

SECTION 9.00 WATER DISTRIBUTION

9.01 Water Distribution Pipe

All pipe used for water distribution lines shall be polyvinyl chloride, or cement lined ductile iron pipe.

It is the intent of this specification to provide pipe of the highest standard known to the trade and to provide pipe that is free from defects in workmanship and materials. All pipes and other materials shall be first class materials and no used or second hand materials will be permitted.

For pipe sizes two inches in diameter, either copper type K soft or PVC pipe shall be used. "MuniPEX" cross linked polyethylene pipe will be considered on a case by case basis.

For pipe sizes six inches, eight inches, or ten inches in diameter, either cement lined ductile iron pipe (PC350), or PVC (C-900-75) shall be used.

For pipe sizes twelve inches or sixteen inches in diameter cement lined ductile iron pipe shall be used (min. PC350).

For pipe sizes in excess of sixteen inches in diameter, the City Engineer shall specify type of pipe to be used.

See Section 2.0 for General information including but not limited to layout, staking, and R/W requirements. For Special Conditions requiring ferrous material pipe see Section 2.10.

9.02 Polyvinyl Chloride Water Pipe

2" PVC

All 2" PVC pipe shall be manufactured and tested within the United States of America. It shall be twin gasketed coupling or integral bell and o-ring rubber gasket type pipe.

All 2" PVC pipe shall be suitable for use at a maximum hydrostatic working pressure of 200 psi at 73⁰ Fahrenheit (standard dimension ratio SDR 21) , and shall conform to the requirements as set forth in Commercial Standard No. CS-256063, ASTM 1598-63T, ASTM D-2241 or the latest subsequent revision. PVC pipe shall comply with and shall bear the National Sanitation Foundation (NSF) seal of approval.

All 2" PVC pipe and fittings shall be made from clean, virgin NSF approved Type I, Grade I polyvinyl chloride conforming to ASTM D 1784 resin specification (equivalent to, new cell classification 12454).

All 2" PVC water pipe shall be furnished in standard laying lengths of 20 feet, plus or minus one inch and shall have one or both ends tapered for use with a twin gasketed coupling or with the integral thickened-wall bell. Each coupling or bell shall allow for the contraction and expansion at the joints. Joints shall be sealed with a gasket or rubber o-ring in accordance to the manufacturer's instructions.

Couplings shall permit 5⁰ deflection (2-1/2 degree each side) of the pipe without any evidence of infiltration, exfiltration, cracking or breaking. See Section 9.11 also.

Lubrication used on joints shall be water soluble, non-toxic, non-objectionable to taste and odor imported to the fluid, non-supporting of bacteria growth and have no deteriorating effect on the PVC pipe or rubber gasket , **as recommended by AWWA and the pipe manufacturer.**

All 2" PVC pipe and fittings shall be stored and protected from direct sunlight to prevent warping or deformation until installed. Maximum accumulated exposure shall be six (6) months, with no visible defects. Any visible defects including but not limited to chalking, discoloration, blisters, or loss of sheen shall be cause for the pipe to be rejected and replaced. Any testing suggested in lieu of the above shall be at the manufacturer's expense, all such test shall be performed by an independent laboratory.

All pipe which has warped or otherwise deformed shall be rejected and shall be removed from the project.

6", 8", 10" PVC PIPE

All 6", 8", and 10" PVC pipe installed in the TRU system shall be DR-14 pressure pipe conforming to AWWA C-900, latest revision. DR 18 PVC may be allowed (in low pressure zones) . All outside diameters shall be compatible with cast and ductile iron fittings.

All 6", 8", and 10" PVC pipe shall be furnished with an elastomeric-gasketed compression type joint, and the appropriate gasket(s) shall be furnished with each length of pipe. Pipe bells shall be integral to the pipe, sleeve couplings are not permitted.

All 6", 8", and 10" PVC pipes and materials are to be tested according to the requirements of AWWA Standard C-900, latest revision. Certified Test results shall be provided to the City Engineer when requested. These tests shall be performed by an independent testing laboratory at the expense of the pipe manufacturer. All PVC pipe shall be manufactured and tested within the United States of America.

All 6", 8", and 10" PVC water pipe will be shipped, stored, and strung at the project in a manner as to be protected from total accumulated exposure to sunlight and possible ultraviolet radiation of no more than six (6) months, with no visible defects. Any visible defects including but not limited to chalking, discoloration, blisters, or loss of sheen shall be cause for the pipe to be rejected and replaced. Any testing suggested in lieu of the above shall be at the manufacturer's expense, all such test shall be performed by an independent laboratory.

When the plans and/or proposal calls for the use of PVC pipe, a 14 gauge solid copper wire shall be attached on top of the pipe to aid in locating the pipe. This wire shall be secured to the pipe with duct tape near each bell and at the center of each joint of pipe. The wire shall be fastened securely to each main line valve and fire hydrant. Tracer wire shall be tested with a pipe locator before acceptance of project. Any splice connection shall be as approved by the City Engineer.

9.03 Cement Lined Ductile Iron Water Pipe

Ductile Iron Pipe shall be manufactured and tested in the U.S.A. and shall conform to AWWA Specification C-151 and ANSI Standard #A21-51 or latest revision.

Cement linings **with an asphaltic seal coat** for ductile iron pipe shall conform to AWWA Specification C-104. Special linings shall be specified in the Special Provisions

Exterior of ductile iron pipe shall be coated with a layer of arc-sprayed zinc per ISO 8179. The mass of zinc applied shall be 200 g/m² of pipe surface area. An asphaltic topcoat layer shall be applied over the zinc to a minimum 2 mil thickness. Zinc coating system shall conform to ISO 8179-1 "Ductile iron pipes – External zinc based coating - Part 1, Second edition 2004-06-01 or latest revision.

Ductile iron pipe shall be mechanical joint or push-on joint type. Push-on type joints shall be "Bell-Tite", "Fastite", "Tyton", or approved equal. All joints for ductile iron pipe shall conform to the applicable dimensions and weights shown in the tables in AWWA C-151 and to ANSI A-21.11 (AWWA C-111) or latest revision.

All pipe shall be clean and sound without defects that will impair their service. Repairing of defects by welding or other methods shall not be allowed.

All pipe shall have an outside coating of a petroleum asphalt coating approximately 1 mil thick, as per AWWA. The coating shall be applied to the outside of all pipe and the finished coating shall be continuous, smooth, neither brittle when cold nor sticky when exposed to the sun, and shall be strongly adherent to the pipe.

Thickness for all Ductile Iron Pipe in this contract shall be as recommended for the proposed depth of cover in the "Design of Ductile Iron Pipe", as published by the Ductile Iron Pipe Research Association, or as shown on the Project Plans (with the minimum being Pressure Class 350). See Fittings for special thickness required with retaining glands

Flanged Ductile Iron Pipe

Flanged ductile iron shall be cement-mortar lined and shall conform to AWWA C-115, C-151 and ANSI A21.15, A21.51 as to metal thickness and quality and the cement lining to AWWA/ANSI C-104/A21.4, **unless specified otherwise**. The thickness class or classes shall be 53. Flanges shall be screw type, faced and drilled 125-pound ANSI. Flanges and bolts shall conform to ANSI B16.1. The ductile iron pipe and flanges shall be rated for 250 P.S.I. working pressure.

Gaskets for Flanged Pipe

Gasket material for flanged joints in cast iron shall be cloth-inserted sheet rubber gaskets conforming to AWWA C207 and ANSI B16.21, 1/8 inch thick. The gasket shall be full-cut, with holes to pass bolts. Gasket material shall be free from corrosive alkali or acid ingredients.

Polyethylene Encasement

Polyethylene material, thickness and width, shall conform to latest revision of AWWA/ANSI C-105/A21.5 . Only tubes shall be used on the main pipeline. Minimum thickness shall be 8 mil.

The inside surface of the polyethylene wrap to be in contact with the pipe exterior shall be infused with a blend of antimicrobial biocide to mitigate microbiologically influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion.

Polyethylene encasement shall be installed where shown on the drawings on ductile iron pipe, fittings, and valves in accordance with AWWA C105. Method C, using polyethylene sheets, shall only be used when directed by the Engineer.

9.04 Gate Valves

All gate valves shall have a cast iron body, fully bronze mounted, resilient seated wedge valves with mechanical joint hubs and shall be placed at locations indicated on City approved plans in accordance to City Standards.

Gate valves shall, open counterclockwise (left), shall be a non-rising stem type with 2-inch square operating nut and shall be AWWA C-509 standard design for 200 psi working pressure for 12” and smaller.

Gate valves for 14-inch or larger diameter pipes shall be bevel geared with gear case and indicator, grease packed, and shall include a 3-inch by-pass and valve (unless AWWA specifies a larger bypass for the size valve), for horizontal installation. As per AWWA spec., all such valves shall include rollers, scrapers, and tracks, and shall be AWWA C-500 standard design for 150 psi for all 14” and larger; unless specified otherwise in the Special Provisions or Proposal.

Gate valves shall be those shown on the City’s approved materials list or an approved equal.

Gate valves shall be placed as shown on City Standard Drawing 71B-6 and on the City approved plans or as directed by the City Engineer. The gate valve shall be installed so that the operating stem is plumb, lengthwise in the trench.

Valve boxes shall be centered over the operating nut and shall stand plumb, with the top of the valve box set flush with the finished surface. Boxes shall be set in such a manner that the operating wrench may be inserted on the operating nut and the valve operated without undue stress or difficulty.

Valves installed at dead end mains shall be securely rodded in accordance with City Standard Drawing 71B-9 from the plug to the valve and from the valve to the deadman. This will allow the future removal of the dead end plug.

9.05 Tapping Sleeve and Valve

All tapping sleeves and valves shall be cast iron or ductile iron and be manufactured and tested within the U.S.A. according to AWWA specifications. All tapping sleeves and valves shall be as per the City’s approved materials list or an approved equal. All tapping sleeves shall be full size CIP or DIP, MJ with split/bolted glands; or full body stainless steel. All tapping sleeves shall be those as approved by the City Engineer.

9.06 Water Pipe Fittings

For all water lines greater than two-inches in diameter, all fittings shall be cast/ductile iron mechanical joint and shall have a minimum working pressure of 150 psi, shall be manufactured and tested within the U.S.A. and shall meet AWWA C-110 Standards and (ANSI 21.11) for mechanical joint pipe. Fittings for two-inches in diameter shall be same material specification as the pipe material.

Compact Ductile Iron Fittings may be used in lieu of the Standard Cast Iron or Ductile Iron Fittings. All Compact Ductile Iron Fittings shall be mechanical joint and shall have a minimum working pressure of 350 psi, shall be manufactured and tested within the U.S.A. and shall meet AWWA/ANSI C-153/A21-53 and AWWA/ANSI C-III/A21.11 for mechanical joint pipe.

All fittings larger than two (2) inches in diameter shall have a cement-mortar lining and seal coating in accordance with AWWA/ANSI C-104/A21.4. Ductile Iron fittings may be also supplied with a 6-8 mil nominal thickness fusion bonded epoxy coating internally and externally, conforming to the requirements of AWWA/ANSI C550 and C116/A21.16.

All tee, bends, plugs, etc. shall be installed in accordance to Standard Details 71B-7 thru 71B-9B. All concrete for blocking shall be "Ready Mixed Concrete" with minimum 28 day strength of 3000 psi. No onsite mixing of concrete will be allowed. Retainer glands may be used in lieu of tie rods and concrete blocking for the installation of bends, and fire hydrant leg valves and fittings. **Retainer glands will not be allowed for use with plugs on the end of a line.** All retainer glands shall be used with mechanical joint ductile iron or cast iron pipe and fittings; and shall meet specifications AWWA C-111 (ANSI A21-11) latest revision, for rubber gasket joints table 11-1 mechanical joint dimension. Retainer glands furnished shall be approved by Factory Mutual, Underwriter's Laboratories, and the City Engineer for the City of Gastonia.

Flanged fittings shall conform to ANSI B16.1 and shall be faced and drilled 125-pound ANSI. The fittings shall be 250 psi rated working pressure and cement-mortar lined to same thickness specified for pipe.

Retaining Glands, DIP

Retaining Glands for use on Ductile Iron Mechanical Joint Pipe shall be as specified herein.

Minimum pressure class 350 DIP may be used with retaining glands that incorporate the use of breakaway at specified torque "Auto Tork" bolts and contoured wedge face contacts to the pipe, or with retaining glands that incorporate machined serrations for exact fit and 360° contact and support of the pipe wall, same as specified in "Retaining Glands, PVC".

Retaining Glands, PVC

Joint Restraint devices for PVC Pipe shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.

Restraint Devices shall be manufactured of high strength ductile iron, ASTM A 536, Grade 65-45-12. Bolts/connecting hardware shall be of high strength low alloy material in accordance with AWWA/ANSI C111/A21.11.

All Joint Restraint Devices for PVC shall carry a water working pressure rating equivalent to the full rated pressure of the PVC Pipe they are installed on, with a minimum of 2:1 safety factor in any nominal pipe size. In addition, they shall meet or exceed the requirements ASTM Standard F1674, Standard Test Method for Joint Restraint for Products for Use with Polyvinyl Chloride (PVC) Pipe. Notarized certification from the manufacturer of the restraint device shall be provided with submittals.

Restraint Devices shall be as on the City's approved material list or an approved equal.

Solid Sleeves - Cast iron sleeve coupling with mechanical joint ends and alloy bolts and follower. Use pipe manufacturer's standard sleeve.

Flap valves shall be Clow Flanged End Flap Valve model F-3012, Troy Model A-2540-6, or approved equal.

9.07 Valve Boxes

Valve boxes shall be standard cast iron extension valve boxes 5-1/4 inch shaft for the appropriate cover over the pipe, normally 36" to 48". All valve boxes shall be cast iron and shall be those manufactured and tested within the U.S.A. All boxes shall be two sections with both top and bottom sections equipped with a flange footing. Adjustments to varying depths shall be by a sliding joint. Screw type extensions are not acceptable. Valve box depth shall be compatible for adjustment for the depth of water line bury, Contractor shall be responsible to verify the bury depth necessary. See Detail 71B-7 for **Protector Ring** dimensions for locations outside the pavement section

Valve boxes shall be those listed on the City's approved material list or an approved equal.

9.08 Fire Hydrants

Fire hydrants shall be cast iron body, full bronze mounted, suitable for a working pressure of 150 pounds per square inch and shall be in accordance with the latest specification of the AWWA

Fire hydrants shall be constructed in a manner permitting withdrawal of internal working parts without disturbing the barrel or casting. Hydrants shall have a breakable safety flange in the barrel and safety coupling in valve stem. Fire hydrant valve, when shut, shall be reasonably tight when upper portion of barrel is broken off. Valve opening shall be at least 4-1/2" in diameter, with net area of waterway at smallest part, with valves wide open, not less than 120 percent of valve opening.

Hose nipples shall be bronze or non-corrosive metal. Each hydrant shall have two 2-1/2" nipples, National Standard Threads and one steamer nozzle opening 4-7/8" O. D. , with threads or fittings conforming to the local fire jurisdiction standard.

Hydrants shall be painted with one coat of zinc chromate primer and one coat (acceptable for final coat) of porcelainized enamel, standard color as used by the local Fire Department, or approved equal. All cast iron parts below ground lines shall be coated with a black asphaltum varnish.

Fire hydrants shall be as listed on the City's approved material list.

Hydrants shall be set on a base of twelve inches (12") of thoroughly compacted washed stone. The hydrant shall be securely rodded/restrained in accordance with City Standard Drawing No. 71B-9 to prevent blowing-off under pressure. All hydrants shall be set plumb.

Clean, coarse washed stone shall be placed around the barrel of the hydrant to within twelve inches (12") of the ground level and shall conform to the typical section as shown on City Standard Drawing Nos. 71B-7, 71B-8, 71B-9, as applicable. Care shall be exercised to avoid earth materials being mixed with the stone backfill material.

The fire hydrant assembly (which would include the hydrant, 6" valve and valve box, 1-6" tee, 2 sections of 6" pipe, rodding, and other fittings) shall be cast iron with mechanical joint connections. **Slip joint pipe or fittings will not be permitted for fire hydrant assemblies.**

Hydrants shall have 6-inch mechanical joint hub with strapping lugs, pentagon operating nut (1-1/4" measured from one flat side to an opposite point). **The hydrant valve shall open in a clockwise** (right) direction and the direction of opening shall be indicated on the head of the hydrant.

Fire hydrants shall be installed, as shown on City of Gastonia Standard Drawing 71B-6 thru 71B-9, as shown on the approved plans, or as directed by the City Engineer.

All new fire hydrants installed or existing fire hydrants taken out of service shall be kept "bagged" or "tagged", indicating them as being out of service. The contractor shall maintain this indication until the water system has been approved by the City of Gastonia for placing into service. The contractor shall then remove the "bags" or "tags" as he checks all valves to make sure the system is in service.

9.09 Blow-Off Valves

Blow-off valves shall be constructed at the end of all dead end lines, except where there is a fire hydrant installed on the line within fifty (50) feet of the dead end of the line. See Section 9.04 for rodding to deadman.

A temporary blow-off valve may be provided for cleaning and testing of the line during construction. After all tests have been completed and the line approved, the Contractor shall remove the temporary blow-off valve and replace it with a T/2 plug or a two-inch plug.

Pipe materials for 3/4" and 2" Blow-Offs shall be all Brass (IPS) pipe conforming to ASTM B43-02(2004) or latest revision. Fittings shall be brass, conforming to ASTM B62-02 or latest revision, or Federal Specification WW-P-460.

When the installation is behind curb and gutter or behind the shoulder of the road, a City Standard water meter box, as approved by the Public Works/Utilities Director or the City Engineer, may be used in lieu of the two standard valve boxes, as shown on Detail 71B-9B.

9.10 Trench Excavation

Water lines shall be laid at the location as shown on City Standard Drawing No. 71D-15, 71D-15A and 71B-6 thru 71B-9, and unless otherwise specified or shown on the plans shall have a nominal cover of thirty-six (36") inches for 2-inch, 6-inch, and 8-inch pipe and forty-two (42") inches for all pipe ten (10") inches or more in diameter. Utility and storm drainage crossings may require deeper installations.

The contractor shall "pothole" excavate at known utility crossing locations for the identification of conflicts and adjustment of alignment and grade accordingly.

See Sections 8.17 (a) and 5.05 for compaction test requirements.

Trench Stabilization (#57 washed stone) will be required when a wet or poor sub-grade condition is encountered by the contractor and when in the City Engineer's opinion other proper foundations cannot be provided. Refer to Standard Specifications Section 10.02 for additional requirements.

Washed stone screening dust shall be spread prior to placing any trench material on any pavement. This is to allow for the through cleaning of the pavement (no discoloration or debris).

Rock Excavation

Excavation of hard rock, ledge rock, or boulders larger than two cubic yards which can not be ripped, clawed, etc., and or removed by conventional construction methods will be considered as Rock Excavation.

All blasting operations (use of explosives) shall be conducted in strict accordance with existing laws, rules, and regulations relative to the storage and use of explosives. Blasting shall be performed only by experienced personnel working according to accepted practice. The Contractor shall be responsible for securing all necessary permits including, but not limited to the City Fire Department. The Contractor shall comply with the City's Standard Specifications including, but not limited to Section 2.06. Extreme care shall be exercised by the Contractor to prevent injury to any existing pipes, water, sewer, gas, poles, wires, cables, drains, buildings or other structures or utilities either below or above the surface of the ground. The Contractor shall be solely responsible for any and all damage resulting from the use of explosives. Where there is any possibility of damage being caused by blasting it may be necessary to resort to drilling and wedging to remove the rock.

Any rock encountered shall be excavated six inches (6") below the subgrade of the pipe bed.

9.11 Pipe Laying

At the start of construction, **any existing valves to be used as isolation valves to the new project lines, shall be visually inspected by the inspector, contractor, and as necessary by TRU representative.** Any leaks shall be repaired or isolation construction method used, see Section 9.14.

Each joint of pipe shall be laid according to manufactures recommendations and in accordance with latest revision of AWWA C-600 for Ductile Iron and Cast Iron Pipe, and AWWA C-900 for PVC. The nominal allowable deflection for all the pipes listed shall be 1/2 of the manufacturer's recommended maximum deflection per joint. The engineer may vary from this City policy when prudent.

Competent pipe layers shall be required for pipe installation.

The Contractor shall plug all pipe ends, at the end of each days work.

Where rock is encountered, the rock shall be excavated a minimum of six inches below the pipe grade and the cut shall be backfilled to grade with an approved earth material.

9.12 Hydrostatic Tests

The contractor shall provide all necessary equipment and tests.

After the pipe has been laid and partially backfilled and before any service taps have been made, the newly laid pipe and appurtenances shall be subject to a hydrostatic pressure and leakage test.

The operating pressure gradient at the lowest point of the proposed system shall be determined by one of the following methods as directed by the City Engineer.

- (a) The operating gradient pressure shall be determined at a similar point on the existing system in the immediate area of the project.
- (b) The pressure gradient shall be taken at the lowest point on the proposed system.

After the operating pressure gradient has been determined, the test pressure shall be 50 percent greater than operating pressure gradient. In no case shall the test pressure be less than 125 psi, the maximum test pressure shall be 200 psi. No test shall be made for at least 36 hours after the last concrete thrust or reaction block has been poured with high early-strength cement or at least seven days after the last concrete thrust or reaction block has been cast with standard cement. The duration of the test shall be two hours, unless otherwise directed by the City Engineer.

Each section of the pipeline shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the City Engineer. The pump, pipe connections, and all necessary apparatus shall be furnished by the Contractor. The Contractor shall also furnish the necessary personnel to administer the test under the inspection of the City Engineer or his representative.

See section 2.02 for use of City water.

During the filling of the pipe and before the application of the specified test pressure, all air shall be expelled from the pipeline, additional corporation stops/curb stops may be necessary. During the test, all pipe, fittings, valves, hydrants, and couplings shall be carefully examined for leakage.

Pressure in the new water line shall be maintained within 5 psi of the test pressure. The test pressure shall be maintained for at least two hours, after which the pressure of the line shall be measured and logged by the City Inspector. Any water added to maintain the test pressure shall be logged by the City Inspector. If this pressure is less than the required test pressure, the contractor shall add measured amounts of water until the line is brought back to the test pressure. The amount of water added shall then be compared to the allowable leakage values from the AWWA formula below. Any joint or section of pipe which is not within the allowable value shall be rejected and shall be replaced or repaired and the test shall then be repeated until the results are satisfactory.

TABLE 1. AWWA ALLOWABLE LEAKAGE FORMULA

$$L = \frac{ND (\text{square root of } P)}{7400}$$

L = Allowable leakage in gph
N = No. couplings (joints)
D = Diameter of pipe in inches
P = Average test pressure in psi

NOTE: When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal./hr./in. of nominal valve size will be allowed.

Where lines have been only partially backfilled or where lines have been uncovered for inspection or correction, the contractor shall backfill and tamp these areas as prescribed elsewhere in these specifications. Care shall be taken not to disturb or damage the pipe.

9.13 Taps/Service Connections (Water)

Only authorized personnel of the City of Gastonia Utilities Department shall be permitted to make water taps unless the developer has received permission, in writing, from the City's Public Works and Public Utilities Director or designated representative, for an approved Utilities Contractor to make these taps.

All taps shall be made, with the water main under normal operating pressure, in strict conformance to City requirements. No tap shall be made before the pressure and sterilization tests are complete and approved.

Where existing water lines are to be abandoned, the contractor will be required to abandon and plug the water lines and service taps. The contractor shall also install a new tap/service connection from the new water line to the existing meter. The new taps and abandoning of the old lines shall be performed in order to cause the least disruption in service as is possible. No taps may be installed until all tests are completed and approved.

Water service connections may be installed by the developer of property upon request. The Application (form supplied by the City) should be completed and sent to the Director of TRU. Material for these services will be obtained by the contractor with the exception of water meters. Materials used in making the water service connection shall be as approved by TRU

Tap approvals are subject to change without notice, as such a current list of approved tap materials will be available at the Two Rivers Utilities, 1300 N. Broad St.

All material will be inspected for compliance by Water and Sewer Division inspector prior to installation. All services will be inspected prior to backfill operation for compliance. The backfill and compaction operation shall be according to standard procedure, and the Standard Specifications including Section 5.05.

All taps shall be made in a method approved by the City Engineer, and according to Standard Details including 71B-20, 71B-21, 71B-22 and any Special Project Details included in the Plans.

In the event that a water meter is collocated with a proposed driveway, the water meter shall be re-located out of the proposed driveway. **No fittings will be permitted in the relocation of the water meter.** If the water meter cannot be effectively relocated without the use of fittings, the builder/developer shall install a new service line of sufficient length of pipe, from the corporation stop at the main to the new meter location.

Pavement cuts across public streets for services shall be avoided. The contractor shall install these lines using an air pressure driven, pneumatic "mole" or an auger type machine. If an open cut is unavoidable, the contractor shall secure approval from the City Engineer prior to making any street cut for a service line.

No water tap shall be permitted until the curb and gutter has been installed.

All tap locations shall be plused in on the "as-built" plans and shall be marked on the top of the curb with "arrow" indicating the water and "X" indicating the sewer .

See Section 2.34 for additional as-built requirements.

9.14 Sterilization of Completed Lines

The contractor, before any new pipe is placed into service, shall fill, disinfect, and test the line as per AWWA C-651, latest revision. **The lines shall be filled slowly to eliminate any possibilities of backflow or contamination of the existing lines with the high CL₂ content water. Isolation valves on the system shall be covered with stone (or tagged) to inhibit any accidental opening and consequently cross contamination**, see Section 9.11. To fill, only one valve shall be open at any given time. If proper technique is not demonstrated by the contractor, the City may require him to isolate his new construction and fill and test with a cross-connection control device as approved by the City Engineer, see AWWA C-651 optional sec. **4.3.9**. If isolation is required , then the subsequent final tie-in shall be a sanitary tie-in as described in AWWA C-651 section **4.6**. The contractor shall disinfect the line by the addition and thorough dispersion of a chlorine solution (derived from liquid chlorine bleach) in concentrations sufficient to produce a chlorine residual of at least 100 ppm in the water throughout the distribution system. This solution must remain in the lines for at least 24 hours, after which the chlorine residual shall be at least 10 ppm. Then the lines are to be flushed by the contractor and bacteriological samples taken by the City Inspector. No water shall be turned on for public use until sterilization approval is given by the City.

The following test procedures shall be incorporated in conjunction with the above :

- 1) A City Construction Inspector must be present to operate existing valves when flushing or filling a new line.
- 2) Liquid Bleach (industrial strength, 15% free CL₂) shall be used as the disinfectant.
- 3) After flushing the disinfecting solution from new lines, the inspector shall take samples (for chemical analysis) from both the new water lines and the City maintained lines being used as a water source. After samples are collected for a chemical analysis the new line is to be left idle for a minimum of 24 hours. After the 24 hour period, samples shall again be collected from the new line and the City maintained lines for chemical and bacteriological analysis. These samples will be analyzed to determine if the new line has been adequately disinfected.

- 4) All chemical and bacteriological samples must be delivered to the City lab (by the inspector) no later than 3:00 p.m. Monday-Friday.
- 5) **All new lines shall be flushed at a velocity of 4 feet per second for sufficient time to discharge a minimum of 2 times the total volume of the entire line. Additional flushing may be required as deemed necessary by the field engineers.**

The responsibilities of sample collection will be shared between Construction Inspections and the City Lab. Construction Inspections will coordinate and collect the initial set of samples for each segment of new water lines; the City Lab will collect the follow-up samples.

If the test results are not acceptable, the contractor shall repeat sterilization and retest lines.

The City reserves the right to make any tests on the system by City employees as may be deemed necessary by the City Engineer.

Only authorized personnel of the City shall operate valves in the existing distribution system.

9.15 Temporary Plugs

The contractor shall seal off all exposed ends of pipe before terminating work at anytime. At the end of each days work or at any time the pipe laying operation is stopped or delayed, the contractor shall provide a water tight seal at all exposed ends of pipe or fittings.

9.16 Backflow Prevention

All back flow Devices shall be as per AWWA C-506, latest revision.

Proper type backflow prevention devices must be installed on water lines designed to serve non-potable water systems such as sprinkler fire protection systems and irrigation systems. If any chemicals such as anti-freeze chemicals are to be added into sprinkler fire protection systems, reduced pressure backflow preventers must be installed. If no chemicals are to be added into sprinkler fire protection systems, double detector check valve assemblies or reduced pressure principle backflow preventers must be provided. All backflow prevention devices must have a detector meter unless metered separately. All backflow prevention devices must be approved by the Foundation For Cross-Connection Control & Hydraulic Research, University of Southern California. Plans and

specifications for each backflow prevention device shall be submitted to and approved by the N.C. Department of Human Resources for the specified degree of hazard in addition to approval by the City Engineer prior to construction. **The Utility Dept. shall keep an up to date list of approved backflow devices, the contractor shall use said material current at the time of approval of a customer service.** See section 9.14 for backflow prevention during testing/filling.

9.17 Air Release Valve

The Contractor shall supply all material, equipment, and labor necessary to install and construct air release valves in locations shown on the project plans or as directed by the City Engineer. The air valve shall be installed in an approved precast manhole according to Standard Detail 71B-17, latest revision.

All “Air Release Valves” shall be Iron-bodied, bronze mounted with 1” or 2” air valve opening, and shall be able to withstand a hydrostatic test pressure of 350 p.s.i.

All “Air Release Valves” shall be with vacuum check unit and shall be as listed in the City’s approved materials list.

9.18 Abandonment and Shutdown of Existing Operations of Utilities, Tie-ins, Rodding/Blocking Verification

The Contractor shall supply all necessary labor, equipment, and materials to plug and abandon in place the existing water distribution system as indicated on the Project Plans.

Continuous operation of the City's existing water system is of critical importance.

Connection to existing services or utilities, or other work that requires the temporary shutdown of any existing operations or utilities shall be planned in detail with appropriate scheduling of the work and coordinated with the Utility Customer and the Engineer. **The approved schedule for shutdown or restart shall be indicated on the Contractor's Progress Schedule, and advance notice shall be given in order that the customer and the Engineer may witness the shutdown, tie-in, and start-up.**

The Contractor shall be responsible for notification of each property Owner prior to disruption of service, except in the event of an emergency situation. The Contractor shall coordinate his activities with any non-City owned utility.

Only City personnel shall operate any valves and controls on the City's existing utility systems.

The testing, acceptance, tap and mainline tie-overs shall be coordinated so as to eliminate any disruptions in service. See Section 9.12 and 9.14 also.

All materials and equipment (including emergency equipment) necessary to expedite the tie-in shall be on hand prior to the shutdown of existing services or utilities.

The Contractor shall be responsible to verify any and all rodding/blocking prior to the removal of items including but not limited to plugs, caps, and fire hydrants. The valves isolating these appurtenances has to be rodded to the associated tee and/or deadman, or temporary blocking is required prior to removal of the items so mentioned. When necessary or expedient the contractor shall provide such temporary blocking. Temporary blocking is limiting in scope and should be used for only short periods, normally less than one (1) day.

Progress of Pipe Line Construction

The work shall proceed in a systematic manner so that a minimum of inconvenience will result to the public in the course of construction. It is, therefore, necessary to confine operations to as small a length of work area per crew as is practical. Normally, the trenching equipment shall not be farther than 200 feet ahead of each pipe laying crew or such distance as necessary to provide maximum safety. Backfill the trench so no section of properly laid pipe is left uncovered longer than is absolutely necessary. The safety conditions of open excavations shall be the Contractor's responsibility. Completely backfill and clean up after each section of pipe has been inspected and approved.

9.19 Dry Bore and Jack (Highway Undercrossings)

The contractor shall supply all labor, material, and equipment necessary to install the water line without open cutting the pavement where indicated on the plans. The encasing pipe may be jacked through dry bores slightly larger than the pipe, bored progressively ahead of the leading edge of the pipe. Continuous check shall be made as to the elevation, grade, and alignment of each successive section of pipe as well as the tracks upon which the boring rig travels.

The boring operation shall be continuous to its completion.

In the event an obstruction is encountered during the boring and jacking, the auger is to be withdrawn and the excess pipe cut off, capped, and filled with 1:3 Portland Cement Grout as sufficient pressure to fill all voids. A new site will then be picked for a new bore.

If an open cut is allowed, then the aborted length shall be utilized and paid for at 100% of the unit bid price for completed bores. The remaining length allowed to be installed by open cut shall be paid as per pipe installed by open cut as described in Sections including but not limited to 9.01 and 9.14.

The carrier pipe shall be protected so as to prevent as much foreign material from entering as is possible. This installation will have to pass the tests in the Section 9.13 before it can be placed into service. See Special Provisions and Plans for controlling agent notification requirements.

The operation across the highway right-of-way must conform to requirements of the permitter. Execute all necessary agreements and/or permits before entering upon or commencing any work in the highway right-of-way. Comply, also, with the applicable requirements of the General Conditions and the Supplementary Conditions.

The Water Line Carrier Pipe Shall be Class 52 Ductile Iron Pipe, Mechanical Joint with Retaining Glands.

The minimum gauge or wall thickness shall correspond to the size of casing selected from the following. However, the contractor shall be responsible for selecting the gauge consistent with his operation:

Gauge Table for Railroad Crossings
Minimum Wall Thickness for Smooth Steel Casing Pipe for E80 Loading
(ASTM A139 Grade B; AWWA C-200)

<u>Nominal Diameter</u> <u>(inches)</u>	<u>When Coated or Cathodically</u> <u>Protected Nominal Thickness</u> <u>(inches)</u>	<u>When not Coated or Cathodically</u> <u>Protected</u> <u>Nominal Thickness</u> <u>(inches)</u>
12-3/4 and under	0.188	0.188
14	0.188	0.250
16	0.219	0.281
18	0.250	0.312
20 and 22	0.281	0.344
24	0.312	0.375
26	0.344	0.406
28	0.375	0.438
30	0.406	0.469
32	0.438	0.500
34 and 36	0.469	0.531
38	0.500	0.562
40	0.531	0.594
42	0.562	0.625
44 and 46	0.594	0.656
48	0.625	0.688
50	0.656	0.719
52	0.688	0.750
54	0.719	0.781
56 and 58	0.750	0.812
60	0.781	0.844
62	0.812	0.875
64	0.844	0.906
66 and 68	0.875	0.938
70	0.906	0.969

The exterior coal-tar enamel protective coating to be supplied in accordance with AWWA C-203, the steel casing pipe minimum thickness may be reduced by 0.063 inches, as per the table for E80.

Gauge Table for NCDOT (Street) Crossings (H-20 Loadings)

<u>Diameter Inches</u>	<u>Smooth Steel Pipe</u> <u>Minimum Thickness, Inches</u>
15-24	0.250 ASTM A139, Grade B AWWA C-200

The contractor shall provide a strapped timber cradle under barrel of pipe, join pipe, and slide into casing. Pipe barrels shall bear continuously on cradles.

SUPPORTS: Carrier pipe shall be supported on either approved “spider” supports as indicated on the plans (not less than two supports per length of pipe), or lumber skids (pipe barrel shall bear continuously on skids). Lumber shall be Cedar, or No. 2 or better Southern Yellow Pine. Lumber shall be pressure treated with approved rot-resistant treatment for ground contact. Method of treatment in accordance with the applicable portion of the AWWA manual standards. All timbers shall be cut to size before the material is given the preservative treatment. See Standard Detail 71B-25.

STAINLESS STEEL BANDS: One-half inch wide by 0.020-inch thick, 304 stainless steel bands, or equal.

Prior to the start of the work, submit satisfactory evidence to the Engineer that all bond and insurance coverage requirements called for by the Permittee have been complied with. All proposed construction methods and materials for the undercrossing shall be approved by the Engineer and Permittee prior to the crossing operation, and no construction shall be started until written approval to proceed from the Permittee has been submitted to the Engineer.

PLACING SEALS AT ENDS OF CASING: After the carrier pipe has been tested and approved, place 3/16-inch black neoprene rubber seals, or 8” masonry plug, as shown on the drawings. Encroachment approval may require weep pits, contractor shall be responsible to check with the Permit requirements and include them in his bid.