

EDGECOMBE COUNTY

WATER DISTRIBUTION SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Work under this section includes, but is not limited to, piping, valves, fire hydrants, water service line, and appurtenances for a complete potable water distribution system.

1.02 RELATED SECTIONS

- B. The following Sections have work that is directly related to this Section. This does not relieve the Contractor of his responsibility of proper coordination of all the work:
1. Section 02315 Trenching for Utilities
 2. Section 02445 Bore and Jack of Conduits

1.03 REFERENCES

- A. Publications are referred to in the text by basic designation only.
1. American Society of Sanitary Engineering (ASSE) Standards
 - a. 1013 Reduced Pressure Principle Backflow Preventers
 - b. 1015 Double Check Backflow Prevention Assembly
 - c. 1069 Outdoor Enclosures for Backflow Prevention Assemblies
 2. American Society for Testing and Materials (ASTM)
 - a. C443 Flexible Watertight Joints for Precast Manhole Sections
 - b. C478 Precast Reinforced Concrete Manhole Sections 88a
 - c. C828 Low-Pressure Air Test of Vitrified Clay Pipe Lines (4 to 12 inch)
 - d. C890 Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
 - e. C923 Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
 - f. D1784 Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
 - g. D1785 Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
 - h. D2241 Poly(Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series)
 - i. D2466 Socket-Type Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
 - j. D2467 Socket-Type Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule

- k. D3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
 - l. D3350 Polyethylene Plastics Pipe and Fittings Materials.
 - m. F477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe
 - n. F1483 Specification for Oriented Poly(Vinyl Chloride) PVCO, Pressure Pipe
3. American Water Works Association (AWWA)
- a. B300 Hypochlorites
 - b. B301 Liquid Chlorine
 - c. C104 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
 - d. C105 Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids
 - e. C110 Ductile-Iron and Gray-Iron Fittings, 3 inch through 48 inch, for Water and Other Liquids
 - f. C115 Flanged Ductile-Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges
 - g. C150 Thickness Design of Ductile Iron Pipe
 - h. C151 Ductile-Iron Pipe, Centrifugally Cast, for Water
 - i. C153 Ductile-Iron Compact Fittings, 3 inch through 24 inch and 54 inch through 64 inch, for Water Service
 - j. C502 Dry-Barrel Fire Hydrants
 - k. C504 Rubber-Seated Butterfly Valves
 - l. C508 Swing-Check Valves for Waterworks Service, 2 inch Through 24 inch NPS
 - m. C509 Resilient Seated Gate Valves for Water and Sewerage Systems.
 - n. C510 Double Check Valve Backflow-Prevention Assembly
 - o. C511 Reduced-Pressure Principle Backflow-Prevention Assembly
 - p. C512 Air-Release, Air / Vacuum, and Combination Air Valves for Waterworks Service
 - q. C550 Protective Epoxy Interior Coatings for Valves and Hydrants
 - r. C600 Standard for Installation of Ductile Iron Water Mains and Their Appurtenances
 - s. C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
 - t. C651 Disinfecting Water Mains
 - u. C700 Cold-Water Meters-Displacement Type, Bronze Main Case
 - v. C701 Cold-Water Meters-Turbine Type, for Customer Service
 - w. C702 Cold-Water Meters-Compound Type
 - x. C704 Cold-Water Meters-Propeller Type for Waterworks Applications
 - y. C800 Underground Service Line Valves and Fittings
 - z. C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch, for Water Distribution
 - aa. C901 Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inch through 3 inch for Water Service

- bb. C905 Polyvinyl Chloride (PVC) Water Transmission Pipe, 14 inch through 36 inch, for Water Distribution
- cc. C909
- dd. M23 PVC Pipe - Design Installation
- 4. National Sanitation Foundation (NSF) Standards
 - a. 14 Plastic Piping Components and Related Materials
 - b. 61 Drinking Water System Components - Health Effects

1.04 SUBMITTALS

- A. Submit the following in accordance with Section, Submittal Procedures:
 - 1. Affidavit of Compliance: Affidavit shall attest that supplied products conform to the referenced standard and this specification and that all tests set forth in each applicable referenced publication have been performed and that all test requirements have been met. Submit for each of the following materials:
 - a. Pipe
 - 1) Ductile iron
 - 2) Polyvinyl Chloride (PVC)
 - i) AWWA C900
 - ii) AWWA C909 Oriented PVC
 - iii) PVC
 - iv) Pressure rated
 - v) Schedule 40 & 80
 - 3) Polyethylene (PE) pressure pipe and tubing
 - b. Valves
 - 1) Gate
 - i) Resilient-Seated
 - ii) Tapping
 - 2) Check
 - 3) Pressure Reducing Valve
 - c. Fire hydrants
 - d. Service valves and fittings
 - 1) Corporation valves
 - 2) Meter valve and check valve
 - e. Backflow prevention assembly
 - f. Meters
 - 2. Catalog Data: Submit manufacturer's standard drawings or catalog cuts for the following. Clearly indicate equipment to be furnished for the Project including options to be provided.
 - a. Pipe
 - 1) Ductile iron
 - 2) Polyvinyl Chloride (PVC)
 - i) AWWA C900
 - ii) AWWA C909 Oriented PVC
 - iii) Pressure rated
 - iv) Schedule 40 & 80
 - 3) Polyethylene (PE) pressure pipe and tubing
 - b. Valves
 - 1) Gate
 - i) Resilient-Seated

- ii) Tapping
 - 2) Check
 - 3) Pressure Reducing Valve
 - c. Castings
 - d. Tapping sleeves
 - e. Valve boxes
 - f. Fire hydrants
 - g. Service valves and fittings
 - 1) Service saddles
 - 2) Corporation valves
 - 3) Meter valve and check valve
 - 4) Meter box
 - h. Backflow prevention assembly
 - i. Meters
 - j. Blowoff assembly
3. Reports:
- a. Field test report for each section of pipe for the following:
 - 1) Measured chlorine residual
 - 2) Bacteriological test
 - 3) Pressure test
 - b. Field test report for each backflow prevention device.
4. Operation and Maintenance Instructions: Submit complete operation and maintenance manual for the following:
- a. Valves
 - b. Fire hydrants
 - c. Meters
 - d. Backflow prevention assemblies.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Provide a suitable pipe hook or rope sling when handling the pipe with a crane. Lifting of the pipe shall be done in a vertical plane. Under no conditions shall the sling be allowed to pass through the pipe unless adequate measures are taken to prevent damage to both the tongue and groove ends.
- B. Deliver pipe in the field as near as practicable to the place where it is to be installed. Distribute pipe along the side of the trench opposite to the spoil bank. Where necessary to move the pipe longitudinally along the trench, it shall be done in such a manner as not to injure the pipe or coating.
- C. Shield PVC pipe and fittings stored on site from the sun's ultraviolet rays by suitable cover, or indoor storage.

PART 2 PRODUCTS

2.01 DUCTILE IRON PIPE

- A. Pipe and fittings 3-inch to 64-inch shall conform to AWWA C150 and C151 and the following requirements:
 - 1. Size shall be as indicated on the Drawings.

2. Suitable for a system working pressure of 60 psi at the depth indicated on the Drawings with a Type 2 laying condition.
 3. Interior lining to be used in a drinking water system shall be certified and listed in accordance with NSF 61.
 4. Interior shall be lined with cement-mortar with seal coat in accordance with AWWA C104.
- B. Ductile-iron pipe for below ground service shall have push-on or mechanical joints, unless noted otherwise on the Drawings, conforming to AWWA C150 and C151, and to the following requirements:
1. Provide mechanical joint fittings, unless noted otherwise on the Drawings.
 2. Encase pipe in polyethylene conforming to AWWA C105.
- C. Ductile-iron pipe for above ground service shall have flanged joints, unless noted otherwise on the Drawings, conforming to AWWA C115.
1. Pipes to be painted shall have only a shop primer on the outside by the manufacturer. Verify that proposed manufacturer's primer is compatible with the proposed paint system.
- D. Fittings for ductile-iron pipe shall conform to AWWA C110, or C153 and to the following requirements:
1. Joint type shall be as specified above for the supplied ductile-iron pipe.
 2. In lieu of exterior asphaltic coating and interior cement lining, fittings may be provided with a 6-8 mil nominal thickness fusion bonded epoxy coating inside and out in conformance with AWWA C550.
 3. Fittings shall be made of ductile-iron.
- E. Gaskets shall be nitrile material for installation in areas as designated on the Drawings.
- F. Ductile iron pipe on piers shall have Mech-Lok™ rigid restrained joint by Griffith Pipe Products Co. or approved substitute.
- G. Special Pipe Joints
1. Restrained
 - a. Provide restrained joint pipe at fittings and valves on water mains. Length of restrained pipe shall be as indicated on the Drawings. Restrained joints shall be Snap-Lok (Griffin Pipe), Flex Ring and Lok-Ring (American), TR Flex (U.S. Pipe) or approved equal.
 - b. Restrained joint pipe and fittings shall meet all AWWA standards and other requirements as specified above for standard ductile iron pipe and fittings unless addressed herein.
 - c. Field made joints are allowable but should be avoided where possible. Careful planning to locate field cuts in standard pipe sections is preferred. For field made joints in restrained piping, use field weldments or an insert equal to TR Flex Gripper Rings or approved equal. Gasket type field made joints will not be allowed.
 - d. Restrained joint fittings shall be provided by the restrained joint pipe supplier. Fittings shall be of the same model / type as the pipe supplied from the pipe manufacturer.
 - e. Restrained joint fittings may be push-on joint type.

- f. Megalugs, Series 1100, as manufactured by EBAA Iron Sales shall be allowable for restraint where fittings or valves are not available with restrained joints.
- g. Where additional fittings/valves are required for pipes not shown on Drawings, consult with Engineer for length of restrained joint pipe necessary each side of fittings/valve prior to installation of pipe/fitting.
- h. Tees for hydrants do not have to be restrained along the main line except where they are within required restrained length of nearby fittings or valves.
- i. Contractor shall develop a field layout schedule and drawing for restrained joint pipe installations.

2.02 POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

- A. General
 - 1. Pipe and fitting size shall be as indicated on the Drawings.
 - 2. PVC materials shall comply with ASTM D1784 with a cell classification of 12454-B.
 - 3. Pipe shall be certified and listed for potable water distribution products in accordance with NSF 14 or 61 and bear the NSF seal on each section of pipe.
- B. AWWA C900: C900 PVC pipe 4-inch to 12-inch shall conform to AWWA C900 and the following requirements:
 - 1. Outside diameter shall conform with ductile-iron pipe.
 - 2. Pipe shall be pressure class 200, with a standard dimension ratio of DR 14.
 - 3. Pipe shall have plain end and elastomeric-gasket bell ends.
 - 4. Fittings shall conform to AWWA C110, or C153 and have mechanical joints. Fittings shall be made of gray-iron or ductile-iron. Interior of fittings shall be cement-mortar lined with seal coat in accordance with AWWA C104.
- C. Ultra Blue IPS: PVCO pressure pipe 6-inch to 12-inch shall be manufactured from a Rigid Poly (Vinyl Chloride) compound in accordance with ASTM F1483 and shall conform to the following requirements.
 - 1. Outside diameter shall conform to iron pipe size.
 - 2. Pipe shall be pressure-rating 200.
 - 3. Pipe shall have an integral elastomeric-gasket bell end. The gasketed joint system shall conform to ASTM D3139.
 - 4. Fittings shall conform to AWWA C110 or C153 and have mechanical joints. Fittings shall be made of gray-iron or ductile-iron. Interior of fittings shall be cement-mortar lined with seal coat in accordance with AWWA C104. Cast Iron OD transition gaskets shall be used with MJ fittings.
- D. Pressure Rated: Pressure Rated (PR) PVC pipe 1-1/2-inch to 12-inch shall conform to ASTM D2241 and the following requirements:
 - 1. Pipe shall be pressure rated 200 with a standard dimension ratio of SDR 21.

2. Pipe shall have an integral elastomeric-gasket bell end. The joints and gaskets shall comply with ASTM D3139 and ASTM F477.
 3. Fittings for pipe 3-inch and larger shall conform to AWWA C110, or C153 and have mechanical joints with transition gaskets as required for the pipe outside diameter. Fittings shall be made of gray-iron or ductile-iron. Interior of fittings shall be cement-mortar lined with seal coat in accordance with AWWA C104.
- E. Schedule 40 & 80: Schedule 40 & 80 PVC pipe 1/2-inch to 12-inch shall conform to ASTM D1785 and the following requirements:
1. Outside diameter shall conform with iron pipe.
 2. Pipe shall be schedule 80.
 3. Pipe shall have an integral elastomeric-gasket bell end or solvent weld joints.
 4. Fittings for the pipe shall conform to ASTM D2466 or D2467 as appropriate for the pipe schedule.

2.03 POLYETHYLENE PRESSURE PIPE AND TUBING

- A. Polyethylene pressure pipe and tubing, 1/2-inch through 3-inch, shall conform to AWWA 901 and the following requirements:
1. The line shall be the size indicated on the Drawings and shall be polyethylene tubing.
 2. The line shall be made from material having standard PE code designation PE 3406.
 3. The line shall have a minimum pressure class of 160 psi with a dimension ratio (DR) of DR-9.

2.04 TAPPING SLEEVE

- A. Tapping Sleeve: Sleeves shall be 304 stainless steel, flanged for the tapping valve and manufactured for a working pressure of 150 psi. Sleeve shall have a full body 360-degree gasket. Sleeve shall have a 3/4-inch test plug. Bolts and nuts shall be stainless steel.

2.05 VALVES

- A. General: Valves shall meet the following requirements:
1. Size shall be as required for the pipe size and material as indicated on the Drawings and specified.
 2. Open by counterclockwise rotation.
 3. Provide an interior protective epoxy coating in accordance with AWWA C550 on ferrous surfaces in contact with the liquid.
 4. Components in contact with the liquid shall be in compliance with NSF 61.
 5. Standard system working pressure is 150 psi.
 6. Equip valves with a suitable means of operation.
 7. Ends shall be mechanical joint for underground location.

8. For buried valves over 5 feet deep, provide extension stems of cold rolled steel to bring the operating nut to within 2 feet of the ground surface. Extension stems shall also be provided as required for floor stands and to floor valve box.
 9. Provide valve accessories as required for proper valve operation for valve locations as indicated on the Drawings and as recommended by valve manufacturer.
 10. Similar valve types shall be of one manufacturer.
- B. Gate Valves, Resilient-Seated: Gate valves 3-inch to 20-inch shall conform to AWWA C509 for and to the following requirements:
1. O-ring stem seal on non-rising (NRS) stem valves.
 2. Valves shall be non-rising stem (NRS) with wrench nut for underground locations and Outside Screw and Yoke (OS&Y) with handwheel for above ground locations unless noted otherwise on the Drawings.
- C. Tapping Valves: Tapping valves shall conform to the specifications for the gate valves as indicated in this Section and the following:
1. Valve shall be specifically modified for the passage and clearance of the tapping machine cutter.
 2. The mating end to the tapping sleeve shall be raised male surface to provide true alignment to the sleeve and tapping machine. The valve shall of the same manufacturer as the tapping sleeve.
- D. Edgecombe County Water and Sewer District No. 3 has passed an Amendment that approves all valves to be manufactured by Clow Corporation.

2.06 VALVE BOXES

- A. Valve Box, Below Ground: Boxes shall be high strength cast iron of the screw or telescopic type. Box shall consist of a flare base section, center extension as required, and a top section with the word "WATER" cast in the cover. Length of box shall be such that full extension of box is not required at the depth of water main cover.
- B. Extension Stem (if necessary): Stem shall be sized so as to transmit full torque from the operating mechanism to the valve stem without binding, twisting, or bending. Stem shall be made from extra heavy steel pipe. Stem shall be complete with couplings for connection to valve and floor stand where required. When valve extension kits are used they must be as recommended by the valve manufacturer.

2.07 SERVICE VALVES AND FITTINGS

- A. Water service valves and fittings shall conform NSF 61 and AWWA C800 for normal pressure and the following requirements:
1. Service valves and fittings shall conform to Owner's standards. If Owner's standards conflicts with these specifications, consult with Engineer before proceeding.

2. Service saddle: Provide service saddle for service pipe connection to main pipe material. Saddles shall meet the following requirements:
 - a. Brass body to conform to the outside dimension of the main.
 - b. O-ring, Buna N rubber gasket to provide watertight connection.
 - c. Hinged, double bottom strap design.
 - e. Threaded outlet to match threads on corporation valve.
3. Corporation valve
 - a. Stop size shall be the same as service line.
 - b. Inlet thread shall be as per AWWA C800.
 - c. Outlet thread shall be as required for the pipe material specified.
4. Pressure reducing valve
 - a. Shall meet ASSE 1003.
 - b. Bronze body, renewable stainless steel seat.
 - c. Suitable for reducing from an inlet pressure range of 100 – 150 psi to an outlet pressure of 60 psi.
5. Meter boxes
 - a. Boxes and cover shall be cast iron
 - b. Minimum 18 inches deep.
 - c. Sized for required water meter.

2.08 FIRE HYDRANTS

- A. Fire hydrants shall conform to AWWA C502 and to the following requirements:
 1. Nozzles: Two (2) 2-1/2-inch hose and One (1) 4-1/2-inch pumper connections.
 2. Nozzle threads: National Fire Protection Association (NFPA) for National (American) Standard Fire Hose Coupling Screw Threads.
 3. Main valve diameter: 5-1/4- or 4-1/2 inch.
 4. Minimum depth of bury: 42-inches.
 5. Inlet connection: 6-inch mechanical joint.
 6. Open counterclockwise.
 7. Close with water pressure.
 8. O-ring seals
 9. Traffic model with frangible sections near the ground line designed to break on impact.
 10. Provide extension for hydrant standpipe as required to set centerline of hydrant nozzle a minimum of 15-inches and a maximum of 24-inches.
 11. Exterior color above ground line shall match Owners.
 12. All hydrants shall be of one manufacturer.

2.09 POST HYDRANTS

- A. Blow-offs for 4" and smaller water mains shall be constructed by use of iron bodied self draining, non-freezing post hydrants similar to fire hydrants except smaller and easily discernible from true fire hydrants due to their size and paint color. The post hydrant shall be equipped with at least a 2-3/16" valve opening with a mechanical joint base elbow of size equal to the branch piping to which it is connected. The barrel size shall be 3" with a 1-15/16" single nozzle (National Standard threads) and a tamper proof recessed pentagon operating nut.

Internal operating parts shall be of brass or stainless steel with the valve assembly removable by withdrawal through the hydrant barrel leaving the hydrant in place. Hydrant shall be designed so that no excavation or extension wrenches are required to accomplish valve removal. Hydrant shall be equipped with a traffic breakaway feature and shall receive thrust blocking and crushed stone at the shoe as shown on the details for hydrant installation. Exposed exterior surfaces shall be safety yellow to contrast with the coloration of fire hydrants. Post hydrants shall be Kupferle Foundry Company Eclipse No. 2 or equivalent item manufactured by American Flow Control or Mueller.

2.10 METERS

- A. Displacement Type Meters: Displacement type meters shall conform to AWWA C700 and to the following requirements:
1. Meter size shall be as indicated on the Drawings.
 2. Meter ends shall match pipe fittings.
 3. Provide magnetic drive with sealed gear housing.
 4. Totalizer shall have:
 - a. 4-inch dial reading in gallons
 - b. Six-digit totalizer
 - c. Must be capable of remote readout to match Owner's existing system.
 5. Meters and meter parts shall be manufactured, assembled, and tested within the United States. Meters shall be manufactured by Neptune T10 w/Prop Read which is compatible with the existing county's meter reading system.
 6. The meters shall contain a removable polypropylene strainer screen.
 7. All meters shall have meter lock installed with a standard bullet lock. The Contractor shall be required to provide to the Owner five (5) keys for every 100 locks.

2.11 REMOTE RADIO FREQUENCY ENCODER

Remote Radio Frequency (RF) Encoder Based Meter Data Acquisition System.

- A. Summary of Equipment: All new water meters whether customer or master meter type shall be equipped with devices which will provide meter identification and total gallons read to a vehicle mounted portable data acquisition unit (PDA). Meters shall be read by use of a vehicle mounted portable personal computer with a radio frequency transceiver capable of interrogating meters at a driveby of 30 mph and recording readings for later download to an office PC for billing reports. The data PDA will store the meter I.D. and total flow to date and readily download the data to a desktop computer which shall interpret the data to provide individual bills and summary reports as desired by the Owner. The equipment which shall be provided by the Contractor is summarized as follows:
1. Register - Each meter shall have a data interrogation compatible waterproof register capable of sending a signal with the meter identification to vehicle

mounted portable Data Acquisition Unit (PDA) by Radio Frequency transmission. The register shall not require batteries or external power but will provide a passive reading to the PDA via a meter box lid mounted meter interface unit (MIU). The register shall comply with the applicable provisions of AWWA C-707 and FCC Regulations with regards to submergence, environmental conditions, signal transmission assembly, and accuracy.

- B. Register - Encoder Type With Meter Interface Unit: The register shall direct mount to the meter main case with a bayonet style connection requiring no bolted connections removable for replacement with the meter in place in the field. The register shall be of the absolute encoding type. Pulse type output registers and registers requiring batteries are not acceptable. The register shall be equipped with encoded 6-digit odometer wheels reading in total gallons with an instantaneous sweep hand with a leak detection indicator on the dial face. Increments of at least tenths of gallons will be visible on the dial face and the units shall be clearly indicated on the face of the register. The register shall be hermetically sealed and compatible with flooded meter box service. The unit shall, in a digital format, simultaneously encode four or six digits of the meter reading for transmission to a meter interface unit for the purpose of transmitting total gallons used through a meter box lid mounted meter interface unit (MIU). Provision shall be made to provide terminal screws which are accessible for routine register change out in the field allowing hookup to an existing MIU. The terminals though accessible shall be water resistant and shall not cause damage to the meter register or MIU in the event of standing water in the meter box. The register shall also provide to the MIU reprogrammable ten-digit identification number. The digitally formatted data transmitted by the register shall incorporate a check sum character to verify correct information transmission and integrity. Data errors shall be noted and indicated by the reading equipment.
- C. Meter Interface Unit (MIU): Each meter shall be equipped with a Radio Frequency Drive-by Meter Interface Unit which shall be mounted by the contractor through the industry standard 1.8" diameter hole in the meter box lid. The unit shall be powered by a 5-year battery and the unit shall be so designed as to not require reprogramming should the battery discharge before its replacement. The unit shall be housed in a NEMA 4 enclosure incorporating a tamper resistant seal. The unit's operating temperature range shall be -22_F to 149_F. The MIU shall read the register output once every hour and transmit the data every 4 seconds by radio using the unlicensed frequencies of 902 MHz to 928 MHz in accordance with FCC part 15 regulations. The power output shall conform to FCC part 15.247 requirements and the range of the data transmission shall be at least 300 feet by line of sight.

2.12 THRUST BLOCKING

- A. Provide concrete thrust blocking in accordance with the detail on the Drawings.

2.13 DISINFECTANT

- A. The following products may be used as the disinfectant:
 - 1. Chlorine, liquid: AWWA B301.

2. Hypochlorite, calcium and sodium: AWWA B300.

2.14 DETECTABLE MARKING TAPE

- A. A three-inch wide 0.5 millimeter thickness detectable marking tape shall be installed over all PVC pipelines. The top shall be clearly marked "water main" and shall be centered over the main twelve inches below finished grade. Any breaks in the tape shall be repaired in accordance with the manufacturer's recommendations.
- B. Tape shall be by Blackburn Manufacturing, Joseph G. Pollard Co., or Reef Industries Inc.

2.15 TRACER WIRE

- A. Tracer wire shall be #12 wire.
- B. Splices in tracer wire are to be kept to a minimum and joined with copper split nuts of appropriate size.

PART 3 EXECUTION

3.1 GENERAL

- A. Pipe installation shall meet the following general guidelines:
 1. Lay pipe in the presence of Engineer, unless specifically approved otherwise.
 2. Handle pipe and accessories in accordance with manufacturer's recommendations. Take particular care not to damage pipe coatings.
 3. Carefully inspect pipe immediately prior to laying. Do not use defective pipe. Replace pipe damaged during construction.
 4. Lay pipe to grade and alignment indicated on the Drawings.
 5. Provide proper equipment for lowering pipe into trench.
 6. Do not lay pipe in water or when the trench or weather conditions are unsuitable for the work.
 7. Provide tight closure pipe ends when work is not in progress.
 8. Keep pipe interior free of foreign materials.
 9. Clean bell and spigots before joining. Make joints and lubricate gasket in accordance with pipe manufacturer recommendation.
 11. Disinfection of pipe during installation:
 12. Soak gaskets for minimum of one hour in a 50 - 100 ppm hypochlorite solution prior to installation.
 13. Mop bells and spigots of pipe, fittings and valves with a 50 - 100 ppm hypochlorite solution immediately prior to making joints.

14. Block fittings with concrete, or restrain as indicated on the Drawings or as required to prevent movement.

3.2 RELATION OF WATER MAINS TO SEWERS

- A. Lateral Separation: Lay water mains at least 10 feet laterally from existing and proposed sewers. Where existing conditions prevent a 10-foot lateral separation, the following shall be followed with approval of the Engineer:
 1. Lay water main in a separate trench, with the elevation of the bottom of the water main at least 18 inches above the top of the sewer.
 2. Lay water main in the same trench as the sewer with the water main located at one side on a bench of undisturbed earth, and with the elevation of the bottom of the water main at least 18 inches above the top of the sewer.
- B. Crossing Separation: Lay bottom of water main at least 18-inches above the top of the sewer. Where existing conditions prevent an 18-inch vertical separation, construct both the water main and sewer of ferrous materials and with joints that are equivalent to water main standards for a distance of 10 feet on each side of the point of crossing.
- C. Crossing a Water Main Under a Sewer: When it is necessary for a water main to cross under a sewer, construct both the water main and the sewer of ferrous materials and with joints equivalent to water main standards for a distance of 10 feet on each side of the point of crossing. A section of water main pipe shall be centered at the point of crossing.

3.3 WATER SERVICE

- A. Water service lines shall extend from the main distribution line to a meter box located at the right-of-way.
- B. All water service taps shall be made using a service saddle.
- C. Taps shall be located at 10 or 2 o'clock on the circumference of the pipe.
- D. Service taps shall be staggered, alternating from one side of the water main to the other and at least 12 inches apart.
- E. Taps on the same side of the main shall be a minimum of 24 inches apart.
- F. Install meter boxes and water service components so top of meter will be within 6 inches of the surface.
- G. Contractor will provide and install water meter as directed by Edgecombe County Water Department.
- H. The water meters to be installed within Speed corporate limits will be supplied by Edgecombe County Water Department. The contractor will be responsible

for installing the new water meters at the right-of-way for each service. The valve boxes and any components necessary to install the new water meters shall be supplied and installed by the contractor. The contractor will also supply and install a new water line from the newly installed water meter to each residence as directed by Edgecombe County Water Department. Old water meters and valves boxes will be removed and disposed of as directed by Edgecombe County Water Department. Contractor will be responsible for clean-up and returning private property to original condition.

3.4 DUCTILE IRON PIPE

- A. Install pipe in conformance with AWWA C600 and the following:
 - 1. For laying pipe in a vertical or horizontal curve, each full length pipe may be deflected by the following offset distance:
 - a. Push-on joint
 - i. 3 to 12-inch pipe: 14-inch offset
 - ii. 14 to 36-inch pipe: 8-inch offset
 - b. Mechanical joint
 - i. 3 to 6-inch pipe: 20-inch offset
 - ii. 8 to 12-inch pipe: 15-inch offset
 - iii. 14 to 20-inch pipe: 8-inch offset
 - iv. 24 to 36-inch pipe: 6-inch offset

3.5 PVC PRESSURE PIPE

- A. Install PVC C900 pipe in conformance with AWWA C605.
- B. Solvent Weld: Field cut ends shall be sanded to roughing the surface. Joints shall be cleaned of foreign material. Solvent shall be applied to the joint and joint made as recommended by the manufacturer. Excess solvent shall be wiped off. Joint should not be moved until sufficiently set up.
- C. Bell and Spigot Joints: Clean bell and spigot ends prior to jointing. Ends of field cut pipe shall be beveled with file. Gasket shall be clean and lightly lubricated. Joint shall be made as recommended by the manufacturer.

3.6 VALVES AND FITTINGS

- A. Install buried valves on firm foundation of crushed stone or concrete. Connection to pipe shall be such that there shall be no stress at the joint caused by misalignment or inadequate support of pipe or valve.
- B. Valve Box: Set a valve box over each buried valve. Support box so that no stress shall be transmitted to the valve or pipe line. Install box plumb and set top flush with finished grade. Operating nut shall be centered in box. Provide a 24-inch x 24-inch wide by 6-inch thick concrete pad at top of valve boxes outside paved areas.

- C. Valve operation nut shall be within 30 inches of the top of box. Provide stem extension if necessary to bring operating nut to within 30 inches of the top of box.
- D. Install fittings as recommended by the manufacturer. Fittings shall be blocked or otherwise restrained from movement.
- E. Install valves, gates, and accessories indicated on the Drawings and in complete accordance with the manufacturer's recommendations.
- F. Install air / vacuum valve inside a manhole.

3.7 METERS

- A. Install meter boxes and water service components so top of meter will be within 6 inches of the surface.
- B. The Contractor will install water meter.

3.8 HYDRANT

- A. Set hydrant in accordance with detail on Drawings.

3.9 PAINTING

- A. Equipment shall receive the manufacturer's standard coating for the intended application. Coatings shall be suitable for the intended application.
- B. Repaint damaged paint services.

3.10 TESTING

- A. Install and test Backflow prevention devices in accordance with the requirements of the local authority having jurisdiction.

3.11 PRESSURE TESTING

- A. Pressure test in accordance with AWWA C600 for ductile iron pipe and AWWA C605 and M23 for PVC pipe and as specified herein
- B. General:
 - 1. The Engineer shall approve the source, quality, and method of disposal of water to be used in test procedures.
 - 2. Obtain Owner's permission 48 hours prior to filling or flushing of pipe system with water from Owner's water system. Owner shall operate valves connected to the existing water system. Where large quantities of water may be required for flushing, Owner reserves the right to require that flushing be done at periods of low demand.
 - 3. Clean and flush pipe system of foreign matter prior to testing.

4. Provide air vents at the high points in the line section to be tested for releasing of air during filling. Service corporation stops may be used for air vent when located at a high point. Include cost of air vents in price of testing. Leave corporation stops in place after testing and note locations on As-Built Drawings.
5. Allow concrete blocking to reach design strength prior to pressure testing.
6. Test main prior to installation of service taps.
7. Repair defects in the pipe system. Make repairs to the same standard as specified for the pipe system.
8. Retest repaired sections until acceptance.
9. Repair visible leaks regardless of the test results.
10. Pipe sections shall not be accepted and placed into service until specified test limits have been met.

C. Testing

1. Notify Owner and Engineer a minimum of 48 hours prior to testing.
2. Perform tests in the presence of Engineer.
3. Make pressure tests between valves. Furnish suitable test plugs where line ends in "free flow."
4. Upon completing a section of pipe between valves, test pipe by maintaining for a two hour period a hydrostatic pressure of 150 psig.
5. Test pressure shall not vary by more than +/- 5 psi for the duration of the test.
6. No length of line shall be accepted if the leakage is greater than that determined by the following formula based on the appropriate test pressure:
L = Allowable leakage per 1,000 feet of pipe in gallons per hour.
D = Nominal diameter of the pipe in inches.
 - a. 100 psi: $L = D \times 0.07$
 - b. 150 psi: $L = D \times 0.08$
 - c. 200 psi: $L = D \times 0.09$
 - d. 250 psi: $L = D \times 0.10$

3.12 DISINFECTION

- A. After satisfactory completion of the pressure test, disinfect new potable water mains and existing mains that have required repair in accordance with AWWA C651 and as specified herein. Disinfect water mains in a maximum length per day of 2,000 feet.
- B. General:
 1. Provide a superintendent experienced in the required procedures for disinfecting with chlorine.
 2. Obtain Owner's permission 48 hours prior to filling, flushing, and chlorinating of the water mains. Owner shall operate valves connected to the existing water system.
 3. Do not allow highly chlorinated water into the existing distribution system.
 4. If there is any question that the chlorinated discharge will cause damage to the environment, a reducing agent shall be applied to the water to neutralize the residual chlorine. Federal, state, or local environmental regulations may

require special provisions or permits prior to disposal of highly chlorinated water.

5. Perform disinfection and testing in presence of Engineer.
- C. Connection to Existing System: Notify Owner 48 hours prior to making connections to the existing system. Thoroughly clean the existing water main exterior prior to the installation of tapping sleeves and corporation stops. Lightly dust with calcium hypochlorite powder the water main exterior and the interior surface of the tapping sleeve, and corporation stops.
- D. After satisfactory flushing of the main, disinfect by the injection of a chlorine solution. Induce chlorine in sufficient quantity to maintain a chlorine residual of at least 50 ppm throughout the system to be tested. Maintain the chlorine solution in the system for at least 24 hours.
- E. Valves and Fire Hydrants: Open and close valves on the mains being disinfected a minimum of three times during the chlorine contact period and a minimum of three times during flushing. Fire hydrants and other appurtenances should receive special attention to insure proper disinfection.
- F. For Cut-In Construction: Use the following procedures for disinfecting of the new installation and the existing main at the cut-in point in accordance with AWWA C651, Section 9:
 1. Apply liberal quantities of hypochlorite, in the form of tablets, to the open trench.
 2. Interior of new pipe and fittings and the ends of the existing mains shall be swabbed or sprayed with a one percent hypochlorite solution before installation.
 3. Install a 2-inch tap downstream of the work area. Tap shall be used for blowing off the main. Or use the next fire hydrant downstream of the work area for blowing off the main.
 4. Install a 2-inch tap just upstream of the new installation. Control Water from the existing system so as to flow slowly into the work area during the application of chlorine. After the line is thoroughly flushed, add chlorine solution at a concentration of 100 ppm by the continuous feed method and hold in the main for one (1) hour.
- G. Prior to flushing, the free chlorine residual shall be a minimum of 10 ppm. Flushing of the lines shall proceed until the lines contain the normal chlorine residual of the system.
- H. Bacteriological and Chlorine Residual Sampling and Testing
 1. Test for free chlorine residual at required bacteriological test locations immediately after induction of highly chlorinated water and again after 24-hours, prior to flushing of the highly chlorinated water from the potable water system.
 2. Obtain two samples at each location specified after the chlorination procedure is completed, and prior to placing the system in service. Take the first sample immediately after flushing of the chlorinated water and again in

24-hours. A set of samples shall be taken as a minimum at the following locations:

- a. Every 1,200 lf
 - b. End of each main.
 - c. A minimum of one from each branch.
 - d. Mains at cut-in locations: Each side of work area. Time between samples to be determined by Engineer in field.
3. Recommended additional samples. During the required sampling of water from the new system, it is recommended that samples be taken from the existing potable water source to determine if coliforms are present.
 4. Care in sampling. No hose or fire hydrant shall be used for the collection of samples. Take samples from an approved sample tap consisting of a corporation stop installed in the main with a copper tube gooseneck assembly. Operation shall be such as to ensure that the sample collected is actually from water that has been in the new system.
 5. Test samples for the presence of coliform organisms in accordance with the latest edition of Standard Methods for the Examination of Water and Wastewater. Testing method used shall be either the multiple-tube fermentation technique or the membrane-filter technique.
 6. A laboratory certified for the required testing by the State of North Carolina shall perform testing.
 7. Test for odor. The water in the new system should also be tested to assure that no offensive odor exists due to chlorine reactions or excess chlorine residual.
 8. If samples show the presence of coliform, procedure 1 or 2 described below shall be followed, with the approval of the Owner, before placing the unit or facility in service.
 - a. Take repeat samples at least 24 hrs. apart until consecutive samples do not show the presence of coliform.
 - b. Again subject the system to chlorination and sampling as described in this section.
 9. If samples are free of coliform, and with the approval of the Owner, the potable water system may be placed in service.
- I. Contamination: If, in the opinion of the Engineer, possible contaminants have entered the existing water system, or water samples show the water in the existing system to be unsafe on completion of the work, the existing water system shall be disinfected as specified herein and shall include all contaminated components. Disinfection of the existing system shall be coordinated with the Owner.

3.13 VALVE OPERATION

- A. Prior to final acceptance provide competent personnel to operate each valve in presence of Engineer. Verify that valves are left in the open position.

3.14 GRADING AND CLEAN-UP

- A. General:

1. Provide for testing and clean-up as soon as practicable, so these operations do not lag far behind the pipe installation. Perform preliminary clean-up and grading as soon as backfilling operations are complete.
2. All finished surfaces are to provide adequate drainage. The finished surface shall be reasonably smooth, compacted, free from irregular surface changes and comparable to the smoothness of the adjacent surfaces.
3. Surfaces shall be sloped to drain away from structures.
4. All existing grassed or seeded areas damaged by the Contractor shall be replaced with the same type of grass as the adjoining area without additional cost to the Owner. The Contractor at his option may seed such areas and maintain them until a satisfactory stand of grass is obtained or may sprig or sod the areas to obtain the same result. A repaired area shall be considered satisfactory when a stand of grass has been obtained and is growing vigorously. The Contractor shall provide lime and fertilizer as may be required and water for maintaining the areas until accepted by the Engineer.
5. Upon completion of backfilling operations, all excess earth, broken pavement, rock, shoring and other materials and debris resulting from the operations shall be removed from the work areas and disposed of by the Contractor. He shall find his own disposal areas and bear all costs arising from the disposal of this excess material and debris.

B. Finish Grading and Cleanup

1. Particular care shall be taken to cleanup lawns and residential yards and shoulders and ditches fronting lawns and residential yards during pipe installation.
2. The Contractor shall establish in all his crews a minimum standard of preliminary cleanup to occur at the time of excavation and backfill of the water main. This cleanup will be done concurrent with pipe installation and will be required of the crew performing the pipe installation. Crews which cannot or will not perform this minimum preliminary cleanup will be required to cease operation and leave the site. The Contractor will then provide an alternate crew with no claim for additional time or compensation therefore. The minimum preliminary cleanup shall consist of the following:
 - a. Backfill of the trench flush with surrounding grade and free from humps or holes or depressions which are larger than 10 square feet and deeper or higher than 8" at their deepest point.
 - b. Driveways with 90% Standard Proctor Compaction or better with stone in any soft yielding spots such that the drive is traversable by vehicular, bicycle and pedestrian traffic. The drive shall be free of dips and humps. Residents must be provided ingress and egress through drives with their vehicles as soon as backfill operations through the drive are complete. No resident will be

denied access with his vehicles overnight due to contract operations. This shall be the Contractor's responsibility.

- c. Original drainage patterns must be established as part of preliminary cleanup. All disturbed surfaces must be worked at the time of backfill until they drain. If the terrain is too wet to work the surfaces as required to drain them then pipelaying shall cease in the wet area. Small ponds smaller than 100 square feet after rainfalls events are to be expected occasionally prior to final cleanup and will not be cause to consider preliminary cleanup unsatisfactory.
 - d. Mailboxes shall be restored by the Contractor at their previous horizontal location and height. Contractor shall provide firmly compacted access by mail carrier vehicles to the mailbox including the use of stone if required.
 - e. Debris, rubble, rock, trash, packing materials, pipe, lubricants, stockpiles, trees, stumps, branches, and equipment must be removed by the Contractor.
 - f. Regulatory signs must be restored, holes near or in the roadway must be filled flush and soil or debris humps or ridges on or near the roadway must be removed by the Contractor immediately as they pose a safety hazard. It shall be the implicit duty of the Contractor to control and maintain site safety at all times without need of instruction to do so.
3. Final cleanup shall follow preliminary cleanup as soon as practical after pipeline construction. At the time of payment requests, final cleanup shall be within one mile of the current pipe laying operations for each crew. In addition, final cleanup must be completed any given road before the crew constructing the pipeline on that road can move to another road. Final cleanup includes all items required for a finished project including final grading, repair of roadways and drives and all testing and chlorination, service installation and punch list items for final acceptance of the water main suitable for final payment and the commencement of service installation.

---END OF SECTION---