5.1 WATER DISTRIBUTION SYSTEM

5.1.01 General

A. This section provides specifications for the materials and products which must be used to construct public water facilities in Goochland County, Virginia.

B. Reference Specifications are referred to by abbreviation as follows:

1. American National Standards Institute ---------- ANSI
2. American Railway Engineering Association --------- AREA
3. American Society for Testing and Materials --------- ASTM
4. American Water Works Association ---------- AWWA

5.1.02 Underground Pipe

A. Ductile Iron Pipe

1. Ductile iron pipe shall meet the requirements of AWWA C151 and AWWA C150. Minimum thickness shall be Class 52 with a working pressure of 350 psi. Rubber-gasket joints shall meet the requirements of AWWA C111. Pipe shall have a single cement-mortar lining and a bituminous seal coat conforming to the requirement of AWWA C104.

2. A minimum of 5% of the pipe furnished for a project shall be gauged for roundness full length and so marked.

3. Pressure class of pipe shall be increased if the specific installation warrants it.

B. Ductile Iron Restrained Joint Pipe

1. Ductile iron restrained joint pipe shall meet the requirements of AWWA C151 and AWWA C150. Minimum thickness shall be Class 52 with a working pressure of 350 psi. Rubber-gasket joints shall meet the requirements of AWWA C111. Pipe shall have a single cement-mortar lining and a bituminous seal coat conforming to the requirement of AWWA C104. Restrained push-on joints shall utilize a gripper ring, field weldments, or approved equal and shall be designed for a working pressure of 350 psi for sizes 4” through 24”.

2. A minimum of 5% of the pipe furnished for a project shall be gauged for roundness full length and so marked.

3. Pressure class of pipe shall be increased if the specific installation warrants it.

C. PVC Pipe

1. PVC pipe shall meet requirements of AWWA C900 (DR-14, CL. 305) for sizes up to 8 inches in diameter. Joints shall be in accordance with manufacturer's instructions and ASTM D2564, D2464, D2467, D319, and F477. Cell classification shall be 12454-B.

2. Where working pressures over 150 psi are anticipated, ductile iron pipe shall be used.

D. High Density Polyethylene (HDPE) Pipe

1. 3-Inches and Smaller Pipe: Pipe shall be manufactured from a PE 4710 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material shall meet the specifications of ASTM D3350 with a cell classification of 445574C/E and shall be formulated with carbon black and/or ultraviolet stabilizer. Pipe shall have a manufacturing standard of ASTM D2737 (copper tubing size), ASTM D2239 (iron pipe size, controlled inside diameter) and ASTM D 3035 (iron pipe size, controlled outside diameter). Pipe shall have a maximum dimension ratio of DR-9 and a minimum pressure class PC 250 psi. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All pipes shall be suitable for use as pressure conduits, and per AWWA C901, have nominal burst values of three times the Working Pressure Rating (WPR) of the pipe. Pipe shall also have the following agency listing of NSF 14.

2. 4-Inches and Larger Pipe: Pipe shall be manufactured from a PE 4710 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material will meet the specifications of ASTM D3350 with a cell classification of 445574C/E and is formulated with carbon black and/or ultraviolet stabilizer. Pipe shall have a manufacturing standard of ASTM F714. Pipe O.D. size shall be ductile iron pipe size (DIPS). Pipe shall have a maximum dimension ratio of DR-9 and a minimum pressure class PC 250 psi. Pipe larger than 24" nominal diameter shall have the lowest DR, and the highest PR, available for the size of pipe being used. The pipe shall contain no

recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All pipes shall be suitable for use as pressure conduits per AWWA C906 and listed as NSF 61. Pipe shall have a nominal burst value of three and one-half times the Working Pressure Rating (WPR) of the pipe.

3. HDPE pipe shall be continuously marked by the manufacturer with permanent printing indicating the following:

   a. "NSF-PW"

   b. Nominal size (inches)

   c. Dimension ratio (DR)

   d. Pressure rating (psi)

   e. Material classification (PE 4710)

   f. Plant, extruder, and operator codes

   g. Resin supplier code

   h. Date produced

4. HDPE pipe used for water shall be black in color with permanent blue stripes extruded into the pipe along its entire length or shall be solid blue.

E. Copper Tubing – 2" and Smaller

1. Underground services shall be seamless, annealed copper tubing Type K, in conformance with ASTM B88. Fittings shall be brass with compression joints suitable for direct burial.

2. Above ground, copper tubing shall be seamless hard copper tubing Type L, in conformance with ASTM B88. Fittings shall be brass or wrought copper. Joints shall be threaded or soldered.

3. Solder shall be 95-5 lead free solder meeting the requirements of NSF 61.

5.1.03 Underground Fittings

A. Ductile Iron Fittings

1. Fittings for PVC pipe and DI pipe shall be ductile iron. Ductile iron fittings shall be in accordance with AWWA C110 or AWWA C153. Pressure ratings shall be a minimum of 350 psi. All fittings shall have a single cement mortar lining on the interior and a bituminous seal coating on the exterior. Fittings shall have mechanical joints conforming to the requirements of AWWA C111. Bolts for mechanical joint fittings shall be high strength, corrosion resistant low alloy steel with hexagon nuts having a minimum yield point of 45,000 psi in accordance with AWWA C111. Mechanical joint bolts shall be torqued with a torque wrench as per manufacturer's recommendations.

B. Polyethylene Pipe Fittings

1. Fittings for polyethylene pipe shall be manufactured specifically for the intended use and be approved by the piping manufacturer to be compatible with their product. All fittings shall have a working pressure rating equal to or greater than the pipe and shall meet all requirements of NSF 61.

2. Butt Fusion Fittings: Butt fusion fittings shall be PE4710 HDPE, Cell Classification of 445574C/E as determined by ASTM D3350 and approved for AWWA use. Butt fusion fittings shall have a manufacturing standard of ASTM D3261. Molded & fabricated fittings shall have a pressure rating equal to the pipe unless otherwise specified in the plans. Fabricated fittings are to be manufactured using Data Loggers. Temperature, fusion pressure, and a graphic representation of the fusion cycle shall be part of the quality control records. All fittings shall be suitable for use as pressure conduits, and per AWWA C901 and C906, shall have a nominal burst value of three and one-half times the Working Pressure Rating (WPR).

3. Electro-fusion Fittings: Electro-fusion fittings shall be PE4710 HDPE, Cell Classification of 445574C/E as determined by ASTM D3350. Electro-fusion fittings shall have a manufacturing standard of ASTM F1055. Fittings shall have a pressure rating equal to the pipe. All electro-fusion fittings shall be suitable for use as pressure conduits, and per AWWA C901 and C906, have nominal burst values of three and one-half times the Working Pressure Rating (WPR).

4. Flanged and Mechanical Joint Adapters: Flanged and mechanical joint adapters shall be PE 4710 HDPE, Cell Classification of 445574C/E as determined by ASTM D3350. Flanged and

mechanical joint adapters shall have a manufacturing standard of ASTM D3261.

C. Thrust Restraint

1. The Contractor shall install concrete thrust blocks at all tie-in points and as indicated on the approved plans or as directed by the Inspector based upon field conditions. Thrust blocks shall be sized as indicated on the applicable Standard Detail for thrust blocking. Concrete shall have 3,000 psi strength at 28 days and shall meet the requirements of ASTM C94.

2. All pipe fittings, plugs, caps, tees, and bends on underground ductile iron or PVC piping shall be restrained utilizing approved wedge-action retainer glands. Glands shall be manufactured of ductile iron conforming to ASTM A 536-80. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI/AWWA A21.11 and C153/A21.53. Twist-off nuts shall be used to insure proper actuating of the restraining devices. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2.

3. Ductile iron bell and spigot pipe joints shall be restrained on both sides of valves and fittings for the length specified on applicable Standard Detail or as indicated the drawings, whichever is greater. Approved push-on restraining gaskets or harness type restraints shall be used. Gaskets shall be manufactured by the pipe manufacturer to be compatible with their pipe.

4. PVC pipe bell and spigot pipe joints shall be restrained on both sides of valves and fittings for the length specified on applicable Standard Detail or as indicated the drawings, whichever is greater. Harness type restraining devices shall be used on PVC bell and spigot pipe joints.

5.1.04 Above Ground or Exposed Piping

A. Ductile Iron Pipe

1. Ductile iron pipe installed above ground, inside buildings, or in underground vaults shall be flanged ductile iron pipe class 53 in accordance with ANSI A21.15 (AWWA C115). Unless indicated otherwise on the drawings, pipe shall have Class 125 flanged joints utilizing factory installed screwed flanges meeting the

requirements of ANSI B 16.1. No Uniflange-type flanges are permitted. Outside coating shall be red primer. Gaskets for flanged pipe shall be 1/8-inch thick full face red rubber. All steel flanges mating to flat face flanges shall have the raised face machined off. Pipe shall have a single cement mortar lining with asphaltic seal coat meeting the requirements for AWWA C104.

B. Ductile Iron Fittings

1. Fittings for above-ground ductile iron pipe shall be flanged ductile iron in accordance with AWWA C110/ANSI A21.10. Fittings shall have a minimum working pressure rating of 250 psi. Unless indicated otherwise on the drawings, fittings shall have Class 125 flanged joints meeting the requirements of ANSI B 16.1. Outside coating shall be red primer. Gaskets for flanged fittings shall be 1/8-inch thick full face red rubber. Fittings shall have a single cement-mortar lining and a bituminous seal coat conforming to the requirement of AWWA C104.

C. Flange Adaptors: Flange adaptors shall only be used for final connections to equipment or to allow for disassembly of pipe for equipment maintenance in approved locations. Flange adaptors are not to be used to make up for misaligned pipe. Uniflanges are not permitted.

5.1.05 Pipe Insulation and Heat Tracing

A. Pipe Insulation

1. Glass Fiber: meeting ASTM C 547, Type I; rigid molded, noncombustible.

a. 'K' ('ksi') Value: 0.23 at 75 degrees F Mean Temperature.

b. Maximum Service Temperature:
0 degrees F to 850 degrees F.

2. Vapor Retarder Jacket: Kraft paper reinforced with glass fiber yarn and bonded to aluminum foil, secure with self-sealing longitudinal laps and butt strips or AP Jacket with outward clinch expanding staples coated with vapor barrier mastic as needed.

3. Field Applied Jackets

a. Field applied jackets shall be aluminum 0.016 inch (0.406 mm) thick sheet, smooth finish, with longitudinal slip joints

and 2 inch (50 mm) laps, die shaped fitting covers with factory applied moisture barrier.

b. Sheet metal screws shall be aluminum or stainless steel.

c. Jackets shall be secured with 0.020 by 3/4-inch type 304 stainless steel expansion bands.

4. Insulation Covers

a. Aluminum covers shall be constructed of smooth finish aluminum sheet conforming to ASTM B209, alloy 5005, temper H16, with integral vapor barrier. Covers shall be 0.016 inch thick.

B. Heat Tracing

1. All pipes, valves, equipment, and appurtenances shall be provided with heat tracing where shown; where not shown, heat tracing shall be provided in all cases where such items could be subject to freezing.

2. Heat tracing shall consist of spiral wrapping with electrical heating cables as specified by the manufacturer, and subsequent installation of insulation.

3. Heating cables shall be controlled from thermostats installed in representative locations and shall be accessible for adjustment.

4. Heat tracing systems shall be installed complete, including heating elements, power connections, end seals, and controlling thermostats in accordance with the manufacturer's printed installation instructions.

5. Materials

a. Heating Cable: The electrical heat tracing system shall consist of a flat, flexible, low heat density, electrical heating strip of parallel construction, consisting of a continuous inner core of conductive material between two parallel copper bus strips. The electrical insulation of the heater strip shall be polyester and rated for 140 degrees F temperature, and its width shall be a minimum of ½ inch. It shall be suitable for operation on 120 volts.

b. Thermostats: A thermostat with a range of 40 degrees to 120 degrees F shall be provided for each heated pipe. It shall be

double-pole, single-throw and mounted in a weatherproof NEMA 4X enclosure.

c. The capillary bulb shall be mounted on the pipe under the insulation. Heating strips for pipes over 2 inches in size shall be rated at 8 watts per foot. For pipes 2 inches and smaller heating strips shall be rated at 4 watts per foot.

d. All heat tracing circuits shall be provided with indicating lights at the beginning and end of all heat tracing runs for a visual indication that the heat tracing is on for the complete run.

5.1.06 Temporary Above Ground Pipe and Fittings

A. Temporary above ground piping used for bypass piping, hydrant jumping or other temporary services shall be manufactured from high tensile strength, abrasion-resistant steel that is hot-dipped galvanized. Pipe and fittings shall be joined with quick connections with degree of articulation on coupling joints as indicated in the table below. Working pressure shall be as indicated in the following table.

Pipe diameter (inches)	Working pressure (psi)	Deflection (degrees)
2	290	30
3	290	30
4	175	30
6.25	175	20
7.625	175	20
10	99	10

5.1.07 Gate Valves

A. Gate valves 3 through 12 inches shall open counterclockwise, have a resilient seat and meet the requirements of AWWA C509 or AWWA C515. Body shall be of ductile iron with a 250 psig maximum working pressure and hydrostatically tested to 500 psig. Wedge shall be constructed of cast iron or ductile iron, bonded in synthetic rubber in accordance with ASTM D2000. Valve shall be coated inside and out with a fusion epoxy coating of a nominal 10 mil thickness on all exposed iron surfaces in compliance with AWWA C550 and be NSF 61 certified. Valves shall be bi-directional flow and have a ten-year limited warranty.

1. Except as specifically approved otherwise, above ground valves or exposed valves in vaults shall utilize outside screw and yoke (OS&Y) with rising stems and have flanged ends meeting the requirements of ANSI B 16.1, Class 125.

2. Underground valves shall utilize non rising stems, mechanical joint ends with a 2-inch operating nut in accordance with AWWA C111.

3. Gate valves 3 inches and larger when located 6 feet or more above the finish floor or operating platform shall have chain operators.

B. Gate valves 14 through 24 inches shall open counterclockwise, have a resilient seat and meet the requirements of AWWA C515. Body shall be of ductile iron. These valves shall have a 250-psi working pressure and be hydrostatically tested to 500 psig. Wedge shall be constructed of ductile iron and bonded in synthetic rubber in accordance with ASTM D2000. Valves shall be coated inside and out with a fusion epoxy coating of a nominal 10 mil thickness on all exposed iron surfaces in compliance with AWWA C550 and be NSF 61 certified. Valves shall be bi-directional flow and have a ten-year limited warranty.

1. Underground valves shall have mechanical joint ends, shall open counter-clockwise, and shall utilize non rising stems with a 2-inch operating nut in accordance with AWWA C111.

C. Buried gate valves 2 inches in size shall utilize a non-rising stem, a resilient seat, shall open counterclockwise, and must meet the requirements of AWWA C509. Valve shall be equipped with a 2-inch square AWWA operating unit. Valve ends shall be NPT connections.

D. Above ground gate valves 2 inches and smaller shall be 150-pound bronze body union bonnet, rising stem gate valves with threaded connections and which open counter-clockwise. Valves shall be Crane Figure 431UB or approved equal.

5.1.08 Butterfly Valves

A. Butterfly valves shall have a ductile iron body, seat in body design, ductile iron disk with a 316 stainless steel disc edge (3- and 4-inch valves to have 316 disk), symmetrical disc, nonmetallic bearings, chevron self-adjusting "V" type packing and have a 250 psi working pressure. Valves shall meet or exceed all the requirements of AWWA C504 standard class 250B and be NSF 61 certified. Exposed piping shall have flange ends Class 125 and underground valves shall have mechanical joint ends. Valves 4 inches and larger shall have gear operators. All exposed valves with gear operators shall have a position indicator.

5.1.09 Ball Valves - Above Ground

A. Ball valves 2 inches and smaller shall be 150 pounds rated, threaded ends, bronze or stainless steel body (stainless steel valves shall be used on stainless steel pipe), full port, lever operated, ball valves, with stainless steel ball and stem, and Teflon seats.

5.1.10 Check Valves

A. Swing check valves

1. 3 inch and larger

a. Check valves 3 inches and larger shall be Class 125 flanged ends, ductile iron body, bronze mounted, bronze disc facing, swing type lever and weight check valves in accordance with AWWA C508. Flanged end dimension and drilling shall comply with ANSI B 16.1, Class 125. Check valves 3 through 24 inches shall have a 250 psig maximum working pressure.

b. Check valves shall have an adjustable air decelerator (air cushion) installed on the outside of the valve to control valve closing.

c. All check valves shall have a factory installed limit switch to indicate close position for flow confirmation.

2. Check valves 2 inches and smaller shall be class 150 bronze or stainless-steel y-pattern swing check valves with threaded ends.

B. Silent check valves

1. Silent check valves shall be the globe type with a spring-loaded disk. Valve shall have a ductile iron body, bronze plug, 316 stainless steel spring and a working pressure rating of 250 psig. Valves shall be flanged in accordance with ANSI B 16.1 class 125.

2. Wafer type check valves shall not be permitted.

5.1.11 Corporation Stops and Tapping Saddles for Underground Service

A. Corporation stops shall have either compression end for 1-inch copper tubing. All corporation stops shall be installed with a tapping saddle. Saddles shall be double strap epoxy coated ductile iron with stainless steel straps, bolts and nuts.

5.1.12 Above Ground or Exposed Taps

A. All taps on exposed pipe, flanged pipe or above ground pipe shall be made on fitting bosses. No tapping saddles or tapping of pipe will be allowed. All taps shall have a shutoff valve at the tap.

5.1.13 Valve Boxes

A. Valve boxes for buried valves shall be cast iron, screw adjustable shaft boxes, with a minimum shaft diameter of 5-1/4 inches, unless otherwise specified on the Drawings.

B. Valve box covers shall be marked with the word “WATER”.

C. Valves with valve boxes shall have an extended shaft pinned to the 2-inch operating nut. The extension shall terminate 12 inches below finish grade.

D. Valve boxes outside pavement shall have a 24-inch by 24-inch by 4-inch concrete collar around top of the valve box as per Standard Details.

E. A Valve Box Adaptor shall be installed between the valve and the valve box.

5.1.14 Combination Air Valves

A. Combination air valves shall have a minimum of a 1-inch N.P.T. inlet for pipe sizes 16 inches and smaller. For pipes 18” and larger, a 2-inch N.P.T. inlet shall be used. Valves shall be single body, double orifice.

B. Combination air valves shall be of the combination type to relieve large volumes of air as the lines are filled or emptied and also release small quantities of entrained air under pressure.

C. Valves shall be installed with a full-size gooseneck on the outlet.

D. Valves shall have a cast iron body and cover, stainless steel float, Buna-N seat, Delrin lever frame and all other internal part shall be stainless steel or bronze.

E. Air release valves shall be suitable for 150 psi working pressure at a minimum.

F. All air release valve installations shall contain an isolation valve to allow removal of the air release valve for maintenance or replacement while the line is under pressure.

G. Air release valve shall have a manual valve on the body to allow manual venting of the pipeline without removal of the air release valve.

5.1.15 Reduced Pressure Zone (RPZ) Backflow Preventer

A. RPZ backflow preventer assembly shall consist of an internal pressure differential relief valve located in a zone between two positive seating check modules with captured springs and silicone seat discs. Service of all internal components shall be through a single access cover secured with stainless steel bolts. The assembly shall also include two resilient seated isolation valves, four resilient seated test cocks, a protective bronze wye strainer with a 20-mesh screen and an air gap drain fitting.

B. The assembly shall meet the requirements of the latest available American Water works Association (AWWA) standards including Std. C511; hold current University of Southern California Foundation for Cross Connection Control and Hydraulic Research (USC) approval, and hold the American Society of Sanitary Engineers (ASSE) listing.

C. All RPZ backflow preventers shall be installed in strict accordance with the manufacturer's instructions.

5.1.16 Reduced Pressure Detector Assembly (RPDA) Backflow Preventer

A. RPZ backflow preventer assembly shall consist of an internal pressure differential relief valve located in a zone between two positive seating check modules with captured springs and silicone seat discs. Service of all internal components shall be through a single access cover secured with stainless steel bolts. The assembly shall also include two resilient seated isolation valves, four resilient seated test cocks, a protective bronze wye strainer with a 20-mesh screen and an air gap drain fitting.

B. The bypass line shall include a meter, small diameter reduced pressure zone assembly and isolation valves. The bypass reduced pressure assembly shall have a single bolted on cover and top mounted test cocks.

C. The assembly shall meet the requirements of the latest available American Water works Association (AWWA) standards including Std. C511; hold current University of Southern California Foundation for Cross Connection Control and Hydraulic Research (USC) approval, and hold the American Society of Sanitary Engineers (ASSE) listing.

D. All RPZ backflow preventers shall be installed in strict accordance with the manufacturer's instructions.

5.1.17 Double Check Detector Assembly (DCDA) Backflow Preventer

A. DCDA backflow preventer assembly shall consist of a main line valve body composed of two (2) independently acting approved poppet-type check modules with replaceable seats and disc rubbers. Servicing of both check modules do not require any special tools and are accessed via a single top entry cover. The device shall be fitted with approved UL Listed OS&Y Gates Valve Assemblies and contain properly located resilient seated test cocks along the main valve body.

B. The auxiliary bypass line shall contain a water meter that complies with ANSI/AWWA Standard C700 coupled with an approved double check assembly (DC).

C. The assembly shall meet the requirements of the latest available American Water works Association (AWWA) standards including Std. C510; hold current University of Southern California Foundation for Cross Connection Control and Hydraulic Research (USC) approval, and hold the American Society of Sanitary Engineers (ASSE) listing.

D. All DCDA backflow preventers shall be installed in strict accordance with the manufacturer's instructions.

5.1.18 Sample Taps

A. All sample taps shall be threadless and lead-free.

5.1.19 Sampling Stations

A. Sampling Station shall have a 3/4" FIP inlet, and 3/8" unthreaded blow off and sampling bibb. Station shall be enclosed in a lockable, aluminum box with hinged openings. When open, the station shall require no key for operation, and all water flow shall pass through an all stainless steel waterway. Seat rubber and all operational components shall be serviceable and replaceable from above ground with no digging or excavation needed. A secondary valve (stainless steel petcock) shall be located on the evacuation line, independent of the sampling bibb and when open shall allow for evacuation of any water remaining inside the station, via pump or compressed air blow off, to prevent freezing.

5.1.19 Wall Sleeves

A. Pipes through concrete walls and slabs shall be provided with wall sleeves or penetration seals.

B. Sleeves shall be sized to contain the outside diameter of the penetrating pipe and the link seal.

C. Sleeves shall be of adequate thickness to maintain their shape and shall be manufactured by the seal manufacturer.

D. All sleeves shall have waterstops and be PVC, or steel which is hot dipped galvanized after fabrication.

E. Where pipe penetrations are added to existing concrete structures, core drilling shall be used. The hole size shall be coordinated with the seal manufacturer.

F. Core drilling shall be coordinated with structural drawings, ground penetrating radar, or other methods to determine the location of steel reinforcement bars or post tensioning cables within the concrete walls or slabs. Coring shall be located so as to avoid any damage to the structural integrity of the concrete walls or slabs.

5.1.20 Flushing Hydrants

A. Flushing hydrants shall comply with AWWA C502 standards for "dry barrel" compression type hydrants that open against pressure.

B. Hydrants shall have a working pressure rating of 150 psi and a test pressure of 300 psi. They shall meet all the requirements of fire hydrants regarding operating nuts, stems, working parts, stem design, full 360 rotation, body castings, and repairs without dismantling.

C. Flushing hydrants shall be equipped with a threaded or mechanical joint inlet of the size as indicated on the plans, and shall have one 2-½-inch outlet with cap and chain.

5.1.21 Water Service Accessories

A. Meter coppersetters shall be provided for all 5/8- inch and 1-inch meters. Each shall have removable pack joints suitable for copper tubing. All coppersetters shall have saddle nuts, padlock wings, and two valves. Copper setters shall be installed in accordance with the applicable Standard Detail(s).

B. Meter coppersetters shall be provided for all 1-½- thru 2 inch- meters. Each shall have removable NPT connections for hard copper tubing adaptors. All coppersetters shall have saddle nuts, padlock wings, and two valves. Meter setters for 1.50-inch and 2-inch meters shall have a lockable bypass. Meters and copper setters shall be installed in accordance with the Standard Drawings.

C. The meter box shall be in accordance with Standard Drawings.

5.1.22 Hydraulic Operated Control Valves

A. Hydraulic operated control valves include pressure reducing valves, pressure sustaining valves, altitude valves, pump control valves, surge relief valves, surge anticipator valves, flow control valves, or other similar type hydraulically controlled valves.

B. The main valve shall be pilot-controlled, hydraulically operated, differential piston actuated and full ported.

C. The control valve shall be "self-contained" and incorporate a system of pilot controls, factory assembled to and tested with the main valve. The valve shall be operated by line pressure and utilize the pilot system to open, close or throttle the differential piston main valve to perform the specified function(s).

D. The main valve body shall be globe style, constructed of high-strength cast iron conforming to ASTM A126 Class B with integral flanges, faced and drilled per ANSI B16.1 Class 125.

E. The valve shall be "full-ported" so that when fully open the flow area through the valve is no less than the area of its nominal pipe size. Globe body valves shall have an integral bottom pad or feet to permit support directly beneath the body.

F. The main valve shall operate on the differential piston principle such that the area on the underside of the piston is no less than the pipe area and the area on the upper surface is greater than that of the underside. There shall be no diaphragms or springs in the main valve.

G. The valve piston shall be fully guided on its outside diameter and all guiding and sealing surfaces shall be bronze. To minimize the consequences of throttling, throttling shall be by long, stationary vee-ports located downstream of the seat and not by the seat itself. Sawtooth attachments or other add-on devices are not permitted.

H. Valves shall be provided with an anti-cavitation ring or similar device to prevent cavitation in the valve if required by the operating conditions.

I. The valve shall be fully capable of operating in any position without the need of springs and shall not incorporate stems, stem guides or spokes in the waterway. A visual position indicator shall be provided.

J. The main valve shall be serviceable in the line through a single flanged top cover that provides easy access to all internal components.

K. The valve shall be shop coated with NSF-61 certified epoxy on internal surfaces in accordance with American Water Works Association Standard C550 (latest revision).

L. The valve shall be operated by a system of pilot controls necessary to perform the specified function(s).

M. The pilot system shall be factory pre-piped, installed on the main valve and tested as an assembly.

N. In addition to the necessary pressure regulating and/or electrically operated pilots, the system shall incorporate a wye-strainer and opening and/or closing speed control valves.

O. Sufficient isolating valves and pipe unions shall be provided to facilitate removal and maintenance of the pilot system without disturbing the main valve.

P. Pilots, controls, piping and fittings shall be corrosion resistant copper, bronze or brass.

5.1.23 Tapping Sleeves

A. Tapping sleeves shall meet requirements of AWWA C110 for pressure ratings shown on the drawings. Sleeves shall be two-part stainless steel with stainless steel bolts and nuts, flanged outlet, and a full circumferential gasket. Tapping sleeves shall be for the size and type of pipe specified on the approved plans.

5.1.24 Couplings

A. Bolted, sleeve-type couplings, reducing or transition couplings, and flanged coupling adapters for above ground or exposed service used to join plain-end pipe shall meet the requirements of AWWA C219. Each coupling shall have similar components: a center sleeve (sometimes called a “middle ring”), end rings (sometimes called “followers”), and threaded fasteners (bolts and nuts), that, when tightened, pull the end rings together. These components compress elastomeric gaskets in the space formed between the end rings, center sleeve, and pipes being joined, thereby sealing the coupling/pipe combination. They shall be manufactured from ductile iron and intended for use in systems conveying water. All couplings shall be rodded.

5.1.25 Fire Hydrants

A. Fire hydrants shall be of the safety, flange, breakaway top type, meeting requirements of AWWA C502. Hydrants shall have a barrel diameter no smaller than 6 inches. The hydrant valve diameter shall be 4-½ inches and shall be equipped with two 2-½-inch hose nozzles and one 4-½-inch pumper connection. Hose and pumper outlet threads shall be National Standard. The fire hydrant base shall be coated with fusion bonded epoxy and all hardware below grade shall be ASTM F593/F594 rated stainless steel. Fire hydrant tees shall be used.

B. Fire hydrant color shall be as required by the Goochland County Code.

5.1.26 Tracer Wire

A. Tracer wire for open cut pipe installations shall be High Strength, High Flexibility 12 AWG Copper Clad Steel (CCS) wire with minimum 0.030" thickness blue-colored insulation of High Molecular Weight Polyethylene (HMW-PE) and shall be specifically manufactured for use as tracer wire.

B. Tracer wire for HDD pipe installations shall be Extra High Strength 10AWG Copper Clad Steel (CSS) polyethylene insulated with 0.045" thickness blue-colored insulation of High Molecular Weight Polyethylene (HMW-PE) and shall be specifically manufactured for use as tracer wire.

5.1.27 Connectors for Tracer Wire

A. Wire connectors for tracer wire on open cut pipe installations shall be Set Screw Pressure type for use with 12AWG wire.

B. Wire connectors for splicing tracer wire on HDD pipe installations shall be In-line splice type with set screws, a solid brass lug, and a heat-shrink cover, for use on 10AWG wire.

C. Wire nuts shall not be used on tracer wire.

5.1.28 Tracer Wire Access Boxes

A. Tracer wire access boxes shall be made of cast iron with a permanently attached 3-inch by 12-inch ABS tube with a flared end to secure it in the ground.

B. Tracer wire access boxes shall have tamper-resistant cast iron locking lids with stainless steel terminal connectors on the bottom side to which tracer wires are attached.

C. Tracer wire access box lids shall utilize an AWWA pentagon key for opening.

D. Sufficient slack shall be coiled inside boxes to allow the removal of the lid and full access to the interior of the box without disconnecting wires.

E. Lids shall be marked “WATER”.

5.1.29 Marking Tape

A. Tape shall be 3.5 mil polyethylene tape, 3 inches in width, with a 14-gage metallic core, and continuous printed message “Caution – Waterline Buried Below”. Tape shall be primarily blue in color.

5.1.30 Steel Casing Pipe

A. Steel casing pipe shall be welded or seamless or smooth wall, consisting of Grade “B” steel as specified in ASTM A-139. Minimum yield strength shall be 35,000 psi, and pipe thickness shall be as specified on the construction plans. All pipe shall be furnished with beveled ends prepared for field welding of circumferential joints. Welds shall be a full penetration welds subject to visual inspection. All burrs at pipe ends shall be removed. Encasement pipe must be approved by the appropriate controlling agency (VDOT, railroad, etc.) and the Engineer prior to ordering. Spiral weld casing pipe will not be allowed.

5.1.31 Pressure Gages

A. Pressure gauges shall be liquid-filled, of all stainless-steel construction, 3.5- to 4-inch case size, accuracy of 1% over the entire dial arch and a ¼-inch NPT bottom connection, Pressure range shall be as indicated on the drawings.

B. All pressure gages shall be installed with a ¼-inch stainless steel ball valve and stainless-steel nipples.

C. Gages shall be graduated so the median system operating pressures are in the middle third of the scale.

D. All pressure gages shall be mounted with fittings, fitting bosses, or isolation rings. NO TAPPING OF PIPE OR SADDLES WILL BE ALLOWED.

5.1.32 Pipe Supports

A. Pipes shall be supported by steel pipe hangers, clamps, brackets, rods and inserts as required to support the imposed pipe loads. Hangers in general shall be new, manufactured of carbon steel and hot dipped galvanized after fabrication or 304 stainless steel. In corrosive environments, 316 stainless steel pipe hangers may be required at the discretion of the Director.

B. Pipes 2-½ inches and larger shall be supported with adjustable floor stand type pipe supports as detailed on the drawings.

C. Pipes 2 inches and smaller shall be supported from the floor, walls, or ceiling depending on the type of building construction. Pipe supports for these size pipes shall consist of floor stands, wall brackets, or clevis type hangers. Strut and appurtenances shall be stainless steel. Clips for copper tubing shall be copper coated. Minimum threaded rod size shall be 3/8 inch.

D. Ductile Iron and steel pipe supports shall be spaced in accordance with the following schedule:

Pipe sizes (inches)	½ - 3/4	1- 1 1/4	1 ½ - 2	3 – 4
Max spacing (feet)	4	6	8	10

E. Copper tubing pipe supports shall be spaced in accordance with the following schedule:

Nominal tubing size (inches)	1/2 - 3/4	1- 1 1/4	1 1/2 - 2
Max spacing (feet)	4	5	6

F. PVC pipe supports shall be spaced in accordance with the following schedule:

Nominal pipe size (inches)	1/2 - 3/4	1- 1 1/4	1 1/2 - 2	3-4
Max spacing (feet)	2.5	3	4	6

G. Maximum spacing between pipe supports shall be 10 feet for all pipes, 6 inches and larger.

H. Additional supports shall be placed at the locations of valves, fittings, flow meters, risers, drops and other devices.

I. In addition to the above, pipe supports shall be located as per the following:

1. Maximum of 12 inches from all horizontal and vertical changes in direction.

2. On the suction and discharge of pump piping to eliminate pipe stresses on the pump flanges.

3. On the connections to all equipment to eliminate pipe stresses on the equipment connections and allow equipment removal.

4. On the inlet and outlet piping to the water meter to allow the removal of the water meter.

5. At the location of valves, fittings or other devices that add additional weight to the piping.

6. Additional pipe supports as indicated on the drawings.

5.1.33 Service Saddles

A. Service saddles shall be stainless steel, with stainless steel double straps and bolts, and tapped for AWWA threads.

END OF SECTION 5.1