

UNION COUNTY PUBLIC WORKS
SANITARY SEWER & WATER SPECIFICATIONS

NOTICE TO CONTRACTORS

The contractor shall contact Union County Public Works personnel at least 48 hours before beginning construction. Any work or tests performed without notification and contact with Field Inspectors shall be installed at the contractor's risk.

Union County Public Works
704-296-4210

May 31, 1994
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Union County Public Works Sanitary Sewer and
Water Specifications reviewed and approved by
Mike Garbark, P.E.



UNION COUNTY PUBLIC WORKS

SANITARY SEWER AND WATER

SPECIFICATIONS

DEFINITIONS

Whenever in these specifications and contract document the following terms, or pronouns in place of them, are used the intent and meaning shall be interpreted as follows:

CONTRACTOR

Any individual, firm, or corporation with whom a contract is made by the developer for the purpose of constructing the facilities described in these documents.

COUNTY ENGINEER

The Director of Union County Public Works or their designee.

DEVELOPER

Any individual, firm, or corporation who contracts to construct a water or sewer system with the intent for donation to and inclusion as part of the utility system of Union County Public Works.

ENGINEER

The registered professional engineer retained by the developer to prepare working drawings and specifications to guide the construction of the water or sewer system.

“OR EQUAL”

The name of a certain brand, make or definite **clause** specification is to denote the quality standard of the article desired, but does not restrict bidders to the specific brand, make or manufacturer named. It is to set forth and convey the general style, type, character, and quality of the article desired. whenever the word “or equal” appear in the specifications they shall be interpreted to mean an item of material or equipment similar to that named and which is suited to the same use and capable of performing the same function as that named.

PLANS

All drawings, or reproductions of drawings, pertaining to the construction under the contract.

SPECIFICATIONS

The directions, requirements and provisions herein contained in the definitions, material specifications and general conditions relating to the method and manner of performing the work, or the quantity and quality of the material to be furnished, or the results to be obtained.

SECTION 1 - GENERAL REQUIREMENTS

1.01 - SCOPE This specification is intended for use on projects constructed with private funds and intended for donation to and inclusion as part of the utility system of Union County.

1.02 - WORKING DRAWINGS have been prepared by an engineer retained by the developer. These drawings have been reviewed and approved by the county engineer as complying with county standards. The contractor is cautioned against using any drawings for purchasing materials or installation unless they are marked "approved for construction" and signed by the county engineer or his assignee.

1.03 - MATERIAL SUBMITTALS The design engineer shall review, approve and provide material submittals to the county for approval prior to purchase by the contractor. Two (2) copies of all literature and certification shall be provided for review along with complete materials checklists included in Section 6 of these specifications. The contractor is encouraged to buy and use only American made products.

1.04 – INSURANCE The contractor shall furnish proof to the county engineer that he has and maintains adequate liability insurance prior to beginning any work. Minimum coverage acceptable to the county shall be written for a limit of liability of not less than \$500,000 for all damages arising out of bodily injury including death at any time resulting there from, sustained by any one person in any one accident, and a limit of liability of not less than \$500,000 aggregate for any such damage sustained by two or more persons in any one accident, and a limit of liability of not less than \$300,000 aggregate for any such property damage sustained in any one accident.

1.05 – ENVIRONMENTAL PROTECTION the contractor's attention is directed to follow any or all environmental protection or erosion control plans filed by the developer or his engineer.

1.06 – START-UP The contractor will notify the county engineer at least 48 hours prior to beginning work. No work will be permitted on weekends or holidays without special permission of the county engineer.

1.07 – GUARANTEE The contractor shall guarantee all work for a period of one (1) year from date of final acceptance by the county.

SECTION 2 – SANITARY SEWER AND APPURTENANCES

2.01 – MATERIALS Furnish all materials as shown on the drawings and herein specified.

- A. Gravity sewer pipe sizes 8 thru 18 inches shall comply with the following requirements.
1. DUCTILE IRON PIPE shall be in accordance with ANSI/AWWA A21.51. Push on joints and mechanical joints shall comply with ANSI/AWWA C151/A21.51. Pipe shall be furnished with cement mortar lining and seal coating in accordance with ANSI/AWWA A21.4/C104. Unless otherwise shown on the drawings, pipe thickness shall be based on Class 350.
 2. SMOOTH WALLED PVC pipe shall conform to the requirements of ASTM D1784 for “rigid poly (vinyl chloride) and chlorinated poly (vinyl chloride) compounds” and ASTM D3030 “type PSM poly (vinyl chloride) sewer pipe and fittings” pipe shall be manufactured from PVC resins having a minimum cell classification of 1245B or 12454C as defined by ASTM D1784. Pipe joints shall be bell/ring type conforming to ASTM D1869 for extended pipe with integrally molded bell. Pipe thickness shall be determined according to the standard dimension ratio (SDR) 35 for pipe placed to depth of 10 feet or less; SDR 26 pipe shall be used in installation greater than 10 feet of depth. Pipe length shall be 13 feet. Pipe shall be first class product with smooth interior and exterior surfaces. Pipe minimum stiffness at 5% deflection shall resist a minimum loading of 46 PSI for all sizes when tested in accordance with ASTM D2412. Pipe shall also resist cracking, splitting, or breaking up until the inside diameter is reduced by 60% or original dimensions as specified by ASTM D794. Impact shall be tested according to ASTM D2444 using a 20 pound weight. Extrusion quality shall be tested in accordance with ASTM D2152. Each joint of pipe shall be marked with this following information: manufactures name, nominal size, cell classification, ASTM designation, “NSF” approvals, pipe thickness class, ANS date code.
 3. STEEL ENCASMENT PIPE shall comply with ASTM A139 for Grade B welded or seamless pipe. Minimum yield strength shall be 35,000 PSI. Diameters and wall thickness shall be as shown on the standard details. Pipe ends shall be furnished beveled for butt welding of circumferential joints.

B. FITTINGS

1. DUCTILE IRON FITTINGS shall be in accordance with ANSI/AWWA A21.10/C110. Fittings shall have a cement mortar lining and seal coated according to ANSI/AWWA A21.4/C104.
2. PVC FITTINGS shall be identical in manufacturer, material, and quality to the type of pipe that they are being used with.

C. TRANSITION COUPLINGS shall be.

- Omni coupling system 441
- Harco B & B adaptors
- Or equal

D. PRECAST CONCRETE MANHOLES shall conform to ASTM C478 for structures designed to support vehicular loadings based on AASHTO H20. Manholes shall be supplied with circular confined rubber "O" ring gasket joints and flexible pipe connections conforming to ASTM C443. Wall thickness shall be 1/12 of the inside diameter but not less than 5 inches. Aggregate shall be sound, crushed angular stone only in accordance with ASTM C33. Cement shall be Type II ONLY with a maximum tricalcium aluminate content of 7%. Fly ash conforming to ASTM C618 may be added to the concrete mix but shall not be considered as replacement for more than 10% of the required cement. Flexible pipe connections shall allow for deflection of 5 to 35 degrees in all planes depending upon pipe size. All metallic accessories shall be Type 304 stainless steel. Manholes shall be furnished with non-corrosive plastic encapsulated No. 4 deformed steel rod steps. Steps shall be spaced at 16 inches on center one over the other. Steps whenever possible shall be positioned over the inlet pipe. Inverts shall be constructed to route flow smoothly through the manhole. Invert trough depth shall be equal to pipe diameter. Trough shall have as smooth a finish as possible. Shelf shall have a broom finish. Precast inverts will be acceptable. Pipe entrance into the manhole shall be sealed with cement grout; however, care shall be taken to prevent cement from running into the flexible boot. Absorption of liquid by the manhole shall not exceed 6% of total volume. Manhole section joints shall be grouted inside and outside surfaces. Manufacturer shall furnish compression test data from random sampling of similar manholes as well as mill reports on cement, aggregate, fly ash and reinforcing materials.

E. CAST IRON FRAMES AND COVERS shall be attached to the top of each manhole with stainless steel threaded concrete anchors. All manhole covers and casting to conform to AASHTO standards. Frame shall be cemented to the top of the cone section and sealed inside. All casting shall comply with

federal specification QQ-T-652 with dimensions as shown on the standard details. all casting shall be designed for H20 highway loading. Mating surfaces shall be machined for proper fit and alignment. Casting shall be free of blow holes or blisters. No plugging of defective casting will be permitted. Casting shall be thoroughly cleaned and coated in accordance with ASTM A47 – 7.7.1.

2.02 – CERTIFICATION Each material supplier shall provide the engineer with certification that all materials shipped to the job site have been tested and comply with Section 2.01 of this specification and the approved drawings. All materials are also to be guaranteed by the manufacturer to be free of defects for a period of one year from delivery to the job site.

2.03 – HANDLING AND DISTRIBUTING MATERIALS shall be handled and distributed as follows:

- A. Handling pipe, fittings, and other materials shall be carefully handled so as to prevent breakage and so as to prevent damage to the lining in the pipe and fittings. Pipe shall not be unloaded by rolling or dropping off trucks but shall be handled by carefully lifting and lowering into position using approved slings or clamps.
- B. STORAGE All pipe, fittings, and other materials which can not be distributed along the route of the work shall be stored for subsequent use when needed. The contractor shall make his own arrangements for the use of storage areas.
- C. DISTRIBUTING Materials shall be distributed and placed so as to least interfere with traffic. No streets or roadways are to be blocked or closed. The contractor shall furnish and maintain proper warning signs and furnish necessary traffic control devices. When working along streets and roadways no materials shall be strung further than is required for the day at hand. No materials shall be placed in drainage ditches nor outside of the road right-of-way.

2.04 – EXCAVATION OF TRENCHES shall include all excavation necessary to install the pipe and manholes at the lines and grades shown on the drawings including sufficient depth to allow for bedding materials. All organic material such as grass, limbs, roots, and stumps shall be removed and discarded from the excavated material. Minimum trench width shall be the outside diameter of the pipe plus 8 inches on each side. Should unstable materials be encountered during excavation, it shall be removed and replaced with stone bedding material. Solid rock shall be excavated to provide a minimum separation of 8 inches between rock and pipe in any direction.

2.05 – INSTALLATION OF PIPE AND ACCESSORIES

- A. LAYING PIPE All sewer pipe shall be laid at the grade and alignment shown on the drawings. All pipe shall be laid with the bell up grade. All pipe shall be bedded according to the standard details or as described herein. Sewer along existing DOT roads to be install a minimum 1:1 (depth of infrastructure:linear feet off edge of pavement) ratio plus 5 feet off edge of pavement.
1. Class C bedding shall be minimum bedding for any pipe. Bedding shall consist of angular bedding material conforming to ASTM D448 Size #67. Bedding shall be placed a minimum of 4 inches below pipe plus $\frac{1}{2}$ of the pipe diameter for the full trench width.
 2. Class B bedding shall consist of an angular bedding material conforming to ASTM D448 Size #67. Bedding shall be placed a minimum 4" below the pipe and continuing to 2" above the pipe for the full width of the trench. Class B bedding shall be used at any time that ground water is encountered in the trench of where solid rock has been excavated.
 3. Class A bedding shall consist of a concrete cradle poured on a flat trench bottom. Concrete shall be 3,000 PSI minimum compressive strength and shall be placed 4 inches below the pipe plus $\frac{1}{2}$ the pipe diameter. Class A bedding shall be used any time that trench bottoms can not be stabilized by undercutting and using Class B bedding.
- B. SETTING MANHOLE Manholes shall be set plumb and level at elevations shown on the state approved design drawings. If manholes are in the street they shall be a minimum of 2.5 feet from the edge of the curb. Stone bedding shall be placed under manhole base to assist leveling. Lifting holes shall be plugged prior to correct alignment of steps. Vent pipes when indicated shall be positioned 45 degrees left of inlet pipe with vent pipe pointing down flow. A maximum of three (3) grade rings using butyl seal (mastic) between joints will be permitted for final adjustment of ring and cover.

2.06 – BACKFILLING OF TRENCHES All backfill shall be placed on the pipeline in such way as not to disturb the alignment or grade. Bedding materials shall be consolidated around the pipe prior to placing backfill. Backfill material shall be free of organic materials. Backfill shall be placed in layers 12 to 14 inches thick and thoroughly compacted with mechanical equipment. 36" minimum cover or use ductile iron pipe.

2.07 – COMPACTION All backfill shall be placed so as to achieve a minimum compaction of 95% based on the standard proctor and in place density tests. The contractor will be required to retain the services of an independent testing laboratory

to certify compaction along existing state maintained roadways. Tests will be required for each 1,000 linear feet of pipe.

2.08 – SEPARATION OF WATER AND SEWER MAINS All water and sewer mains shall have a minimum horizontal separation of 10 feet or vertical separation of 18 inches. Where such separation is not possible ferrous pipe, as specified, shall be substituted for the standard sewer main and water main materials for 10' on each side.

A. Storm Drain – 24 inches minimum separation or use ductile iron pipe.

2.09 – TESTING All pipelines shall be subject to visual, deflection, infiltration, and exfiltration tests. The tests will be preformed as follows:

A. VISUAL TEST PIPE shall be flushed with clean water to remove any dirt or foreign materials. Manholes inverts shall be swept or flushed as necessary. Each section of the pipe shall then be looked at by the engineer to determine if grade is uniform, alignment is true, and that no joints are offset.

B. DEFLECTION TEST shall be preformed by passing a rigid mandrel through the pipe. The mandrel shall have an outside diameter of 5% less than the average pipe inside diameter as shown on the manufacturers certified submittals. The mandrel shall have a minimum length of 24 inches or full diameter. The mandrel and all accessories necessary to pull it shall be furnished by the contractor.

C. INFILTRATION TEST shall be conducted by placing a weir in the pipe. Maximum length of pipe to be tested for infiltration at any one test shall be 2000 feet. Inflow shall not exceed 100 gallons per day per inch-mile diameter of pipe. The weir shall be furnished by the contractor.

D. EXFILTRATION TEST shall be conducted by the low pressure air test method. Test shall be based on time required for pressure to drop from 3 ½ PSIG to 2 ½ PSIG. Allowable time for pressure drop shall be 1.2 minutes for each 100 feet of 8 inch pipe. Time shall be increased by 0.3 minutes for each increased pipe size thru 18 inches and 0.8 minutes for each increased pipe size from 21 thru 30 inches. The contractor shall furnish all equipment and supplies for exfiltration testing. Exfiltration testing may be waived at the direction of the county engineer when the ground water table is above the top of the pipeline.

E. VACUUM TESTING After each manhole is installed and all pipes are connected, but before backfilling, the manhole shall be vacuum tested. All

pipes entering the manhole shall be plugged and braced. The contractor shall furnish all materials, labor and equipment necessary to perform the testing. A vacuum of 10 inches of mercury shall be created on the inside of the manhole. At the vacuum of 10 inches of mercury, the pump shall be stopped and the time shall be measured for the vacuum to drop 9 inches. Failure of the test shall be any amount of time less than the following.

4 FT. Diameter Manhole	=	60 seconds
5 FT. Diameter Manhole	=	75 seconds
6 FT. Diameter Manhole	=	90 seconds
7 FT. Diameter Manhole	=	105 seconds
8 FT. Diameter Manhole	=	120 seconds
10 FT. Diameter Manhole	=	150 seconds

Upon test failure, the contractor shall repair all leaks and retest the manhole until the test has passed.

SECTION 3 – SEWER SERVICE LATERALS

3.01 – MATERIALS furnish and install all materials as shown on the drawings and herein specified.

- A. LATERAL PIPE shall be smooth walled PVC conforming to the requirements of ASTM D1785 for poly vinyl chloride (PVC) plastic pipe, schedule 40. Pipe shall be manufactured of grade 1 type 1 PVC resin having a minimum cell classification of 12454B or 12454C as defined by ASTM D1784. joints and joining methods shall comply with ASTM D2466 for fittings and D2564 for solvent type cement. Position clean out at back of right-of-way where practical. Install clean out near center of the lot with water meter box 10 feet away.
- B. LATERAL CONNECTIONS shall be as described in 2.01 – B of this specification. Fitting shall be tee-wye pattern.

3.02 - CERTIFICATION Each material supplier shall provide the engineer with certification that all materials shipped to the job site have been tested and comply with Section 3.01 of this specification and the approved shop drawings. All materials are also to be guaranteed by the manufacturer to be free of defects for a period of one year from delivery to the job site.

3.03 – HANDLING AND DISTRIBUTING MATERIALS. Materials shall be handled and distributed as follows:

- A. HANDLING Pipe, fittings and other materials shall be carefully handled so as to prevent breakage and so as to prevent damage to the lining in the pipe and fittings. Pipe shall not be unloaded by rolling or dropping off trucks but, shall be handled carefully lifting and lowering into position using approved slings or clamps.
- B. STORAGE All pipe, fittings, and other materials which cannot be distributed along route of the work shall be stored for subsequent use when needed. The contractor shall make his own arrangements for the use of storage area.
- C. DISTRIBUTING MATERIALS shall be distributed and placed so as to least interfere with traffic. No streets or roadways are to be blocked or closed. The contractor shall furnish and maintain proper warning signs and furnish necessary traffic control devices. When working along streets and roadways no materials shall be strung further than is required for the days work at hand. No materials shall be placed in drainage ditches nor outside of the road right-of-way.

3.04 – EXCAVATION OF TRENCHES shall include all excavation necessary to install the pipes and clean-outs at the lines and grades shown on the drawings including sufficient depth to allow for bedding materials. All organic materials such as grass, limbs roots, and stumps shall be removed and discarded from the excavated materials. Minimum trench width shall be the outside diameter of the pipe plus 4 inches on each side. Should unstable material be encountered during excavation, it shall be removed and replaced with stone bedding material. Solid rock shall be excavated to provide a minimum separation of 8 inches between rock and pipe in any direction.

3.05 – INSTALLATION Service fittings shall be laid at the location on the drawings, fittings shall be laid for proper flow and positioned for inflow to be in the upper 1/3 of the main pipe. Lateral pipe shall be extended to the right-of-way line and capped. Clean-out shall be perpendicular to ground as shown on the standard detail. Cap shall be able to withstand test pressures and prohibit infiltration. Ends of laterals shall be marked with a 4"x 4" timber, as shown on the standard detail. The location of all sewer laterals shall be marked with a "X" engraved on the curb.

3.06 – RECORDING OF LATERALS The contractor shall record a measurement for each lateral. Measurements shall be made from the nearest downstream manhole to each lateral location on the main. Measurements shall be furnished to the developer's engineer for recording on the as-built drawings.

3.07 – BORES ALL bores must be cased with steel pipe (see detail).

SECTION 3A - SEWER FORCE MAIN PIPE AND PUMP STATION

1. FORCE MAIN PIPE MATERIAL PVC – C900 SDR 18 (200 PSI)
Ductile Iron – Class 350
With Protecto 401 liner
Epoxy coat manholes (minimum of 5) downstream of any proposed force main connection.
2. Back Filling of Trenches 36 inch minimum cover or use ductile iron pipe.
3. TRACER WIRE 14 gauge solid copper wire to be taped to top of pipe and extended to ground level at air release valve and/or any possible extrusion to ground level.
4. VALVES All valves must conform to AWWA standards. Check valves, gate valves, and plug valves.
5. VALVE BOX Cast iron (screw type) or equal with concrete pad. Valve box must have tracer wire and be installed every 500 feet and lid must state “sewer”
6. WETWELL OR PUMPS MANHOLE The following are required: ladder and safety climb.. Lockable lid on wetwell.
7. PUMP CONTROL Weighted floats (3-floats if 2 pumps). 24 volts step down on float cables. No junction boxes in manhole.
8. CONTROL PANELS 480 volts – 3 Phase
230 volts – 1 Phase
9. EMERGENCY POWER PLUG – 4-prong placed on the outside of the control panel.
10. ALARMS Red flashing light. Buzzer alarm (both floats activated)
11. PHASE MONITOR are required on all pump stations with 3-phase power.
12. All electrical work to be done in accordance with National Electrical Code (NEC).

SECTION 4 – WATER MAINS AND APPURTENANCES

Minimum flow velocity for water mains to be (1,000 GPM)

4.01 – MATERIALS Furnish all materials shown on the drawings and herein specified.

A. GATE VALVES 2 INCHES AND SMALLER shall conform to ANSI/AWWA A21.11/C111 for cast iron bodied, bronze mounted, parallel double disc, non rising stem valves. Valves shall be rated at 200 PSIG working pressure and 400 PSIG test pressure. End connections shall be standard female iron pipe threads or ANSI/AWWA A21.11/C111 mechanical joints for buried locations and ANSI B16.1 Flanges for exposed locations. Valve operator shall be 2 inch square nut for buried locations and standard handwheel for exposed locations. All valves shall be open left. Pending approval of detailed submittals the following valves are acceptable:

AWWA STANDARD

B. GATE VALVES 6 INCHES THRU 12 INCHES shall conform to AWWA C509 For bronze mounted, resilient seated, cast iron bodied gate valves. Valve body shall be rated for 200 PSIG working pressure and 400 PSIG test pressure. Provide valve with solid wedge, non rising stem construction. Valves shall be sealed rubber “O” rings seals both above and below the thrust ring. Valves stem shall be of bronze. Interior of the valves shall be coated in accordance with AWWA C550. End connections shall conform to ANSI/AWWA A21.11/C111 mechanical joints for buried locations and ANSI B16.1 flanges for exposed locations. Valve operators shall be 2 inch square nuts for buried locations or standard handwheel for exposed locations. All valves shall be open left. In line valves to be installed every 2000 feet or every other hydrant. Pending approval of detailed submittals, the following valves are acceptable:

AWWA STANDARD

- | | |
|---------------------------|------------|
| 1. American Darling (AFC) | 4. US Pipe |
| 2. Kennedy | 5. CLOW |
| 3. Mueller | 6. M&H |

C. TAPPING VALVES shall be as specified for gate valves 6 inches thru 12 inches. Depending upon availability standard double disk gate valve conforming to AWWA standard C500 will be accepted.

D. FIRE HYDRANTS shall comply with AWWA C502. Hydrants shall be furnished with one 4 inch and 2 2-1/2 inch hose connections. Threads shall be national standard. Hydrant shall open by turning left. Operating nut and nuts on nozzle caps shall be pentagon pattern. Hydrants to be installed every 1,000 feet maximum (for subdivision all lots must be within 500 feet of fire hydrant to the front set back of the lot).

Nozzle caps shall have retaining chains. Main valve shall have a minimum opening diameter of 4 ½ inches. Hydrant stem shall have double “O” ring seals. Drain valve shall be of all brass or bronze. All hardware shall be stainless steel. Hydrant shall be designed with a breakage flange. Nozzle section of hydrant shall be designed for 360 degree rotation. Standard color of hydrant shall be federal safety red. All hydrants shall be repainted (see standard Detail #3 for color) after installation. Private hydrants shall be painted silver. Depth of bury shall be dependant upon size of main but, in general not less than 3 feet 6 inches. Hydrant tee shall be MJ (x) MJ (x) swivel (Tyler #5-125, or approved equal) pending approval of individual project submittals the following fire hydrants are acceptable:

1. American Darling Mark 73 (AFC)
2. Kennedy K-81A
3. Mueller Centurian
4. M&H 129-T
5. CLOW Medalion
6. US Pipe

E. CURB VALVES shall be of all brass or bronze construction. Sealing of valves shall be by rubber “O” ring. Valve operator shall be tee head pattern. Inlet and outlet shall be female iron pipe thread pattern. Acceptable curb valves shall be listed on the standard drawings.

F. TAPPING SLEEVES shall be cast iron with ANSI/AWWA A21.11/C111 mechanical joint ends. Sleeve shall have a cement mortar lining and seal coating in accordance with ANSI/AWWA A21.4/C104. Approved types are Mueller H-615 or equal.

G. AIR RELEASE VALVES shall be of the automatic type installed as shown on the standard detail. Valve body and cover shall be cast iron. All internal parts shall be brass or bronze with stainless steel hardware. Float shall be stainless steel with buna-n seat. Valve shall have a rated working pressure of 300 PSI.

H. FITTINGS FOR 2 INCH PIPE shall be manufactured from type 1 grade PVC resin in standard iron pipe sizes in accordance with ASTM D-2464. Design working pressure of the fitting shall be 200 PSIG. Fittings shall have a rubber compression seal retained within the bell end of the fitting.

I. FITTINGS FOR PIPE LARGER THAN 2 INCHES shall be ductile iron in accordance with the requirements of either ANSI/AWWA A21.53/C153 or ANSI/AWWA A21.10/C110. Fittings shall have cement mortar lining and seal coating in accordance with ANSI/AWWA A21.4/C104.

J. PIPE shall comply with the following schedule and be installed as indicated on the drawings.

1. 2 INCH BRASS shall comply with ASTM A120 for Schedule 80 (extra heavy duty) wall thickness pipe. End connections shall be by standard iron pattern threads.
2. 2 INCH PVC PIPE shall be made from Type 1 Grade 1 resin conforming to ASTM D-1784. Pipe dimensions shall be controlled by ASTM D-2241. wall thickness shall be determined according to SDR 21. NSF logo must be printed on all pipe joints for the type of pipe.
3. 6 INCH AND 8 INCH PVC PIPE shall be made from Type 1 Grade 1 resin conforming to ASTM D-1784. Pipe dimensions shall be controlled by AWWA C900. Wall thickness shall be determined according to SDR 18 unless otherwise shown on drawings. NSF logo must be printed on all pipe joints for the type of pipe.
4. DUCTILE IRON PIPE shall be accordance with ANSI/AWWA A21.11/C151. Push on joints and mechanical joints shall comply with ANSI/AWWA A21.11/C111. Restraint joint shall comply with ANSI/AWWA C151/A21.51. Pipe shall be furnished with cement mortar lining and seal coating in accordance with ANSI/AWWA A21.4/C104. Unless otherwise shown on the drawing pipe thickness shall be based on Class 350. Twelve (12) inch or larger to be ductile iron pipe.
5. STEEL ENCASEMENT PIPE shall comply with ASTM A139 for Grade B welded or seamless pipe. minimum yield strength shall be 35,000 PSI. Diameter and wall thickness shall be as shown on the standard detail. Pipe ends shall be furnished beveled for butt welding of circumferential joints.

4.02 – CERTIFICATION Each material supplier shall provide the engineer with certification that all materials shipped to the job site have been tested and comply with Section 4.01 of this specification and the approved shop drawings. All materials are also to be guaranteed by the manufacturer to be free of defects for a period of one year from delivery to the job site.

4.03 – HANDLING AND DISTRIBUTING MATERIALS. Materials shall be handled and distributed as follows:

- A. HANDLING PIPE, Fittings and other materials shall be carefully handled so as to prevent breakage and so as to prevent damage to the lining in pipe and fittings. Pipe shall not be unloaded by rolling or dropping off truck but shall be handled by carefully lifting and lowering into position using approved slings or clamps.

- B. STORAGE All pipe, fittings and other materials which cannot be distributed along the route of the work shall be stored for subsequent use when needed. The contractor shall make his own arrangements for the use of storage areas.
- C. DISTRIBUTING Materials shall be distributed and placed so as to least interfere with traffic. No street or roadways are to be blocked or closed. The contractor shall furnish and maintain proper warning signs and furnish necessary traffic control devices. When working along streets and roadways no materials shall be strung further than is required for the days work at hand. No materials shall be placed in drainage ditches or outside of the road right-of-way.

4.04 - EXCAVATION OF TRENCHES shall include all excavation necessary to the pipeline at the alignment and grades shown on the drawings. Trenches shall be dug so that transitions in alignment and grade will be within manufacturer's limits for joint deflection and not put excessive stress on the pipe or fittings.

- A. DEPTH OF TRENCH shall be so as to maintain a minimum cover over the pipe of 36 inches.
- B. WIDTH OF TRENCH shall be a minimum of 6 inches clear on either side of the pipe or fitting.
- C. BELL HOLES shall be cut to allow pipe to rest on full length of the barrel.
- D. EXCAVATED MATERIAL shall be stockpiled away from the traveled roadway. Trench shall be sloped to prevent excavated material from sliding back into the trench.
- E. SOLID ROCK shall be removed to a depth to provide a minimum separation of 8 inches between the rock and pipe or fittings in all directions.

4.05 – INSTALLATION OF PIPE AND FITTINGS

- A. LAYING PIPE The contractor shall lay the pipe as soon as possible after the trench is excavated. The pipe shall be kept clean and dry during the installation process. Joint lubricant shall be manufactured for use in potable water systems. The open end of the pipe shall be plugged at the end of each work day. A 14 gauge stranded copper tracer wire with blue insulation shall be taped to the top of all non-metallic pipes and extend to ground level at all valve boxes.
 - 1. All water mains to be minimum of 1:1 (depth of infrastructure : linear feet off edge of pavement) ratio off edge of payment.

2. Road widening and turn lanes which cover UCPW water mains are required to be relocated to minimum of 1:1 (depth of infrastructure : linear feet off edge of pavement) ratio off edge of pavement.

B. INSTALLING FITTINGS All fittings shall be installed so as to provide maximum insertion of the pipe. Mechanical joint connections shall be tightened per manufactures recommendations. Each fitting shall be wrapped in protective polyethylene and blocked to undisturbed soil with concrete. If it is not practical to block fitting with concrete, steel retaining rods may be used.

4.06 – BACKFILLING All backfill material shall be placed on the pipeline in such a way as not to disturb the alignment or grade. Backfill shall be hand tamped up to the top of the pipe to assure fill bedding. Remaining layers of backfill shall be placed in 6 inch to 12 inch thickness and tamped with mechanical tamping equipment. If pipeline is to be laid over rock excavation, an 8 inch layer of stone or fill dirt bedding shall be placed under the pipe. If the rock extends up the side of the trench, the stone or dirt bedding shall be placed to fully cover the pipe.

4.07 – COMPACTION All backfill shall be placed so as to achieve a minimum compaction of 95% based on the standard proctor and in place density test. The contractor will be required to retain the services of an independent testing laboratory to certify compaction along existing state maintained roadways. Test will be required for each 1000 linear feet of pipeline.

4.08 – SEPARATION OF WATER AND SEWER MAINS

A. LATERALLY Water mains shall be separated from sewer mains by a minimum of 10 feet laterally whenever possible. If physical features or obstructions prohibit such placement, the water main may be placed in a separate trench a minimum of 18 inches above the sewer or in the same trench with the sewer provided a separate bench is cut for the water main in virgin soil with the bottom of the bench a minimum of 18 inches above the top of the sewer.

B. VERTICALLY when crossing over a sewer, a minimum clear separation of 18 inches shall be maintained. If such separation is not possible, both the water and sewer mains must be constructed of ferrous materials as per Section 4.01-J of this specification. The ferrous pipe should extend without joints 10 feet in each direction from the point of crossing. When crossing under a sewer, both water and sewer mains must be constructed of ferrous materials as per Section 4.01-J of this specification. The ferrous pipes should extend without joints 10 feet in each direction from the point of crossing.

4.09 – TESTING all pipelines will be subject to both a pressure test and a leakage test. The contractor will be furnished with water to perform the test one (1) time. If

additional test are required, the contractor will be billed for the amount of additional water used.

- A. PRESSURE TEST shall conform to AWWA standard C605 for PVC pipe and AWWA C600 for ductile iron. The test pressure shall be 100% of the designed rating of the pipe measured at the highest point in the system not to exceed 200 PSIG. Duration of the test shall be not less than 2 hours nor more than 24 hours. The duration of the test will be determined by the county engineer as the test progresses. Pressure shall not be allowed to vary more than 5 PSIG during the test.
- B. LEAKAGE TEST shall be conducted along with pressure test. Leakage will be defined as the amount of water that must be supplied to newly laid lines to maintain the test pressure within a 5 PSIG range over a specified period of time. Allowable leakage will be computed by the following formula:

$$L = \frac{(N) (D) (SGRT) (P)}{7400}$$

WHERE:

- D = nominal diameter of pipe in inches
- L = allowable leakage in gallons per hour
- N = number of joints in the section being tested
- P = test pressure in PSIG

BUT NOT LESS THAN:

10.5 Gallons per inch of diameter per mile of pipe per 24 hours.

4.10 – DISINFECTION shall conform to AWWA C651. All new water mains shall be disinfected after they have been pressure tested. The main shall be thoroughly flushed at a rate of 2 feet per second with clean water after which a chlorine solution of 50 parts per million shall be induced. The chlorine solution shall remain in the lines for a minimum of 24 hours. The lines shall again be flushed at a rate of 2 feet per second with clean water until the chlorine residual is reduced to that of the supporting

system. After 48 hours, samples shall be then collected and tested for coliform bacteria. Analysis shall be by a certified laboratory using the multiple tube fermentation method. One sample shall be collected from each dead end segment of the pipelines installed. If bacteria of any type is found, the test shall be repeated until the lines are clean.

SECTION 5 – WATER SERVICE LATERALS

Where practical, meter boxes to be at center of lot 10 feet from sewer lateral.

5.01 – MATERIALS furnish all materials as shown on the drawings, standard details, and herein specified.

- A. SERVICE SADDLES FOR 2 INCH PIPE shall be of all brass or bronze construction. Saddle shall be sized for the exact outside diameter of SDR 21 PVC pipe. Saddle shall have a rubber “O” ring seal bonded to the saddle. Clamping portion of the saddle shall prevent over stressing the pipe. Outlet threads shall be Mueller “CC” pattern. Pending approval of individual project submittals, the following fittings are acceptable:
1. Ford S70
- B. SERVICE SADDLES For pipe larger than 2 inches shall be of cast or ductile iron. Saddle shall have two (2) flattened stainless steel straps for attachments to the pipe. Saddle shall have a neoprene gasket bonded to the underside. Casting shall be coated with nylon to prevent corrosion. Outlet threads shall be Mueller “CC” pattern. Pending approval of individual project submittals, the following fittings are acceptable:
1. Smith-Blair #317 (12” and larger)
 2. Smith-Blair #315 (8” and smaller)
- C. CORPORATION STOPS shall be of bronze construction. Pending approval of individual project submittals, the following fittings are acceptable:
1. Mueller H-15008 AWWA x 110 Connection
 2. Ford F1000 AWWA x Pack Joint
- D. METER YOKES shall be of cast or ductile iron. Yoke shall be sized for 5/8” x 3/4” x 3/4” services. Pending approval of individual project submittals, the following fittings are acceptable:
1. Ford Y502
 2. Mueller H-5020

- E. ANGLE VALVES shall be bronze. Valves shall be supplied with a lock wing. Inlet shall be compression joint. Valves size shall be 5/8" x 3/4" x 3/4". Pending approval of individual project submittals, the following fittings are acceptable:
1. Ford AV94-323W
 2. Mueller H-14273
- F. CHECK VALVES shall be an "ASSE" approved dual check and shall be of brass and bronze construction. Internal hardware shall be stainless steel. Valve shall be straight pattern. Valve size shall be 5/8" x 3/4" x 3/4".
- G. METER BOX shall have a molded plastic bottom section with a cast iron lid. Inside dimensions shall be approximately 10" x 17" x 12" deep. Lid shall have separate hinged opening for reading the meter. Bottom section shall be Brooks product #1419. Lid shall be Charlotte Pipe and Foundry UTL 291. If to be located in the driveway, meter box shall be traffic rated.
- H. EXPANSION CONNECTION HANDWHEELS shall be of brass or bronze and machined to connect to a 5/8" x 3/4" meter and yoke. Expansion handwheels shall be:
- Ford EC-23.
- I. WATER METERS shall be of the nutating disk type conforming to AWWA C700-77. Meters shall have a hermetically sealed register connected to the flow measuring chamber by a magnetic drive. Meter case shall be of brass or bronze. Register box and case bottom shall be of synthetic polymer. Meter size shall be 5/8 inch with 3/4 inch male iron pipe thread inlets and outlets. Register shall read in gallons. Pending approval of detailed submittals, the following meters are acceptable:
- AMR METERS
- ELSTER (60 series)
 - AMCO (Model C-700)
- J. SERVICE TUBING shall be Type "K" copper (compression fittings).

5.02 – CERTIFICATION Each material supplier shall provide the engineer with certification that all materials shipped to the job site have been tested and comply with Section 5.01 of this specification and the approved shop drawings. All materials are also to be guaranteed by the manufacturer to be free of defect for a period of one year from delivery to the job site.

5.03 – INSTALLATION Service shall not be installed until mains have been successfully tested. Saddles shall be positioned approximately 45 degrees from horizontal. Tubing shall be installed so that a minimum of 24 inches of cover is maintained. Meter boxes shall be set flush with finish grade and positioned at the back of the right-of-way. The location of all meter boxes shall be marked with a “W” engraved in the curb. In subdivisions with no curbs the location of the meter box shall be shown with a “W” painted on the edge of the pavement. All valves shall be marked with a “V” in the same manner. If necessary to prevent settlement, a meter box shall be placed on 4 brick. Meters and expansion wheels are not to be set by the contractor, but turned over to the utility for storage. Each service shall be thoroughly flushed after installation.

SECTION 6 – MATERIALS APPROVAL LIST

6.01 – The Engineer shall furnish to the county three (3) complete materials approval list for the sanitary sewer and water line construction prior to the installation of any system components.

SANITARY SEWER MATERIALS APPROVAL LIST

SUBMIT TO:

Union County Public Works
500 North Main Street, Suite 500
Monroe, N.C. 28112-4804

SUBDIVISION:

SUBMITTED BY:

DATE:

<u>ITEM DESCRIPTION</u> <u>MODEL/TYPE</u>	<u>SIZE</u>	<u>MANUFACTURER</u>
PVC Pipe	_____	_____
	_____	_____
	_____	_____
Ductile Iron Pipe	_____	_____
	_____	_____
Valves	_____	_____

Valve Boxes		
Type Saddles		
Type Manholes		
Cement		
Bedding Materials		
Control Panel		
Pump Control		
Emergency Power		
Air Release		

WATER LINE MATERIALS APPROVAL LIST

SUBMIT TO:

SUBDIVISION:

Union County Public Works
500 North Main Street, Suite 500
Monroe, N.C. 28112-4804

SUBMITTED BY:

DATE:

LISTED BELOW ARE ITEMS OF EQUIPMENT/MATERIALS SUBMITTED FOR APPROVAL:

<u>ITEM DESCRIPTION</u> <u>MODEL/TYPE</u>	<u>SIZE</u>	<u>MANUFACTURER</u>
PVC Pipe	_____	_____
	_____	_____
Ductile Iron Pipe	_____	_____
	_____	_____
Gate Valves	_____	_____
	_____	_____
	_____	_____
Valve Boxes	_____	_____
Valve Box Protector Ring	_____	_____
Fire Hydrants	_____	_____
Service Saddles	_____	_____
	_____	_____
	_____	_____

Corporation Stop	_____	_____
Meter Yoke Angle Valve	_____	_____
Expansion Connection	_____	_____
Iron Yoke	_____	_____
Straight Outlet Piece	_____	_____
Water Meter (Gal.)	_____	_____
Meter Boxes	_____	_____
Service Line Tubing	_____	_____

STANDARD DETAILS