

SECTION 12.0

SANITARY SEWER SYSTEM CONSTRUCTION

12.1	Construction of Gravity Sanitary Lines	12-1 thru 12-3
12.2	Protection of Existing Utilities and Restoration of Property	12-3
12.3	Work Site Safety	12-3 thru 12-4
12.4	Warranty of Work	12-4
12.5	Materials	12-4 thru 12-9
12.6	Gravity Sewer Line Installation	12-9 thru 12-10
12.7	Dewatering and Drainage of Excavated Areas	12-10
12.8	Protection Against Flotation	12-10 thru 12-11
12.9	Shoring and Protection of Excavation	12-11
12.10	Blasting	12-11
12.11	Trench Excavation	12-11 thru 12-13
12.12	Pipe Laying	12-14 thru 12-15
12.13	Testing of Gravity Sanitary Sewer Lines	12-15 thru 12-17
12.14	Standard Manholes	12-17 thru 12-22
12.15	Air Release Valve (ARV) Manholes	12-22
12.16	Service Laterals	12-22 thru 12-23
12.17	Bore and Jack Crossings / Creek Crossings	12-23 thru 12-24
12.18	Aerial Crossings	12-24 thru 12-25
12.19	Force Main	12-25 thru 12-26
12.20	Force Main Valves	12-26 thru 12-27
12.21	Miscellaneous Equipment	12-28
12.22	Final Inspections	12-29
	Sanitary Sewer Line Air Testing Data Sheet	12-30
	Manhole Vacuum Testing Data Sheet	12-31

12.0 SANITARY SEWER SYSTEM CONSTRUCTION

12.1 Construction of Gravity Sanitary Lines

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 gravity sanitary sewer lines. This shall include, but not be limited to, all excavation, trenching, removal and replacement of unsuitable materials, grading, and all pipes and fittings, as shown on the design plans and in these specifications.

BOC:	<u>Columbia County Board of Commissioners</u>
CCWU:	<u>Columbia County Water Utility</u>
CCWUED:	<u>Columbia County Water Utility Engineering Department</u>
CCWUMTD:	<u>Columbia County Water Utility Meter Department</u>
CCDSD:	<u>Columbia County Development Services Department</u>
AWWA:	<u>American Water Works Association</u>
ANSI:	<u>American National Standards Institute</u>
ASTM:	<u>American Standard of Testing Materials</u>
COE:	<u>United States Army Corps of Engineers</u>

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.

12.1.1 License, Permits, Plans and Notifications, Approved Equal, Additional Inspections, Erosion and Sedimentation Control

12.1.1.1 Contractors Utility License

All work associated with the repair, modifications or additions to the Columbia County Water Utility Sanitary Sewer 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.

12.1.1.2 Permits

The engineer 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 necessary 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 (CCDSD).

12.1.1.3 Plans

It is the intent of this section of the specifications that the contractor's bid on this work be based upon the plan, drawings and these specifications and with all applicable codes, permits and regulations as amended by any waivers.

The contract drawings, 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. No work shall be accepted by the CCWUED with any unapproved departures or deviations from the contract drawings, standard drawings or plans.

All sanitary sewer 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.

12.1.1.4 Notifications

The contractor shall notify the Columbia County Water Utility Engineering Department 48 hours in advance of commencing any construction. The contractor shall not make any connections to existing manholes, lateral taps or pipe installations without the presence of a CCWU Inspector.

All work that requires temporary shut downs and/or bypassing of the sanitary sewer system shall be approved by the CCWUED. The contractor shall be required to hand out and notify all potentially affected customers. All work shall be closely coordinated through the CCWUED Inspector. Customers must be given a minimum of a 72 hour notice.

12.1.1.5 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.

12.1.1.6 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.

12.1.1.7 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.

12.2 Protection of Existing Utilities and Restoration of Property

The contractor is responsible for locating all utilities and 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.

12.3 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, and red lanterns, flashing lights and guards during construction work until it is safe for traffic to use the roadway. All materials, equipment, pipe or 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 the County. Any and all federal, state and local safety requirements shall be met by the contractor.

All road closures necessary to facilitate the construction of sanitary sewers shall be pre-approved through the Columbia County Development Services Department and Traffic Department. The contractor is responsible for all traffic control measures and notifications that are required. A minimum of a 72 hour notice must be given.

12.4 Warranty of Work

The developer shall warranty all materials and workmanship for one year from the date of final acceptance by the B.O.C.; however, sanitary sewer service laterals shall have a warranty of one year from the date of occupancy of each lot.

12.5 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 be limited to, blemishes such as cracking, splitting, spalling, damaged coatings, bending, dents and deformations of any type. Material shall be protected from damage at all times including during storage. The materials may be inspected at any time and deemed unsuitable or damaged. Where materials are deemed damaged, the materials shall either be satisfactorily repaired or removed from the job site. All repairs shall be in accordance with manufacturer's recommendations.

12.5.1 Storage of Materials

Pipe, fittings and appurtenances shall be stored above the ground free from foreign material exposure, and UV exposure per manufacturer's recommendations. All PVC materials that will be stored for more than 30 days shall be adequately covered to protect against UV exposure.

12.5.2 Pipe Specifications

Unless otherwise noted, all gravity sanitary sewer shall be Polyvinyl Chloride Pipe (PVC) and in accordance with the following specifications.

12.5.2.1 Polyvinyl Chloride (PVC) Pipe (Standard Underground Installation)

PVC sewer pipe shall be solid wall, bell and spigot pipe, furnished in 12' to 14' lengths and green in color. The pipe shall be made of compounds conforming to ASTM D1784 and as a minimum, manufactured in accordance with the material requirements of ASTM D3034, ASTM D2241 or ASTM F679. Solvent Weld pipe or fittings are not permitted.

12.5.2.1.1 Gravity Sewer pipe 8" and 10" shall conform to a minimum of ASTM D3034 SDR 35.

12.5.2.1.2 Gravity Sewer Pipe 12” to 15” shall conform to minimum of ASTM D3034 SDR 26. Sanitary sewer lines 15” and larger shall be considered a trunk line.

12.5.2.1.3 Gravity Sewer Pipe 18” and larger shall conform to ASTM F679 PS 115.

12.5.2.1.4 Service Lines shall be 6” diameter and conform to ASTM D3034 SDR 35 or SDR26 as required.

12.5.2.1.5 All fittings and couplings shall be fabricated or molded with a bell and spigot conforming to ASTM D3034 SDR35, SDR26 or ASTM D2241 SDR26 per application.

12.5.2.1.6 Transition Adapter Fittings shall be fabricated or molded fittings and manufactured from the same material as standard fittings and meet or exceed ASTM D3034, F1336, and F679. Fernco type couplings are not permitted.

12.5.2.1.7 Transitions from ASTM D3034 PVC SDR35 pipe to ductile iron pipe shall utilize Multi-Fittings Trench Tough Plus™ CIOD-SEWER ADAPTER or approved equal.

12.5.2.1.8 Transitions from ASTM D3034 PVC SDR35 pipe to ASTM D2241 PVC SDR26 pipe shall be Multi-Fittings Trench Tough Fittings #043651 or #043232 (6”), #043714 or #143003 (8”), #043033 (12”) or approved equal.

12.5.2.1.9 Repair Sleeves shall be Multi-Fittings repair couplings #063626 (6”), #063627 (8”), #063630 (10”), and #043631 (12”) or approved equal. Repair sleeves for larger sewer lines shall be similar. The vertical and horizontal alignment of the repair sleeve shall be accordance with standard sewer line installation.

12.5.2.1.10 Joints for PVC pipe and fittings shall have gaskets integrally molded into the bell. Gaskets shall be constructed from a flexible elastomeric material and comply with the physical and installation requirements of ASTM D3212 and ASTM F477.

12.5.2.1.11 Restrained Joint PVC pipe for gravity sewers shall be a minimum of ASTM D2241 SDR26. The restraint for PVC bells shall utilize Mega-Lug® Series 6500 clamping systems or approved equal. Where ASTM 2241 SDR26 is installed, the reach shall be from manhole to manhole or transitioned as required.

12.5.2.1.12 All PVC fittings that require restraint shall be a minimum of ASTM D2241 SDR26. The restraint for PVC fittings shall utilize Mega-Lug® Series 7500 clamping systems or approved equal. PVC fittings are only permitted to be used for

service lateral connections to the main, special conditions for drop connections, and transition adapters.

12.5.2.1.13 Lubricant used for jointing shall be as directed by the manufacturer.

12.5.2.2 Ductile Iron Pipe (EDIP)

All gravity sanitary sewer or force mains and associated fittings that are to be Ductile Iron shall be epoxy lined. Standard cement lined ductile iron pipe or fittings is not permitted for sewer use. Epoxy Lined Ductile Iron Pipe (EDIP) is intended as a remedial measure for Non-Standard or specific applications. Each piece of sewer pipe must be labeled as sewer pipe and contain trade name of lining.

12.5.2.2.1 Interior Lining of the ductile iron pipe for sanitary sewer use shall be epoxy lined. Epoxy lined ductile iron pipe and fittings shall have a completely covered inner surface of the pipe and fittings from bell to spigot. The lining shall be virgin polyethylene complying with ANSI/ASTM D1248 and be a minimum of 40 mils in thickness as manufactured by American Cast Iron Pipe (ACIPCO) Polybond Lining, or U.S. Pipe Protecto 401 Ceramic Epoxy lining. Sewer pipe with lining defects such as cracking or holes in the lining shall not be installed and shall be removed from the site immediately. Field repair of the epoxy lining is not permitted.

12.5.2.2.2 Gravity Sewer Pipe 6” to 12” shall be Pressure Class 350 in accordance with ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51.

12.5.2.2.3 Gravity Sewer Pipe 16” and larger shall be a minimum of Pressure Class 250 in accordance with ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51. Loading and depths may require greater Pressure Classes of pipe.

12.5.2.2.4 Flanged Ductile Iron Pipe and Fittings shall be 4” and larger. Flanged pipe shall be a minimum of Class 53 pipe per AWWA C115. Flanged pipe, fittings and appurtenances are for the above ground use, inside vault, or lift station wet well only. Flanged pipe shall be shop fabricated, faced drilled, lined and exterior coated by the manufacture or manufacturers lining company. Fabrication or lining of flanged pipe on site is not permitted. Complete shop drawings of all pipe, fittings and appurtenances shall be submitted the Columbia County Water Utility Engineering Department for approval before delivery to the site.

12.5.2.2.5 Underground Fittings shall be mechanical joint and conform to C110/ANSI A21.5 or AWWA C153/ANSI A21.53. All follower glands shall be made of ductile iron only. Restraint for fittings shall be in accordance with these specifications. Ductile Iron fittings are only permitted to be used for service lateral connections to the main or drop connections into manholes for gravity sewer applications.

12.5.2.2.6 Underground Pipe shall be push on or restrained (restrained gasketed) joint pipe and shall conform to AWWA C151/ANSI A21. Push on or restrained joint pipe shall be “Fastite” as manufactured by ACIPCO , “Tyton”as manufactured by U.S. Pipe or approved equal.

12.5.2.2.7 Underground Restrained Joint Pipe shall utilize a form of positive restraint. Positive restraint shall be defined as either a restraining gasket or a retainer clip or ring that rests or locks firmly against a welded on ring to the spigot end of the pipe. All restraining gaskets shall be rated for a minimum working pressure of 250 psi. The gasket shall be Underwriters Laboratories listed and Factory Mutual approved. Restraining gaskets shall have stainless steel gripping wedges to completely retain the pipe. Gaskets shall be “Fast-Grip” as manufactured by ACIPCO, “Field-Lok” as manufactured by U.S. Pipe or approved equal. Restrained joint pipe other than restrained gasketed joints shall utilize a retainer type restraint welded firmly to the spigot of the pipe. Restrained joint pipe shall be “Flex-Ring or Lok- Ring” as manufactured by ACIPCO, “TR-Flex” or “HP Lok” as manufactured by U.S. Pipe or approved equal. All flanged jointing shall be recognized as restrained joint.

12.5.2.2.8 Gaskets for EDIP pipe and fittings shall utilize a synthetic rubber gasket and bell combination conforming to ANSI A21.11. All cutting of pipe and joint assembly shall be in strict accordance to manufacturer’s recommendations.

12.5.2.2.9 Restrained Joints for Fittings shall be standard mechanical joints in accordance with ANSI A21.5 and utilize a ductile iron retainer ring with gripping wedges that firmly grips into the plain end of the pipe. All restraint shall be Mega-Lug® series 1100 or series 1100SD restraining system or approved equal.

12.5.2.2.10 Lubricant used for jointing shall be as directed by the manufacturer.

12.5.2.2.11 Flanged Joints for Pipe and Fittings shall be for the above ground use only and in accordance with ANSI A21.15. Fittings shall be in accordance with ANSI A21.10, A21.11, and

A21.53. Flanges for pipe, fittings and gaskets shall be in accordance with ANSI B16.1 Class 125 flanges. Flange nuts and bolts shall be in accordance with ANSI B18.2.1 and ANSI B18.2.2.

12.5.2.2.12 Restrained Flange Adapter (RFA) shall be installed where underground pipe transitions to flanged pipe. The adapter is also required to facilitate the removal of any type of valve or fitting. Flange adapters shall be positively restrained without using any form of rodding or concrete blocking. The flange adapter shall be Mega-Lug® series 2100 or approved equal.

12.5.2.3 **Standard Installation**

PVC pipe shall be used as the material for Standard Installation of sanitary sewer lines. The sewer lines shall be a minimum of ASTM D3034 SDR35 and installed in accordance with ASTM D2321.

12.5.2.4 **Non-Standard Installation**

Ductile iron pipe shall be used for all Non-Standard Installations. Non-Standard Installations shall be as follows:

12.5.2.4.1 Less than 6'-0" of cover within the roadway right of way or paved area.

12.5.2.4.2 Depth of cover 4'-0" or less for offsite sewer installation.

12.5.2.4.3 Extreme depths of 20' through a (maximum depth of 23')

12.5.2.4.4 Manhole Drop Assemblies.

12.5.2.4.5 Bore and Jack Crossings.

12.5.2.4.6 Creek Crossings.

12.5.2.4.7 Aerial Crossings.

12.5.2.4.8 Sewer line / water or storm line crossings where a minimum separation of 18" cannot be achieved.

12.5.2.4.9 Sewers for particular industrial applications. All requests must be submitted for approval.

12.5.2.5 **PVC Pipe use for Non-Standard Installation.**

PVC pipe may be used for Non-Standard Installations with pre-approval by the CCWUED. All PVC pipe for Non-Standard Installation shall be in accordance with ASTM 2241. All underground Non-Standard Installation shall require special bedding in lieu of standard pipe bedding. All PVC pipe to be

installed within a casing shall be restrained joint. The casing for this type of installation shall be a minimum of 18" I.D.

12.6 Gravity Sewer Line Installation

12.6.1 Separation

All sanitary sewer lines, house service lines and manholes shall be separated from lines carrying potable water by a horizontal distance of 10' edge to edge or cross with a minimum vertical separation of 18". All sanitary sewers shall be below potable water lines.

12.6.2 Connections to Existing Sanitary Sewer System

No connection or work to connect to the existing sanitary sewer system is allowed without a CCWU Inspector present whether it is a core, doghouse or service tap connection. The contractor shall insure that all debris and water resulting from a coring or flushing procedure is pumped out of the proposed system. All costs as a result of any damage to the downstream systems or lift station as a result of the new connection shall be solely borne by the contractor.

12.6.3 Connection to Existing Manhole

The sewer connection to the existing manhole shall be cored using a piloted coring machine securely fastened to the manhole. Chipping or hammering is not permitted. A flexible boot shall be installed for the connection. The invert elevation of the new core shall be a minimum of ½ the diameter above the bottom of the existing sewer line or above the existing shelf in the manhole. Coring into the joint of the existing manhole is not permitted. Where the design drawings call for the core to be into an existing joint, the contractor shall cease the core and contact the CCWUED for instruction. Upon completion of the core, boot and pipe installation to the new upstream manhole, a watertight and airtight plug shall be installed. A second plug must be installed at the first manhole beyond the tie-in. All plugs shall be secured using a chain connected to steps or anchors into the manhole. All plugs shall remain in place until the sewer is complete and thoroughly flushed. The plug shall be removed after the final inspection and while a CCWU Inspector is present.

All holes drilled into the manhole for equipment mounting shall be sealed and made water tight. Any visual leaks found in the existing manhole shall be sealed and made water tight.

12.6.4 Connection to Existing Sanitary Sewer Line (Doghouse Manhole)

The existing sanitary sewer line shall be excavated, supported, and properly protected from all construction necessary for the placement of the new manhole over the existing line. The excavation shall be a minimum of 14" below the bottom of the existing sewer line. A minimum of 6" of stone shall be placed as a bedding material beneath an 8" thick reinforced concrete slab on which the precast doghouse manhole shall firmly rest.

Reinforcing for the 8" slab shall be a minimum of #5 @12 E.W. bottom. Where unsuitable material is encountered below the proposed manhole, stone shall be placed in 6" lifts to a maximum of 2' beneath the bottom of the 8" slab. The existing sewer line shall remain intact until the final inspection is complete. No slits or holes shall be made into the existing sewer line for drainage. The contractor is responsible for the proper pumping and disposal of all water and debris that collects in the manhole. The invert shall be shaped around the existing line in accordance with these specifications. Upon approval from the CCWU Inspector, the top of the existing pipe shall be neatly cut out in a manner as to not damage the existing pipe.

12.6.5 Connection to Sanitary Sewer Requiring Bypass Pumping

All required bypass pumping necessary for repair, relocation or connection to the existing sanitary sewer system shall be approved by the CCWUED. The contractor is responsible for providing all plugs, pumping systems, back up pumping systems, equipment, traffic control and material to perform the work necessary.

The bypassing of raw wastewater onto the ground or into a waterway is strictly prohibited.

12.6.6 Tapping an Existing Sanitary Sewer Line (Sewer Service Lateral)

The existing sanitary sewer line shall be excavated, supported and properly protected from all construction necessary to make the service lateral tap. Taps shall be 6" diameter and made 30 to 45 degrees off 90 degrees using a piloted hole-saw bit that retains a coupon of the pipe. All coupons shall be retained and turned over to the CCWU Inspector upon completion. If any coupon is lost into the system, the contractor shall cease production and immediately retrieve the lost coupon by whatever means necessary to prevent a sewer backup. Sewer saddles shall be used for all service taps into existing sewer lines less than 15" in diameter. The saddle shall be constructed of a 3 1/2" wide single adjustable stainless steel band conforming to ASTM A-240, type 304 stainless steel, ductile iron body per ASTM 536, grade 65-45-12 with flexible SBR gasket per ASTM D2000 MBA 710. All clamps and bolts shall be stainless steel type 304. The saddle shall be Romac style 'CB' or approved equal. See Standard Detail 12.16-3.

12.7 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 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. Trench water shall not be diverted or pumped into the sanitary sewer system.

12.8 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.

12.9 Shoring and Protection of Excavation

All shoring, sheeting and bracing required performing and protecting 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.

12.10 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.

12.11 Trench Excavation

The bottom of the trenches shall be over excavated to receive a minimum of 6" pipe bedding for PVC and EDIP sewer lines up to 10" in diameter. Where unsuitable material is discovered in the trench, the contractor shall remove material and replace with select refill material in 6" lifts to a maximum of 2'-0" to establish a foundation for the pipe. Sewer lines larger than 10" shall receive a minimum of 8" of pipe bedding. Bell holes shall be excavated, spaced and sized as to permit first class workmanship of the joint and to insure that the maximum length of pipe possible will rest on the bottom of the trench to facilitate uniform support for each joint of pipe. Where necessary, bell holes and excavations for joints shall be dug by hand. Trenches shall be kept free of water until joints have been made up.

12.11.1 Trench Width minimum 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 pipe diameter.

- 12.11.2 Standard Pipe Bedding shall be Class I (with less than 5% fines) material. Class I material shall be crushed stone or gravel of suitable gradation 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. Pipe bedding shall be uniformly installed and distributed around the pipe line up to a minimum of the spring line on each side. Shovel slicing shall be used to ensure uniform backfilling of the lower quadrant and to support the haunches. A #89 stone may be substituted for #57 stone to ensure compaction.

Standard pipe bedding for 6" diameter service laterals shall be the native material or borrow material as set forth within these specifications. Service laterals shall not receive a Class I bedding. PVC SDR26 may be used for service laterals to prevent deflection due to backfilling.

- 12.11.3 Special Bedding material shall be the same as standard bedding but the installation shall be as specified. The placement shall be a minimum of 6" of stone all around the pipe to include above the top of the pipe. Special bedding shall be used for the underground Non-Standard Installation of PVC pipe or as otherwise required.

- 12.11.4 Unsuitable Material shall include any material that cannot be symmetrically placed and compacted, frozen earth, saturated earth, 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 within these specifications. **Native rock or blasted rock shall not be used as backfill within the trench.**

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 Development Services 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.

- 12.11.5 Backfill Material shall be native material removed from the trench unless it is determined to be unsuitable as defined within these specifications. All backfill material shall consist of a sand-clay (SW-SC) content in accordance with ASTM D 2487. The material shall be free of sod, rocks, sticks, roots and other organic perishable or deleterious matter, foreign material, saturated earth or frozen earth. Native material must consist of a sand-clay mixture capable of being symmetrical placed and compacted as set forth within these specifications. Where native material is unsuitable, borrow material shall be brought and used to backfill the trench as set forth within these specifications.

12.11.5.1 Where sanitary sewer lines are constructed within a wetland under a COE permit, the top remaining foot of backfill material shall be native material as set forth in COE guidelines for construction.

- 12.11.6 Excess Material (Native) 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. Where approved, the contractor shall be responsible for any manhole adjustment necessary per these specifications.
- 12.11.7 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.
- 12.11.8 Select Refill Material shall be the same material as standard pipe bedding and 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. The bedding shall be native material or borrow material as required. Select refill material shall be placed in 6" lifts up to a maximum of 2'-0" as set forth in these specifications.
- 12.11.9 Structural Bedding shall consist of a combination of 4" surge stone and select refill material. Structural bedding shall be installed where the maximum required excavation of unsuitable material for a structure reveals wet or mucky material unsuitable for a proper foundation. The 4" surge stone shall be placed in a maximum of an 12" lift after compaction and topped with a minimum of a 6" lift after compaction of select refill material to create a sound uniform bottom for support of the structure. The minimum area of bedding shall be a 1'-0" perimeter plus the structure perimeter. Blending of the different size stone is permitted. The first lift must be 4" surge stone.
- 12.11.10 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.

12.12 Pipe Laying

Pipe laying shall proceed upgrade only with the spigot end of the bell and spigot pipe pointing in the direction of the flow. Each pipe shall be laid true to line and grade in such manner as to form a closed concentric joint with the adjacent pipe and to prevent offsets in the flow line. Where the pipe line or grade is deflected as a result of installation or backfilling, the laying shall cease, and the pipe and backfill shall be removed and re-laid true to line and grade. As the work progresses, the interior of the sewer shall be cleaned of all dirt and superfluous materials of every description. No pipe shall be laid when the condition of the weather or the trench bottom is unsuitable for such work. The pipe shall be securely temporarily plugged at each end while work has ceased for a duration of more than 8 hours.

The length of open trench shall be a maximum of 200' at one time. The contractor shall use diligence to assure that a minimum amount of trench is left open in severe weather.

All Sanitary sewer extensions shall begin pipe laying from the tie-in / lowest point of the project.

Any pipe which has its alignment, grade, or joints disturbed after installation shall be taken up and re-laid.

12.12.1 Trench Back Filling (Up to 2' above pipe)

12.12.1.1 All backfilling shall be done in accordance with ASTM D 2321. All backfilling compaction densities shall be standard proctor and in accordance with ASTM 698.

12.12.1.2 8" and 10" PVC pipe shall receive a minimum of 6" perimeter pipe bedding up to a minimum of the spring line for the entire trench width cross section to ensure proper support of pipe. Lightly consolidated backfill shall be placed in symmetrical lifts not to exceed 12" after compaction from the spring line to the top of the pipe. The material shall be tamped thoroughly from the spring line up to 2' above the top of the pipe. All backfilling shall be 85% density for offsite conditions and 95% density for all installations within the roadway right of way, paved areas, or as directed by CCWUED.

12.12.1.3 PVC pipes 12" and larger shall receive a minimum of 8" perimeter pipe bedding up to a minimum of 8" above the top of the pipe for the entire trench width cross section to ensure proper support of pipe. Lightly consolidated backfill shall be placed in symmetrical lifts not to exceed 12" after compaction from the pipe bedding to finish grade. The backfill material shall consist of native material and placed so that it is free of rocks, foreign material, saturated earth or frozen earth. The material shall be tamped thoroughly to 2' above the top of the pipe. All backfilling compactions shall be 85% density for offsite conditions and 95% density for all installations within the roadway right of way or paved areas.

12.12.1.4 Ductile iron pipe sewer lines shall only receive a minimum of 6" of select refill material as pipe bedding beneath the pipe to insure uniform loading and to complete continuity of the sewer line bedding installation.

12.12.1.5 All service laterals shall be bedded in native material symmetrically placed and compacted as set forth within these specifications. **No stone bedding is allowed for service lateral installations.**

12.12.2 **Trench Backfilling (from 2' above all pipe)**

Backfilling from 2' above the top of the pipe up to within one foot of finish grade, roadway base or paved area base within the right of way including around manholes shall have a minimum compaction of 95% density. The remaining last foot of backfill within the roadway right of way or paved area shall have a minimum compaction of 100% density. All offsite conditions shall have a minimum compaction of 85% density unless otherwise specified.

12.13 **Testing of Gravity Sanitary Sewer Lines**

The contractor shall furnish all the necessary equipment and be responsible for conducting all testing as set forth in these specifications. In addition, the contractor is responsible for any necessary work on sections that do not pass testing. No sealant shall be used in any newly installed sewer line. Manholes and sewer lines shall be complete before testing is conducted.

All testing, including a video camera inspection, must be completed and approved by the Columbia County Water Utility Inspector before any graded aggregate base (GAB) or curbing can be installed. This shall include all areas to receive any form of paving.

12.13.1 **Visual Inspection / Hydraulic Testing of Sewers**

All sewers shall have been completely cleaned and inverts poured before a visual inspection can be made. The CCWU Inspector shall utilize a light to determine a full clear view through the sewer from manhole to manhole. Any location through which a full view cannot be obtained, or where there is an obvious variation from true alignment or grade (ponding) or deformation of the pipe (egging), the pipe shall be removed and re-laid by the contractor.

The CCWU Inspector shall determine the amount of visible water flowing within sewer lines. In no case will an infiltration rate greater than 25 gallons per inch of pipe diameter per mile of sewer per day be allowed. The testing procedure shall be in accordance with ASTM C 1091 (Infiltration Testing) or ASTM C 969.

All visible or audible leaks shall be repaired. Leaks found in joints shall be exposed and repaired unless the leak can be repaired using chemical grouting. Chemical grouting shall require pre-approval by the CCWUED.

12.13.2 Deflection Test

All sewers shall be tested for deflection. Deflection tests shall be conducted using a go/no-go mandrel. The mandrel's outside dimension shall be sized to permit no more than 7.5 percent deflection as established by UNI-B-6. The percent deflection shall be established from the base inside diameter of the pipe. The minimum outside diameter of the mandrel shall be 7.09". Where required, the contractor shall pull a mandrel supplied by the CCWU Inspector. Pipe sections that do not pass this test shall be dug up and repaired as necessary.

12.13.3 Video Camera Inspection

A video camera inspection is required to visually determine if the new pipe installation is acceptable. All sewer lines whether under pavement or offsite shall be video inspected including service laterals. The camera inspection shall have a minimum of a five (5) day notice in advance of being ready to perform the inspection. The contractor must take the necessary action to schedule the required work, provide the water to be used for the video inspection and provide adequate access to the site for the inspection.

The inspection shall determine if there are bellies in the line, deflection, offsets or standing water. All defects shall be corrected before any further completion of the roadway or paving is done. The camera inspections shall be performed by the CCWU Engineering and Inspections Department at no extra charge to the developer or contractor.

The inspection shall be done before any other required sewer line testing, as set forth within these specifications. In order to video camera inspect the sewer lines and laterals:

- Manholes must be completed to a minimum of the cone section to include inverts
- Sewer lines must be completed from manhole to manhole
- Sewer laterals must be completed to include standpipe
- Sewer lines and laterals must be clean of all debris (washed out)
- The contractor shall have staff and water available to load in the sewer lines and service laterals at the time of the video inspection
- Each service lateral shall receive a minimum of five gallons of water at time of inspection

Any defective installation of the pipe shall be excavated and corrected however necessary. The corrective measure shall include but not be limited to complete removal and replacement. Where approved, the contractor may cut out a portion of deflected or damaged pipe and sleeve in a replacement. All repairs to the sewers shall be in accordance with

these specifications. Upon correcting the defects, the repaired section shall be video camera inspected again for verification.

12.13.4 **Leakage Test (Low Pressure Air Test)**

All sewers shall be tested for leakage using a low pressure air test. The air test shall be conducted in strict accordance with UNI-B-6 "Recommended Practice for low pressure air testing of installed sewer pipe." All stages, equipment and procedures shall be in accordance with UNI-B-6. The maximum allowable pressure drop shall be 1.0 psig per specific time.

The maximum allowable leakage shall be 25 gallons per inch of pipe diameter per mile per day for any section of the system.

12.13.5 **Repairs to Sewer Line or Lateral**

The contractor shall repair all defects as required in accordance with these specifications. All repairs that require a sleeve shall utilize a PVC material sleeve. The use of a ductile iron sleeve is not permitted. The sleeve shall be a Trench Tough Repair Coupling gasket x gasket without pipe stop as manufactured by Multifittings or approved equal.

The sleeve gaskets must receive the appropriate lubricant in order to facilitate proper sliding and placement. The sleeve shall be installed centered over pipe cut. The maximum pipe gap shall be 1 inch. At least two sleeves must be used for each repair.

12.14 **Standard Manholes**

All precast concrete structures shall be manufactured in a plant that is certified through the National Precast Concrete Association (NPCA). All manholes shall be precast concrete structures consisting of a precast base section, riser sections, eccentric cone section, and frame and cover. Manholes shall have a minimum depth of 6'. All manholes up to a depth of 16' shall have a minimum inside diameter of 4'-0". All manholes greater than 16' deep and up to a maximum depth of 23' shall have a minimum inside diameter of 5'-0". Manholes with a depth greater than 23' are not permitted. All invert channels shall be smooth and accurately shaped to the semi-circular bottom conforming to the inside of the adjacent sewer sections. Inverts shall have a minimum differential of 0.2' across the manhole.

Concentric cone sections are not permitted. Brick manholes or adjustments made using brick are not permitted.

12.14.1 **Manholes**

All manholes shall be precast concrete manholes and conform to the requirements of ASTM C478 and having a minimum wall thickness of 5". All concrete shall have a minimum compressive strength of 4,000 psi when tested in accordance with ASTM C478. Precast manholes shall be as manufactured by Hanson, Foley, Tindall, or Georgia-Lina. Manholes

may be inspected prior to installation to ensure the structure is free of all defects such as honeycombs and cracks. Any structure having defects shall not be installed and must be removed from the site immediately.

12.14.2 **Joints**

Manhole Jointing shall be tongue and groove and conform to ASTM C443. Joints shall be free of any flaws. Cracks or voids in the joint shall be unacceptable. Sections of manholes with damaged joints shall be removed from the job site.

12.14.3 **Joint Seals**

All joints shall be sealed using a flexible sealing compound to ensure a water tight joint for each section of the structure. Each joint shall be sealed horizontally and vertically along the outside perimeter of the joint. The horizontal seal shall be a mastic gasket a minimum of 1 1/4" wide x 1" thick and as manufactured by the Henry Company, "RAM-NEK" or approved equal. The vertical exterior seal shall be a mastic gasket with a plastic joint wrap a minimum of 6" wide. The joint wrap shall be as manufactured by Henry Company, "RUB'R NEK" or approved equal.

12.14.4 **Pipe Connections**

Pipe to manholes connections shall utilize a flexible water tight boot connection. The boot shall be made of resilient EPDM or Polyisoprene rubber conforming to ASTM C923. The inner and outer bands shall be made of a minimum of 304 stainless steel nonmagnetic material conforming to ASTM A167. The rubber boot shall be as manufactured by Kor-N-Seal, PSX or approved equal. The pipe shall stop flush with the inside face of the manhole. The void between the pipe and rubber boot shall be filled with grout and smoothed such that the pipe forms to be an integral part of the manhole. There shall only be 3 penetrations in one single vertical plane. Service laterals shall be a minimum of 6" above the bottom invert of the manhole.

All boot connections shall be neatly grouted to completely fill the void between the boot and pipe. The grout around the pipe shall be clean and smooth as to not encroach into the pipe opening or hang over the pipe opening.

12.14.5 **Manhole Steps**

All manholes shall have steps installed to permit ease of access. Manhole steps shall be constructed of grade 60 carbon steel and completely covered with copolymer polypropylene plastic and shall conform to ASTM C478 and ASTM D4101 construction. Manhole steps shall be as manufactured by M.A. Industries, Inc. #PS1-PF or approved equal.

12.14.5.1 The first step in the manhole shall not be greater than 2'-0" below the finish grade of the frame and cover.

12.14.5.2 Steps shall be vertically aligned and no more than 1'-0" o.c.

12.14.5.3 Steps shall not be installed directly over a pipe opening.

12.14.5.4 Steps may be cast into precast sections at the factory or added on site per manufacturer's recommendations and in accordance with these specifications.

12.14.5.5 Step removal and replacement shall be per manufacturer's recommendations. All holes left in the manhole wall shall be filled with non-shrink grout and must pass vacuum testing.

12.14.6 **Manhole Inverts**

12.14.6.1 Standard Inverts shall be constructed of a minimum of 3000 psi plant mix concrete with a smooth finish. The curvature of the invert shall be as long as possible to allow a seamless flow through the manhole. The invert shall be ½ of the pipe diameter in height and sloping upward 2" to the inside wall of the manhole.

12.14.6.2 Precast Inverts shall be constructed of 4000 psi concrete to match the material of the manhole. The curvature of the invert shall be as long as possible to allow a seamless flow through the manhole. The invert shall be ½ of the pipe diameter in height and sloping upward 2" to the inside wall of the manhole.

12.14.6.3 Reshaped Inverts inside doghouse manholes or newly cored manholes shall follow similar guidelines as standard inverts. Doghouse manholes shall have the pipe thoroughly cleaned and free of all deleterious material to pour new invert. Invert shall be shaped before pipe is cut out. The minimum pipe cut out shall be ½ pipe. Newly cored manholes shall require the reshaping of inverts to ensure maximum curvature and seamless flow throughout the manhole. Where the new core is into the existing shelf, the contractor shall saw-cut the existing invert and reshape a semi-circle to create a smooth flowing trough.

12.14.7 **Manhole Frame and Cover**

All manholes shall have a frame and cover to permit access. Frame and cover shall be constructed of cast iron or ductile iron and shall be rated per application. Frame and covers shall have a minimum of a 22" clear opening and be round built up type. Frame and covers to be cast into flat slab tops may utilize a slab cast frame. All round built up type frames shall have a minimum of 4 bolt holes drilled into the flange. All covers shall be stamped "Sanitary Sewer" or "Private Sanitary Sewer" on top of cover. All manholes installed within the 100 year flood plain shall be a water tight frame and cover.

12.14.8 **Standard Frame and Cover (Pavement Installation) FC-1**

Frame and covers shall be round built up type and weigh approximately 285#. Frame and cover shall be designed for heavy duty loading conditions. Frame height shall be 7 ½" tall and as manufactured by US

Foundry #USF 668 KL or approved equal. Covers shall have two pick holes and no vent holes.

12.14.9 **Alternate Frame and Covers (Pavement Installation) FC-1A**

A shorter frame and cover may be used where height adjustment is necessary. A minimum of a 4" tall frame shall be used. The frame and cover shall be as manufactured by US Foundry #USF 664 KL or approved equal.

12.14.10 **Private Manhole Frame and Covers (FC-1P, FC-1AP)**

All private sanitary sewer line installations shall utilize a frame and cover that shall be constructed of cast iron or ductile iron and designed for heavy duty loading conditions. Frame and covers shall be approximately 4" to 7 ½" tall and have a minimum clear opening of 22" as manufactured by US Foundry #USF 668 KL, USF 664 KL or approved equal. The cover shall be stamped "Private Sanitary Sewer" on top.

12.14.11 **Hinged Frame and Covers (Offsite, Non-Pavement or Water Tight Installations) FC-2**

Frame and covers shall be manufactured of cast iron or ductile iron and hinge operated with a minimum opening angle of 90 degrees. All round built up type frames shall have a minimum of 4 bolt holes drilled into the flange. The cover shall be securely fixed while in the open position. Frame and covers shall be gasketed to form a water tight seal. The frame and cover shall also incorporate a locking mechanism to prevent unauthorized entry. Frame shall have a minimum clear opening of 24". Cast iron frame and cover castings shall conform to ASTM-A48, Class 35B, gray cast iron and AASHTO M-306. Hinged frame and covers shall be USF 924-US as manufactured by U.S. Foundry & Mfg. Corp. or Pamrex as manufactured by Certain Teed Corporation.

12.14.12 **Frame and Cover Adjustment**

Final grade for manhole frame and covers shall be set using reinforced concrete grade rings or steel riser rings for finer adjustment. Grade rings shall be stacked to a maximum of 9" high. Where the adjustment is greater than 9", the cone section shall be removed and a standard riser section shall be installed to acquire final grade. Steel ring risers shall fit tight into frame or have set screws to lock the ring into the frame section and prevent excess movement within the frame. All step adjustment or alignment shall be in accordance with these specifications. **Brick as adjustment to frame and covers is not permitted.**

12.14.12.1 Ring Risers shall be constructed of cast iron and of variable thickness for fine adjustment. The riser ring shall be USF Type 'B' or approved equal.

12.14.12.2 Concrete Grade Rings shall be 4000 psi concrete with reinforcing wire or #3 reinforcing steel. Grade rings heights shall range from 2” through 9”.

12.14.13 **Shallow Manholes**

Shallow manholes shall be in accordance with these specifications and must be approved by the CCWUED.

12.14.14 **Drop Manholes**

All drop manholes shall be constructed in accordance with these specifications. All drop connections shall be outside drops. Inside drops are not permitted. The drop assembly shall be in accordance with the piping section of these specifications. The down-pipe for the outside drop shall be encased with pipe bedding material. The first joint of sewer outside of the tee shall be ductile iron pipe.

12.14.15 **Manhole Installation**

Each manhole within the trench shall be over excavated to receive a minimum of 8” of stone to establish a firm foundation in which to rest. Where the excavation reveals an unsuitable foundation, whether rock or muck, the contractor shall remove unsuitable material and install stone in 6” lifts to a maximum of 2’-0” as a foundation for the structure. Where maximum unsuitable material is removed and reveals wet muck or hydric soils, structural bedding shall be placed in accordance with these specifications.

12.14.15.1 All manholes shall be installed plumb.

12.14.15.2 Horizontal joint sealant protruding into the manhole shall be cut off smooth against the interior wall. Interior joints shall not be grouted unless otherwise directed.

12.14.15.3 Exterior wrap shall be centered over joint and placed onto a clean wall.

12.14.15.4 Manholes shall be mechanically compacted in 12” lifts symmetrically around the perimeter of the manhole up to the frame and cover. Compaction densities shall be in accordance with these specifications.

12.14.15.5 Manholes shall be set flush with pavement grade under roadways.

12.14.15.6 Where manholes are adjusted and brought to final grade in the roadway, an area 36” wide and a minimum of 12” deep shall be excavated around the frame and shall be brought to the grade of the base material with a minimum of 3000 psi concrete by forming a square area around the frame.

12.14.15.7 The top of the manhole shall be 12” above finish grade for offsite applications.

12.14.15.8 All lifting holes or equipment mounting holes shall be filled in completely and made watertight as per manufacturer's recommendations.

12.14.16 Manhole Testing

All manholes shall be vacuum tested in strict accordance with ASTM 1244 most current edition "Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test". All stages, equipment and procedures shall be in accordance with ASTM 1244.

12.14.16.1 Visual Inspection

A visual inspection shall be made by the contractor and inspector prior to testing. Any leakage into or out of the manhole shall be repaired before testing. The manholes shall be clear of all debris before testing. Any deficiencies noticed shall be repaired as needed.

12.14.16.2 Vacuum Testing

The maximum allowable drop in pressure shall be 1.0 psig.

12.14.16.3 Repairs after Testing

Manholes that fail testing shall be repaired as required and retested until the manhole passes the vacuum test.

12.15 Air Release Valve (ARV) Manholes

Manholes for air release valves shall be a minimum of 5'-0" diameter and in accordance with the standard manhole specifications. ARV manholes may use a standard base section or a doghouse base section and a flat slab top versus an eccentric cone section. A standard pipe to manhole boot is not required. However, a non-shrinking grout must be used to seal the pipe connection and prevent water from entering the manhole. ARV manholes do not need to be vacuum tested. See Standard Detail 12.14-4.

12.15.1 The depth of the manhole shall be a minimum of 5'-0" to achieve the minimum cover for the force main. The manhole may require additional depth to achieve a 2' foot clearance around the ARV for access and maintenance.

12.15.2 The force main locating wire must remain continuous through the ARV manhole. Mortar sand shall be filled up to the top of the force main within the ARV manhole.

12.15.3 The ARV manhole frame and cover shall be anchored to the flat slab top using a minimum of 2 - 4" x ½" diameter expansion bolts. Frame and cover for ARV shall be the hinged type, USF 924 or approved equal.

12.16 Service Laterals

12.16.1 Each lot or parcel of property shall have an individual service lateral tap.

- 12.16.2 The service lateral shall be 6" diameter pipe with a 6" cleanout and shall have a minimum slope of 1% extending from the sewer main. See Standard Detail 12.16-1.
- 12.16.3 All service lateral building connections points shall be a minimum of 5'-0" below the finish floor elevation of the intended service structure.
- 12.16.4 The horizontal location of the lateral shall be 4'-0" beyond right of way or as designated on plans. The contractor is responsible for all survey staking to correctly position the service lateral cleanout standpipe.
- 12.16.5 Private force mains connecting to the public sanitary sewer system shall connect through a service lateral. See Standard Detail 12.16-4.

12.17 Bore and Jack Crossings / Creek Crossings

12.17.1 Steel Casing pipe

All casing pipe shall be a smooth steel pipe with minimum yield strength of 35,000 psi. The minimum casing diameter shall be 16" I.D. Standard lengths of casing shall be considered 20' long. However, 40' lengths may also be supplied. 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 12.17-1 and 12.17-2.

12.17.2 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.

12.17.3 Carrier Pipe

All carrier pipe shall be restrained joint ductile iron pipe in accordance with these specifications except where pre-approved in accordance with Section 12.5.3.5.

12.17.4 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. **Brick shall not be permitted to seal casing.**

12.17.5 **Bore and Jack Installation**

The carrier pipe installed within the steel casing shall be pulled through the casing pipe on casing spacers securely fastened to the carrier pipe. The jacking operation shall be the dry method and utilize cushioning on the end 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.

12.17.5.1 **Aborted/Abandoned Bore and Jack**

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 engineer of record and CCWU Inspector before attempting another crossing.

12.17.6 **Creek Crossings**

Creek crossings that do not have a minimum cover of 3' over the top of the sanitary sewer line must be installed inside a steel casing. The crossing shall consist of a steel casing pipe, restrained carrier pipe, casing spacers, casing to carrier end seals, and concrete collar anchors. All creek crossing materials shall be the same as the bore and jack installation requirements.

12.17.6.1 **Creek Crossing Installation**

Creek crossings may be installed by the bore and jack method or conventional open cut method. Bore and jack method shall be in accordance with these specifications. All installations shall adhere to all erosion and sediment control guidelines to minimize impact to the waterway.

12.17.6.1.1 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.

12.18 **Aerial Crossings**

Aerial crossings must be approved by the CCWUED. Aerial crossings shall be a restrained carrier pipe inside a steel casing pipe. The minimum steel casing pipe for aerial crossings shall be 0.322" thick. Each crossing shall be specifically designed by a professional engineer to cover span, deflection, and pier design

necessary for the installation. Concrete collar anchors shall be installed on each end to assure solid anchoring of casing pipe.

12.18.1 Concrete Collars Anchors

Concrete collars for casing anchoring shall be designed for each application by a professional engineer. The collars shall be a minimum of 3000 psi concrete 12" thick and a minimum of 4'-0" square. Anchors shall have a minimum reinforcing steel of #5 @ 12 E.W. The collars shall be installed 18" from end of casing pipe. Collars must be secured to the casing. The collar cannot cover the casing to carrier end seals or be used as a pipe transition.

12.18.2 Concrete Piers

Piers for aerial crossings shall be designed for each application by a professional engineer. Piers are not permitted within the natural flow line of the creek. The piers shall be a minimum of 4000 psi concrete 12" thick and a minimum of 1'-6" square. Piers shall have a minimum reinforcing steel of #5 @ 12, E.W. & E.F. The top of the pier shall have an adjustable bracket anchored in the concrete to secure the casing pipe. All anchors and exposed brackets shall be stainless steel or epoxy coated to resist the weather.

12.19 Force Main

All force mains shall be a minimum of 4" diameter and constructed of PVC pipe and/or ductile iron pipe in accordance with these specifications. The minimum depth of force mains within the lift station yard shall be 3'-0" deep. The minimum depth of force mains outside of the lift station yard shall be 4'-0" deep.

12.19.1 Piping Materials

All PVC pipe for force mains shall be rated for a minimum working pressure of 150 psi in accordance with AWWA C900. All PVC pipe used for force mains shall be underground installation only. All force mains shall be green in color. Blue, purple or white color pipe is not permitted.

12.19.1.1 All force main piping shall have a minimum cover of 4'-0". All locations less than 4'-0" shall require epoxy lined ductile iron pipe (EDIP).

12.19.1.2 All other PVC force main piping requirements including testing shall be in accordance with the PVC pipe specifications and testing requirements of Section 14.0 of these specifications.

12.19.1.3 All underground and above ground ductile iron force main piping and fitting requirements shall be in accordance with Section 14.0 of these specifications. All interior lining for ductile iron force mains shall be in accordance with Section 12.0 of the specifications.

12.19.2 Force Main Installation

All force main installation for PVC and EDIP, fittings, valves and manholes shall be in accordance with Section 12.0 and Section 14.0 of these specifications per application unless otherwise specified.

12.19.2.1 Locating Wire shall be a continuous run of wire and including mylar marking tape indicating “Caution Buried Sewer Line” from the valve vault within the lift station yard to the connection of the gravity system manhole. The wire shall be attached to all fittings and valve boxes to ensure ease of location and attachment for locating purposes. The wire shall be brought to within 2’ below finish grade at 100’ intervals along the installation. The locating wire shall extend up to the surface at the valve vault or manhole and be attached to the top of the concrete structure. Wire shall be extended to the top of in line valve boxes also. See Standard Details 13.2-2, 12.14-4, 12.14-5.

12.19.2.2 Pressure Testing force mains shall require a temporary plug properly restrained and/or thrust collared to prevent a blow out or damage to the existing sanitary sewer. The testing pressure shall be a minimum of 150 psi. See Standard Detail 12.14-5 and 12.14-5A.

12.19.2.2.1 Filling the Force Main with water for pressure testing shall be done by filling the wet well with potable water via the yard hydrant and running the pumps to pressurize the force main. An additional testing pump may be required to pump the piping to required test pressure. **A temporary cross connection to the potable water system is not permitted to fill the force main.**

12.20 Force Main Valves

12.20.1 Plug Valves (Isolation)

All isolation valves for force mains shall be plug valves. Resilient seat gate valves are not permitted in the sanitary sewer system. All plug valves shall be of the non-lubricated eccentric type with resilient faced plugs. The pipe connections shall be flanged or mechanical joint as required. Flanged valves shall be in accordance with ANSI 16.1, Class 125 and mechanical joint valves shall be in accordance with ANSI A21.1 or AWWA C111. All buried valves shall have mechanical joint ends. Valve working pressures shall be as designed by professional engineer with a minimum working pressure of 150 psi. The port area for 4” through 6” valves shall be a minimum of 87% full pipe area. The body of the valve shall be constructed of cast iron ASTM A126 class B body and plug. The seat shall be constructed of nickel, raised and welded to the body. The actuator shall be quarter turn with a 2” square nut. Plug valves shall be as manufactured by Dezurik Water Controls #PEC Eccentric plug valve or approved equal.

12.20.2 Check Valves

Check valves shall be swing check with an external swing indicator arm. Ball check valves are not permitted. Check valves shall be all iron body, bronze mounted, full opening swing type. All check valves shall be flanged in accordance with ANSI 16.1, Class 125. Check valves shall be

installed inside a vault or pit. The valve disc shall swing completely clear of the waterway when valve is fully open, permitting full flow. The disc shall be cast iron, rubber faced. Hinge pins shall be 18-8 stainless steel. Check valves shall be as manufactured by Crispin Multiplex Manufacturing Company model #SWL or approved equal.

12.20.3 **Air Release Valves (ARV)**

All air release valves shall be combination air/vacuum valves in order to aid in the stabilization and elimination of air within the pipeline. Air release valves shall have a body and cover manufactured from ductile iron in accordance with ASTM A536 Grade 65-45-12. The exterior coating for the body and cover of the ARV shall be fusion bonded epoxy. The ARV shall be supplied with backwash accessory and isolation valve. Isolation valves shall be a bronze full flow ball valve sized equal to the port required. Air release valves shall be connected to force main piping using a standard fitting with restraint and reducing plug sized specific for the ARV application. The piping assembly between the force main and ARV shall consist of 2 bronze or stainless steel close nipples and an isolation valve. Air release valves shall be Val-Matic #301ABW as manufactured by Val-Matic Valve and Manufacturing Corporation or approved equal.

12.20.4 **Installation of Valves**

All check valves and plug valves installed within a pit or vault shall have flanged joints and require a restrained flange adapter (RFA). Restrained flange adapters (RFA) shall be Mega-Flange® series 2100 in accordance with Section 12.5.3.2.12. All air release valves shall be installed within a manhole.

12.20.4.1 Check Valves shall be installed within a pit or vault. All check valves require a restrained flange adapter (RFA) for ease of installation and maintenance removal.

12.20.4.2 Plug Valves shall be installed within a pit or vault or standard underground installation. Above ground applications shall be flange joint and below ground shall be mechanical joint and restrained where required. Restrained joint application requirements shall be in accordance with these specifications. Plug valve installation within a pit requires a minimum of one operating wrench to be supplied with the valve. The contractor shall turn over operating wrench to CCWU Inspector at time of lift station startup. All buried plug valves shall be installed plumb and have a standard cast iron valve box and concrete ring protector in accordance with Section 14.0 of these specifications. **All valve box tops shall have “Sewer” cast into them.**

12.20.4.3 Air Release Valves (ARV) shall be installed within a manhole. ARV shall be bedded within mortar sand to stabilize the tee and ARV assembly. All backwash piping shall be installed protruding in the direction opposite the access in the manhole. See Standard Detail 12.14-4.

12.21 Miscellaneous Equipment

12.21.1 Yard Hydrant (Post Type)

A yard hydrant shall be installed at each Lift Station Site. All yard hydrants shall be fitted with a screwed joint inlet connection, a single 2 ½” hose nozzle, and have a minimum main valve opening size of 2 ¼” diameter. The minimum bury depth shall be 2’-6” deep. Yard hydrants shall be M&H Style 33 or approved equal. The yard hydrant shall be primarily operated by a 2” square nut gate valve installed at the hydrant. See Section 14.0 for valve specifications

12.22 Final Inspection

The contractor is responsible for contacting the CCWU Inspector once all the work is complete to schedule a 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.

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

Sanitary Sewer Line Air Testing Data Sheet

Project Name _____ Sheet No. _____ of _____

Contractor _____

Date: _____ Specified Maximum Drop: 1.0 psig

Pipe Material Installed _____

Inspector's Name and Title: _____ Signature of Inspector: _____

Pipe Under Test				Spec. Time	Field Test Operations Data					
Upstream MH sta #	Downstream MH sta #	Dia. D (in.)	Length L (ft.)	Refer to UNI-B-6 (min:sec)	Pressure Initially Raised to (psig)	Time Allowed for Pressure to Stabilize (min)	Start Test Pressure (psig)	Stop Test Pressure (psig)	Elapsed Time (min:sec)	Pass or Fail (P or F)

If a section fails, the following items should be completed:

Identify section(s) that failed _____

Leak (was) (was not) located, Method used: _____

Description of leakage found:

Description of corrective action taken: _____

For test results after repair refer to Test No. _____, Inspector _____

Manhole Vacuum Testing Data Sheet

Project Name: _____ Sheet ____ of ____

Inspector: _____ Signature: _____

Date of test: _____ Specified Maximum Drop: **1.0** psig

All manholes shall be vacuum tested to -10Hg and cannot drop below -9Hg within allotted time. 4' diameter manholes from 0-12' deep shall be tested for 35 seconds and 12.1'-24' shall be 60 seconds. 4' diameter manholes deeper than 24' feet shall be tested adding 5 seconds per every 2' of additional vertical depth.

Manhole			ASTM C1244	Field Test Operations Data					
Number	Diameter (ft)	Depth (ft)	Required (min:sec)	Initial Vacuum (psig)	Time Allowed for Vacuum To Stabilize (sec.)	Start Vacuum Test (psig)	Stop Vacuum Test (psig)	Elapsed Time (min:sec)	Pass or Fail (p / f)

If a section fails, the following items should be completed:

Identify manholes(s) that failed _____

Leak (was) (was not) located, Method used: _____

Description of leakage found: _____

Description of corrective action taken: _____
