch services shall be a super jumbo meter box that measures minimum 17 inch wide by 30 inch long by 18 inch deep.
- D. Water meter box color: Black
- E. Water meter box lids shall be plastic and supplied with the box from the manufacturer and have rebar installed for locating purposes with a 2-inch diameter hole offset to one end for touch reader and/or MXU installation.
- F. Water meter boxes shall have the words "WATER METER" embossed on the lid.
- G. Acceptable Manufacturers:
  - a. 1. Jumbo Meter Box
    - i. Carson L Series 1530-18
    - ii. DFW Plastics, Inc. 1600 Series
    - iii. NDS D1600 Series
    - iv. BCWD Approved Equal
  - b. Super Jumbo Meter Box
    - i. DFW Plastics, Inc. 1700 Series
    - ii. Carson 1730-18
    - iii. NDS D1700 Series
    - iv. BCWD Approved Equal

### 6.12.4 Meter Vaults and Valve Vaults

- A. Meter vaults and valve vaults shall be precast concrete in accordance with ASTM C478.
  - B. Concrete Compressive Strength: 4,000 PSI @ 28 days.
  - C. Vaults must be one piece with a concrete slab top. Tongue and groove joints are not allowed.
  - D. Meter vault and valve vaults shall have a minimum 48-inch x 48-inch aluminum access hatch. Access hatch shall be hinged with tamper proof bolts, shall have
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automatic hold open arm, shall have flush aluminum drop handle, and shall have a staple for pad lock. All hardware shall be Type 316 stainless steel. Access hatch shall be U.S. F. Fabrication Model APD300, or BCWD approved equal.

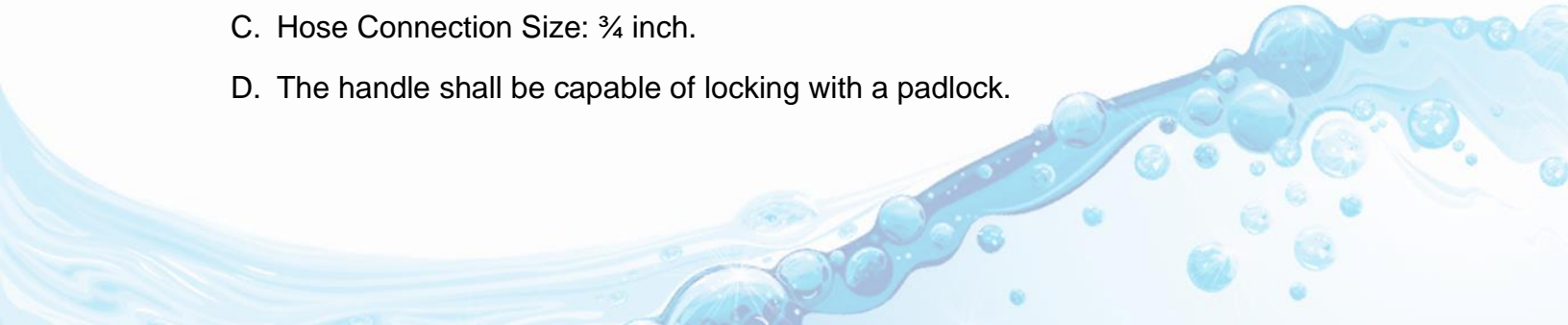
- E. Steps shall be located at hatch, and hatch shall be offset so that steps are accessible.

## **6.13 Fire Hydrants**

### **6.13.1 Fire Hydrants**

- A. Six-inch, dry barrel, fire hydrant in accordance with AWWA C502.
- B. Minimum Working Pressure: 250 PSI
- C. 6-inch MJ base connection.
- C. Minimum 4½ inch main valve.
- D. Fire hydrant shall have automatic drain that closes fully when the main valve is opened.
- E. Nozzles:
  - a. One (1) 4½ inch pumper nozzle
  - b. Two (2) 2½ inch hose nozzles
- F. 1½ inch National Standard pentagon operating nut. Open counterclockwise.
- G. Color: Yellow – factory painted
- H. Minimum Depth of Bury: 4 feet.
- I. Acceptable Manufacturers:
  - a. M&H Valve Company Style 129
  - b. Mueller Valve Company Super Centurion A-421
  - c. American Darling
  - d. Or approved BCWD equal

### **6.13.2 Yard Hydrants**

- A. Non-freezing, compression, post type hydrant with self-draining barrel.
  - B. Suitable for 150 PSI working pressure.
  - C. Hose Connection Size: ¾ inch.
  - D. The handle shall be capable of locking with a padlock.
- 



E. Acceptable Manufacturers:

- a. Simmons 800 Series
- b. BCWD Approved Equal

## **6.14 Pressure Gauges**

### **6.14.1 Pressure Gauges**

- A. Pressure gauges shall be minimum 2½ inch diameter, liquid filled, Type 316 stainless steel gauges.
- B. Range of gauge shall be approximately 2 times the normal operating pressure.
- C. Acceptable Manufacturers:
  - a. Ametek
  - b. Ashcroft
  - c. Terice
  - d. BCWD Approved Equal

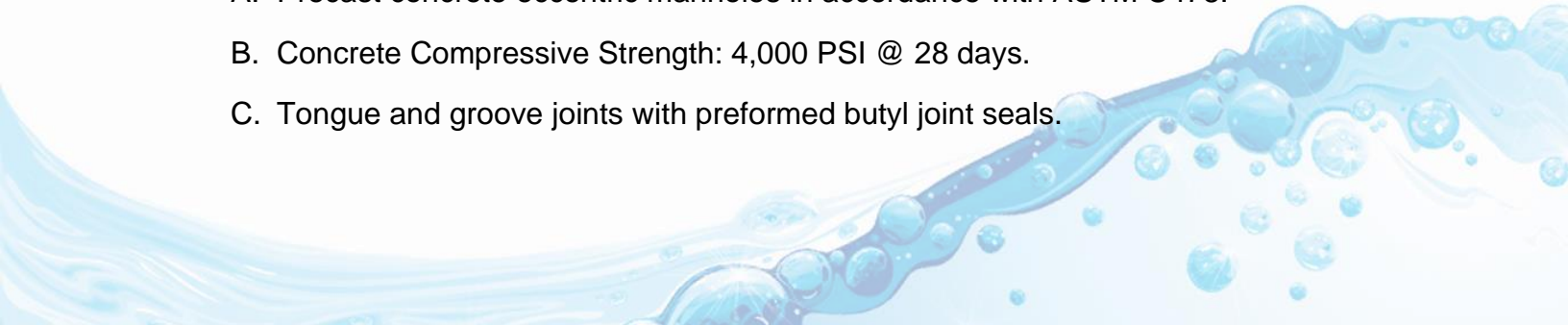
## **6.15 Diaphragm Seals**

### **6.15.1 Diaphragm Seals**

- A. Diaphragm seals shall be Type 316 stainless steel seals with flushing connections.
- B. Acceptable Manufacturers:
  - a. Ametek
  - b. Ashcroft
  - c. Terice
  - d. BCWD Approved Equal

## **6.16 Manholes**

### **6.16.1 Precast Manholes**

- A. Precast concrete eccentric manholes in accordance with ASTM C478.
  - B. Concrete Compressive Strength: 4,000 PSI @ 28 days.
  - C. Tongue and groove joints with preformed butyl joint seals.
- 

### **6.16.2 Polymer Concrete Manholes**

- A. Polymer concrete manholes shall be in accordance with ASTM C478
- B. All grade rings shall be polymer or pro-ring.
- C. Tongue and groove joints with butyl mastic and rubber gasket.


### **6.16.3 Preformed Butyl Joint Seal**

- A. Preformed butyl joint seals shall be in accordance with ASTM C990.
- B. Preformed butyl joint seals shall be provided in rope form. Additional joint sealing methods/measures may be required as conditions warrant.
- C. Acceptable Manufacturers:
  - a. Hamilton Kent, Inc. (Kent Seal No. 2)
  - b. Henry Company (Ram-Nek Joint Sealant)
  - c. Press-Seal Gasket Corporation (EZ-STIK)
  - d. BCWD Approved Equal

### **6.16.4 Pipe-to-Manhole Connectors**

- A. Pipe-to-manhole connectors shall be resilient connectors with stainless steel clamps in accordance with ASTM C923.
- B. Acceptable Manufacturers:
  - a. A-Lok Products, Inc.
  - b. Trelleborg Pipe Seals Milford, Inc. (Kor-N-Seal)
  - c. BCWD Approved Equal

### **6.16.5 Manhole Steps**

- A. Manhole steps shall be copolymer polypropylene type with ½ inch Grade 60 steel reinforcing rod conforming to ASTM C478.
  - B. Acceptable Manufacturers:
    - a. American Step Company, Inc.
    - b. A. Industries, Inc.
    - c. BCWD Approved Equal
- 

### **6.16.6 Frames and Covers**

- A. Frames and covers shall be heavy duty ductile iron castings.
- B. Standard manhole frame and covers for sanitary sewer manholes acceptable manufacturers:
  - a. E.J. Manhole Covers
  - b. BCWD approved equal.
- C. Bolt-down, watertight, manhole frame and covers for sanitary sewer manholes acceptable manufacturers:
  - a. U.S. Foundry, Model 362-CK-BWT
  - b. BCWD Approved Equal
- D. Manhole frame and cover for air release valve and combination air/vacuum (CAV) valves acceptable manufacturers:
  - a. Neenah Foundry, Model R-1563
  - b. BCWD approved equal.

### **6.17 Pipe Support/Pipe Hangers**

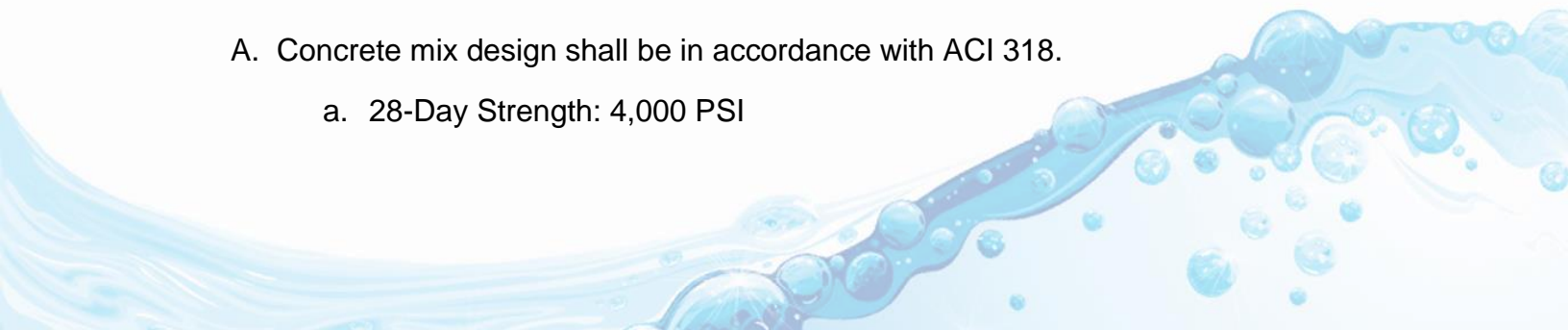
#### **6.17.1 Pipe Supports/Pipe Hangers**

- A. Pipe supports, saddles, hangers, etc. shall be manufactured from carbon steel and shall be prime coated in the factory.
- B. Pipe supports shall be adjustable.
- C. Hardware shall be Type 316 Stainless Steel.
- D. Acceptable Manufacturers:
  - a. Anvil International
  - b. Cooper B-Line
  - c. BCWD Approved Equal

### **6.18 Cast in-Place Concrete**

#### **6.18.1 Cast-In-Place Concrete – MUST HAVE BCWD APPROVAL**

- A. Concrete mix design shall be in accordance with ACI 318.
  - a. 28-Day Strength: 4,000 PSI



- B. Cement Content: Minimum 560 pounds per cubic yard
- C. Air Content: 5% to 7% in accordance with ASTM C231
- D. Water to Cement Ratio: Maximum 0.44
- E. Slump Range: 3 to 5 inches in accordance with ASTM C143
- F. Use of fly ash must be approved by BCWD Engineer
- G. Use of admixtures must be approved by BCWD Engineer
- H. Materials
  - a. Cement
    - i. Domestic Portland cement in accordance with ASTM C150, Type II.
  - b. Fine Aggregate
    - i. Washed, inert, natural sand in accordance with ASTM C33.
  - c. Coarse Aggregate
    - i. No. 57 stone in accordance with ASTM C33.
  - d. 4. Water
    - i. Clean, potable water free from injurious amounts of oils, acids, alkalis, salts, organic matter, or other deleterious substances.

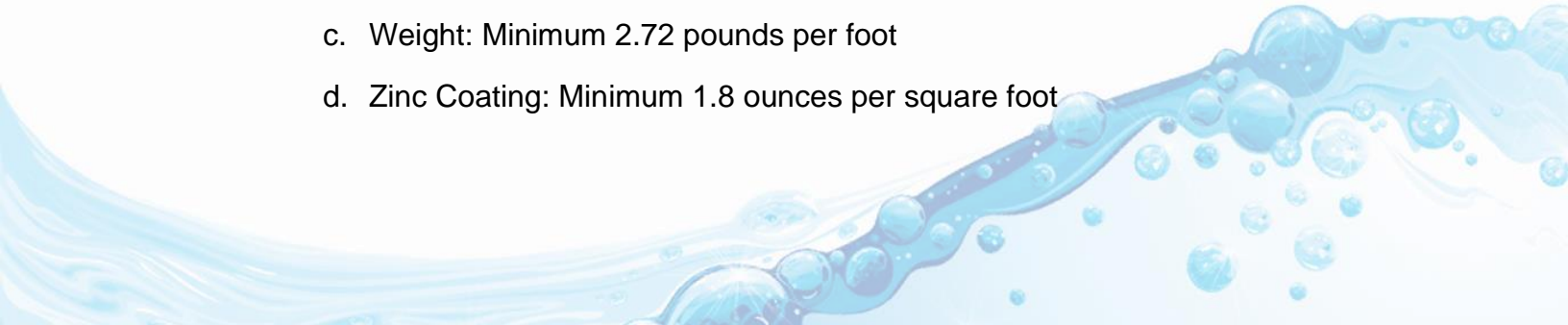
### **6.18.2 Reinforcement**

- A. Steel reinforcing bars shall be in accordance with ASTM A615, Grade 60.
- B. Welded wire reinforcement shall be in accordance with ASTM A185.

## **6.19 Chain Link Fence and Gates**

### **6.19.1 Chain Link Fence and Gates**

- A. All fence pipe for posts, rails, and all braces and appurtenances shall be vinyl clad, schedule 40 round, seamless hot dip galvanized pipe conforming to ASTM-A-120-1, or approved equal.
- B. Chain Link Fence Fabric
  - a. Chain Link fence fabric shall be factory coated 6-gauge core wire with a min .02-inch-thick coating of plasticized polyvinyl-chloride Class 2B Fused and Bonded applied by the fusion method over a thermoset plastic bonding agent

- b. Chain link fence shall be galvanized fabric in accordance with ASTM A392, Type II, Class 2, 2.0 ounces per square foot.
    - c. The fence height shall be six (6) feet.
    - d. Core Wire Gauge: No. 9
  - C. Pattern: 2-inch diamond-mesh
  - D. Posts
    - a. Intermediate/Line Posts
      - i. Schedule 40 galvanized steel pipe in accordance with ASTM F1083.
      - ii. Diameter: 2.375 inch
      - iii. Weight: Minimum 3.65 pounds per foot
      - iv. Zinc Coating: Minimum 1.8 ounces per square foot
    - b. End, Corner, Angle, Pull, and Gate Posts
      - i. Schedule 40 galvanized steel pipe in accordance with ASTM F1083.
      - ii. Diameter: 4-inch
      - iii. Weight: Minimum 9.1 pounds per foot
      - iv. Zinc Coating: Minimum 1.8 ounces per square foot
  - E. Top and Brace Rails
    - a. Schedule 40 galvanized steel pipe in accordance with ASTM F1083.
    - b. Diameter: 1.66 inch
    - c. Weight: Minimum 2.27 pounds per foot
    - d. Zinc Coating: Minimum 1.8 ounces per square foot
  - F. Gate Frame Posts
    - a. Schedule 40 galvanized steel pipe in accordance with ASTM F1083.
    - b. Diameter: 1.90 inch
    - c. Weight: Minimum 2.72 pounds per foot
    - d. Zinc Coating: Minimum 1.8 ounces per square foot
- 

#### G. Interior Bracing Posts for Gates

- a. Schedule 40 galvanized steel pipe in accordance with ASTM F1083.
- b. Diameter: 1.66 inch
- c. Weight: Minimum 2.27 pounds per foot
- d. Zinc Coating: Minimum 1.8 ounces per square foot

#### H. Fence Fittings

- a. All fence fittings shall be in accordance with ASTM F626.
- b. Barbed wire support arms shall have 45-degree angle and shall support three (3) strands of barbed wire.

#### I. Tension Wire

- a. Zinc-coated steel marcelled tension wire in accordance with ASTM A824, Type II.
- b. Diameter: 0.177-inch (7 gauge) I. Zinc Coating: 1.20 ounces per square foot

#### J. Barbed Wire

#### K. Zinc-coated barbed wire in accordance with ASTM A121.

- a. Line Wire:
  - i. Two (2) strands of twisted wire
  - ii. Diameter: 12½ gauge
  - iii. Zinc Coating: 0.80 ounces per square foot
- b. Barbs:
  - i. Number of Points: 4
  - ii. Length: Minimum 3/8 inch
  - iii. Diameter: 14 gauge
  - iv. Spacing: 5-inch

#### L. Gates

- a. Gates shall be designed and fabricated in accordance with ASTM F900.

#### M. Gate Accessories





- a. Provide gate hinges that are structurally capable of supporting the gate leaf and allow the gate to open and close without binding. Hinges shall be designed to allow the gate to open 180 degrees.
- b. Single gates shall be provided with a gate latch that holds the gate in a closed position and has provisions for a gate lock.
- c. Double gates shall be provided with a drop rod or plunger bar type gate latch arranged to engage the gate stop. Locking devices shall be constructed so that the center drop rod or plunger cannot be raised when the gate is locked. Gate latch shall have provisions for a gate lock.
- d. Double gates shall be provided with gate stops.
- e. Gates with gate leafs greater than 5 feet must be provided with gate keepers.

## **6.20 Waterproofing**

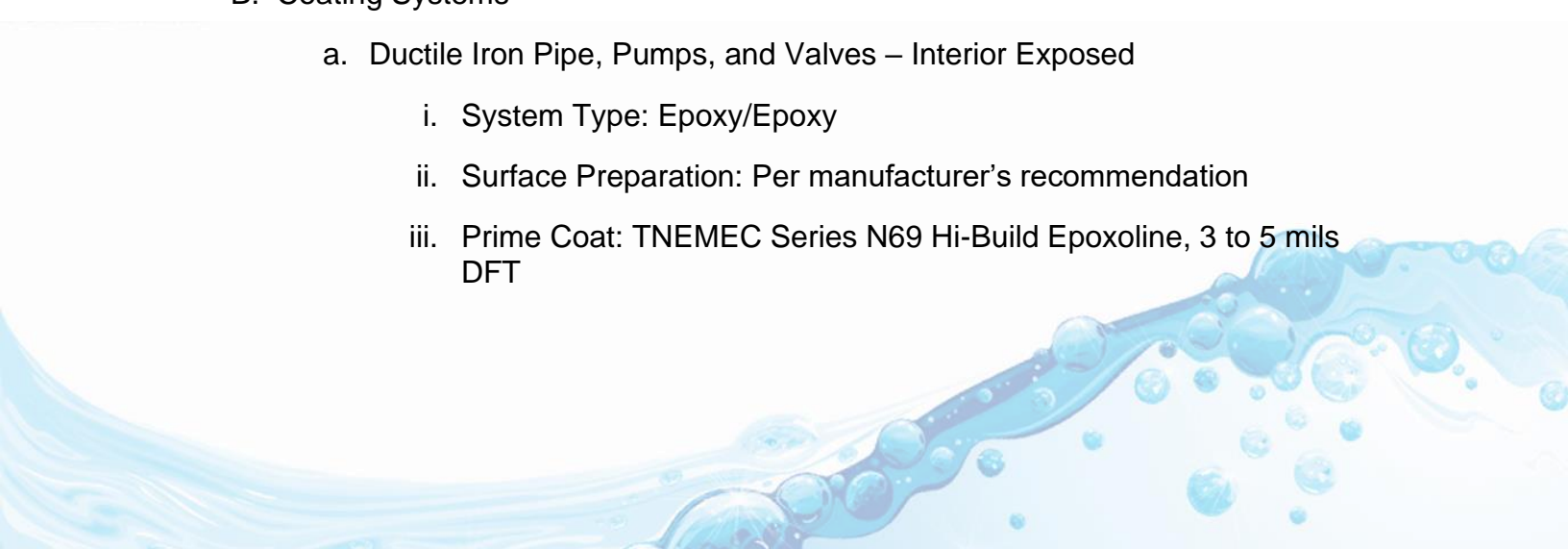
### **6.20.1 Waterproofing**


- A. Water repellent for above grade concrete, brick, and CMU surfaces that are not scheduled to be painted shall be a colorless, totally clean, penetrating water repellent made up of silanes and oligomeric alkoxysiloxanes.
- B. Acceptable Manufacturers:
  - a. PROSOCO, Inc. Sure Klean Weather Seal Siloxane WB Concentrate
  - b. BCWD Approved Equal

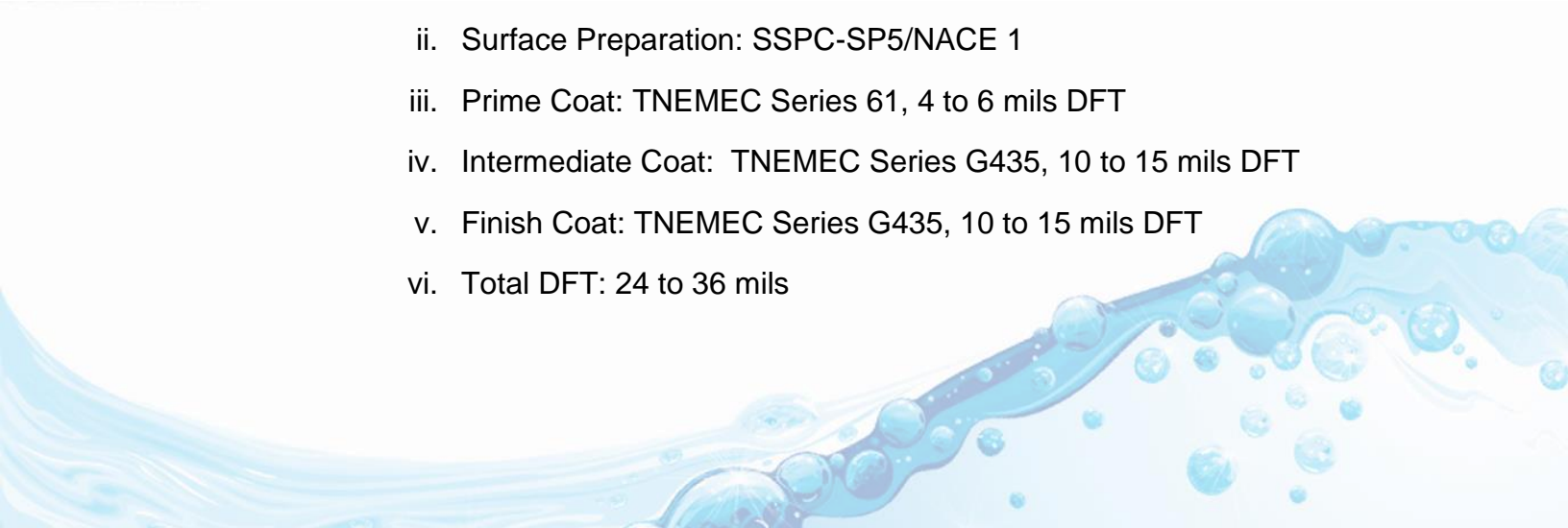
## **6.21 Coating Systems for Wet Well Components**

### **6.21.1 Coating Systems for Wet Wells and Manholes**

- A. TNEMEC product names and numbers are specified herein. Equivalent materials produced by BCWD approved manufacturers shall be acceptable.
- B. Coating Systems
  - a. Ductile Iron Pipe, Pumps, and Valves – Interior Exposed
    - i. System Type: Epoxy/Epoxy
    - ii. Surface Preparation: Per manufacturer's recommendation
    - iii. Prime Coat: TNEMEC Series N69 Hi-Build Epoxoline, 3 to 5 mils DFT



- iv. Finish Coat: TNEMEC Series N69 Hi-Build Epoxoline, 4 to 6 mils DFT
    - v. Total DFT: 7 to 11 mils
  - b. Ductile Iron Pipe, Pumps, and Valves – Exterior Exposed
    - i. System Type: Epoxy/Epoxy/Polyurethane
    - ii. Surface Preparation: Per manufacturer's recommendation
    - iii. Prime Coat: TNEMEC Series N69 Hi-Build Epoxoline, 3 to 5 mils DFT
    - iv. Intermediate Coat: TNEMEC Series 69 Hi-Build Epoxoline, 4 to 6 mils DFT
    - v. Finish Coat: TNEMEC Series 73 Endura-Shield, 2 to 3 mils DFT
    - vi. Total DFT: 9 to 14 mils
  - c. Ductile Iron Pipe, Pumps, and Valves – Below Grade (Buried) and Immersed
    - i. System Type: Epoxy/Coal Tar Epoxy
    - ii. Surface Preparation: Per manufacturer's recommendation
    - iii. Prime Coat: TNEMEC Series N69 Hi-Build Epoxoline, 3 to 5 mils DFT
    - iv. Finish Coat: TNEMEC Series 46H-413 Hi-Build Tneme-Tar, 14 to 20 mils DFT
    - v. Total DFT: 17 to 25 mils
  - d. Wet Well Piping (Tnemec, Sauereisen, Dudick, SprayRoq)
    - i. Surface Preparation: NAPF 500-03-04 Abrasive Blast Cleaning
    - ii. Prime Coat: Series N140-1211 Pota-Pox Plus, DFT 4.0 to 6.0 Mills
    - iii. Finish Coat: Series 431 Perma-Shield PI, DFT 40.0 Mills
    - iv. Total DFT: 44.0 to 46.0 Mills
  - e. Structural Steel – Interior Exposed
    - i. System Type: Epoxy/Epoxy
    - ii. Surface Preparation: SSPC-SP6/NACE 3
- 

- iii. Prime Coat: TNEMEC Series N69 Hi-Build Epoxoline, 3 to 5 mils DFT
  - iv. Finish Coat: TNEMEC Series N69 Hi-Build Epoxoline, 3 to 5 mils DFT
  - v. Total DFT: 6 to 10 mils
- f. Structural Steel – Exterior Exposed
- i. System Type: Epoxy/Polyurethane
  - ii. Surface Preparation: SSPC-SP6/NACE 3
  - iii. Prime Coat: TNEMEC Series N69 Hi-Build Epoxoline, 3 to 5 mils DFT
  - iv. Intermediate Coat: TNEMEC Series N69 Hi-Build Epoxoline, 2 to 3 mils DFT
  - v. Finish Coat: TNEMEC Series 73 Endura-Shield, 2 to 5 mils DFT
  - vi. Total DFT: 7 to 13 mils
- g. Structural Steel – Below Grade (Buried) and Immersed
- i. System Type: Epoxy/Coal Tar Epoxy
  - ii. Surface Preparation: SSPC-SP10/NACE 2
  - iii. Prime Coat: TNEMEC Series N69 Hi-Build Epoxoline, 3 to 5 mils DFT
  - iv. Finish Coat: TNEMEC Series 46H-413 Hi-Build Tneme-Tar, 14 to 20 mils DFT
  - v. Total DFT: 17 to 25 mils
- h. Structural Steel – Severe Atmosphere (Inside Pump Station Wet Wells)
- i. System Type: Modified Polyamine Epoxy
  - ii. Surface Preparation: SSPC-SP5/NACE 1
  - iii. Prime Coat: TNEMEC Series 61, 4 to 6 mils DFT
  - iv. Intermediate Coat: TNEMEC Series G435, 10 to 15 mils DFT
  - v. Finish Coat: TNEMEC Series G435, 10 to 15 mils DFT
  - vi. Total DFT: 24 to 36 mils
- 

- i. Below Grade Concrete – Pump & Lift stations, wet wells and manholes
  - i. System Type: Structural Epoxy
  - ii. Surface Prep: Surface preparation must achieve a clean and sound substrate in accordance with SSPC-SP13/NACE No. 6 “Surface Preparation of Concrete.”
  - iii. High pressure water cleaning (HP WC) or water jetting (HP/UHP WJ) at a minimum of 5,000 psi, and/or dry or wet abrasive blasting may be necessary in order to achieve acceptable surface preparation free from all foreign material, existing coatings or paint, waxes, form release agents, curing compounds, efflorescence, sealers, salts, laitance, oil, grease, sludge, dirt, grit, dust, existing coatings, roots, and all other debris or contaminants.
  - iv. Skim Coat if needed: Apply one coat of Series 218 up to ½” or Series 217 up to 4.”
  - v. Apply one coat of Themec-Epoxytec CPP Trowel or CPP Sprayliner at 125 mils minimum.
- c. Coating systems not listed shall be approved by BCWD.

## **6.22 Miscellaneous Materials**

### **6.22.1 Stabilization Stone**

- A. Stabilization stone shall be No. 57 Coarse Aggregate (maximum stone size of 1½ inch) in accordance with ASTM C33.
- B. Stabilization stone shall be clean, durable particles of crushed stone or gravel capable of withstanding the effects of handling, spreading, and compacting without degradation.

### **6.22.2 Select Earth Backfill**

- A. Select earth backfill shall be excavated SM and ML material that is free from rocks larger than 3 inches in diameter, ashes, cinders, refuse, organic material, frozen soil, and other deleterious material.
- B. Material containing more than 10-percent gravel, stones, or shale particles is not acceptable.
- C. Provide imported material if required to accomplish work.

### **6.22.3 Tracer Wire**

- A. Direct burial #14 AWG solid, soft drawn, high strength copper clad steel wire.

- B. 30-volt rating.
- C. 30-mil high molecular weight, high density, polyethylene jacket complying with ASTM D1248.
- D. Colors:
  - a. Water Service – Blue
  - b. Sanitary Sewage Service – Green
- E. Tracer wires shall be connected together using moisture displacement connectors with strain relief.
- F. Acceptable Manufacturers:
  - a. Copperhead Industries, LLC
  - b. Pro-Line Safety Products Company
  - c. BCWD Approved Equal

## **7 CONSTRUCTION STANDARDS**

### **7.1 General**

- A. Water distribution and sanitary sewerage systems shall be constructed by a BCWD approved utility contractor.
- B. Water distribution and sanitary sewerage systems shall be constructed in accordance with the Design and Construction Standards herein, and the construction plans approved by the BCWD.

### **7.2 Permits**

- A. Construction activities shall not commence until BCWD has granted final approval of the construction plans and specifications and Bartow County has issued a Development Permit.
- B. Developer/Owner and/or Contractor shall be responsible for obtaining all permits and approvals required for working in the county or state right-of-way.

### **7.3 Work Hours**

- A. Work shall be executed Monday through Friday during normal work hours (8:00 AM to 5:00 PM) unless otherwise approved by BCWD.



- B. Requests for work outside of normal working hours must be received in writing by the BCWD a minimum of 48 hours in advance of performing the work.
- C. An inspection fee equal to the employee's time and benefits will be assessed if the Contractor elects to work outside of normal working hours or on Saturday or Sunday.
- D. A fee will be assessed to any Contractor who works on Saturday or Sunday without prior approval from the BCWD.

## **7.4 Utility Notification and Location**


- A. Contractor shall notify BCWD a minimum of three (3) days prior to beginning any clearing, grading, or excavating activities.

## **7.5 Site Safety**

- A. Contractor shall be responsible for site safety. Contractor shall identify a site safety officer who shall be responsible for conducting daily safety meetings and ensuring a safe work environment.
- B. All work shall be conducted in accordance with OSHA standards. In accordance with Safety Resolution 2005-12, BCWD will issue a "Stop Work" order if an unsafe condition exists.
- C. All equipment and tools used in the construction of water distribution and/or sanitary sewerage systems shall be in good working order.
- D. Contractor shall provide, erect and maintain all necessary barricades, signs, lights, and danger signals necessary for the protection of the work and the safety of the public. Contractor shall provide a sufficient number of flagmen whenever it is deemed necessary.
- E. All work shall be planned and performed by the Contractor in such a manner as to minimize interference with vehicular and pedestrian traffic. Whenever work will cause disruption to the normal flow of traffic or pose a potential hazard, the Contractor shall be responsible for implementing safety measures and traffic control procedures in accordance with the "Manual on Uniform Traffic Control Devices," latest edition, published by the U.S. Department of Transportation, Federal highway Administration. Contractor shall obtain approval from the Bartow County DOT and/or Georgia DOT prior to working in any public right-of-way.

## **7.6 Materials**

### **7.6.1 General**

- A. All materials and equipment provided for the project shall be new and shall be in accordance with these Design and Construction Standards.
- 



- B. Contractor shall be responsible for the delivery, handling, storage, and protection of all materials and equipment used on the project.
- C. All materials and equipment shall be boxed, crated, or otherwise protected during transportation, handling, and storage.


#### **7.6.2 Delivery**

- A. Contractor shall coordinate the delivery of all materials and equipment. B. Contractor shall provide all equipment and tools required for unloading and moving materials and equipment.

#### **7.6.3 Materials**

- A. Materials and equipment shall be handled in accordance with the manufacturer's instructions.
- B. Any materials or equipment that are dropped, dumped, improperly handled, or otherwise damaged during construction shall be subject to rejection by the BCWD without further justification.
- C. Contractor shall provide all equipment and tools required for moving materials and equipment to, from, and around the project site.

#### **7.6.4 Storage and Protection**

- A. Materials and equipment shall be stored in accordance with the manufacturer's instructions.
  - B. Contractor shall be responsible for the storage and protection of all materials and equipment.
  - C. Pipe may be stored along the route; however, pipe shall not be strung out for more than 1,000 feet beyond the point that the pipe is being installed.
  - D. Contractor shall be responsible for making the necessary arrangements for obtaining all storage locations/sites required to properly store and protect materials and equipment.
  - E. Materials and equipment shall be protected from exposure to the elements and shall be kept dry at all times. The materials and equipment shall be stored above ground level and shall be adequately supported using wood blocking, wood pallets, or other approved support material.
  - F. Pumps, motors, valves, electrical and instrumentation equipment, and other mechanical equipment shall be stored in a weather-tight enclosure which is maintained at a minimum air temperature of 60 °F.
- 

## **7.7 Erosion and Sedimentation Control**

- A. Contractor shall be responsible for complying with all requirements of Bartow County, the Georgia EPD, and the United States Army Corps of Engineers related to erosion and sediment control. This shall include obtaining all required permits and designing and implementing all erosion and sediment control measures.

## **7.8 Excavation**

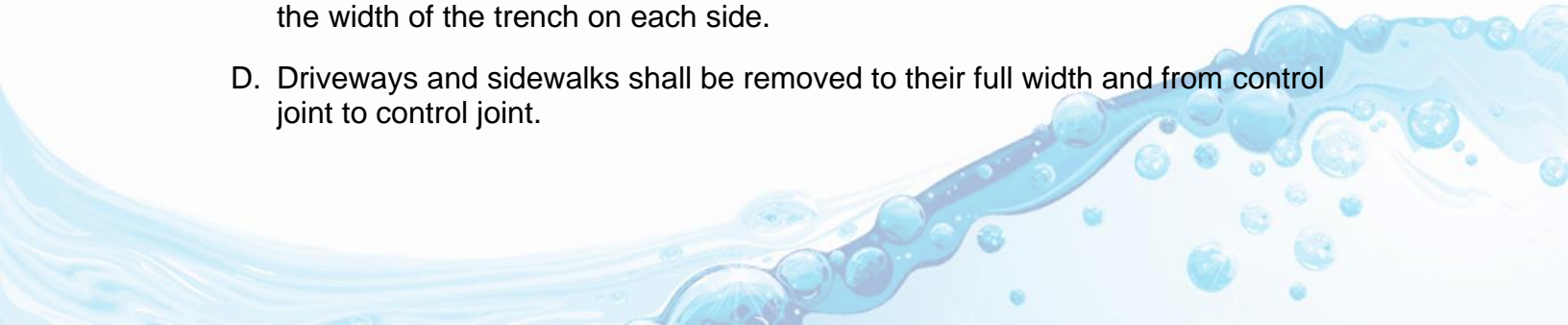
### **7.8.1 General**

- A. Prior to beginning any excavation, an investigation shall be conducted to determine the location of existing underground structures and conflicts. The Contractor shall be responsible for repairing damage to existing structures.
- B. When obstructions not indicated on the plans interfere with the progress of work, an alteration of the plans may be required. All alterations or deviations in line and grade, or the removal, relocation, or reconstruction of the obstruction shall be approved in writing by the BCWD.

### **7.8.2 Clearing and Grubbing**

- A. Areas to be cleared and grubbed shall be limited to the areas shown on the BCWD approved plans.
- B. Trees located within the area to be cleared or along the clearing limits that are not specified to be removed shall be protected with tree protection fence.
- C. All materials that are cleared and grubbed from the project site shall be properly disposed of offsite.
- D. Burning of debris onsite may be permitted; however, the Contractor must obtain a permit from the appropriate agency prior to burning.

### **7.8.3 Pavement Removal**

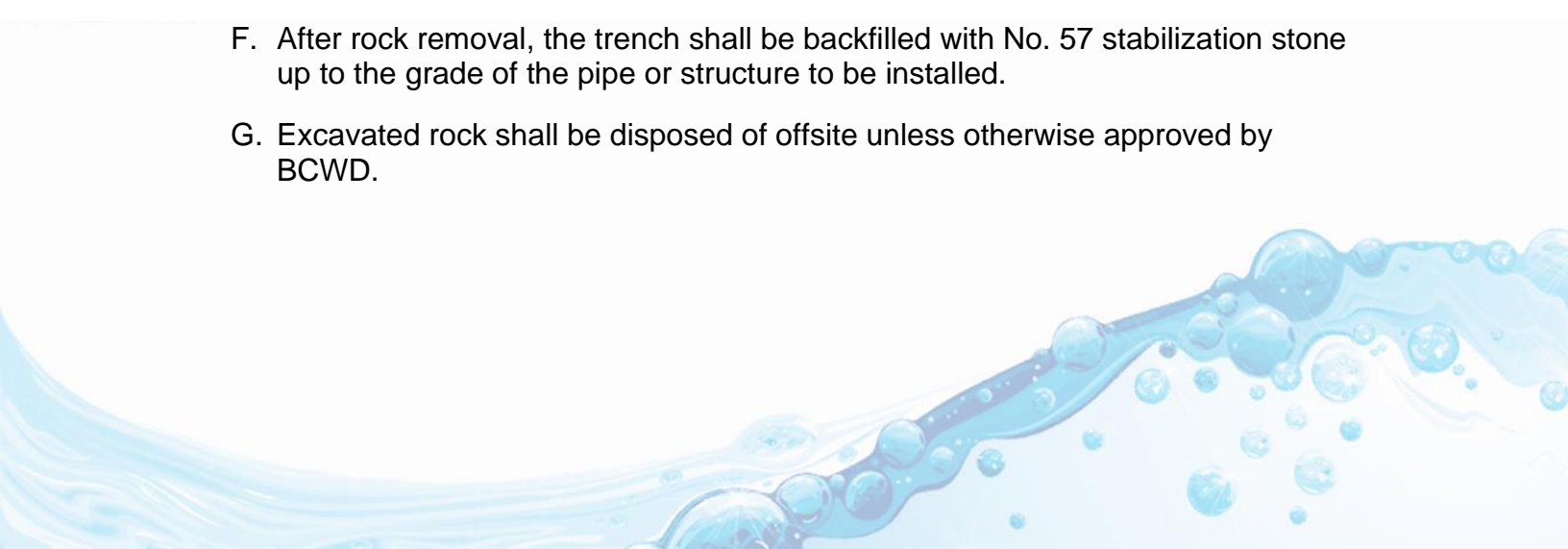
- A. When approved by Georgia DOT, Bartow County DOT, and/or BCWD, pavement and road surfaces shall be removed as required in order to install the water distribution and/or sanitary sewerage system appurtenances.
  - B. Pavement shall be cut using a rotary saw in order to ensure straight lines. If the adjacent pavement is damaged, the damaged pavement shall be cut out.
  - C. The width of pavement removal for pipe trenches shall be 12 inches greater than the width of the trench on each side.
  - D. Driveways and sidewalks shall be removed to their full width and from control joint to control joint.
- 

- E. Curb and gutter shall be removed from control joint to control joint.
- F. All materials shall be properly disposed of offsite.

#### **7.8.4 Soil Excavation**

- A. Excavate soil to the lines, grades, and dimensions shown on the BCWD approved plans and as necessary to accomplish work. Do not over excavate without authorization from BCWD.
- B. Excavated soil shall be stockpiled in locations designated on the BCWD approved plans. If a stockpile area is not designated, soil shall be stockpiled in a manner such that it will not obstruct the work nor endanger the workers or the public, obstruct sidewalks, driveways, roadways, or other structures.
- C. Excavated soil shall not be placed against tree trunks.
- D. Excavated soil that is unsuitable or exceeds the quantity required for fill or backfill shall be disposed of offsite.


#### **7.8.5 Rock Excavation**

- A. When rock excavation is necessary, all rock shall be removed to provide a clearance below and on each side of all pipe, valves, and fittings of at least 6 inches for nominal pipe sizes of 24 inches or less and at least 9 inches for nominal pipe sizes greater than 24 inches. Clearance for structures shall be at least 12 inches.
  - B. Contractor shall obtain written approval from the BCWD prior to conducting any blasting activities.
  - C. Rock blasting shall be conducted in accordance with Chapter 120-3-10-0.4 of the “Rules and Regulations for Explosives and Blasting Agents” and all other applicable local, state, and federal regulations.
  - D. A Blasting Report consisting of a pre-blast report, drilling log, and a post-blast report shall be submitted to BCWD after rock blasting is complete.
  - E. Rock blasting shall be conducted by a licensed blasting contractor.
  - F. After rock removal, the trench shall be backfilled with No. 57 stabilization stone up to the grade of the pipe or structure to be installed.
  - G. Excavated rock shall be disposed of offsite unless otherwise approved by BCWD.
- 

### 7.8.6 Trench Excavation

- A. Trenches shall be excavated to the required alignment, depth, and width required to install the pipe or structure and shall conform to all federal, state, and local regulations for the protection of workers.
- B. The Contractor is responsible for trench safety. BCWD will issue a “Stop Work” order if unsafe conditions exist.
- C. The width of the trench shall be of sufficient width to install the pipe, accommodate compaction equipment, and make necessary inspections. When required, trenches shall be made wider to permit the placing of shoring.
- D. Trench bottom shall be constructed to provide a firm, stable, and uniform support for the full length of the pipe. Blocking shall not be used to change pipe grade or to intermittently support pipe across excavated sections.
- E. If unsuitable soil exists, the trench shall be over-excavated to remove the unsuitable soil and backfilled with No. 57, or suitable BCWD approved, stabilization stone. The BCWD Inspector shall determine the depth of over excavation.
- F. Open trenches shall be limited to 300 feet in length and shall be backfilled at the end of each work day.
- G. Open trenches shall be barricaded or covered until they are completely backfilled.
- H. Excavated soil that is unsuitable or exceeds the quantity required for backfill shall be disposed of offsite.

### 7.8.7 Dewatering

- A. Where running or standing water occurs in an excavation or where the soil in the bottom of an excavation displays a “quick condition” tendency, the water shall be removed by pumping.
  - B. The excavation shall be kept free from water during installation operations by suitable means, such as well points, until the pipe has been installed and backfill placed and compacted to a sufficient height to prevent pipe flotation.
  - C. Contractor shall provide all labor, materials, and equipment required to remove and control water as required to accomplish work.
  - D. Contractor shall properly dispose of water in a manner that will not cause erosion or flooding, or otherwise damage existing facilities, completed work, or adjacent property. Contractor shall be responsible for any damage caused by the dewatering operation.
- 

- E. Contractor shall be responsible for obtaining any required permits, required by regulatory agencies, for discharging water from dewatering operations.

## **7.9 Installation**

### **7.9.1 General**

- A. Pipe shall be laid and maintained on lines and grades established by the BCWD approved plans and specifications.
- B. Fittings, valves, hydrants, manholes, valve vaults, and other structures shall be installed at the locations shown on the BCWD approved plans unless otherwise approved in writing by the BCWD.
- C. Prior to installation, the interior of pipes, fittings, valves, and other appurtenances shall be cleaned free of dirt and debris.
- D. Materials shall be installed in accordance with the manufacturer's recommendations.
- E. Contractor shall provide all labor, materials, and equipment required to install water distribution and/or sanitary sewerage system appurtenances.

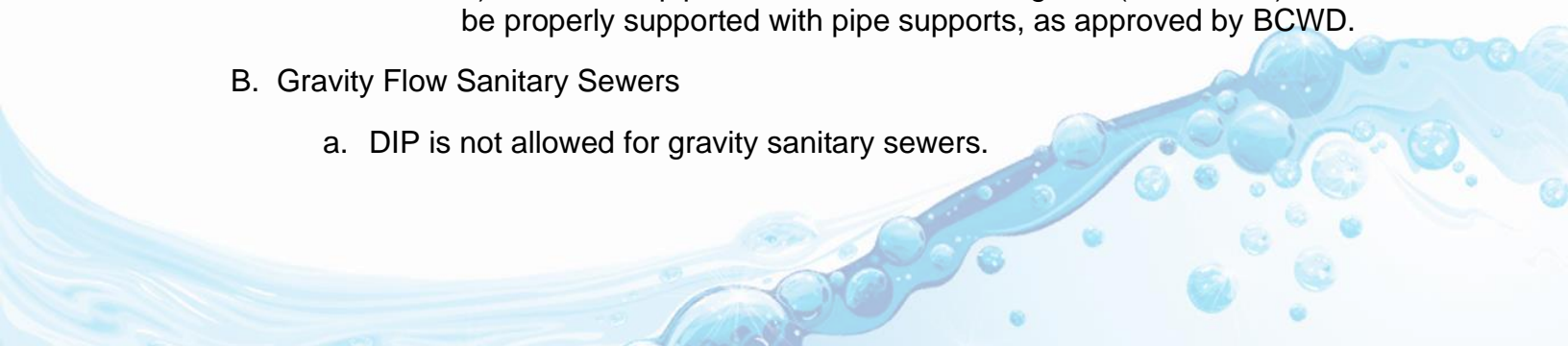
### **7.9.2 Ductile Iron Pipe**

#### **A. Water Lines**

- a. Ductile iron pipe shall be bedded in accordance with ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51, Type 2 Laying Condition.
  - i. a) Ductile iron pipe shall be laid on a flat bottom trench and bedded to its centerline with lightly consolidated select earth backfill.
  - ii. b) Backfill from centerline of pipe to 12-inches below the finished grade with select earth backfill. Backfill shall be placed in 6-inch lifts and manually compacted to a minimum of 90 percent of the maximum dry density, as determined by ASTM D698, prior to placing succeeding lifts.
  - iii. c) Backfill final 12-inches of trench with select earth backfill. Backfill shall be placed in 6-inch lifts and mechanically compacted to 95 percent of the maximum dry density, as determined by ASTM D698, prior to placing succeeding lifts.
  - iv. d) Ductile iron pipe that is installed above grade (non-buried) shall be properly supported with pipe supports, as approved by BCWD.

#### **B. Gravity Flow Sanitary Sewers**

- a. DIP is not allowed for gravity sanitary sewers.





### C. Sanitary Sewer Force Mains

- a. DIP is not allowed for sanitary sewer force main.

### D. Non-Buried Ductile Iron Pipe

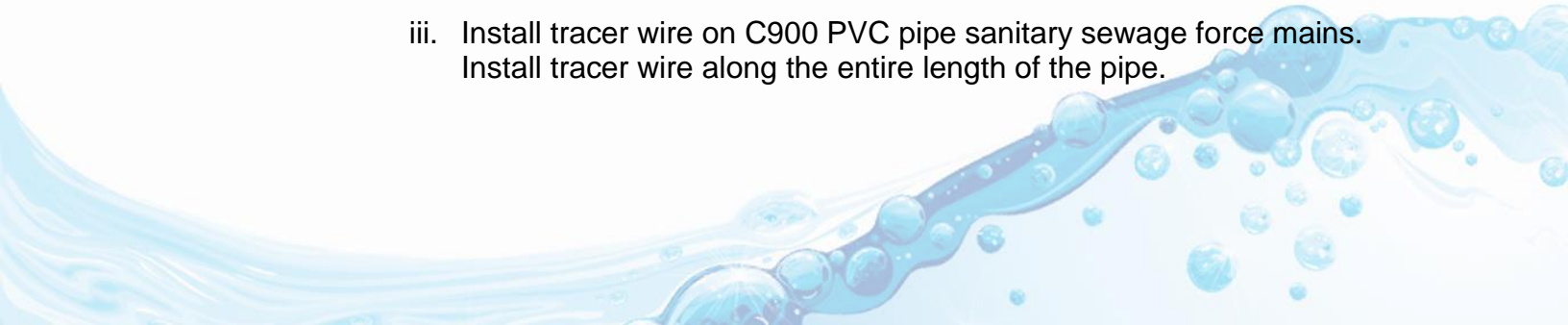
- a. Ductile Iron Pipe that is installed above grade (non-buried) shall be properly supported with pipe supports, as approved by BCWD.

## 7.9.3 PVC Pipe

### A. Gravity Flow Sanitary Sewers

- a. C900 PVC DR 18 pipe shall be bedded in accordance with AWWA C605, minimum Type 4 Bedding.
  - i. C900 PVC pipe shall be bedded on a minimum of 4-inches of loose select earth backfill.
  - ii. C900 PVC pipe shall be backfilled to the crown of the pipe with lightly consolidated select earth backfill.
  - iii. Install tracer wire on C900 PVC pipe sanitary sewage force mains. Install tracer wire along the entire length of the pipe.
  - iv. Backfill from top of pipe to 12-inches below the finished grade with select earth backfill. Backfill shall be placed in 6-inch lifts and mechanically compacted to a minimum of 90 percent of the maximum dry density, as determined by ASTM D698, prior to placing succeeding lifts.
  - v. Backfill final 12-inches of trench with select earth backfill. Backfill shall be placed in 6-inch lifts and mechanically compacted to 99 percent of the maximum dry density, as determined by ASTM D698, prior to placing succeeding lifts.

### B. Sanitary Sewage Force Mains

- a. C900 PVC DR 18 pipe shall be bedded in accordance with AWWA C605, with minimum Type 4 Bedding.
    - i. C900 PVC pipe shall be bedded on a minimum of 4-inches of loose select earth backfill.
    - ii. C900 PVC pipe shall be backfilled to the crown of the pipe with lightly consolidated select earth backfill.
    - iii. Install tracer wire on C900 PVC pipe sanitary sewage force mains. Install tracer wire along the entire length of the pipe.
- 



- iv. Backfill from top of pipe to 12-inches below the finished grade with select earth backfill. Backfill shall be placed in 6-inch lifts and mechanically compacted to a minimum of 90 percent of the maximum dry density, as determined by ASTM D698, prior to placing succeeding lifts.
- v. Backfill final 12-inches of trench with select earth backfill. Backfill shall be placed in 6-inch lifts and mechanically compacted to 95 percent of the maximum dry density, as determined by ASTM D698, prior to placing succeeding lifts.

#### C. PVC Force Main Markers

- a. Install PVC force main markers at grade along the centerline of the pipe. Install at intervals as determined by BCWD. Markers will be provided by BCWD.

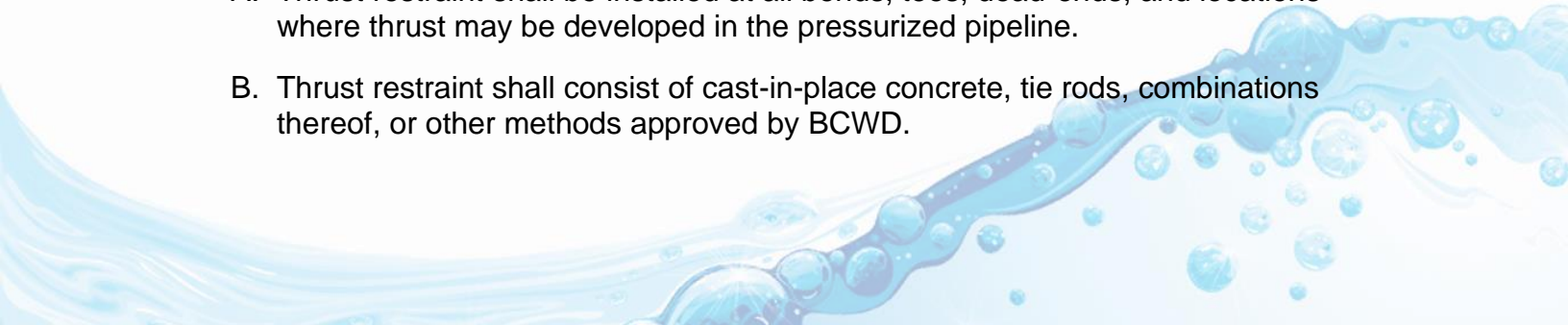
### 7.9.4 Valves

- A. Valves shall be installed plumb with the operator straight up and the valve aligned with the direction of the pipe.
- B. Valves shall be properly supported so that they do not place any undue stress on the pipe.
- C. A valve box shall be installed plumb over the valve operator and adjusted so that it is flush with the finished grade. A cast in place collar 2' x 2' min 4" thick shall be placed around the top of the valve box.
- D. Valves installed above grade (non-buried) shall be properly supported with pipe supports.

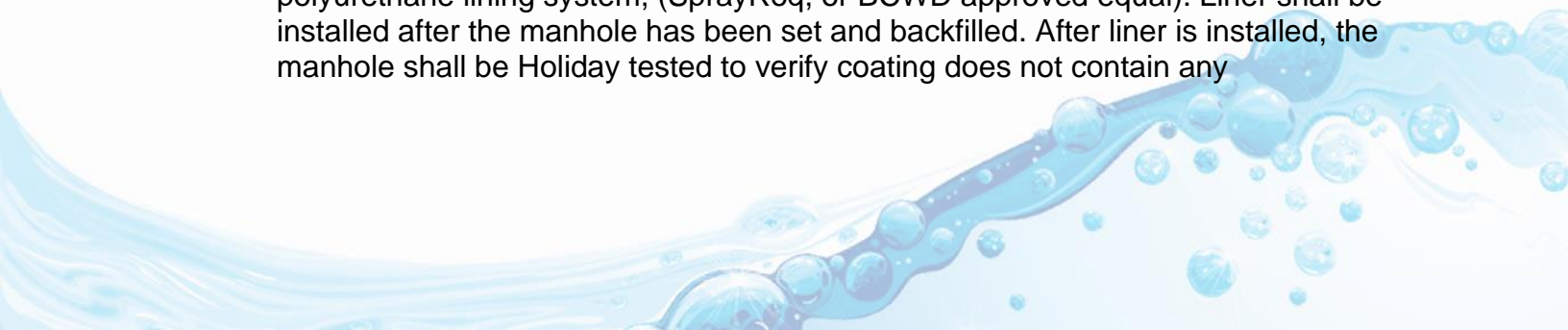
### 7.9.5 Hydrants

- A. Fire hydrants shall stand plumb with the hose nozzles parallel with or at right angles to the curb and the pumper nozzle facing the curb in the locations shown on the BCWD approved plans.
- B. Fire hydrant shall be placed on top of a minimum of 18-inches of No. 57 stabilization stone. No. 57 stabilization stone shall extend up 6 inches above the drain hole and shall extend out 12 inches in all directions from the fire hydrant. Minimum 8 cubic feet of No. 57 stabilization stone.

### 7.9.6 Thrust Restraint

- A. Thrust restraint shall be installed at all bends, tees, dead-ends, and locations where thrust may be developed in the pressurized pipeline.
  - B. Thrust restraint shall consist of cast-in-place concrete, tie rods, combinations thereof, or other methods approved by BCWD.
- 

- C. Thrust blocking, using cast in place concrete, shall be placed against undisturbed ground.
- D. A minimum 10-mil plastic sheet shall be placed between the concrete and the pipe and fittings. Concrete shall not cover the bolts and nuts on the valves and fittings.
- E. Pipe that is encased in concrete shall be poly-wrapped.
- F. Manholes and Wet Wells
- G. Manholes and wet wells shall be set plumb in the locations shown on the BCWD approved plans.
- H. Manholes and wet wells shall be placed on top of a minimum of 12 inches of No. 57 stabilization stone. No. 57 stabilization stone shall extend a minimum of 12-inches beyond the outside of the structure in all directions. Unsuitable ground conditions may require additional and/or larger stabilization stone.
- I. Manholes shall be positioned such that the influent and effluent pipes enter the center of their respective openings and do not pinch the resilient seal. Pipe shall not rest on the invert of the opening.
- J. Prior to joining sections, tongue and groove joints shall be cleaned free of dirt and debris.
- K. Manhole sections shall be aligned such that the interior manhole steps are vertically aligned.
- L. Resilient pipe seal clamps shall be tightened in accordance with the manufacturer's instructions.
- M. Manhole lifting holes and all inside joints shall be sealed using non-shrink grout.
- N. H. Manholes and wet wells shall be backfilled with select earth backfill. Backfill shall be placed in 6-inch lifts and mechanically compacted to a minimum of 95 percent of the maximum dry density, as determined by ASTM D698, prior to placing succeeding lifts.
- O. An invert shall be built in each manhole to transition flow from the influent pipe to the effluent pipe. The invert shall have a "U" shape.
- P. Manholes that that have a sanitary sewage force main discharging into them plus all manholes located within 1,600 feet downstream of the discharge manhole and all other manholes that are subject to corrosion shall be lined with an elastomeric polyurethane lining system, (SprayRoq, or BCWD approved equal). Liner shall be installed after the manhole has been set and backfilled. After liner is installed, the manhole shall be Holiday tested to verify coating does not contain any



discontinuities. Additional joint sealing methods/measures may be required as conditions warrant.

#### **7.9.7 Meter Boxes**

- A. Meter boxes shall be set plumb in the locations shown on the BCWD approved plans.
- B. The top of the meter box shall be set flush with grade and shall not be set in a depression.
- C. Backfill around the meter box shall be manually compacted.

#### **7.9.8 Meter Vaults and Valve Vaults**

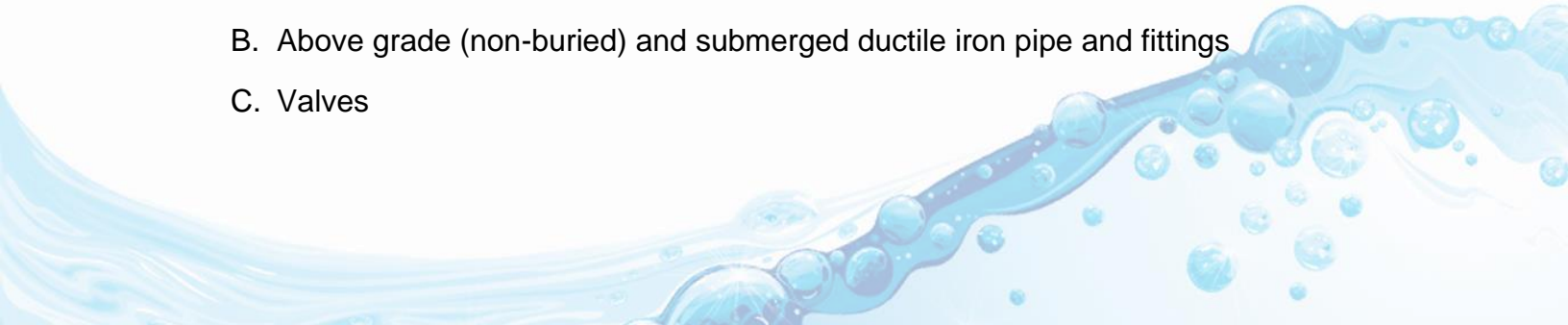
- A. Meter vaults and valve vaults shall be set plumb in the locations shown on the BCWD approved plans.
- B. Meter vaults and valve vaults shall be placed on top of a minimum of 12-inches of No. 57 stabilization stone. No. 57 stone shall extend a minimum of 12-inches beyond the outside of the vault in all directions.
- C. Meter vaults and valve vaults are not allowed on pavement.
- D. The top of the meter vaults or valve vaults shall be 6 inches above grade and shall not be set in a depression. Surface water shall be directed away from the vault lids.
- E. Openings for pipe shall be sealed using non-shrink grout.
- F. Meter vaults and valve vaults shall be backfilled with select earth backfill. Backfill shall be placed in 6-inch lifts and mechanically compacted to a minimum of 95 percent of the maximum dry density, as determined by ASTM D698, prior to placing succeeding lifts.

#### **7.9.9 Pavement Replacement**

- A. Pavement shall be replaced in accordance with Georgia DOT and/or Bartow County DOT standard specifications.

#### **7.10 Coatings and Linings**

The following items/materials shall be painted or lined with the appropriate coating system:

- A. Above grade concrete, brick, and CMU that is scheduled to be painted
  - B. Above grade (non-buried) and submerged ductile iron pipe and fittings
  - C. Valves
- 

- D. Pipe supports
- E. Structural steel
- F. Equipment and appurtenances
- G. Pump station wet wells
- H. Manholes that a force main discharges into plus all manholes within 1,600 feet of the discharge manhole.
- I. Other manholes subject to corrosion as determined by BCWD.
- J. All above grade concrete, brick, and CMU surfaces that are not scheduled to be painted shall be applied with a clear water repellent.

### 7.11 Testing

- A. All testing methods selected should take into consideration the range in groundwater elevations during the test and anticipated during the design life of the system.

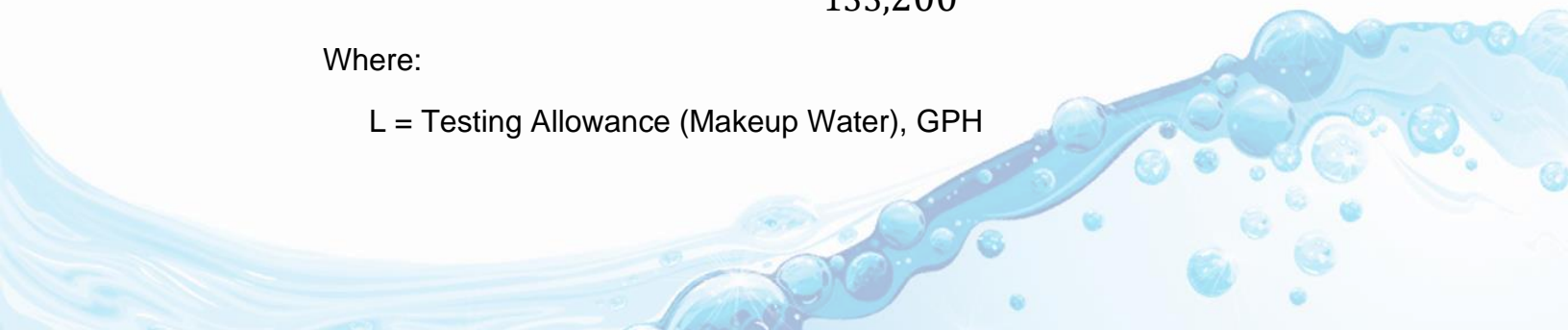
#### 7.11.1 Hydrostatic Testing - Distribution Lines & San. Sew. Force Mains

- A. Water distribution system piping and sanitary sewage force mains shall be hydrostatically tested in accordance with AWWA C600.
- B. Hydrostatic test shall be witnessed by a BCWD Inspector.
- C. Pipe shall be slowly filled with potable water until all air is removed and the line is pressurized to the test pressure. Service lines shall be included as part of the hydrostatic test.
- D. Test pressure shall be 1.5 times the maximum working pressure or 150 PSI, whichever is greater as measured at the lowest point in the system.
- E. Test pressure shall not vary by more than  $\pm 5$  PSI for the duration of the test.
- F. Test shall last a minimum of two (2) hours.
- G. Makeup water shall be added, as required, to maintain the pressure within 5 PSI of the test pressure. The maximum amount of makeup water allowed shall be determined by the following formula.

$$L = \frac{SD\sqrt{P}}{133,200}$$

Where:

L = Testing Allowance (Makeup Water), GPH



S = Length of Pipe Tested, ft

D = Nominal Diameter of Pipe, in

P = Test Pressure, PSIG

- H. Test shall be considered acceptable if pressure remains within the acceptable limits for the entire test period and the makeup water volume does not exceed the maximum allowable.
- I. When unsatisfactory test results are obtained, repair pipe and retest until pipe passes hydrostatic test. Repair visible leaks regardless of quantity of leakage.

### 7.11.2 Air Pressure Testing of Gravity Sewer Lines

- A. Gravity sewer piping shall be low pressure air tested in accordance with UNI-B-6.
- B. Low pressure air test shall be witnessed by the BCWD Inspector.
- C. Gravity sewer lines shall be tested from manhole to manhole. Lines shall be free of dirt and debris and no personnel shall be permitted in the manholes when the test is being conducted.
- D. The gravity sewer line shall be pressurized to 4.0 PSIG greater than the average back pressure of any groundwater above the pipe, but no greater than 9.0 PSIG.
- E. After temperatures have equalized and the pressure has stabilized at 4.0 PSIG (greater than the average groundwater back pressure), the air supply shall be shut off.
- F. The pressure shall then be decreased to no less than 3.5 PSIG (greater than the average groundwater back pressure).
- G. The time shall then start and the pressure shall not drop more than 1.0 PSIG during the testing period. The minimum test time for various diameter pipes is presented below.

Nominal Pipe Diameter (inches)	Minimum Test Time (min:sec)	Maximum Length for Minimum Test Time (feet)	Test Time for Longer Length (L) Sections (seconds)
8	7:34	298	1.520 L
10	9:26	239	2.374 L
12	11:20	199	3.418 L

15	14:10	159	5.342 L
16	15:07	149	6.078 L
18	17:00	133	7.692 L
20	18:54	119	9.497 L
24	22:40	99	13.674 L
30	28:20	80	21.366 L
36	34:00	66	30.768 L

- H. In general, lateral sewers may be ignored when computing required test time. However, if a section fails to pass the air test when lateral sewers have been ignored, the test time shall be recomputed to include all lateral sewers using the method of calculation in UNIB-6.
- I. Test shall be considered acceptable if pressure does not drop more than 1.0 PSIG during the test period.
- J. When unsatisfactory test results are obtained, repair pipe and retest until pipe passes low pressure air test. Repair visible leaks regardless of quantity of leakage.
- K. Infiltration testing for the allowable limit for any section from manhole to manhole will be 25 gallons per day per inch of pipe diameter per mile of pipe. If any infiltration is present at the most downstream point, then it will be measured using a specially-made weir and measurements will also be made at each upstream manhole that has any visible flow of water.

### 7.11.3 Television Inspection of Gravity Sewer Lines

- A. Gravity sewer lines shall be television inspected after the trench is backfilled and compacted.
- B. Prior to television inspection, gravity sewer lines shall be cleaned using high pressure water. Water usage for cleaning gravity sewer lines shall be metered.
- C. Television inspection shall be performed by an approved contractor using pan and tilt camera.
- D. Television inspection shall be recorded.
- E. At a minimum, the television inspection shall look for the following deficiencies.
  - a. Cracks in the pipe and/or lining
  - b. Rolled gaskets




- c. Leaking joints
  - d. Deviations from line and grade
  - e. Pipe deformations
  - f. Other deficiencies
- F. A television inspection report containing the following information shall be submitted to the BCWD.
- a. Length of pipe between manholes
  - b. Location of services
  - c. Deficiencies
- G. No paving shall be done until gravity sewer lines are passed by the BCWD.

#### **7.11.4 Mandrel Testing of Gravity Sewer Lines**

- A. The sewer line shall be capable of passing a mandrel which has a diameter that is 95 percent of the diameter of the sewer line.
- B. Any sewer line that fails the mandrel test shall be re-laid or replaced as required.

#### **7.11.5 Clean-out Box**

- A. Clean-out box shall be high density polyethylene plastic.
  - B. Clean-out box shall be 10-inch diameter round valve box.
  - C. Clean-out box lid shall be high density polyethylene plastic T-cover.
  - D. Clean-out boxes shall have the words "SEWER" embossed on the lid.
  - E. Clean-out box color: GREEN
  - F. Acceptable Manufacturer's:
    - a. Carson L Series 910
    - b. DFW Plastics, Inc. 1100 Series
    - c. BCWD Approved Equal
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### 7.11.6 Hydrostatic Testing of Water Retaining Structures

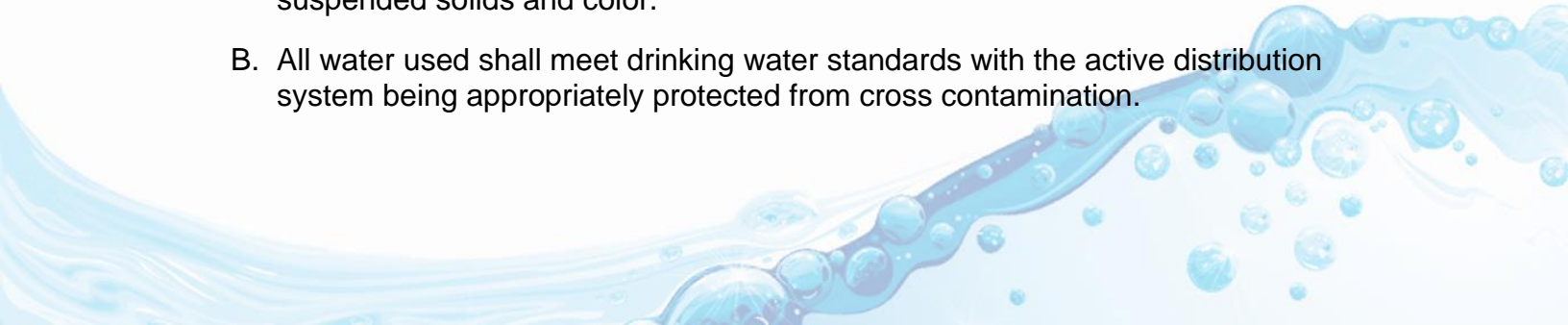
- A. Water retaining structures shall be hydrostatically tested in accordance with ACI 350.1 and 350.1R.
- B. Hydrostatic test shall be witnessed by the BCWD Inspector.
- C. Hydrostatic testing shall not begin until concrete has cured for a minimum of 14 days.
- D. Water retaining structures shall be filled with potable water to the maximum operating level within the structure. Water level shall be maintained at this level for 24 hours prior to beginning the actual test.
- E. Test shall be considered acceptable when there is no visible sign of flowing or seeping water and no measurable loss of water (HST-NML) which means the drop in water surface shall not exceed 1/2 inch after 1 hour.
- F. When unsatisfactory test results are obtained, repair water retaining structure and retest until structure passes hydrostatic test. Repair visible leaks regardless of quantity of leakage.

### 7.12 Disinfection

#### 7.12.1 General

- A. All newly installed water distribution piping and existing water distribution piping affected during construction shall be disinfected in accordance with AWWA C651.
- B. The BCWD Inspector shall be present during the disinfection process.
- C. Water volume shall be traced using an approved method of additive as a tracer measuring concentration over intervals. Volume shall be provided to BCWD for Record Keeping.
- D. All water samples will be collected and tested by the BCWD. A Coliform analysis fee applies and can be found at [www.bartowcountygga.gov](http://www.bartowcountygga.gov) under the Development tab/Permit and Connection fees.

#### 7.12.2 Disinfection Procedures

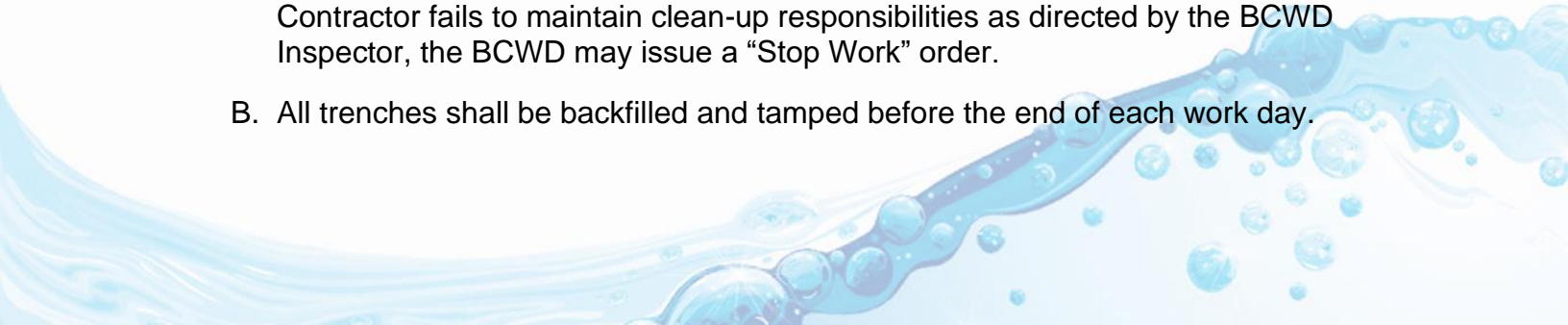
- A. Prior to chlorination, the water line shall be slowly filled with water to remove air pockets and then flushed to remove foreign debris. A minimum flushing velocity of 2.5 ft/s shall be maintained. Line shall be flushed until water is clear of suspended solids and color.
  - B. All water used shall meet drinking water standards with the active distribution system being appropriately protected from cross contamination.
- 

- C. Chlorine shall be injected into the system in sufficient quantity to obtain a concentration of 25 mg/l.
- D. All valves, hydrants, services, etc. shall be operated to ensure disinfection.
- E. Chlorine solution shall be retained in the system for a minimum of 24 hours. At the end of the 24-hour period, a residual of not less than 10 mg/l shall remain. If the residual is less than 10 mg/l, the disinfection procedure shall be repeated.
- F. Flush all lines until the chlorine residual is equal to the existing system. After system is flushed, all valves shall be closed.
- G. After chlorination and flushing is complete, BCWD will collect a sample from the disinfected water distribution system and perform a total coliform analysis. If the system does not pass the total coliform analysis, the disinfection procedure shall be repeated.
- H. System shall not be placed into service until all tests are acceptable and BCWD gives Final Approval to place the system into operation.

### **7.13 Field Testing and Starting of Systems**

- A. Contractor is responsible for start-up of all equipment and mechanical systems.
- B. Contractor shall provide all labor and materials required to perform start-up of all equipment and mechanical systems.
- C. Contractor shall obtain the services of the equipment manufacturer(s), as required, to certify the installation.
- D. Equipment manufacturer(s) shall certify in writing that their equipment has been installed properly, the equipment functions properly, and the equipment warranty is valid. Written certification shall be on the manufacturer's letterhead.
- E. Contractor shall obtain the services of the equipment manufacturer(s), as required, to train BCWD personnel on the operation and maintenance of their equipment.
- F. A copy of the start-up test report and manufacturer's certification shall be given to the BCWD.

### **7.14 Site Cleanup**

- A. Contractor shall remove all unused material, excess soil and rock, 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 BCWD Inspector, the BCWD may issue a "Stop Work" order.
  - B. All trenches shall be backfilled and tamped before the end of each work day.
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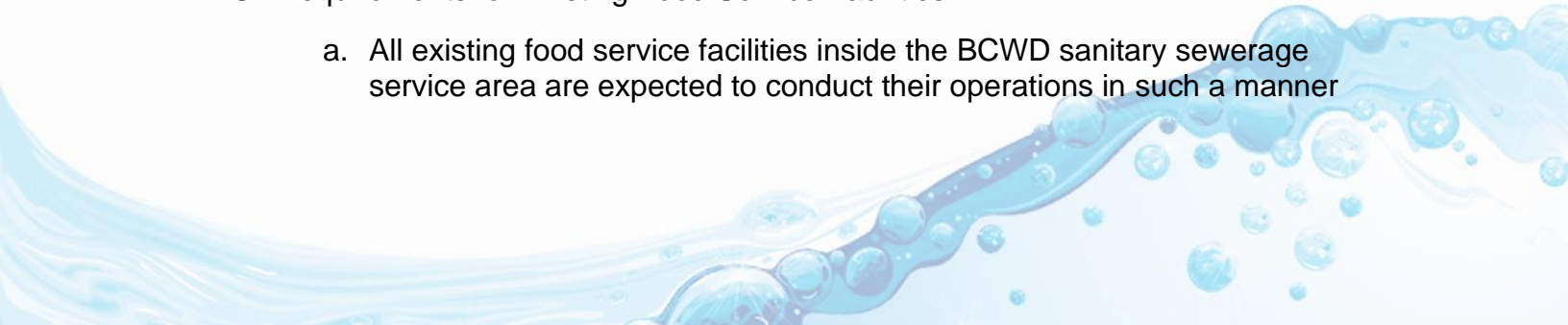
- C. Prior to requesting final completion, the Contractor shall complete the following cleanup tasks.
- a. Remove and properly dispose of all accumulated debris and all excess material of any kind from the job site.
  - b. Repair or replace any work, trees, lawns, shrubs, fences, flower beds, drainage culverts, or any other property damaged by the construction. All items damaged beyond repair shall be replaced with new material of equal or better quality.
  - c. Clean all road surfaces.

## **7.15 Grease Management Program**

### **7.15.1 Purpose**

- A. The purpose of the BCWD Grease Management Program is to minimize the introduction of fats, oils, and grease into the BCWD sanitary sewerage system. The main components of the program are the proper sizing, installation, and maintenance of grease interceptors. The administrative and inspection requirements of food service facilities are established herein.

### **7.15.2 General Criteria**

- A. Installation Requirements for New Food Service Facilities
- a. All food service facilities inside the BCWD sanitary sewerage service area shall be required to properly size, install, operate, and maintain an approved grease interceptor. Minimum size is 1,500 gallons.
  - b. All interceptor units shall be installed outside of the food service facility building unless the user can demonstrate to the BCWD that an interceptor located outside of the food service facility is not feasible.
  - c. All grease interceptor units shall be of the type and capacity approved by BCWD.
  - d. All dumpster pads shall be covered.
- B. Prohibited Discharges
- a. Domestic wastewater shall not be discharged into the grease interceptor unless specifically approved, in writing, by the BCWD.
- C. Requirements for Existing Food Service Facilities
- a. All existing food service facilities inside the BCWD sanitary sewerage service area are expected to conduct their operations in such a manner
- 

that grease is captured on the user's premises and then properly disposed.

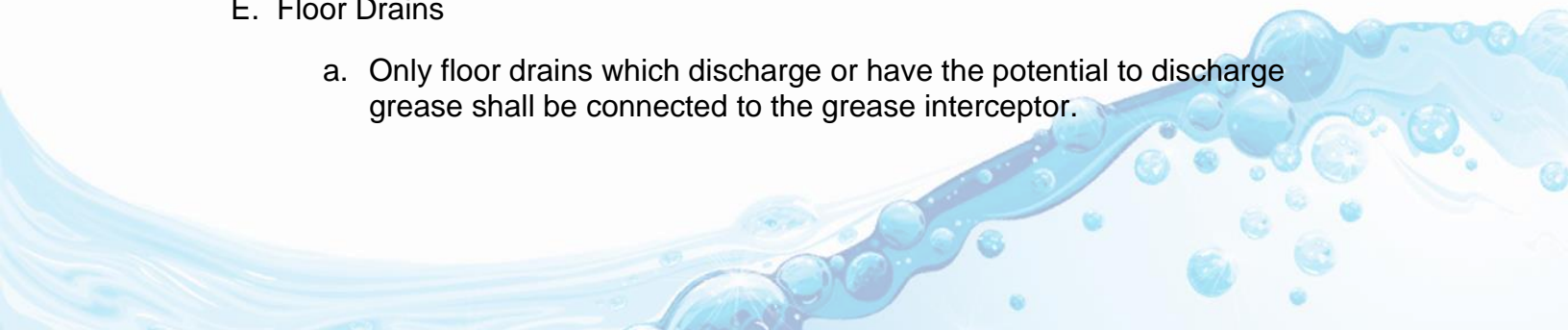
- b. Existing food service facilities will be handled under BCWD's Grease Management Program in the following manner.
  - i. BCWD will periodically inspect each food service facility on an as needed basis to ensure that each facility is complying with the intent of the Grease Management Program. The frequency of the inspection shall be determined by the BCWD.
  - ii. Each food service facility in the vicinity of an identified problem area will be inspected. The facilities grease control practices and the adequacy of their grease control interceptor/equipment will be assessed. Maintenance records will also be reviewed.
  - iii. Following the inspections, BCWD will send written notice to the inspected food service facility. The written notice will contain a summary of the policy requirements and the results of the inspection. The inspections will typically result in one of the following actions:
    - 1. After notice and an opportunity to be heard, facilities that are not in compliance shall be required to develop and submit to BCWD a proposed plan designed to achieve compliance through improved housekeeping and/or increased maintenance and pumping on the existing grease interceptor/equipment.
    - 2. Facilities that are not successful in achieving compliance with the intent of the Grease Management Program through improved housekeeping and increased maintenance and pumping on the existing grease interceptor/equipment will be required to install the necessary grease interceptor/equipment to bring the facility into compliance.

#### D. Waste Minimization Plan

- a. Food service facilities shall develop and implement a Waste Minimization Plan pertaining to the disposal of grease, oils, and food particles.
- b. Educational materials are available from BCWD regarding the minimization of these wastes.

#### E. Floor Drains

- a. Only floor drains which discharge or have the potential to discharge grease shall be connected to the grease interceptor.





## F. Location

- a. Each grease interceptor shall be installed and connected so that it is easily accessible for inspection, cleaning, and removal of the intercepted grease at any time.
- b. Grease interceptors required under this ordinance shall be installed outside of the food service facility. The best location is in an area outside of an exterior wall, but upstream of the domestic wastewater drain line(s).
- c. A grease interceptor shall not be installed inside any part of a building unless approved, in writing, by the BCWD. The user bears the burden of demonstrating that an outside grease interceptor is not feasible.

### 7.15.3 Design Criteria

#### A. Construction of Interceptors

- a. Grease interceptors shall be constructed in accordance with Bartow County plumbing standards and shall have a minimum of two compartments with fittings designed for grease retention.
- b. All alternative grease removal devices or technologies shall be subject to the written approval of the BCWD. Such approval shall be based on demonstrated removal efficiencies of the proposed technology.

#### B. Access

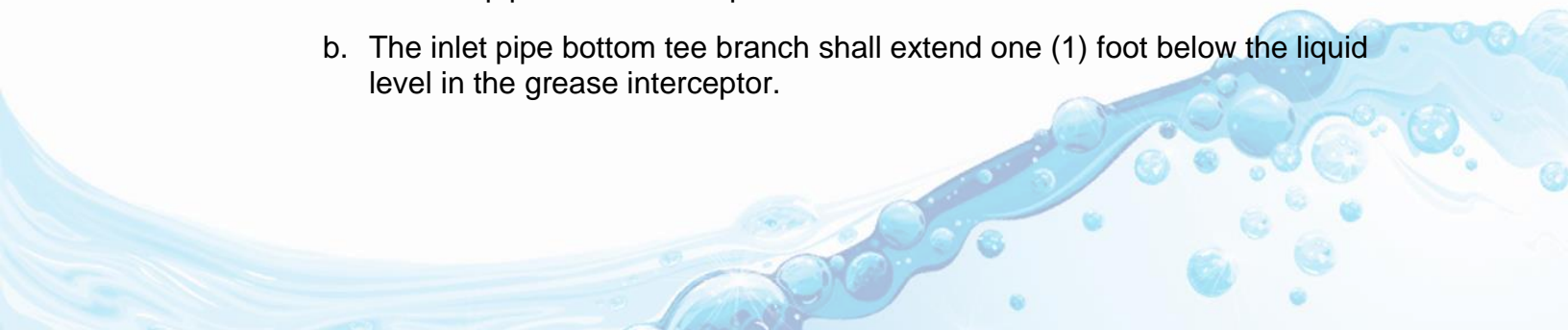
- a. Grease interceptors shall be provided with two (2) manhole lids installed flush with grade (in pavement) or 1" above grade outside of pavement.
- b. All grease interceptors shall be designed and installed to allow complete access for inspection and maintenance of the inner chamber(s) as well as viewing and sampling of the wastewater that is discharged to the sanitary sewer system.

#### C. Load Bearing Capacity

- a. In areas where additional weight loads may exist, the grease interceptor shall be designed to have adequate load-bearing capacity (i.e. for vehicular traffic in parking or driving areas).

#### D. Inlet and Outlet Piping

- a. Wastewater discharging to the grease interceptor shall enter only through the inlet pipe of the interceptor structure.
- b. The inlet pipe bottom tee branch shall extend one (1) foot below the liquid level in the grease interceptor.





- c. The outlet pipe bottom tee branch shall be submerged to 2/3 of the liquid depth in the grease interceptor.
- d. Grease interceptor shall have only one (1) inlet pipe and one (1) outlet pipe.

#### E. Interceptor Sizing

- a. Grease interceptors shall have a minimum capacity of 1,500 gallons and an individual grease interceptor unit shall have a maximum capacity of 3,000 gallons. If the calculated capacity using one of the following formulas exceeds 3,000 gallons, then multiple grease interceptor units shall be installed in series in order to meet the capacity requirement.
- b. The capacity of the grease interceptor shall be calculated using the following equations. The capacity of the grease interceptor shall be the larger of the two results.

##### i. a) Equation #1

$$\text{Interceptor Capacity (in gallons)} = S \times 25 \times \frac{HR}{12}$$

Where:

S = Number of Seats

HR = Maximum Hours of Daily Operation (including preparation and cleanup)

##### ii. Equation #2

$$\text{Interceptor Capacity (in gallons)} = \text{Sum of Fixture Flows} \times 20$$

Type of Fixture	Flow Rate
Restaurant Hand Sink	15
Pre-Rinse Sink	15
Single-Compartment Sink	20
Double-Compartment Sink	25
Two Double-Compartment Sinks	35
Triple-Compartment Sinks	30
Dishwasher up to 30 Gallons	15
Dishwasher up to 40 Gallons	20

Dishwasher up to 50 Gallons	25
Dishwasher up to 100 Gallons	40
Other Fixtures	Manufacturer Peak

- c. If allowed, under-sink or in-line grease interceptor requirements shall meet Plumbing and Drainage Institute Standard PDI-G101 and shall have a minimum grease retention capacity of 100 pounds. Larger interceptors shall be provided if required by the BCWD. Under sink may be allowed by BCWD if a restaurant has no indoor cooking and with a test port provided.
- d. Grease interceptor designs represent minimum standards for normal usage. Installations with heavier usage require more stringent measures for which the user is responsible and shall pay the costs to provide additional measures if required by the BCWD.
- e. Sizing calculations shall be provided by the applicant's design professional for review and approval by BCWD.
- f. BCWD reserves the right to evaluate interceptor sizing on an individual basis for facilities with special conditions, such as highly variable flows, high levels of grease discharge, or other unusual situations that are not adequately addressed by the formula.

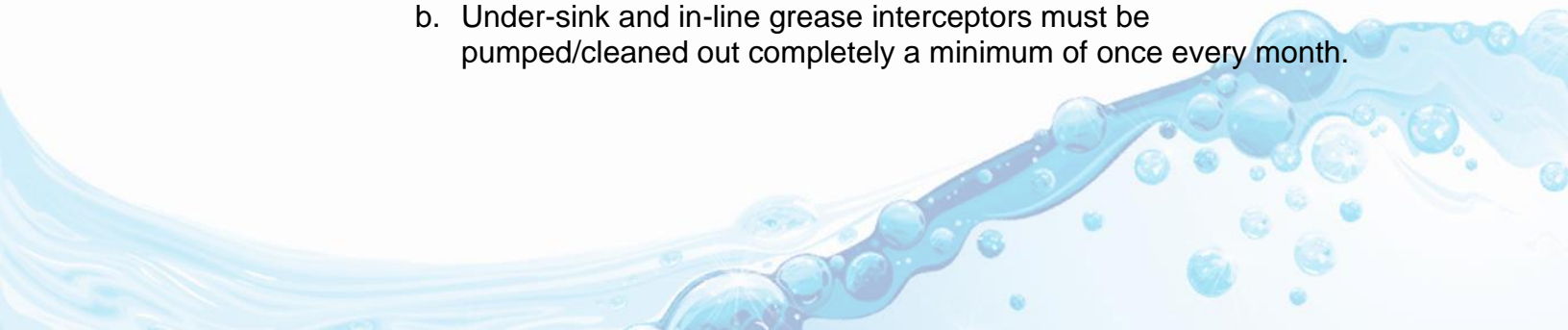
#### 7.15.4 Grease Interceptor Maintenance

##### A. Pumping

- a. All grease interceptors shall be maintained by the user at the user's expense.
- b. Maintenance shall include the complete removal of all contents, including floating materials, wastewater, and bottom sludge and solids.
- c. Decanting or discharging of removed waste back into the interceptor for the purpose of reducing the volume to be disposed of is strictly prohibited.

##### B. Pumping Frequency

- a. Grease interceptors must be pumped out completely a minimum of once every three (3) months.
- b. Under-sink and in-line grease interceptors must be pumped/cleaned out completely a minimum of once every month.



- c. Grease interceptors may need to be pumped more frequently as needed to prevent carry over grease into the sanitary sewer collection system.
- d. Pumping frequency may be extended past the minimum period if the user can demonstrate that the grease interceptor can function properly with a longer pumping frequency. Extended pumping frequencies must be approved by the BCWD.

#### C. Notice of Violation

- a. Grease interceptor inspections will be performed at the food service facility.
- b. If the oil and grease concentrations exceed BCWD's maximum discharge limits and/or the combined depth of bottom and top solids exceeds 33 percent of the total depth of the trap, the facility will be notified in writing of the findings and the user will be given seven (7) days to achieve compliance.
- c. If the interceptor is not cleaned or BCWD is not notified of the interceptor being cleaned within this time period, a Notice of Violation (NOV) letter will be issued to the user. In the NOV, the user will be given three (3) days to comply.
- d. If compliance is not achieved within the three-day period, the user's water service will be terminated. Water service, once terminated, will not be restored until the user has achieved compliance.

#### D. Disposal of Interceptor Pumped Material

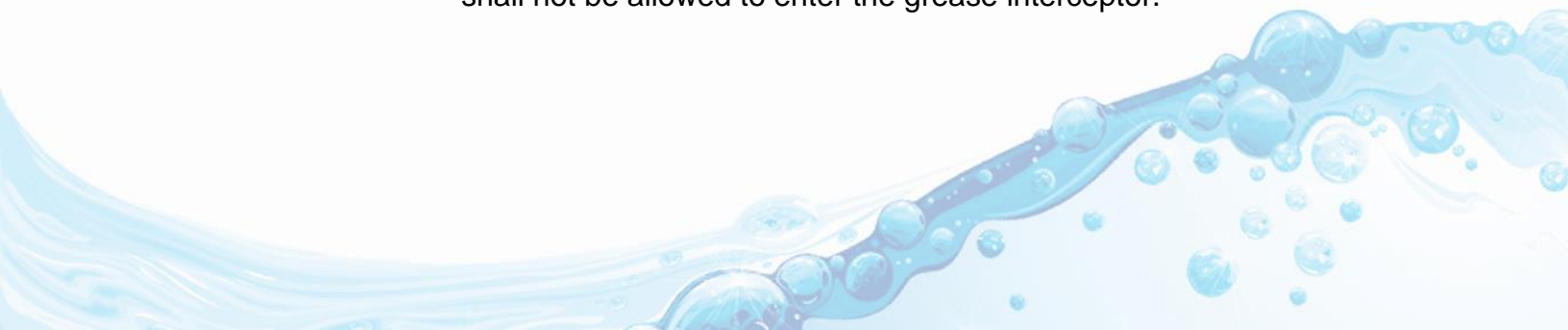
- a. All waste removed from each grease interceptor shall be recorded on a proper manifest form.
- b. In no way shall the pumped material be returned to any private or public portion of the sanitary sewer collection system.

#### E. Additives

- a. 1. No additives shall be used at any time.

#### F. Chemical Treatment

- a. 1. Chemical treatments such as drain cleaners, enzymes, acids, and other chemicals designed to dissolve, purge, or remove grease shall not be allowed to enter the grease interceptor.



### 7.15.5 Administrative Requirements

#### A. Administrative Fees

- a. No fee will be charged for an inspection by BCWD; however, if the user's grease interceptor is not in compliance with the Grease Management Program, a reinspection fee will be charged for each inspection thereafter until compliance is achieved. The current reinspection fee can be obtained on the BCWD website at [www.bartowcountygov.gov](http://www.bartowcountygov.gov).

#### B. Inspection and Entry

- a. Authorized personnel of the BCWD, bearing proper credentials and identification, shall have the right to enter upon all properties subject to the Grease Management Program at any time and without prior notification for the purpose of inspection, observation, measurement, sampling, testing, or record review.

#### C. Record Retention and Reporting

- a. All users must keep a record of any cleaning or maintenance performed on their grease interceptor.
- b. The following records must be kept on-site at the food service facility for a minimum of two (2) years.
  - i. Manifests are required for all grease interceptors and shall contain the following information.
    - 1. Food service facility (generator) information including name, address, volume pumped, date and time of pumping, and generator signature verifying the information;
    - 2. Transporter information including company name, address, license plate number, permit number, driver name, and driver signature verifying transporter information;
    - 3. Receiving information including facility name, address, date and time of receiving, EPD permit number, and signature verifying receipt of waste.
    - 4. Manifests must be mailed, faxed, or electronically submitted to BCWD within fourteen (14) days after the interceptor maintenance was performed.

5. A manifest may not be required for under-sink or in-line grease interceptors if the user can present a valid reason to BCWD as to why one is not necessary.
6. Maintenance logs are required for all grease interceptors and shall indicate the date and time that the maintenance was performed and shall have a description of the maintenance that was performed.

#### **7.15.6 Enforcement**

- A. Enforcement of these regulations shall be in accordance with the provisions of the BCWD Enforcement Response Plan.
- B. Failure to comply with the Grease Management Program will be grounds for discontinuation of water service.



## 7.16 Appendix A – See Standard Water Details





## 7.17 Appendix B – See Standard Sewer Details



## 7.18 Appendix C – See Lift Station Details

