Technical Specification 018.01

WATER DISTRIBUTION SYSTEM

1.0 General

a) It is the intent of this specification to ensure that all water system infrastructure constructed within the service area of the Brunswick County Public Utilities Department meets or exceeds all local, state, and federal rules and regulations as applicable. This specification also provides technical guidance to contractors and engineers to ensure that all water system infrastructure is properly constructed, tested, chlorinated, and placed in service to protect the public.

2.0 Materials and Requirements for Water Mains

a) General

1) To the maximum extent possible all materials shall be manufactured in the United States. This includes all pipe, valves, fittings, hydrants, meter boxes, etc.

2) All pipe material shall be marked with the manufacturer, type, class, thickness, and date of production in lettering legible to the Engineer and County staff.

3) The Engineer is responsible for reviewing all shop submittals for approval. County Engineering may assist as needed to answer any questions concerning material suitability.

4) All piping material must have a minimum pressure rating of one and one-half (1.5) times the normal working pressure of the pipe.

5) All pipes, valves, hydrants, fittings, etc., must conform to the applicable AWWA standards.

6) Water mains shall be constructed of AWWA C900 or C905, PVC, minimum DR-18, except when DIP, HDPE, or Fusible PVC mains are required.

7) All pipes shall be shipped with gaskets installed inside the pipe bell.

8) Water main installation shall conform to AWWA C600: Standard for Installation of Ductile Iron Pipe (DIP), or AWWA C605: Standard for Installation of Polyvinyl Chloride (PVC) pipe

b) Ductile Iron Pipe (DIP)

1) All sizes of pipe shall be manufactured to a nominal laying length of 18'-0" to 20'-0”, except to make adjustments for bends, tees, and other fittings.

2) DIP shall conform to ANSI / AWWA C150 / A21.50 and ANSI / AWWA C151 / A21.51, with interior cement mortar lining and an exterior asphaltic coating for corrosion resistance.

3) Cement mortar linings shall conform to ANSI A21.4 / AWWA C104.

4) DIP that has an interior lining of Protecto 401 (or equivalent) for use in sewer systems shall not be permitted on potable water systems.

5) Joints shall be the push-on or mechanical joint type conforming to ANSI / AWWA C111 / A21.11 as modified by ANSI / AWWA C151 / A21.51.

6) Fittings and specials shall be cast or ductile iron conforming to ASNI 21.10 and shall be rated for one hundred and fifty (150) pounds per square inch minimum pressure.

7) Wall thickness shall be in accordance with Table 51.1 of ANSI/AWWA C151/A21.51 with working pressure of one hundred and fifty (150) psi. Final pipe class shall be determined based on specific structural calculations as they relate to conditions encountered during design. Brunswick County reserves the right to designate the final pipe thickness.

   a) (4) inch – (12) inch diameter pipe: minimum pressure class 350

   b) (14) inch – (20) inch diameter pipe: minimum pressure class 250

   c) (24) inch pipe: minimum pressure class 200

   d) Flanged pipe shall be minimum pressure Class 53

8) Rubber gaskets and lubricant shall conform to ANSI/AWWA C111/A21.11.

9) No metric sized pipe shall be permitted.

10) In corrosive, contaminated, and dredged soils, DIP and all fittings shall be wrapped in a polyethylene encasement per ANSI / AWWA A21.5 / C105 *Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids*. All fasteners shall be stainless steel Type 304, minimum grade.

11) Acceptable products are American Cast Iron Pipe Company, Griffin Pipe Company, U.S. Pipe Company, or approved equal.

c) Polyvinyl Chloride Pipe (PVC)

1) All sizes of pipe shall be manufactured to a nominal laying length of 18'-0" to 20'-0" except to make adjustments for bends, tees, and other fittings.

2) Two (2) inch PVC mains shall be SDR-21, gasketed pipe, in accordance with ASTM D2241 and shall bear the seal of the National Sanitation Foundation (NSF).

3) Four (4) inch through twelve (12) inch PVC mains shall be AWWA C900 Class 150 (DR-18) and shall bear the seal of the NSF. Joints shall conform to ASTM D3139 or ASTM D3212.

4) Fourteen (14) inch through thirty-six (36) inch PVC mains shall be AWWA C905 Class 235 (DR-18) and shall bear the seal of the NSF. Joints shall conform to ASTM D3139 or ASTM D3212.

5) PVC mains shall be manufactured with PVC material conforming to PVC 1120.

6) Fittings shall be molded PVC with joints similar to the PVC pipe. Fabricated fittings using solvent welded joints are not acceptable. Fittings may also be DIP fittings listed and approved for use with PVC pipe and shall have a cement mortar lining on the interior and an asphaltic coating on the exterior for corrosion resistance.

7) All PVC water mains shall be factory dyed industry standard blue.

8) Push on joints shall conform to ASTM D3139 with an elastomeric gasket and the joint pressure rating shall not be less than the pipe pressure rating.

9) In corrosive, contaminated, and dredged soils, all fittings shall be wrapped in a polyethylene encasement per ANSI / AWWA A21.5 / C105 *Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids*. All fasteners shall be stainless steel Type 304, minimum grade.

10) Acceptable products are Diamond Plastics Corporation, J M Eagle Manufacturing Company, National, Certainteed, North American, or approved equal.

d) Fusible Polyvinyl Chloride (Fusible PVC)

1) Fusible PVC pipe shall be in the four (4) inch to thirty-six (36) inch diameter range.

2) Fusible PVC shall be AWWA C900 (4 inch through 12 inch diameter) and C905 (14 inch through 36 inch diameter) with National Sanitation Foundation (NSF) certifications NSF– 61 and NSF – 14.

3) Fusible PVC shall conform to ASTM cell classification 12454.

4) Fusible PVC shall have a minimum safety factor of (2.0).

5) Fusible PVC shall be joined by the thermal butt fusion method in accordance with ASTM F-1674 and D-638.

6) Four (4) through twenty-four (24) inch Fusible PVC (DIPS) shall be minimum DR-18.

7) Thirty (30) inch Fusible PVC (DIPS) shall be DR-25.

8) Thirty-six (36) inch Fusible PVC (DIPS) shall be DR-32.5.

9) All Fusible PVC water mains shall be factory dyed industry standard blue.

10) Fittings and specials shall be as stated in Section (4.0) of this specification.

11) Acceptable products are Fusible PVC ™ by Underground Solutions, Inc.

e) <u>High Density Polyethylene Pipe (HDPE)</u>

1) HDPE mains shall be high density polyethylene conforming to AWWA C906 with PE 3408 material and shall conform to ASTM F714 specification for HDPE pipe.

2) HDPE shall be joined by the thermal butt fusion method in accordance with ASTM D3261.

3) HDPE shall be minimum DR-9 rated at a minimum two hundred (200) pounds per square inch.

4) All HDPE water mains shall have a factory standard blue stripe on the pipe.

5) Fittings and specials for HDPE mains shall be per the HDPE manufacturer's recommendations and shall be submitted as shop submittals by the utility contractor to the Engineer for review and approval prior to use. All fittings and specials shall conform to ASTM D3350 for fittings materials.

6) HDPE used for horizontal directional drills (HDD) shall have the pipe diameter increased in order to maintain equivalent inside diameter as the open cut installed pipe it connects to.

7) Acceptable products are Mono-Line Pipe System by Joseph T. Ryerson and Sons, Inc.; Driscopipe 1000 by Phillips Products, Inc.; Sclairpipe by Dupont of Canada; JM Manufacturing Company Inc., or approved equal.

3.0 Materials and Requirements for Water Services

a) Water services that are less than fifty (50) percent of the outside diameter of the supplying main may utilize a wide band body tapping saddle. All other water service connections shall use a tapping sleeve.

b) (3/4) inch and (1) inch service lines and tapping saddles

1) Service line piping shall be minimum one (1) inch diameter for (3/4) and (1) inch water meters and shall be HDPE tubing, SDR 9, 200 psi, conforming to ASTM D2737 / AWWA C901. No joints are allowed on a service line between the main service tap and the meter stop.

In proven contaminated soils the service line shall be Type K copper with rated and approved gaskets for contaminated soils.

2) Service saddles shall be wide band body service saddles, ACIPCO, US Pipe, McDonald, Mueller, Smith Blair, Ford, JCM, Romac, or approved equal. All fasteners shall be minimum high strength alloy steel.

3) Size of tap shall match that of the service line (1 inch minimum tap).

4) The corporation stop shall have AWWA inlet threads, ball type, outlet connection to be CTS /OD, conductive compression type (grip nut). Size of corporation stop shall match that of service line (1-inch minimum). Corporation stops shall be Mueller B 25028, Ford –Ball Corp FB 1100 or 1000, McDonald – Ball Corp 4704 –BT, or approved equal.

c) (1.5) inch and (2) inch service lines and tapping saddles

1) Services shall be two (2) inch diameter for one and one-half (1.5) inch and two (2) inch water meters and shall be HDPE tubing, SDR 9, 200 psi, conforming to ASTM D2737 / AWWA C901. No joints are allowed on a service line between the main service tap and the meter stop.

In proven contaminated soils the service line shall be Type K copper with rated and approved gaskets for contaminated soils

2) Service saddles shall be wide band body service saddles, McDonald 3800 series, Mueller H 13000 or DR 2S series, Smith Blair 317, Ford FC 202, JCM 406, Romac 202, or approved equal. All fasteners shall be minimum high strength alloy steel.

3) Tapping valve shall be a two (2) inch, resilient wedge gate valve, Mueller A 2360, or approved equal, installed with a valve box and concrete collar per County Standard Detail.

4) Large meter boxes with meter setters are required for one and one-half (1.5) inch and two (2.0) inch water meters and shall be provided by the contractor and shall accommodate the Sensus AMR/AMI water meter. The contractor shall submit the proposed large meter box and lid to the Engineer for approval prior to installing the meter box.

d) (3) inch and (4) inch service lines

1) Service lines shall be four (4) inch diameter for three (3) inch and four (4) inch water meters and may be HDPE, DIP, or PVC material conforming to technical specifications for these materials per Section (3.0) of this Specification. Water meters three (3) inch and larger shall be installed in a meter vault per County Water Standard Details – Large Meter Vaults.

2) Tapping sleeves are required per County Standard Details. Tapping saddles are not allowed on any services larger than two (2) inch. See Section (12) of this specification for tapping sleeve information. All fasteners shall be minimum high strength alloy steel.

e) Services for water meters larger than four (4) inch shall be sized to match the installed meter size.

f) All services shall be installed as shown on the approved plans and the tap shall be made perpendicular to the main and run straight to the meter box or vault. Variations from this requirement due to field conditions are only by approval of the County in advance of installation.

g) Locating wire is required on water services and water mains. See Section (14) of this specification for locating wire information.

h) Service taps shall be made at the 10:00 o'clock or 2:00 o'clock position on the water main. Service taps shall be staggered from one side of the main to the other with a minimum distance of eighteen (18) inches between taps. Taps are to be a minimum twenty (20) inches apart if made on the same side of the main.

i) Services shall not be installed by the contractor until all the mains have passed hydrostatic testing, cleaning, and chlorination results are satisfactory and provided to County staff.

j) No taps are allowed on a fire hydrant leg.

k) No taps are allowed where rodding is in place.

l) No burned taps are allowed.

m) No taps are allowed on horizontally directionally drilled (HDD) pipe.

n) Brunswick County Public Utilities is standardizing on the Sensus AMR / AMI water meter. Water meters shall be Sensus AMR / AMI, or approved equal.

o) Water meter boxes for three-quarter (3/4) inch and one (1) inch meters shall be:

Single Meter Boxes:

Ford	LYLV141-243-TP-NL
McDonald	776-208PC2G437
Mueller	H-1462-K

1) Or approved equal – all boxes must accommodate the Sensus water meter with AMI/AMR technology.
2) Box lids shall be the non-locking type.

Double Meter Boxes:

Ford With Box Lid #	DG118-243-LLID-NL RT – 10 X 13 LID

1) Or approved equal – all boxes must accommodate (2) Sensus water meters with AMI/AMR technology.
2) Box lid shall be the non-locking type

p) All new residential subdivisions that have County public sewer shall install a double water meter box on the one (1) inch service lateral on each lot to accommodate an irrigation meter for separate billing purposes.

q) Large water meter vaults shall be per the County Standard Details for meter vaults. Quazite or GlasMasters polymer concrete enclosures, minimum Tier 22 rating for both the box and lid, are an approved "or equal" to a standard concrete vault. Contact County Engineering with any questions concerning large water meter vaults.

4.0 Materials and Requirements for Fittings and Specials

a) Fittings and specials shall be class (54) ductile iron per ANSI / AWWA A21.11 / C111, ANSI / AWWA A21.53 / C153, and ANSI / AWWA A21.51 / C151, minimum class 350 for (18) inch and smaller fittings and minimum class 250 for (20) inch and larger fittings.

b) Profiles of fittings and specials may have special dimensions as required by the pipe manufacturer.

c) Ductile iron fittings and specials shall be cement mortar lined per ANSI / AWWA A21.4 / C104 and have an asphaltic coating on the exterior for corrosion resistance.

d) No metric sized fittings shall be permitted.

e) All fittings to be shipped with gaskets, glands, nuts, and bolts unless specified otherwise. Nuts and bolts shall be high strength alloy steel.

5.0 Materials and Requirements for Restrained Joints, Piping, and Fittings

a) Restrained joints are required to prevent movement of system piping caused by forces in or on buried piping, tees, valves, branches, bends, plugs, etc.

b) Restrained joints shall be installed as shown on the approved plans, standard details, or as directed by county staff or the Engineer.

c) Concrete thrust blocking shall be installed as shown on the approved plans, standard details, or as directed by county staff or the Engineer.

d) All carrier pipe installed inside a casing shall be pressure class 350 ductile iron pipes per county standard details with restrained joints.

e) All restrained joint systems shall have a pressure rating equal to or greater than that of the pipe on which they are installed.

f) Restraint type gaskets that provide internal restraint by means of stainless steel inserts embedded within the gasket are not permitted for use in Brunswick County.

g) Ductile Iron Pipe (DIP)

1) Install restraints in strict accordance with the manufacturer's recommendations.

2) All ductile iron horizontal directional drill and bore-and-jack installations shall use boltless, integral, positive locking restraint systems that allow for joint deflection and disassembly should the need arise. The restrained joint system shall be a manufacturer's standard restrained joint system such as American (Flex-Ring or Lok-Ring), U S Pipe (TR-Flex), or Griffin (Snap-Lok), or approved equal.

Note: the aforementioned boltless, integral, positive locking restraint systems are also acceptable for use in open cut pipe installations.

3) External bell restraint harness shall have ductile iron glands. The dimensions of the gland shall be such that it can be used with the standard mechanical joint bell. Twist off nuts with preset factory torque setting

shall be used to ensure proper actuation of the restraint device. All nuts, bolts, and fasteners shall be high strength alloy steel. Mechanical joint restraints shall conform to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153, latest revision.

The restrained joint system shall be a manufacturer's standard restrained joint system manufactured by EBAA Iron, Inc., Smith-Blair, Inc., JCM, Inc., or approved equal.

4) Restraint for valves and fittings shall have ductile iron glands. Twist off nuts with preset factory torque setting shall be used to ensure proper actuation of the restraint device. All nuts, bolts, and fasteners shall be high strength alloy steel. Mechanical joint restraints shall conform to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153, latest revision.

The restrained joint system shall be a manufacturer's standard restrained joint system manufactured by EBAA Iron, Inc., Smith-Blair, Inc., JCM, Inc., or approved equal.

5) Stainless steel rodding and fasteners, Type 304 minimum, is acceptable per county standard details. Manufacturer's restraint system and/or glands are preferred in lieu of rodding.

h) Polyvinyl Chloride Pipe (PVC)

1) Install restraints in strict accordance with the manufacturer's recommendations.

2) External bell restraint harness shall have ductile iron glands. The dimensions of the gland shall be such that it can be used with the standard mechanical joint bell. Twist off nuts with preset factory torque setting shall be used to ensure proper actuation of the restraint device. All nuts, bolts, and fasteners shall be high strength alloy steel. Mechanical joint restraints shall conform to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153, latest revision.

The restrained joint system shall be a manufacturer's standard restrained joint system manufactured by EBAA Iron, Inc., Smith-Blair, Inc., JCM, Inc., or approved equal.

3) Restraint for valves and fittings shall have ductile iron glands. Twist off nuts with preset factory torque setting shall be used to ensure proper actuation of the restraint device. All nuts, bolts, and fasteners shall be high strength alloy steel. Mechanical joint restraints shall conform to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153, latest revision.

The restrained joint system shall be a manufacturer's standard restrained joint system manufactured by EBAA Iron, Inc., Smith-Blair, Inc., JCM, Inc., or approved equal.

4) Stainless steel rodding and fasteners, Type 304 minimum, is acceptable per county standard details. Manufacturer's restraint system and/or glands are preferred in lieu of rodding.

6.0 Materials and Requirements for Pipe Couplings – 4 inch and larger

a) Provide couplings where needed to make piping connections.

b) Provide full-length, mechanical joint, ductile iron solid sleeve with twelve (12) inch minimum length.

c) Provide ductile iron cut-in sleeve with mechanical restrained joints where installing fittings in an existing line.

7.0 Materials and Requirements for Fire Hydrants

a) Hydrants shall be the dry barrel type with breakaway flange, shall open left only, conforming to AWWA Standard C502, latest revision, with a six (6) inch mechanical joint connection on the inlet end, minimum four and one-half (4.5) inch valve opening, and two (2.5) inch hose connections and one (4.5) inch pumper connection, all with American National Standard fire hose coupling threads.

b) Hydrants shall have breakaway barrel and operating stem with barrel length for three (3) foot main cover, six (6) inch bottom hub, and one and one-half (1.5) inch solid operating nut with O-ring seals.

c) Main valve seat shall have bronze to bronze threads into the hydrant shoe. Hydrant shall be grease lubricated with a thrust bearing to reduce operating torque or may be oil lubricated.

d) Hydrants shall be rated at one-hundred –fifty (150) psi working pressure and three-hundred (300) psi test pressure.

e) Hydrants shall be shop painted chrome yellow Tnemenc paint (or approved equal) and shall be touched up after installation and given one (1) field coat of chrome yellow enamel. If the hydrant is painted with color other than chrome yellow from the manufacturer, there shall be three (3) field coats of chrome yellow paint applied by the contractor after installation.

f) Hydrant shall be dry bonnet type and be provided with a drain outlet for draining when the valve is closed and shall be provided with washed stone per County Standard Detail to ensure adequate drainage.

g) All fire hydrant legs shall be ductile iron pipe from the hydrant tee on the main to the fire hydrant and shall be restrained joint (Meg-A-Lug or equal) or rodded to the hydrant leg gate valve – see County Standard Detail for fire hydrants. Meg-A-Lug is preferred in lieu of rodding. Thrust blocking is required per County Standard Detail.

h) Hydrants shall be installed plumb one-eight (1/8) inch per foot, and set so that the pumper nozzle is eighteen (18) inches minimum above the final finished grade.

i) Contractor shall be allowed one (1) barrel extension as required to maintain pumper nozzle at eighteen (18) inches above final finished grade and the fire hydrant shall not be left too high such that the breakaway will not work properly.

j) Hydrants shall be Mueller, Clow, American Darling, or approved equal.

8.0 Materials and Requirements for Building Fire Sprinkler Systems

a) Backflow prevention devices are required on all fire lines and sprinkler systems to prevent cross- contamination of the County's water transmission and distribution system. Refer to the Brunswick County Public Utilities Department's *Cross-Connections and Backflow Protection Policy* for additional information.

b) A lockable post indicator valve (PIV) is required at the right-of-way or easement line on all fire lines to delineate ownership of the fire line between the County and the property owner. The top of the PIV shall be thirty-six (36) inches above finished grade. Refer to County Standard Details for fire lines.

c) Backflow prevention devices shall be installed at the right-of-way or easement line immediately adjacent and downstream of the PIV. With County approval the backflow prevention device may be installed inside a building's mechanical room where the sprinkler riser is located.

e) Where a building utilizes a sprinkler system, or has a Fire Department Connection (FDC), then the required level of backflow protection is a Reduced Pressure Zone (RPZ) backflow preventer.

f) Fire hydrants shall not be installed on private fire lines.

9.0 Materials and Requirements for Water System Valves

a) General Information for all Valves

1) Valves shall be installed on all system branches from feeder mains, on hydrant legs, at each end of horizontal directional drills per standard detail, per a), b) and c) as follows, or as directed by county staff or the Engineer:

a) Install three (3) valves at crosses

b) Install two (2) valves at tees

c) Install one (1) valve on a fire hydrant leg

2) For distribution mains isolation valves are required at approximately every one-hundred (100) feet per one (1) inch diameter of the installed main up to a maximum distance of two thousand (2,000) feet between valves. For example, for an eight (8) inch diameter main install a main line isolation valve every eight hundred (800) feet. Place mail line isolation valves in close proximity to fire hydrants. Also adjust main line isolation valve placement to take into account subdivision entrances, driveways, fences, street intersections, other underground utilities, etc, or as directed by county staff. Restrained joint pipe is required on the first joint in each direction from a main line valve as per county standard detail

3) For transmission mains - defined as twelve (12) inch and larger - install an isolation valve approximately every two hundred (200) feet per one (1) inch diameter of the installed main up to a maximum distance of five thousand (5,000) feet between valves. Place main line isolation valves in close proximity to fire hydrants. Also adjust main line isolation valve placement to take into account subdivision entrances, driveways, fences, street intersections, other underground utilities, etc, or as directed by county staff. Restrained joint pipe is required on the first joint in each direction from a main line valve per county standard detail.

4) Place main line isolation valves on the downstream side of the fire hydrant tee per the direction of water flow.

5) Valves shall be located per the approved plans, at the proper elevation, and operable. Hard to operate or inoperable valves and fire hydrants are not acceptable and shall be repaired or replaced prior to system hydrostatic pressure testing.

6) All valves shall open left – no right hand open valves are allowed.

7) Valves shall be rodded to the cross or tee if within ten (10) feet of the cross or tee.

8) All valves shall have a metal screw type valve box with lid marked WATER and a concrete collar (in non-traffic areas) installed per the County Standard Detail for valves and valve boxes. Masonry blocking shall be used to support the valve box such that it does not rest on the bonnet of valve – refer to county standard details. Valve lid shall be painted blue.

9) Maximum depth of the valve stem nut shall be five (5) feet. If valve stem nut is deeper than five (5) feet below grade then a valve operating nut extension kit, manufactured by the same company that produced the valve, must be installed by the utility contractor.

b) Gate Valves

1) All valves shall be in conformance with the latest revision of all reference standards of AWWA C509 / 515: *"Resilient Seated Gate Valves for Water Supply Service".*

2) Four (4) inch through twelve (12) inch mains: use resilient wedge gate valves or ¼ turn stainless steel ball valves. No valves smaller than four (4) inch diameter are allowed.

3) All valves shall open left (counter clock wise) – no right hand valves allowed.

4) Valves shall have a two (2) inch metal operating nut with arrow indicating direction of opening.

5) Valves shall be designed for a working pressure of not less than one hundred fifty (150) psi unless specifically approved by county staff or the Engineer.

6) Valves shall be equipped with a non-rising stem. Valves installed in vaults or manholes shall be provided with hand wheel actuators.

7) All valves shall have a screw type valve box and a four (4) inch thick concrete collar in non-traffic areas per county standard detail.

8) Resilient Seated Wedge Gate Valves:

a) Iron body, bronze mounted, double disc, parallel seat type, factory tested to three hundred (300) psi, valve ends to be constructed for use with mechanical joints or push on joints.

b) Bonnet and body flanges shall be fully machined to assure proper sealing of the gasket.

c) Shall have O-Ring sealed stems with one O-Ring located below the thrust collar and with two O-Rings located above the thrust collar. The thrust collar between the two lower O-Rings shall be factory filled with a lubricant to provide permanent lubrication of the thrust collar area.

d) Provide integrally cast bronze or stainless steel thrust collar.

e) An antifriction thrust washer shall be provided both above and below the thrust collar for ease of operation.

f) Acceptable product: Mueller, M & H, American Flow Control, Clow, or approved equal.

c) Butterfly Valves

1) Butterfly valves shall be installed on water mains sixteen (16) inch diameter and larger.

2) Butterfly valves shall meet the requirement of AWWA C504, latest revision.

3) Valves shall have mechanical joints.

4) Operating stem and nut shall be two (2) inch and open left only.

5) Resilient and elastomer seats are to be synthetic rubber (EPDM).

6) Shafts to be turned, ground and polished, constructed of 18-8 Type 304 stainless steel.

a) Shafts to be of one piece design.

b) Attach disc to shaft with stainless steel tapered pins and locking nuts.

7) Provide operators with not less than maximum operator torque, as determined in accordance with Appendix A of AWWA C504, to operate valves under actual line pressures and velocities:

a) Provide worm and gear, or traveling nut type, self-locking to prevent the valve disc from creeping or fluttering when it is in any intermediate position between open and closed.

b) Gear operators to be permanently lubricated, totally enclosed, with adjustable stops for the open and closed position.

c) All exterior fasteners shall be minimum high strength alloy steel.

8) Epoxy coated inside and outside conforming to AWWA C550.

9) Rated for a one hundred fifty (150) psi working pressure.

10) Acceptable product: Mueller, American Darling, Pratt, or approved equal.

d) Tapping Valves – less than 30 inches

1) Tapping valves smaller than thirty (30) inches shall conform to the following:

a) Resilient seated wedge type conforming to AWWA C509 / C515.

b) Epoxy coated inside and outside conforming to AWWA C550.

c) Both ends shall be flanged with tapping boss by mechanical joint conforming to ANSI B16.1, Class 125 and ANSI / AWWA C111 / A21.11 respectively.

d) Rated for two hundred fifty (250) psi working pressure.

e) All exterior fasteners shall be minimum high strength alloy steel

f) Acceptable Product: Mueller T-2360 -16, AVK Series 25, or proved equal.

e) Tapping valves (30) inches and larger

1) Bronze seat, double disk type, conforming to AWWA C500, or resilient seated wedge conforming to AWWA C515.

2) Epoxy coated inside and out conforming to AWWA C550.

3) Equipped with four (4) inch by-pass valves.

4) Ends shall be flanged with tapping boss by mechanical joint conforming to ANSI B16.1, Class 125 and ANSI/AWWA C111/A21.11 respectively.

5) Rated for (200) psi working pressure.

6) Acceptable product: Mueller t-2360 -16, AVK Series 25 or approved equal.

10.0 Materials and Requirements for Valve Boxes and Concrete Collars

a) Install per county standard details at each water valve.

b) Cast iron or ductile iron, screw type, with flared base, length as required for the buried valve, Sigma VB-261 or approved equal.

c) The word “WATER” shall be cast in the cover.

d) The contractor shall spray paint the cover blue after installation.

e) No part of the valve box is to rest on the buried valve bonnet – use masonry bricks for support per county standard detail.

f) Install precast concrete ring around valve box in unpaved non-traffic areas per county standard detail.

g) Valve boxes in traffic areas to be AASHTO H-20 load rated and installed per county standard detail.

11.0 Materials and Requirements for Valve Markers

a) Valve markers shall be installed in rights-of-way and utility easements as shown on the County Standard Details

b) Valve markers in public rights-of-way shall be concrete, extend thirty-six (36) inches above finished grade, with the cast MV (main valve), AV (air release valve), or BO (blow off) facing the nearest street. Valve markers in utility easements shall be fiberglass and extend sixty (60) inches above finished grade. Refer to county standard details for additional information.

c) Valve markers are not required for fire hydrant leg isolation valves.

d) Valve markers shall be painted blue for water mains.

e) Concrete valve markers shall have a bronze, stamped, insert on top of marker per county standard detail.

12.0 Materials and Requirements for Tapping Sleeves (services larger than 2 inch)

a) Tapping sleeves shall have outlet flange counter bored to accept a mating tapping valve for true alignment of the tapping sleeve, tapping valve, and tapping machine.

b) Sleeves shall be stainless steel, split type, with gasket and flanged outlet.

c) Sleeve fasteners shall be minimum high strength alloy steel.

d) Provide for a minimum working pressure of one hundred fifty (150) psi.

e) Provide (¾) inch NPT test plug on the tapping sleeve.

f) Air test of tapping sleeve – minimum fifty (50) psig for five (5) minutes - shall be witnessed by county staff prior to the contractor performing tapping operations on county water mains. No taps are allowed without county staff present.

g) Acceptable tapping sleeves are:

1) Romac, Ford, and Mueller for mains four (4) inches through twenty-four (24) inches diameter.

2) Dresser, Cascade, and JCM for mains thirty (30) inches and larger.

13.0 Materials and Requirements for Curb Stops and Water Meter Boxes

a) All new residential subdivisions that have public sewer shall install a double water meter box on each lot to accommodate an irrigation meter.

b)

b) See Section 3.0 (o) of this specification for approved water meter boxes.

c) All single gang water meter boxes will have an in-line curb stop valve and an in-line check valve per county standard detail.

d) All irrigation meters, and all non-residential water meters, must have an approved backflow prevention device installed per county standard detail.

e) Brunswick County is standardizing on the Sensus AMR / AMI water meter. All water meter boxes used in the service area of Brunswick County Public Utilities must accommodate the Sensus AMR / AMI water meter.

14.0 Materials and Requirements for Locating Wire, Marking Tape, and Marker Balls

a) Tape shall be three (3) inches wide, blue in color, bearing continuous message "CAUTION WATER LINE BURIED BELOW". Tape shall be made of plastic or other permanent material, and shall be buried continuously above the water main at a depth of eighteen (18) inches below finished grade.

b) All water mains shall have a #12 AWG, high strength copper clad steel conductor (HS-CCS) such as Copperhead Superflex, or approved equal, with HDPE insulation, and rated for direct burial. Listed and approved underground connectors shall be used for all splices. The wire shall be brought up in valve boxes per County Standard Detail. In any event, the wire shall be brought up into a valve box at 1,000 feet maximum intervals to provide wire access points. The wire shall be taped to the top of the water main at minimum ten (10) feet intervals.

c) The contractor shall be required to perform a signal strength test of the installed tracer wire at the end of the project with county staff present. Refer to county standard details for tracer wire information.

d) Individual water services shall have tracer wire installed from the main to the meter box.

e) In addition to the tracing wire, electronic marker balls shall be installed on the water main in accordance with Brunswick County Technical Specification TS 035.01: *Electronic Markers for Water and Sewer Pressure Mains.*

15.0 Separation of Water Mains and Sewer Mains

a) Horizontal and Vertical Separation

1) Minimum horizontal separation between water mains and sanitary sewer shall be ten (10) feet. The distance shall be measured edge of pipe to edge of pipe.

2) Should ten (10) foot separation not be feasible, then the water main may be located closer to the sewer main provided that:

   a) It is laid in a separate trench,

   b) It is laid in the same trench with the water main located at one side on a bench of undistributed earth,

   c) In either of the above cases, crown elevation of the sewer shall be at least eighteen (18) inches below invert elevation of the water line.

3) Sewers crossing water mains shall be laid to provide a minimum vertical separation of eighteen (18) inches between the invert of the water main and the crown elevation of the sewer main. The crossing shall be arranged perpendicularly so that the sewer main joints will be equidistant and at least ten (10) feet from the crossing in each direction.

4) If it is impossible to maintain the required horizontal and vertical separation as described above or anytime sewer must be laid above a water main then both the water main and sewer main must be constructed of pressure class 350 ductile iron pipe with watertight joints and pressure tested to (150) psi to assure water tightness before backfilling. At the discretion of Brunswick County a ferrous sleeve may be installed around existing water mains and force mains to meet this requirement provided DENR approval for the ferrous sleeve is first obtained by the Engineer.

5) Mechanical joints will be required for the transition in the sewer main at water main / sewer main crossings. Fernco couplings are not permitted to be used. Special structural support for the water and sewer mains may be required.

16.0 Hydrostatic Testing

a) Conduct hydrostatic testing in accordance with AWWA C600 (DIP) or AWWA C605 (PVC) as applicable. Conduct tests on each line or valved section of line. Water mains shall be tested to one-hundred and fifty (150) percent of the pipe working pressure, but in no case shall the hydrostatic test pressure be less than (150) psig for a minimum of two (2) hours and shall be witnessed and certified by county staff and / or the Engineer.

b) Slowly fill the main in order to expel air from the main through the air release valves, fire hydrants, blow offs, or other appurtenances. If permanent air release valves are not located at all high points, the contractor shall install corporation cocks at such points so that air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure supplied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged.

c) Hydrostatic pressure testing shall not be made until seven (7) days after installation of piping to be tested is backfilled, and a minimum forty-eight (48) hour notice to county staff is required.

d) Directionally drilled pipe may be pressure tested after any manufacturer's required pipe relaxation period, as applicable, in order to ascertain the successful completion of the directional drill. All directionally drilled piping shall be tested again with the system as a whole and witnessed by county staff and /or the Engineer.

e) A suitable test pump, furnished by the contractor, shall be connected to the line by means of a tap in the line, or other suitable methods, and the proper test pressure slowly applied to the line.

17.0 Water Main Flushing and Chlorination

a) Conduct disinfection in accordance with AWWA C651 and 15A NCAC 18C .1003 before placing a newly installed water main in service:

1) Upon completion of construction thoroughly flush the water main to remove all sediment, stone, and other foreign matter.

2) Hydrostatically pressures test the water main per Section (16) of this specification.

3) The water main shall be disinfected by the addition and thorough dispersion of a chlorine solution in concentrations sufficient to produce a chlorine residual of at least fifty (50) milligrams per liter (or ppm) in the water throughout the water main system.

4) All installed valves or other appurtenances shall be operated several times while line is filled with chlorinating agent to ensure proper filling of the entire system.

5) The chlorine solution shall remain in contact with the interior surfaces of the piping system for a minimum period of twenty-four (24) hours.

6) At end of retention period flush the system with potable water. At least (10) ppm of chlorine shall remain in the water at the extreme end of the system.

7) If the initial disinfection procedure fails to produce satisfactory laboratory results the system must be disinfected again as needed by the contractor until satisfactory results are obtained.

8) Originals of the laboratory test results shall be provided to county staff.

b) Acceptance:

1) Provide separate samples for each sample location free of coliform bacteria:

a) Contractor shall submit water samples to an approved laboratory for testing.

b) Contact County Engineering or Public Utilities for assistance and verification of sampling – a minimum forty-eight (48) hour notice is required.

c) The sample results shall include the free chlorine residual at the time the samples were collected.

d) All sample locations are to be given an identifying label.

e) The certified laboratory results shall indicate the absence of coliform bacteria in the water samples.

2) At a minimum, sample locations shall be as required by NCDENR and the following:

a) The tie-in location of new and existing water lines.

b) The end of all dead end lines.

c) At intervals of no more than (1,200) feet for all new lines longer than (1,200) feet in length.

c) Disposal of Chlorinated Water

1) The contractor is cautioned that the spent chlorine solution must be disposed of in such a way as not to be detrimental to animal, plant, or fish life.

18.0 Operation of Brunswick County Water System Valves and Fire Hydrants

a) No county valves or hydrants shall be operated by the contractor without prior approval of county staff.

b) All hydrant and blow-off operations shall be done in a manner so that private property is not impacted and there shall be no flooding of streets, driveways, or roadways or any other traffic problems created.

c) The contractor shall contact county staff prior to performing system flushing or blow-off operations with a minimum forty-eight (48) hour notice.