SECTION 14.0

WATER DISTRIBUTION SYSTEM CONSTRUCTION

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14.1 Construction of Water Lines

14.1.1 Description

The work covered by this section of the specifications consists of furnishing and performing all operations, necessary and incidental to the construction and installation of water lines. This shall include, but not be limited to, all blasting, shoring and protection of excavation, trenching, removal and replacement of unsuitable materials, grading, and all pipes, fittings, valves, hydrants, and testing as shown on the design plans and in these specifications.

BOC:	Columbia County Board of Commissioners
CCWU:	Columbia County Water Utility
CCWUED:	Columbia County Water Utility Engineering Department
CCWUMTD:	Columbia County Water Utility Meter Department
CCDSD:	Columbia County Development Services Department
AWWA:	American Water Works Association
ANSI:	American National Standards Institute
ASTM:	American Standard of Testing Materials
NSF:	National Sanitation Foundation
PPM:	Parts Per Million (milligrams per liter (mg/l)
COE:	United States Army Corps of Engineers

All AWWA, ANSI, and ASTM specifications shall be made part of these specifications to cover the materials, installation, testing and disinfection required for final acceptance into water distribution system. All references made to these specifications shall be in accordance with latest revisions.

14.1.2 License, Permits, Plans, Notification, and Approved Equal, Additional Inspections, Erosion and Sedimentation Control

14.1.2.1 Contractors Utility License

All work associated with the repair, modifications or additions to the Columbia County Water Utility Water Distribution System shall be performed by a contractor or sub-contractor with a contractor's utility license that is valid in the State of Georgia. No work shall be performed by a contractor or sub-contractor without said license. All work performed by a contractor or sub-contractor using another valid utility license shall be in strict accordance with rules or regulations as set forth by the State of Georgia.

14.1.2.2 Permits

The engineer and/or contractor is responsible for securing all permits necessary for the intended construction. The contractor shall not begin any construction without the prior written approval for the permit needed. Permits include, but

are not limited to, Georgia Department of Transportation, CSX Railroad, U.S. Army Corps of Engineers (COE) or the Columbia County Development Services Department.

14.1.2.3 **Plans**

It is the intent of this section of the specifications that the contractor's performance be based upon the plans, and these specifications and details along with all applicable codes, permits and regulations as amended by any waivers. The Approved Plans and Standard Details indicate the extent and specific arrangement of the work. If any departure from the indicated line grade or location as shown by the Approved Plans are deemed necessary by the contractor, details of such departures and the reasons thereof shall be submitted as soon as practicable for approval before commencing work. No work on such departures or deviations shall begin without written approval of the CCWU Inspector.

All water line crossings of COE jurisdictional areas shall be shown and noted on the plans. Each crossing shall be labeled with Permit Number. No construction activity shall begin until approval of permitted area.

14.1.2.4 **Notification**

The contractor shall notify the CCWUED 48 hours in advance of commencing any construction. **No valves shall be operated, no taps made, nor any connection made to the existing water system by a contractor or his representative without an authorized employee of the CCWU present.**

14.1.2.5 **Approved Equal**

The contractor or supplier for the project shall submit all appropriate information and details for materials that are not listed within these specifications but are requested to be Approved Equal. Each item must be submitted and approved as equal by the CCWUED prior to delivery to the site for installation.

14.1.2.6 **Additional Inspections**

All projects funded through GEFA, SRF, ARRA, USEPA, DOC and The Georgia Board of Regent will require state inspections in addition to County Inspections.

14.1.2.7 **Erosion and Sedimentation Control**

All plan preparation and construction is under the jurisdiction of The State of Georgia Erosion and Sedimentation Control Act of 1975, latest edition as outlined within the Manual for Erosion and Sediment Control in Georgia, latest edition.

All areas disturbed to construct the utility shall receive grassing and/or RIP RAP as outlined on the plans and/or the Manual. All grassing whether temporary or permanent shall be installed in strict accordance of the Manual and/or plans.

All BMPs must be installed in accordance to the Manual and prior to any construction activity.

Final grassing shall be considered acceptable when the viable stand of grass covers at least 98% of the total area with no bare spots exceeding one square foot and the ground surface is fully stabilized against erosion.

The contractor shall use all methods necessary to control dust on and near the work and all off-site borrow areas. The contractor should thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors and concurrent performance of work on the site.

14.1.3 Water Consumption During Construction

Water used for all phases of the construction of the development shall be metered. Meters shall be rented from the CCWU Main Office.

14.1.4 Protection of Existing Utilities and Restoration of Property

The contractor is responsible for locating all utilities and providing the protection necessary for the intended work. These utilities include subsurface or above ground utilities within the work site. The contractor shall protect said utilities at all cost and properly notify all utilities involved within the work site.

The contractor shall contact the Utilities Protection Incorporated prior to starting any excavation or construction. The phone number is 811 or 1-800-282-7411.

The contractor is responsible for the complete restoration of the property and any improvements necessary to bring the work site back to a minimum of the existing condition. This shall include, but not limited to, grading, drainage, grassing, and asphalt patching.

14.1.5 Work Site Safety

The contractor shall be responsible for the safety of public and private property. The contractor shall be responsible for the placement and maintenance of adequate barricades, construction signs, red lanterns, flashing lights and guards during construction work until it is safe for traffic to use the roadway. All materials, equipment, pipe excavations or stock piles that may be hazardous or obstructive to traffic or pedestrians shall be enclosed by fences or barricades and shall be noted by flashing lights. The contractor shall make every effort to safeguard the public at all stages of construction at no cost to Columbia County. Any and all state and local safety requirements shall be met by the contractor.

14.1.6 Warranty of Work

The developer shall warranty all materials and workmanship for one year from the date of final acceptance by the BOC. All service taps shall have a warranty of one year from the date of occupancy for each lot.

14.2 Materials

All materials shall be furnished and installed by the contractor and shall meet or exceed these specifications. All materials shall be new and of first quality and free from any

and all defects including, but not limited to, blemishes such as cracking, splitting, spalling, damaged coatings, UV damage, bending, dents and deformations of any type. The materials may be inspected for conformance at any time and deemed unsuitable or damaged. Where materials do not conform or are deemed damaged, the materials shall be replaced with materials that conform or be satisfactorily repaired or removed from the job site as directed. All repairs shall be in strict accordance with the manufacturer's recommendations unless otherwise noted.

14.2.1 **Handling**

All materials shall be transported to insure the least amount of impact and damage to all elements of the materials. Grates, straps and proper equipment shall be employed to transport materials from delivery truck to installation site area. **No pipe, fittings, valves, or hydrants shall be transported with a loader fork inserted into the pipe or water way as a means of transportation. Free dropped pipe, fittings, valves, or hydrants may constitute removal and replacement of when dropped.**

14.2.2 **Storage of Materials**

All pipe, fittings, valves, hydrants and appurtenances shall be stored above ground free from foreign material exposure, and UV exposure per manufacturer's recommendations. All PVC materials and rubber gaskets that will be stored for more than 30 days shall be adequately covered to protect against UV exposure. **All water system materials that come in to contact with any foreign material shall be thoroughly cleaned before installation in strict accordance with AWWA C651.**

14.3 Pipe Specifications

14.3.1 **Polyvinyl Chloride Pipe (PVC)**

All PVC pipe for water lines shall be blue in color and conform to AWWA C900. All PVC pipe shall be made of compounds conforming to ASTM D1784 and have a cell classification of 12454. All fittings for PVC pipe shall be ductile iron fittings. PVC fittings are not permitted. **Solvent weld joints are not permitted.** All PVC water lines shall be installed with a locating wire and indicator tape. See Standard Detail 14.4.9-1.

14.3.1.1 **Underground Pipe**

All PVC pipe shall be installed underground with a minimum cover of 4'-0" above the top of the pipe. **Where 4'-0" of cover cannot be achieved, the water line must be DIP. All water lines greater than 10" in diameter shall be DIP.**

14.3.1.1.1 Direct Taps are not permitted into PVC pipe. All taps must have a service saddle.

14.3.1.1.2 Pressure Rating for all PVC water line pipe shall be a minimum of Pressure Class 200 and furnished in approximately 20' lengths.

14.3.1.1.3 Joints for all PVC water line pipe shall have push joints with a bell and spigot end. The bell shall have an integrally molded gasket. Joints shall conform to the requirements of ASTM 3139.

14.3.1.1.4 Cutting Pipe for PVC pipe ends shall be properly cut and beveled to facilitate a clean joint assembly without damage to the gasket or to prevent over insertion into the bell end.

14.3.1.1.5 Pipe Joint Restraint for all PVC pipe to be restrained shall be push on joints and shall utilize a restraining bell to spigot harnessing system. The harness shall be rated for a minimum working pressure of 200 psi with a minimum safety factor of 3:1. Bell harnesses shall be as manufactured by Ebba Iron, Inc. Series 1500, 1600 or approved equal.

14.3.1.1.6 Gaskets for PVC water line pipe shall utilize an elastomeric seal conforming to ASTM F477.

14.3.1.1.7 Lubricant for joining of pipe shall utilize lubricant that is a non-toxic water soluble material that does not impart taste or odor and is ANSI/NSF 61 approved.

14.3.1.1.8 Identification of PVC water line pipe shall have the pressure rating, class, specification, manufacturer, and NSF clearly marked on each joint of pipe.

14.3.1.1.9 Locating Wire for PVC pipe shall be installed with 12 gauge copper locating wire firmly attached to the top of pipe. The pipe shall have "Caution Buried Water Line" tape attached to the pipe. The wire shall be one continuous piece for as long as possible. All splices shall be stripped and securely twisted to ensure continuity. The wire shall also be a continuous run through the DIP hydrant lead and be exposed at the traffic flange of each hydrant. See Standard Detail 14.15-1. The wire shall be brought to within 2' below finish grade at 100' intervals and brought up the outside of each valve box for ease of access and connection for locating equipment. The wire shall be attached using adhesive tape or cable ties as necessary. See Standard Detail 14.9-1.

14.3.1.2 **Fittings**

All fittings used with PVC pipe shall be ductile iron fittings in accordance with Section 14.6 of these specifications.

14.3.1.2.1 Fitting Joint Restraint for PVC pipe to fitting or valve restraint shall be mechanical joint restraint. Restraint shall be rated for a minimum working pressure of 200 psi. Joint restraint shall have a minimum safety factor of 2:1. Restraint for fittings and valves shall be as manufactured by Ebba Iron, Inc. series 2000PV or approved equal.

14.3.2 **Ductile Iron Pipe (DIP)**

This specification shall cover the use of ductile iron pipe in the water distribution system. All ductile iron pipes for water lines shall be cast, cleaned, cement lined, coated, tested and certified at a single manufacturing facility. All elements of the construction of the pipe shall be contiguous with one another. Approved ductile iron pipe manufacturers shall be American Cast Iron Pipe Company, U.S. Pipe Company, or McWane Incorporated. No other pipe manufactures shall be permitted to supply ductile iron pipe. **Gray iron or Cast iron pipe, fittings or accessories are not permitted.**

14.3.2.1 **All water lines installed in GDOT right of way shall be ductile iron pipe.**

14.3.2.2 Interior Lining: The interior lining for ductile iron pipe and fittings shall be cement mortar lined in accordance with ANSI A21.4 and AWWA C104 for potable water use. All pipes with a damaged lining shall be flagged and repaired per manufacturer's recommendations.

14.3.2.3 Exterior Coating**:** The exterior coating for all ductile iron pipe and fittings shall be an asphaltic coating in accordance with AWWA C151.

14.3.2.4 **Underground Pipe**

All underground ductile iron pipe shall be push-on joint or restrained joints as required. Specific fabricated pipe may be mechanical joint as required. All DIP shall be in accordance with ANSI A21.5 and ANSI A21.51 using 60/42/10 grade of iron. The minimum physical properties shall be in accordance with AWWA C151. All installations of DIP shall be in accordance with these specifications and AWWA 600. See Standard Detail 14.3.2.4-1.

14.3.2.4.1 Direct Taps are permitted into underground ductile iron pipe up to a 1" diameter. All direct taps shall be in accordance with the pipe manufacturer. A standard service saddle may still be used in lieu of direct tapping.

14.3.2.4.2 Pressure Rating for DIP 4" through 12" shall be Pressure Class 350. Pipes greater than 12" shall be Pressure Class 250.

14.3.2.4.3 Joints for underground pipe shall be push on, mechanical or restrained joints where indicated on the plans or required in these specifications. Push on joints shall be in accordance with ANSI A21.51, AWWA C151 and mechanical joints in accordance with ANSI A21.51, AWWA C151 and restrained joints in accordance with ANSI A21.53, AWWA C153.

14.3.2.4.4 Restrained Joints shall utilize a restraining gasket made of elastomeric rubber and combination of stainless steel gripping wedges that firmly secure into the pipe or a steel retainer ring welded to the pipe with a split flex-ring assembly locking mechanism. The minimum

pressure rating for the restraint shall be 250 psi with a 2:1 safety factor.

14.3.2.4.4.1 Restrained Gasket restraint shall be "Fast-grip Gasket" by American Cast Iron Pipe Company, "Field-Lok Gasket" by U.S. Pipe Company or approved equal.

14.3.2.4.4.2 Retainer Ring Restraint restraint shall be a Retainer Ring Type shall be "Flex-Ring" by American Cast Iron Pipe Company, "TR Flex" by U.S. Pipe Company, or approved equal.

14.3.2.4.4.3 Restraint on Push on Joint or Existing Pipe Bells shall utilize a bell-harness clamping system to prevent pull-out of un-restrained joints. The bell restraint harness for DIP shall be Mega-lug Series 1700 or Series 1100HD. The required length of restraint shall be determined using Standard Detail 14.3.2.4-1.

14.3.2.4.5 Welded on Thrust Collars may be welded on the pipe from the supplier or added by an approved certified fabrication shop in order to develop restraint using bearing pressure. The collars shall be fabricated from steel and field encapsulated in a concrete collar to act as reaction blocking. Multiple thrust collars may be used to develop the magnitude necessary to counter act the thrusting force. The thrust collar must be installed in undisturbed soil. All soil surrounding the collar and pipe shall have a minimum compaction around the installation of 100% density standard proctor in accordance with ASTM D698. All compaction within the vicinity shall be done in 8" lifts maximum. All assemblies between thrust collars shall be restrained.

14.3.2.4.6 Welded on Outlets and Tangential Welded on Outlets may be used in lieu of tees for water lines 16" and larger. Tangential welded outlets are preferred for the use at hydrant assemblies @ low points to facilitate maximum flushing permissible through the hydrant. All welded outlets shall be manufactured in accordance with ANSI A21.5 and AWWA C151.

14.3.2.4.7 Cutting Pipe ends shall be properly cut and beveled to facilitate a clean joint assembly without damage to the gasket or to prevent over insertion into the bell end.

14.3.2.4.8 Gaskets for DIP water line pipe shall be Styrene Butadiene Rubber (SBR) or Ethylene Propylene Diene Monomer (EPDM) in accordance with ANSI A21.11

and AWWA C111.

14.3.2.4.9 Lubricant for joining of pipe shall utilize a lubricant that is a non-toxic water soluble material that does not impart taste or odor and is ANSI/NSF 61 approved.

14.3.2.4.10 Identification for DIP water line pipe shall have weight, pressure class, casting period, and manufacturer's identification clearly marked on each joint of pipe.

14.3.2.4.11 Deflection shall be in strict accordance with manufacturer's recommendations.

14.3.2.5 **Polyethylene Encasement**

All ductile iron pipe installed in hydric soil conditions (wetlands) shall be installed in a polyethylene encasement. The polyethylene encasement shall utilize a tube wrap form with tape for joints that is manufactured in accordance with ANSI/ASTM D1248. The installation of the polyethylene wrap and tape shall be in strict accordance with ANSI A21.5 and AWWA C105.

14.3.2.6 **Flanged Pipe**

All above ground DIP shall be flanged pipe and fittings. All pipe and flanges shall be in accordance with ANSI A21.15 and AWWA C115. Flanged pipe shall be a minimum of Special Class 53 pipe and have the same interior and exterior coatings as underground pipe. **Grooved or Shouldered Joints (AWWA C606) are not permitted.**

14.3.2.6.1 Direct Taps for pressure gauge installations are permitted into Special Class 53 Pipe.

14.3.2.6.2 Pressure Rating for flanged pipe shall have a minimum working pressure rating of 250 psi.

14.3.2.6.3 Flanges shall be manufactured in accordance with ANSI A21.5 and AWWA C110 with Class 125 flanges and bolting conforming to ANSI B16.1.

14.3.2.6.4 Gasket material shall be the same as for underground pipe.

14.3.2.6.5 Fabricated Piping exiting the vault or pit shall be flanged on one end and plain end on the other to facilitate installation of pipe within the vault or pit. Proper restraint of piping exiting the structure shall be achieved by a thrust collar or the required length of restrained joints.

14.3.2.6.6 Restrained Flange Adapter for equipment installed within a vault or pit shall have a minimum of one restrained flange adapter (RFA) installed within the pipe assembly in order to facilitate removal and

replacement of flanged components. The RFA shall be as manufactured by Ebba Iron, Inc. series 2100 or approved equal.

14.3.2.6.7 Pipe Supports shall be installed for flanged pipe inside a vault or pit. Pipe supports shall be stainless steel with adjustable mounting to the flange or cradling the pipe directly. Pipe supports shall be as manufactured by Standon Pipe supports style S89, S92 or C92 or approved equal. All hardware necessary for the installation of the pipe supports shall be stainless steel.

14.3.2.7 **Flanged Fittings**

All fittings for water lines above ground or inside a vault or pit shall be flanged and have a minimum rating of 250 psi. All fittings shall conform to ANSI A21.10 / AWWA C110 or ANSI A21.53 / AWWA C153. All flanges for fittings shall be Class 125 and bolting conforming to ANSI B16.1.

14.4 Water Line Installation

All water lines shall be installed true to grade and horizontally located as set forth in these specifications or approved plans. The contractor is responsible for providing all reference points in order to accurately install the water lines and appurtenances. All installation of water lines shall be in strict accordance with these specifications and in accordance with AWWA C600 and AWWA C605.

14.4.1 **All water lines shall be installed a minimum of 20' from a permanent structure.**

14.4.2 **All water lines installed longitudinally within pavement or roadway shall be restrained joint ductile iron pipe and fittings. Concrete blocking shall not be permitted under paving.**

14.4.3 **Separation**

All lines carrying potable water shall be separated from lines carrying sanitary sewer water by a minimum of 10' horizontally from edge to edge and have a minimum of 18" separation vertically when crossing laterally. See Standard Detail 14.4-3.

14.4.4 **Curbing / Reference Points / Staking**

The contractor shall not proceed installing the water line or appurtenances without the roadway curbing being installed or a valid form of staking with reference points established for proper location of installation vertically and horizontally.

14.4.5 **Dewatering and Drainage of Excavated Areas**

Where water is encountered in the excavated area, the accumulation shall be prevented by pumping, well pointing, or other acceptable means. Water so removed shall be discharged in a manner and location so as not to cause injury or damage to public or private property, work in progress, or completed work.

14.4.6 **Protection Against Floatation**

The contractor shall be responsible for all protection against flotation of pipe or

structures installed or partially installed. Pipes or structures that are partially floated or completely floated from original installation locations shall be removed and re-installed per these specifications. Damaged pipe or structures shall be discarded and replaced in accordance to these specifications.

14.4.7 **Shoring and Protection of Excavation**

All shoring, sheeting and bracing required to protect the excavation, and to safeguard employees and the public, shall be solely the contractor's responsibility. The contractor shall comply with all Occupational Safety and Health Administration Regulations per Part II, 29 CFR-Part 1926-Excavations; Final Rule (current issue) for all trenching, shoring and sheeting operations during construction.

Whenever sheeting is driven to a depth below the elevation of the top of the pipe, that portion of the sheeting shall not be disturbed or removed. Sheeting left in the place shall be cut off not less than one foot below finished grade. Sheeting shall not be removed until the excavation is substantially back filled.

14.4.8 **Blasting**

All explosives used within the right of way, easement or limits of construction shall be done in strict accordance with the "Georgia Blasting Standards Act of 1977" or of current date. All blasting operations shall be done by blasting contractors licensed under the provisions of the above mentioned act.

The contractor shall contact the Columbia County Emergency and Operations Department a minimum of 48 hours prior to any blasting operations. The current contact number is (706) 868-3303. The contractor shall use matting or other blast protection devices necessary to contain free flying debris. The contractor is solely responsible for any kind of damage resulting from blasting operations.

No blasting shall be performed within 100' of existing structures, piping, or piping under construction within the trench.

14.4.9 **Trench Excavation**

All trenches shall be excavated true to line and grade. All trench widths and bottoms shall be as set forth in these specifications. Trenches for water line installation shall be Trench Type 3. **No water line piping shall be installed on a native rock trench bottom.** See Standard Detail 14.4.9-1.

14.4.9.1 Trench Width minimum width of trench shall be 16" (8" each side of pipe) greater than the pipe diameter. The maximum width of the trench shall be 24" (12" each side of pipe) greater than the O.D. of the pipe. Trench width is defined as the immediate area surrounding the pipe to be installed up to a maximum of 4'-0" of cover above the pipe. Greater excavation depths shall utilize trench protection, shoring, larger trench widths or a combination of these as necessary to install the water lines and to protect life and property.

14.4.9.2 Trench Bottoms for the water line installation shall be 4" to 6" of loose native material to accept the water line. Bell holes shall be dug and placed as to permit first class workmanship on the joint and to insure that the maximum length of pipe possible will uniformly rest on the bottom of the trench. Where necessary, bell holes and excavations for joints shall be dug by

hand. Trenches shall be kept free of water by what ever means necessary. No pipe shall rest directly atop of native rock, saturated earth, frozen earth, contaminated earth, or muck. Native rock, saturated earth, and muck are considered unsuitable material.

14.4.9.3 Unsuitable Material shall include any material that cannot be symmetrically placed and compacted, frozen earth, saturated earth (muck), contaminated earth or rock. Where unsuitable material is discovered, the contractor shall replace the unsuitable material with native material, borrow material or select refill material as set forth in these specifications.

Where unsuitability of the material is in question, the Unified Soil Classification System (USCS) shall be used to make the determination. All unsuitable material shall be disposed of in a manner that can not adversely impact the environment. A CCWU Inspector or Columbia County Engineering Department Inspector must approve disposal location and method.

All material deemed unsuitable because of contamination shall be disposed of in accordance with all state and federal guidelines.

14.4.9.4 Unsuitable Material Replacement shall be installed in 6" lifts after compaction at a maximum of 2'-0" to establish a uniform supporting trench bottom. Replacement material shall be installed as follows:

14.4.9.4.1 *Polyvinyl Chloride Pipe* is to be installed atop excavated unsuitable material, native material shall be placed or borrow material shall be brought in to establish a trench bottom as specified to uniformly support the pipe. PVC pipe shall not be installed atop select refill material.

14.4.9.4.2 *Ductile Iron Pipe* is to be installed atop excavated unsuitable material, native material, borrow material or select refill material may be used to establish a trench bottom as specified to uniformly support the pipe.

14.4.9.4.3 *Hydric Soil Installations* of DIP shall be completely restrained and installed within a polyethylene encasement.

14.4.9.5 Rock Excavation shall be defined as the removal of material that cannot be excavated without systematic drilling and blasting or jack hammering. Any boulder larger than ½ cubic yard generally is also classified as rock. **All excavated rock shall be removed from the site and may not be used as backfill.**

14.4.9.6 Over Excavation for other than the removal of unsuitable material shall require backfill to be installed as set forth within these specifications. The backfill material shall be native material, borrow material or select refill material as required.

14.4.9.7 Native Material (Excess) shall be stockpiled a sufficient distance from the side of excavation walls to prevent excessive surcharge on the wall. All suitable fill and backfill material in excess shall be stored properly to be readily used whenever unsuitable excavated material is encountered. This material shall be used for fill and backfill before borrow material shall be brought in and used. Excess excavated material not suitable or required for backfill or filling shall be wasted within the limits of the site or removed as directed. Any wasting of excess material along sanitary sewer line easements shall be pre-approved.

14.4.9.8 Borrow Material shall be brought in after suitable excess native material has been exhausted as backfill. The material shall be a Class II material that consists of sand-clay soils (SW-SC) in accordance with ASTM D 2487. The material shall be free of rocks, foreign material, saturated earth or frozen earth and capable of being readily shaped and compacted to the as required.

14.4.9.9 Select Refill Material shall be Class I (with less than 5% fines) material. Class I material shall be crushed stone or gravel of suitable graduation in accordance with ASTM D 2487 (GW) or GDOT Section 800. Material shall be free of sod, sticks, roots and other organic, perishable or deleterious matter. The stone or gravel shall be #57 stone. Select refill material shall be used to refill the trench bottom to a minimum depth of 6" where rock excavation is required in the trench or unsuitable material is encountered. Select refill material shall not be used for PVC pressure pipe bedding. Select refill material shall be placed in 6" lifts up to a maximum of 2'-0" as set forth in these specifications.

14.4.9.10 RIP RAP shall be graded stone material between the sizes of 12" through 24" in accordance with GDOT Type 1 RIP RAP. The stone shall be free of sod, sticks, roots and other organic, perishable or deleterious matter. All areas shall be properly compacted and prepared to receive the stone and ensure stability of the area.

14.5 Pipe Laying

Each pipe shall be laid true to line and grade in such manner as to form a closed concentric joint. All installation shall proceed with the bells in the direction of laying. Where the pipe line or grade is deflected as a result of poor installation, or the pipe is not uniformly supported, the laying shall cease, and the pipe and backfill shall be removed and re-laid true to line and grade. No pipe shall be free dropped into the trench for installation.

14.5.1 Cleaning bells and spigot ends of the water line shall be thoroughly performed before installation. All dirt and superfluous materials shall be removed from the pipe before the joint is closed. **When pipe laying is not in progress, all open ends shall be kept tightly closed with an approved temporary plug.**

14.5.2 Joint Closure or makeup shall be in accordance with the manufacturer's recommendations. Pipe closure methods shall not damage the bell of the pipe being inserted. Any damaged pipe shall be removed immediately from the site.

14.5.3 Open Trench maximum length shall be limited to as much pipe that can be installed and properly backfilled in one work day period or a maximum of 300' at one time. No pipe shall be laid when the condition of the weather or the trench bottom is

unsuitable for such work.

14.5.4 Pipe Cutting shall be done with a mechanical cutter, in a neat workmanlike manner, without any damage to the pipe or coatings. Cut pipe shall be worked to facilitate an assembly in strict accordance with the manufacturer's recommendations.

14.5.5 Deflection of pipe shall be in strict accordance with manufacturer's recommendations. Where the deflection is greater than recommended, a fitting shall be installed or the pipe shall be removed and completely re-laid within the maximum allowable deflection.

14.5.6 **Trench Back Filling (Up to top of pipe)**

When backfilling begins, the trench shall be completely dry, and free of any water or ground water intrusion. Backfill shall be placed symmetrically in a loose form to insure complete support in the lower quadrant of the pipe and along the sides of the pipe. This material shall be symmetrically tamped thoroughly up to the top of the pipe.

14.5.7 **Trench Backfilling (From the top of pipe)**

Backfilling from the top of the pipe up to finish grade or sub-grade, including around valves and structures, shall be mechanically tamped or compacted as follows:

14.5.7.1 First Lift above the pipe shall be a minimum of 12" in depth after proper tamping. This lift shall be carefully placed, uniform in depth and length, across the trench. The lift shall be mechanically tamped or compacted using a remote operated vibratory sheepsfoot, to the required compaction.

14.5.7.2 Second Lift above the pipe shall also be a maximum of 12" in depth. This lift shall be carefully placed, uniform in depth and length, across the trench. The lift shall be mechanically tamped or compacted using a remote operated vibratory sheepsfoot, to the required compaction.

14.5.7.3 Remaining Lifts shall be a maximum of 24" in depth. These lifts shall be carefully placed, uniform in depth and length, across the trench. The lift shall be mechanically compacted using a remote operated vibratory sheep's foot or an operated vibratory sheepsfoot. Operated mechanical compactors shall not be used over the water line unless a minimum of 48" of backfill has been placed.

14.5.8 **Trench Backfill Material**

Backfill Material shall be defined as lightly consolidated material free of rocks, foreign material, or frozen earth and readily available to be placed in the trench and tamped or compacted as required. Backfill material shall be either native material or borrow material. Select refill material shall not be used as backfill for water line installation. All backfilling operations shall be symmetrical and placed in uniform horizontal layers as set forth in these specifications. The maximum lift shall not exceed 24". Each lift shall have the optimum moisture content when compacted. **The contractor is responsible for determining the maximum depth of the lifts per soil conditions for proper compaction.**

14.5.8.1 Where backfill material becomes saturated, it shall be spread out and

dried before use as backfill or fill material.

14.5.8.2 Flowable Fill Material shall not be used as backfill material for water lines.

14.5.9 **Compaction**

14.5.9.1 Right of Way compaction for all water lines under pavement or within a roadway right of way shall be mechanically tamped or compacted to a minimum of 95% density from the top of the pipe to finish grade.

14.5.9.2 Under Pavement compaction for all water lines under pavement or within a roadway right of way shall be mechanically tamped or compacted to a minimum of 95% density from the top of the pipe to within 1'-0" of the sub-grade. All water lines under any pavement shall have the last 1'-0" of backfill mechanically compacted to 100% density.

14.5.9.3 Offsite compaction for all water lines outside of the right of way or not under pavement shall be mechanically compacted to a minimum of 85% density unless otherwise indicated on the drawings or details.

14.5.9.4 Compaction Test Densities shall be standard proctor in accordance with ASTM D698. The contractor shall provide compaction testing as required.

14.5.9.5 Failed Testing shall require backfill lifts to be removed and backfilled and re-compacted as directed using a maximum of an 8" lift after compaction.

14.5.9.6 Unacceptable Means of Compaction shall be any means of compaction not listed in these specifications and shall be rejected. If at any time methods of compaction are observed which are not in accordance with the above specifications, it is assumed that such methods were employed prior to observation, and no work or pipe previously placed shall be accepted for service by the Columbia County Water Utility. The burden of proof to the contrary shall be on the contractor.

14.6 Fittings

Fittings shall be manufactured from ductile iron grade 70/50/05 in accordance with ANSI A21.10 / AWWA C110 or ANSI A21.53 / AWWA C153. All fittings shall be interior lined in accordance with ANSI A21.4 / AWWA C104 and have an asphaltic exterior coating the same as DIP. All fittings for underground use shall be mechanical joint. All retainer glands shall be manufactured of ductile iron in accordance with ANSI A21.1 / AWWA C111. Cast iron fittings or accessories are not permitted. Fittings shall be manufactured by American Cast Iron Pipe Company, Union Tyler Foundry Company, U.S. Pipe Company or Sigma Corporation. Pre-approval is required for any other fitting suppliers.

14.6.1 Fitting Restraint shall be concrete blocking and or restrained joint as required. All fittings installed to facilitate vertical change shall be restrained joint. A concrete anchor installed below the fitting and pipe is not permitted. Restrained joint pipe in each direction shall be used to develop proper thrust restraint for all vertical changes. See Standard Detail 14.3.2.4-1.

14.7 Fitting Installation

All fittings shall be installed similar to the complete pipe installation as set forth in these specifications. Deflection of joints within the fittings shall be taken after completion of each joint. All glands and/or restraint shall be tightened before fitting is deflected.

14.7.1 Thrust Blocking shall be poured symmetrically at the bearing point of the fitting and firmly against an undisturbed trench wall. The concrete shall be poured to provide access to all joints. No bolts, glands or restraint shall be in direct contact with the concrete. See Standard Detail 14.7-1 for thrust blocking information.

14.7.2 Vertical Offsets that require fittings must be restrained joint. In addition to restrained joint fittings, the assembly shall be made up of restrained joint pipe and/or thrust collars to prevent any movement of the piping assembly. Standard bearing point thrust blocking is not permitted for use with vertical bends. See Standard Detail 14.7.1.2-1, 14.3.2.4-1, 14.7-2, and 14.7-3.

14.7.3 Thrust Collars shall be poured continuous around pipes and bearing against undisturbed earth. Thrust collars shall be poured at least 7 days prior to tie-in connection of water lines. All concrete used shall be a minimum of 3000 psi concrete. All restraining rods used shall be a minimum of A307 steel and completely field coated with bituminous coating after installation. Threaded rod or rebar shall not be bent into thrust block to establish anchoring. All rods shall terminate using a sufficient anchor on the back side of the thrust collar. See Standard Detail 14.7-2 and 14.7-3.

14.8 Gate Valves

All gate valves for water lines shall be non-rising stem type, with a resilient seated gate valves. The gate valve shall have the identifying mark of the manufacturer, year of manufacture and pressure rating cast on the valve body. All gate valves shall open by turning counter-clockwise (left). **Open right valves are not permitted**. An arrow shall be cast into the metal of the operating nut or valve bonnet. Gate valves 16" and larger shall be fitted with gear operators. All gate valves shall be rated for a minimum of 200 psi working pressure and 400 psi testing pressure. All buried gate valves shall be fitted with mechanical joints in accordance with these specifications unless otherwise noted. All gate valves shall be as manufactured by M&H Valve Company, Mueller Company, American Flow Control or U.S. Metroseal. **Butterfly valves are not permitted.**

14.8.1 Valve Body shall be made of a ductile iron. All pressure containing castings shall be full wall thickness and a clear waterway equal to the full nominal diameter of the pipe in accordance with AWWA C509. The interior and exterior of the body and bonnet shall be coated with fusion bonded epoxy in accordance with AWWA C550 Standard for Protective Interior Coatings for Valves and Hydrants. All bolts exposed to the earth shall be stainless steel grade 18-8.

14.8.2 Valve Stem shall be bronze in accordance with AWWA C509.

14.8.3 Stem Extension is required for gate valves or tapping valves deeper than 7'-0", a stem extension shall be added to the valve stem to bring the 2" operator nut to within 5'-0" of finished grade. All stem extensions shall be bronze bar stock with a bronze or stainless steel connector to the valve stem. The connector shall be fitted with a shear

pin and locked into place.

14.8.4 Gate shall be constructed of ductile iron and shall be fully encapsulated with SBR or EPDM rubber.

14.8.5 Operator shall be fitted with a ductile iron 2" square nut for buried gate valves. All gate valves installation within a vault or pit shall be fitted with a standard ductile iron hand-wheel.

14.8.6 Joints for buried gate valves 2" in diameter shall have threaded joints in accordance with ANSI B2.1. All buried gate valves 4" and larger shall be fitted with mechanical joints in accordance with these specifications. All gate valves installed within a vault or pit shall be flanged in accordance with these specifications.

14.8.7 Tapping Valves

All tapping valves shall conform to the Gate Valve requirements of these specifications unless otherwise specified.

14.8.7.1 Joints for tapping valves 2" in diameter shall be threaded joints in accordance with ANSI B2.1. All tapping valves larger than 2" in diameter shall have flanged x mechanical joint ends. All joints shall be restrained.

14.8.8 Tapping Valve Installation

All tapping valves shall be installed in the horizontal position. Back tapping is not permitted. All valves shall be firmly supported and have a valve box installed in accordance with these specifications.

14.9 Gate Valve Installation

Valves shall be installed similar to DIP and in accordance with AWWA 600. All valves shall be installed plumb and have a cast iron or ductile iron valve box placed over the center of the 2" operator nut. The box shall be clean and free from any debris to insure ease of operation. The minimum cover for valves shall be 4'-0". Valves shall not be installed with concrete bedding or concrete anchoring. See Standard Detail 14.9-1.

14.9.1 Valve Box: shall be manufactured of cast iron or ductile iron and be adjustable screw type. Valves with greater than 4'-0" cover shall utilize screw type adjustment barrels to bring the top of the box to finish grade. Valve box covers shall have "Water" cast on the top. A precast concrete ring shall be placed around the valve box opening when outside of paved areas. A piece of pipe is not permitted to be used as a valve box. Valve boxes shall be as manufactured by the Sigma Corporation style VB26 (1-8) as required or approved equal. Valve box tops shall vary in accordance with these specifications.

14.9.1.1 System Boundary Valves**:** All valves labeled on the plans as system boundary valves shall have a lockable lid and have "WATER" cast on the top. These valves shall be normally closed and locked. The cover shall be as manufactured by Trumbull # 367-5045.

14.9.1.2 Fire Line Valving requires a Post Indicator Valve (PIV) type in accordance with Fire Code (current edition and as amended). Specific installations may require an additional buried isolation valve on the fire line.

14.9.1.2.1 PIV shall be manufactured and installed per Fire

Code (current edition and as amended). All PIV shall remain private and be installed on private property. See Standard Detail 14.10-5 for installation locations.

14.9.1.2.2 Buried Fire Valves shall be in accordance with the Gate Valve Section of these specifications. The valve box top shall be lockable, cast with "FIRE" and shall be painted red. The paint shall be a quality enamel paint that will adhere to cast iron or ductile iron and retain its color. The valve box top shall be as manufactured by Trumbull #367-5045 ("FIRE"). See Standard Detail 14.10-5 for installation locations.

14.9.1.3 Valve Identification / Locating **requires** a "V" to be cut into the gutter line or edge of asphalt roadway and painted blue.

14.9.2 Backfill and Compaction shall consist of symmetrically compacting the material around the bonnet of the valve to create a uniform foundation for the valve box to rest.

14.9.3 Valve Anchoring for terminating valves for future expansion shall utilize a sufficient thrust collar or lengths of restrained joint pipe to restrain the valve properly and facilitate ease of re-connection at a future date. See Standard Detail 14.7-3. A sufficient number of restrained lengths of pipe may be used in lieu of thrust collar. The restrained pipe lengths shall include the tee and hydrant assembly.

14.10 Service Line and Appurtenances

All service lines shall consist of a service saddle / tapping sleeve, ballcorp corporation stop / gate valve, copper tubing / DIP, curb stop /gate valve and meter box / concrete vault. All service lines up to 2" diameter shall be rolled soft copper and seamless type "K" conforming to AWWA C800/ASTM B88 and be one continuous piece of copper tubing. Excessive bending or crimping is not permitted. All service lines crimped or damaged during construction shall be completely replaced as directed. All service lines greater than 2" diameter shall be DIP. **PVC, polyethylene or solder joint copper pipe are not permitted.**

All water service lines (2" and smaller) to be installed crossing the GDOT right of way, shall require a casing (steel, PVC or polyethylene). The casing material type shall be determined by the engineer of record according to depth, actual conditions of crossing and shown on plans. The casing diameter shall be sized as to permit ease of copper service pulling through casing.

14.10.1 The developer's contractor is responsible for all water or irrigation services on the plans, added to the plans, removed or relocated as a result of a change in the number of lots or repositioning of the lot lines for the development. Existing service taps that shall not be utilized shall be removed by developer's contractor.

14.10.2 Meters for residential development may be purchased and installed upon final acceptance by the BOC.

14.10.3 Meters for commercial development may be purchased upon plan submittal approval. However; where a water or sewer extension is necessary, the meter shall be

held and not installed until the CCWU Inspector accepts the extension. The developer's contractor is responsible for all water or sewer extensions.

14.10.3.1 Meter Installation up to 2" diameter shall be installed by the CCWUMTD. All meters greater than 2" diameter shall be installed by developer's contractor.

14.10.4 Residential Service Lines shall be a minimum of ¾" diameter. See Standard Detail 14.10-1 and 14.10-1A.

14.10.5 Commercial Service Lines shall be a minimum of 1" in diameter. See Standard Detail 14.10-1 and 14.10-1A. All commercial service lines require backflow prevention. See Section 15.0 for requirements.

14.10.5.1 1 ½:" and 2" Service Lines shall have a service saddle, 2" gate valve, copper tubing, curb stop and super jumbo meter box. See Standard Detail 14.10-2 and 14.10-2A.

14.10.5.1.1 Brass Nipples shall be used for 1 ½" and 2" service line valve connections. The brass nipples shall be closed type and conform to ASTM B43, extra heavy strong wall.

14.10.5.2 4" and Larger Service Lines shall consist of a tapping sleeve, gate valve, restrained joint ductile iron pipe, and meter vault. All 3" and 4" service lines shall be 4" ductile iron pipe. All domestic meters 3" and larger require a concrete meter vault and bypass. Irrigation meters 3" and larger do not require a bypass. See Standard Detail 14.10-3 (3" & 4" meters) and 14.10-4 (6" & 8" meters). See Standard Detail 14.10-8 for irrigation meter vault detail.

14.10.5.3 Metering Including Fire Service All installations to be master metered and to include fire protection may utilize a Fire Line Meter versus a standard domestic service meter. Fire Line Meters shall have an additional fee versus the standard fee for a domestic meter. See Standard Detail 14.10-5 and 14.10-6 and 14.10-7.

14.10.5.4 Fire Service Lines shall be restrained joint ductile iron pipe and fittings through the required isolation valve and/or PIV. Fire service lines do not require an inline meter; however, a detector meter and a backflow preventer must be installed. See Section 15.0 for backflow requirements and Standard Detail 14.10-6 and 14.10-7.

14.10.6 **Service Line Removal and Required Upgrade**

All services that will not be used for the development whether existing or newly installed shall be removed by the developer's contractor. Service meter box and service line shall be removed. The meter box shall be returned to the CCWU Inspector. The corporation stop shall be turned off and capped.

Where an existing service is to be used for the development, the developer is responsible for upgrading the service to meet the current specifications of installation and materials as set forth in these specifications.

14.10.7 **Corporation Stops, Curb Stops and Compression Fittings**

Service line fittings and appurtenances shall be red brass and as manufactured by Ford Meter Box Company or Mueller. Red Brass fittings shall be a "Grip Joint" type as manufactured by Ford or 110 Compression as manufactured by Mueller.

14.10.7.1 **Corporation Stops**

All services lines up to 1" diameter shall have a corporation stop. All 1 ½" and larger service lines shall have a gate valve in lieu of corporation stop. All corporation stops shall be ballcorp corporation stops as manufactured by Ford Meter Box Company, Mueller Company or pre-approved equal.

¾"- FB1000-3G	B-25008
1" - FB1000-4G	B-25008

14.10.7.2 **Curb Stops**

All service lines up to 2" diameter shall have a curb stop on the meter end of the service line.

¾"- BA43-232WG	B-24258
1" – BA43-344WG	B-24258 (1R)
1 ½" – B41-666WG	B-25170
2" – B41-777WG	B-25170

14.10.7.3 **Compression Fittings**

3 Part Union	**90 degree 3 Part Union**
¾" – C44-33G	¾" – L44-33G
1" – C44-44G	1" – L44-44G
1 ½" – C44-66G	1 ½" – L44-66G
2" – C44-77G	2" – L44-77G
Male Adapter *(CTS x MIP)*	**Male Adapter** *(CTS x FIP)*
¾" – C84-33G	¾" – C14-33G
1" – C84-44G	1" – C14-44G
1 ½" – C84-66G	1 ½" – C14-66G
2" – C84-77G	2" – C14-77G

14.11 Service Line Installation

The minimum depth of cover for all service lines shall be 3'-0". A separate trench shall be dug for all water services. Under no circumstances will water services be laid in the same trench as a sewer service lateral. Trench excavation and backfill shall be in accordance with Section 14.0 of these specifications.

14.11.1 Flowable Fill may be used as backfill for service line installation when a casing conduit is be placed prior to backfilling to permit the installation of the service line. ¾" and 1" diameter services shall require a 2" schedule 40 conduit. 1 ½" and 2" services shall require a 4" schedule 40 conduit.

14.12 Meter Box / Meter Vault

All water meters shall be installed within a meter box or vault in accordance with these

specifications. All meter boxes shall be black in color. Meter box/vault locations shall be 5' inside the right of way or within an easement approved by the CCWUED. **All meters shall be at least 10' away from a permanent structure to permit access and maintenance.**

14.12.1 Meter Box shall be installed for all water meters ¾" thru 1" in diameter. Meter boxes shall be "Rome Type" made of cast iron or ductile iron and weigh approximately 40 lbs. Meter boxes shall be 10" x 19" x 12". The top shall have 4 cast ribs on the bottom side to prevent a sliding movement. The top shall have a 1 ½" diameter hole cast in one end to insert touch read service eye.

14.12.2 Super Jumbo Meter Box shall be installed for all water meters 1 ½" and 2" in diameter. The meter box shall be black in color and have a minimum nominal size of 20" x 32" x 18" deep. The meter box shall be a Carson 1730-18 or approved equal.

14.12.3 Meter Vault or Pit shall be installed for all meters 3" and larger. The meter vault or pit shall be a pre-cast concrete structure large enough to accommodate the required piping, valves, meter and proper access for maintenance of assembly. The structure shall be water tight, drain to daylight and be designed for H20 loading. See Standard Details 14.10-3, 14.10-4, 14.10-6, 14.10-7 and 14.10-8.

14.13 Meter Box / Meter Vault Installation

All meter boxes and vaults shall be set in a flat area flush with finish grade. All boxes shall be set to prevent ponding of water around the meter location. All backfilling and compaction shall be in accordance with Section 14.o of these specifications. Where meters must be installed in sloped areas, proper grade adjustments or landscaping shall be done in order to prevent ponding and covering of the meter box or vault. Meter boxes shall not be installed in sidewalks or concrete or asphalt pavement.

14.13.1 Subdivision Installation curb stops shall be installed 8" behind the curb and 10" deep maximum. Meter boxes for subdivision installation shall be set at 6" behind and flush with concrete curbing. The meter box shall be installed on compacted earth to prevent settling of the box. All meter box locations shall be clearly marked in the concrete gutter line or the edge of the asphalt roadway with a "W". The mark shall be clear and neatly etched and painted blue.

14.13.2 Commercial Installation curb stops up to 1" in diameter shall be installed 8" deep maximum. Curb Stops for 1 ½" and 2" applications shall be installed 12" deep maximum. Meter boxes for commercial installations shall be banked to minimize the length of service line and in a uniform alignment. Where meter banks are installed at the curb line, the boxes shall be as specified in subdivision installation. All larger meter vaults shall be installed within the back of the right of way or within an easement as approved by the CCWUED.

14.13.3 Compaction for Meter Boxes and Vaults shall be the same as standard pipe installation. All installations shall prevent the structures from being placed within a hole to create a ponding effect or to prohibit access by the CCWUMTD. All grading and/or additional landscaping to facilitate proper drainage away from the structure shall be the developer's responsibility.

14.13.4 Vault Drain shall have a minimum of a 2" diameter drain with sump area in the bottom of the structure. The drain line shall drain to daylight, into a storm structure or

into a ditch line as approved by a CCWU Inspector. The structure may be installed up to 1'-0" above ground to facilitate drainage as necessary.

14.14 Hydrants

Hydrants shall comply in all respects with AWWA C502, latest revision. Hydrants shall be of the compression type, with the main valve opening against pressure and closing with pressure. The main valve opening shall be 5 ¼" in diameter minimum. Hydrants shall be traffic rated (traffic flange) and of a dry barrel, dry top design. Hydrants shall have 2-2 ½" nozzles and 1-4 ½" pumper nozzles. All nozzle threads shall be National Standard. Hydrants shall be marked with name of manufacturer, size of valve opening, direction of opening and year of manufacture in accordance with AWWA C502. Hydrants shall be as manufactured by M&H Valve Company model #129, Mueller Super Centrion 200 or 250, or American Flow Control model # B84B. Reflective markers shall be placed within the pavement marking all hydrant locations.

14.14.1 Pressure Rating shall be a minimum of 200 psi working pressure and 400 psi testing pressure.

14.14.2 Hydrant Shoe shall be 6" mechanical joint (restrained) in accordance with these specifications.

14.14.3 Operating Nut & Shaft shall be made of bronze and be a 1 ½" pentagon flat to point. The hydrant shall be left opening. The operating shaft or main valve rod shall be stainless steel and bronze combination and fitted with a breakable coupling at the ground flange.

14.14.4 Painting shall be done using water reducible alkyd enamel primer, black (below grade) and a coat of short oil alkyd high gloss enamel, "Fire Department Red" above grade.

14.14.5 Private Hydrants All private hydrants shall be the same as County owned and maintained hydrants. All private hydrants shall have a marker installed on the top bonnet or around the pumper nozzle indicating the hydrant is private.

14.14.6 Reflective Markers All hydrants require a reflective marker be placed one foot right of the center line of pavement along the roadway. Markers shall be 4" square, 3/4" thick, high impact ABS / Acrylic filled with inert thermosetting compound. Markers shall be manufactured by Stimsonite and supplied by Hy-Viz, Incorporated or approved equal. Markers shall utilize an epoxy style material for adhesion in accordance with manufacturer's recommendations.

14.14.7 Yard Hydrants shall be used for lift station installations only. All yard hydrants shall be as manufactured by M&H Style 33 or approved equal.

14.14.7.1 Pressure Rating shall be a minimum of 150 working pressure and 300 psi testing pressure.

14.14.7.2 Hydrant Shoe shall be 2" shoe with threaded joints in accordance with these specifications.

14.14.7.3 Operating Nut & Shaft shall be made of bronze and be a 1 ½" pentagon flat to point. The hydrant shall be left opening. The operating shaft or main valve rod shall be stainless steel and bronze combination.

14.14.7.4 Painting shall be done using a water reducible alkyd black enamel primer below grade and a coat of short oil alkyd high gloss enamel, "Fire Department Red" above grade.

14.15 Hydrant Installation

All hydrants shall be positively restrained to the piping assembly and valve. Rodding or concrete blocking is not permitted. Hydrants shall be easily removable for repair or replacement by simply closing the isolation valve and removing hydrant from assembly. Hydrant pumper nozzles shall face the roadway or apparent travel way. See Standard Detail 14.15-1.

14.15.1 Hydrant Locations shall be as set forth in these specifications and as required on the approved plans.

14.15.1.1 All dead end water lines shall have a Hydrant Assembly.

14.15.1.2 Hydrant assemblies may be added to low points to properly flush water lines and high points to adequately purge air from water lines. **Air release valves are not permitted on water lines.**

14.15.1.3 Within 500' of the most remote point of a residential or commercial structure and/or required by Fire Code (current edition and as amended).

14.15.2 Hydrant Assembly shall consist of a tee, restrained valve, and restrained joint pipe with restrained hydrant. The entire hydrant assembly shall be constructed of ductile iron pipe. Hydrant tees and/or welded outlets may be used in lieu of standard tees in accordance with these specifications. The minimum hydrant assembly length shall be 5'-0". PVC hydrant assemblies are not permitted. See Standard Detail 14.15-1.

14.15.3 Burial shall be a minimum of 4'-0" depth of cover. Where hydrants are connected to lines deeper than 4'-0", greater burial depths shall be used or hydrant extensions added to bring hydrant to "bury line" at finish grade. All hydrants shall have stone placed under and around the hydrant shoe to properly weep the drain valve. The hydrant shall be backfilled and compacted in accordance with Section 14.0 of these specifications.

14.15.4 Hydrant Removal or Relocation shall be pre-approved. All hydrant relocations shall assure fire protection distance requirements as set forth within these specifications or applicable fire codes (current edition and as amended). Hydrants that must be removed shall have the assembly removed and a restrained joint plug installed in the water line tee. The removal shall require a scheduled shut-down. All shut-downs shall be approved/coordinated by the CCWUED.

14.16 Tapping Sleeves / Service Saddles

14.16.1 Tapping Sleeves

Tapping sleeves for wet tap connections shall be full body style wrap around sleeves. The sleeves shall have a full wrap around gasket seal. Tapping sleeves shall be rated for a minimum working pressure of 200 psi.

14.16.1.1 Sleeve Body shall be made entirely of 18-8 304 stainless steel including branch and joint connection. All nuts and bolts shall be 18-8 304 stainless steel and coated to prevent galling. Tapping sleeve branch joints shall

be flange joints in accordance with these specifications. The sleeve shall be fitted with a test port for testing.

14.16.1.1.1 4” -- 12” Smith-Blair #663, Ford Meter Box style FTSS or Mueller H-304SS.

14.16.1.1.2 14” --24” Smith-Blair #662 or Mueller H-304SS.

14.16.2 **Service Saddles**

Service saddles shall be installed for all water service taps. DIP water lines may be direct tapped without a service saddle up to 1" diameter. Saddles shall be epoxy coated ductile iron body with single 3" wide stainless steel strap. All service saddles shall be rated for a minimum working pressure of 200 psi. Service saddles shall be Smith-Blair model 397, Ford Meter Box Company style FC202 or approved equal.

14.16.2.1 Saddle Body shall conform to ASTM A536 and shall be epoxy coated using fusion bonding. Threads for the corporation stop shall be "CC" style up to 1" diameter. Threads for the 2" saddles shall be I.P.

14.16.2.2 Straps shall be 18-8 Type 304 stainless steel. All bolts and nuts shall be 18-8 Type 304 stainless steel and coated to prevent galling.

14.16.2.3 Gasket shall be NSF 61 approved and manufactured of SBR or EPDM.

14.17 Tapping Sleeve / Service Saddle Installation

14.17.1 **Tapping Sleeve Installation**

The contractor shall excavate to locate the existing water line prior to any pipe laying in order to verify depth and horizontal placement. Excavation for the installation of the tapping sleeve and valve shall be adequate enough to determine placement based on existing bell and spigot ends, thoroughly clean the existing pipe all around, fit the tapping machine and safely harbor labor as necessary during all operations for the installation.

14.17.1.1 Tapping Sleeve Placement shall be a minimum of 3'-0" from either end of the existing pipe to be tapped. Where tapping sleeve placement differs from approved plan placement, the contractor shall contact the CCWU Inspector to receive approval for the new placement location before beginning tapping sleeve installation.

14.17.1.2 Tapping Sleeve Initial Installation Once the existing pipe has been thoroughly cleaned, the tapping sleeve or service saddle shall be bolted on the existing pipe. All tapping valves shall be uniformly supported to prevent additional stress to the existing water line or sleeve. The tapping sleeve and valve shall be installed in the horizontal position only. All taps to be made shall face the direction of pipe laying. Back taps are not permitted.

14.17.1.3 Tapping of water lines whether PVC pipe, DIP pipe or CIP shall be in strict accordance with the manufacturer's recommendations and these specifications. All taps made shall retain a coupon of the pipe being tapped. All coupons shall be returned to the CCWU Inspector. Tapping equipment shall be sanitized and made safe for the potable water system application.

14.17.1.3.1 Tapping Bits shall be a shell cutter head type utilizing a pilot bit. All shell cutter bits shall be adequately sized and of first class workmanship free of damage before being used to tap any water line.

14.17.1.4 Pressure Testing the tapping sleeve and valve shall be completed

before any tapping of existing water lines is permitted. The pressure test shall be a minimum of 200 psi for not less than 2 hours. A CWWU Inspector must witness pressure test and authorize the tap to be made.

14.17.2 **Service Saddle Installation**

All service taps shall be located within a roadway right of way or an approved dedicated easement. Service saddles shall be installed on a clean smooth surface of a newly laid water line or existing water line. When approved, multiple saddles or banking of service lines is permitted; however, service taps shall be a minimum of 24" apart and alternated to prevent a longitudinal crack or split within the water line. Saddles shall be installed in the 10 o'clock or 2 o'clock positions unless banked for ¾" and 1" diameter taps. See Standard Detail 14.10-1 and 14.10-1A. All 1 ½" and larger shall be installed in the horizontal position. See Standard Details 14.10-2, 14.10.-2A.

14.17.2.1 Service Saddle Placement shall be a minimum of 3'-0" from either end of the pipe. Where service saddle placement differs from the approved plan placement, the contractor shall contact the CCWU Inspector to receive approval for the new placement location before beginning service saddle installation.

14.17.2.1.1 Service taps shall not be placed on a hydrant assembly lead.

14.17.2.1.2 Service taps shall not be placed on a fitting or a specialty fitting.

14.17.2.1.3 Service taps shall be placed within the metes and bounds of the lot or parcel which shall be served.

14.17.2.1.4 Service taps shall not be tapped off of a private water line.

14.17.2.2 Service Saddle Initial Installation shall be in strict accordance with manufacturer's recommendations and these specifications. Strap tightening shall utilize a torque wrench to insure correct seating and prevent damage to the water line or rolling the saddle gasket.

14.17.2.3 Tapping of PVC, DIP or CIP water lines shall be in strict accordance with pipe manufacturer's recommendations and these specifications. All taps made shall retain a coupon of the water line. All coupons shall be retuned to the CCWU Inspector. Tapping equipment shall be sanitized and made safe for the potable water system application.

14.17.2.3.1 Tapping Bits shall be a shell cutter head type. Taps 1" in diameter and larger shall utilize a pilot bit. All shell cutter bits shall be adequately sized and of first class workmanship free of damage before being used to tap any water line.

14.18 Bore and Jack Crossing

14.18.1 Steel Casing Pipe

All casing pipe shall be smooth steel pipe with minimum yield strength of 35,000 psi. The minimum diameter shall be 12" I.D. Standard lengths of casing shall be 20' but 40' lengths may also be supplied as standard casing pipe. The joints shall be matched-cut and marked from the supplier. The joints shall be butt welded in the field by a qualified technician. A 1/16" corrosion allowance of wall thickness has been included in the tabulated pipe data in lieu of any coating and wrapping requirement. See Standard Detail 14.18-1.

14.18.2 Casing Spacers

All casing spacers shall be constructed of a stainless steel band, bolts and nuts conforming to ASTM A240. The band shall be lined with an elastomeric PVC material conforming to ASTM D149. The spacer or chock between the band and casing pipe shall be reinforced nylon or polyethylene per ASTM D638. The casing spacer shall be Powerseal Casing Chock model 4810, Advanced Products and Systems model SSI, or approved equal. The casing spacers shall be securely installed on the pipe at a maximum of 10'-0" apart along the entire length of the carrier pipe. Adjustment to spacers is permitted to meet correct alignment as long as the carrier pipe is not in a bound position within the casing pipe. Wood blocks are not permitted as spacers.

14.18.3 Carrier Pipe

All carrier pipes shall be restrained ductile iron pipe in accordance with these specifications. PVC pipe is not permitted as carrier pipe. The carrier pipe installed within the steel casing shall be pushed through the casing pipe on casing spacers securely fastened to the carrier pipe. The carrier pipe shall be protected against the pushing mechanism to prevent damage to the ends of the pipe. All damaged pipe shall be removed and replaced.

14.18.4 Casing to Carrier End Seals

End seals shall be a minimum of 1/8" thick synthetic rubber and have adjustable stainless steel banding straps with a non-magnetic worm gear mechanism. End seals shall be Advance Products and Systems (APS) model AM or approved equal.

14.18.5 Bore and Jack Installation

All pits necessary for the operation shall be made to facilitate a safe working area, protect all existing structures and prevent any road failure. The front line of the bore pit must be a minimum of 5'-0" from the existing edge of pavement. The jacking operation shall be the dry method and utilize cushioning on the end of the pipe subjected to the forces from the jacking device. Any damaged pipe shall be cut off and removed from the site. After the carrier pipe has been completely installed, the CCWU Inspector shall verify line and grade before casing to carrier ends can be installed. All bore and jack operations that are deflected more than can be corrected through adjustable spacers must be aborted and abandoned in place.

14.18.5.1 **Aborted/Abandoned Bore and Jack**

All unsuccessful bore and jack installations which must be abandoned due to failure to meet alignment or grade requirements or rock discovery may leave the casing pipe in place. The casing pipe shall be completely filled with concrete or flowable fill under pressure. Upon completion of the aborted bore, the contractor shall contact the engineer of record and CCWUED before attempting another crossing.

14.19 Creek Crossing

Creek crossings may be installed by the bore and jack method or conventional open cut method. All creek crossings shall consist of a steel casing pipe, restrained joint ductile iron carrier pipe, casing spacers, casing to carrier end seals, and concrete anchors in accordance with these specifications. See Standard Detail 14.18-1 or 14.19-1.

All installations shall adhere to all erosion and sediment control guidelines to minimize the impact to the waterway.

14.19.1 **Creek Crossing Installation**

A creek crossing using the bore and jack method shall be in accordance with Section 14.18 of these specifications.

14.19.1.1 Open Cut Method shall receive a Rip Rap lining 10' wide centered over the trench from top of bank to top of bank. The Rip Rap material and installation shall be in accordance with these specifications to prevent washout or movement of the stone blanket.

14.20 Hydrostatic Testing (Pressure and Leakage)

After completion of the piping, it shall be tested for leaks in accordance with AWWA C600 and proved tight at a minimum of 200 psig. The contractor shall provide, at his expense, all labor, supervision, pumps, measuring devices, power, miscellaneous equipment, temporary plugs or valves and water necessary for the performance of all hydrostatic testing of all piping in accordance with the requirements of these specifications. **Allowable pressure differential shall be plus or minus 5 psig.**

14.20.1 Preparation of Testing shall include the installation of all service taps, chlorination and sample taps along with concrete blocking or additional restraint before pressure testing shall begin. The contractor is required to thoroughly flush the newly laid water line prior to pressure testing. All newly installed pipe, or any valved section thereof, shall be subjected to the appropriate hydrostatic pressure based on the elevation of the lowest point in the line or section under test and corrected to the elevation of the test gage. All air must be expelled from the water line before testing shall begin.

14.20.2 Pressure Test shall be conducted in the presence of a CCWU Inspector and in accordance with these specifications. The contractor shall have the testing service line completely uncovered and clearly visible in order to verify pumping hook up or testing will cease.

14.20.3 Test Duration shall be a minimum of two hours.

14.20.4 Repairs shall be made to any cracked or defective pipe, joints, fittings, valves or hydrants discovered in consequence of the pressure test shall be removed and replaced

with sound material and the test shall be repeated until satisfactory to the CCWU Inspector.

14.20.5 Testing Tap (service): shall be removed unless service shall be used for water service line. Removal of the service shall consist of removing curb stop, tubing, and capping or plugging corporation stop in the closed position.

14.20.6 **Allowable Leakage**

Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof, necessary to maintain the specified test pressure. No pipe installation will be accepted unless leakage is less than the number of gallons per hour as determined by the formula:

$$L = \frac{D\sqrt{P}}{133}$$

L = Allowable leakage in gallons per hour per 1,000 ft. pipe.

D = Nominal diameter of the pipe in inches.

P = Average test pressure during the leakage test in psig.

All visible leaks shall be repaired regardless of the allowance used for testing.

14.21 Chlorination / Disinfection

All piping complete with fittings and appurtenances shall be flushed until thoroughly clean, and sterilized as specified in AWWA C651 and in accordance with these specifications. Disposal of heavily chlorinated water (following disinfection) must be accomplished in accordance with AWWA C651. Heavily chlorinated water shall not be deposited directly into a live creek or stream. The requirements of this paragraph apply equally to new pipe and fittings, and to existing pipe lines into which connections have been made, or which may have been otherwise disturbed to the extent that contamination may have occurred.

14.21.1 All disinfection methods and practices are thoroughly described in the AWWA manual "Disinfection of Pipelines and Storage Facilities Field Guide" (ISBN 1-58321-423-2).

14.21.2 Chlorine Chemicals

All chlorine chemical concentrations shall be in accordance with ANSI/AWWA B300. All chemicals used to create chlorine solutions shall be new and have been properly stored before use in disinfection process. All chlorine solutions introduced into the pipe line shall not exceed 100ppm. **Chlorine liquid, calcium hypochlorite tablets, or calcium hypochlorite for swimming pools are not acceptable chemicals for disinfection.** The only chlorine chemicals permitted for disinfection shall be as follows:

14.21.2.1 Sodium Hypochlorite in liquid solution containing 5-15% available chlorine. The chemical solution shall be mixed as required and injected into the water line.

14.21.2.2 Calcium Hypochlorite in granular or powdered form containing

approximately 65% available chlorine. Calcium hypochlorite chemical shall be solely used as a pre-mixed solution and introduced into the water line as a liquid. Granules or powder dumped or thrown into the inside the pipe line is not permitted.

14.21.2.2.1 Chlorine Testing shall be the contractor's responsibility in order to produce the proper dosage (ppm) of chlorine during all phases of disinfection. The contractor shall be responsible for adequately flushing all air out of the system before chlorine testing. The contractor may secure the HACH test kit model CN-21P for 10-200ppm (High Range) and the HACH test kit model CN-70 for 0-3.5ppm (System Residual) to verify dosages and expedite the disinfection process.

14.21.3 Water Feed Source shall be made through the temporary connection to the existing Columbia County Water System. See Standard Detail 14.21-1.

14.21.3.1 Temporary Connection shall consist of a piping arrangement that contains a meter and backflow device between the existing water system and newly installed piping. The maximum distance between the existing system connection point and newly laid water line shall be 18'. This connection shall be in use until all flushing, pressure testing and disinfection is complete and finalized by the CCWU Inspector. See Standard Detail 14.21-1.

14.21.3.1.1 Meter and Backflow device shall be rented from the CCWU Main Office.

14.21.4 Chlorine Injection shall be pre-mixed and made a homogenous solution before injecting into the water line. The injection tap shall be done thorough an adequately sized tap not less than 1" diameter. All chlorine injection points shall be within 10' of the water feed source.

14.21.5 Sample Tap installations shall be the same as service line installations. All sample taps installed shall extend a minimum of 12" above finish grade with a curb stop readily available to be sterilized by an open flame. Where sample taps shall only serve as sampling sites, the appropriate pressure rated polyethylene tubing may be used with a brass curb stop. **A hydrant shall not be used as a sample location.** Galvanized pipe is not permitted as sample line material. See Standard Detail 14.21-2.

14.21.5.1 Sample Tap Locations shall be installed at each end of the water line and no more than 1200 feet apart along the length of the newly laid water line. A minimum of three sample taps shall be installed for shorter lengths of water lines. Service tap installations may also be used as sample points.

14.21.5.1.1 Sample / Flushing Taps for water Lines (short side fire lines) installed without a hydrant to properly flush the line shall, require a temporary restrained plug with a minimum of a 2" tap to adequately flush and serve as a sample point.

14.21.5.2 Securing Sample & Service Taps shall be performed by the contractor. Each curb stop shall be locked using a combination padlock or keyed padlock before disinfection begins. The contractor is responsible for purchasing and installing all locks necessary to secure taps before the

disinfection is complete.

14.21.5.2.1 Sample / Injection Tap Removal shall be in accordance with Section 14.20.5 of these specifications.

14.21.6 **Disinfection Procedure**

The disinfection procedure shall not begin until the water line has been thoroughly flushed and has passed the pressure testing required. **The disinfection procedure takes a minimum of 4 days to complete. The CCWU Inspector shall be notified not less than 48 hours in advance to schedule required disinfection. Inspector must be present during all stages of disinfection.**

14.21.6.1 **All sample tap and service tap curb stops shall be locked before beginning disinfection.**

14.21.6.2 **Day 1 (High Range):** Disinfection shall consist of the injection of the chlorine solution into the entire water line and appurtenances in a homogenous solution. The line shall be tested to verify a minimum chlorine residual of 50ppm. After the inspector has verified that 50ppm exists within the entire water line, the high range shall remain in the line for a minimum of 24 hours.

14.21.6.2.1 No water shall be flushed, moved or used from the line at this point. Where water has been removed from the water line, Day 1 shall be repeated.

14.21.6.2.2 Where the inspector has determined that a chlorine residual of 50ppm has not been achieved at all sample locations, the contractor shall attempt to correct this deficiency. If the deficiency cannot be corrected, the water line shall be thoroughly flushed and Day 1 shall be repeated until a minimum of 50ppm can be achieved at all sample locations.

14.21.6.2.3 The maximum high range chlorine residual shall be 100ppm. Where the chlorine residual is greater than 100ppm at particular sample locations, the contractor shall flush and/or move water to maintain no more than 100ppm.

14.21.6.3 **Day 2 (High Range Verification, TCB Set 1):** The water line shall be tested 24 hours after all sample locations were verified at a minimum of 50ppm. The chlorine residual shall not be less than 25ppm. After the inspector has verified a minimum of 25ppm within the entire water line, the high range shall be thoroughly flushed out and the system residual shall be loaded into the water line to remain for another 24 hours. The inspector shall document system residual for later verification.

14.21.6.3.1 **Where test locations have less than 25ppm, the disinfection procedure shall cease and be repeated beginning at Day 1.**

14.21.6.3.2 **The first set of TCB samples shall be taken.**

14.21.6.4 **Day 3 (System Residual):** The water line shall be tested 24 hours after all sample locations were verified to maintain system residual. The chlorine residual in the water line shall be approximately 70% of the previously verified system residual from Day 2. After the system residual is verified, the Total Coliform Bacteria (TCB) samples shall be drawn and sent to the CCWU Central Lab for testing. The testing requires another 24 hours.

14.21.6.4.1 **Where test locations have less than approximately 70% of previously verified system residual, re-disinfection may be required.**

14.21.6.5 **Day 4 (TCB Set 2):** Where all of the TCB samples return with a negative result 24 hours later, the water line shall be considered disinfected. The CCWU Inspector shall notify the contractor of the result. All locks for service taps may be removed. All sample taps shall be removed in accordance Section 14.20.5 of these specifications.

14.21.6.5.1 **TCB samples cannot be drawn while it is raining.**

14.21.6.5.2 **Where any TCB is returned positive, the water line shall be completely flushed. Twenty four hours later, repeat TCB samples shall be taken. Fourty eight hours later, a second set of repeat samples shall be taken to verify the initial failed sample results.**

14.21.6.5.3 **Any positive repeat sample or Ecoli positive sample shall constitute re-flushing and re-chlorination of the water line beginning at Day 1.**

14.21.6.6 The contractor shall be responsible for contacting the CCWU Inspector and scheduling a connection to the existing system.

14.22 Connections or Repairs to Existing Water System

14.22.1 The contractor shall over excavate the area to insure a proper work space and facilitate dewatering the existing pipe properly to prevent any cross contamination by trench water. The contractor shall provide a pump sufficient for the rate of flow and/or appropriate drainage to ensure there is no backflow into the existing water line. The cut or break in the existing water line shall be at the highest point of the connection as possible. All repairs and connections to the existing water system shall be done in the presence of a CCWU Inspector.

14.22.1.1 Connection The contractor shall verify existing conditions of tie-in and submit to CCWUED for approval, a sketch of the connection if conditions differ from plans.

14.22.1.2 The contractor shall furnish and install all fittings and appurtenances necessary to make connections to the existing water system. All solid sleeves used to cut into existing pipes shall have a maximum gap of 3/4" between butted plain end pipes. Where this is unable to be achieved, a filler ring shall be installed to close the gap between the cut pipes. All sleeves shall be restrained joint.

14.22.1.2.1 Disinfection of connections or repairs to the existing water system shall utilize a bleach solution of 1 1/2 parts water to 1 part bleach. The solution shall be sprayed inside pipe, valves, fittings and appurtenances before the connection is to be put back on line with the existing water system. A CCWU Inspector shall be present to witness all stages of connection or repair.

14.23 Final Inspection

The contractor is also responsible for contacting the engineer of record to request that the as built and final plat be prepared and submitted prior to final inspection. The contractor is responsible for contacting the CCWU Inspector once all the work is complete to schedule a final inspection.

14.23.1 The CCWU Inspector shall have the first submission of the as built and final plat in hand to conduct the final inspection.