

TOWN OF PITTSBORO

STANDARD SPECIFICATIONS

SECTION 3

PUBLIC WATER DISTRIBUTION CONSTRUCTION

01. **MATERIALS:** All materials used in water distribution system construction shall be made in the United States of America (U.S.A.) and conform to applicable industry standards including American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), Ductile Iron Pipe Research Association (DIPRA), American Association of State Highway and Transportation Officials (AASHTO), and American National Standards Institute (ANSI) and the requirements of the Town of Pittsboro and North Carolina Department of Environmental Quality (DEQ), and Division of Water Resources (DWR) for certifications and permits.
- A. **Ductile Iron Pipe:** Ductile iron pipe 6-inch and larger shall be in accordance with AWWA C150 and C151; cement-mortar lining and seal coat in accordance with AWWA C104. Joints shall be in accordance with AWWA C111 and include rubber compression gasket. All ductile iron pipe shall be marked "Ductile" and bear the name of the manufacturer.

Pipe Diameter	Depth of Cover	Pressure Class
6-8 inch	3 - 20 feet	350 psi
10-12 inch	3 – 14 feet	350 psi
≥ 14 inch	3 – 10 feet	250 psi

1. Pipe Joints:

- i. Slip-Type: AWWA C111 rubber gaskets and lubricant.
- ii. Mechanical Joints: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.
- iii. Restrained Joints: Joint restraint mechanisms shall be AWWA C111 and consistent with the pipe manufacturers' recommendation and intent.
- iv. Flanged Pipe: Flanged pipe shall be used only in above-ground applications. All flanged pipe shall be of ductile iron with ductile iron flanges per AWWA C115/ANSI A21.15, and shall be rated for a working pressure of 250 psi. Flanges shall be standard ANSI B16.1, Class 125.

- B. **Steel Encasement Pipe:** Steel pipe for encasing pipe beneath roads or railroads shall be high strength spiral welded or seamless grade "B" steel with minimum yield

strength of 35,000 psi. The inside diameter of the casing pipe shall be at least 6 inches greater than the largest outside diameter of the carrier pipe at the bell, allowing for at least 3 inches of annular space around the circumference of the carrier pipe.

Minimum casing pipe thickness shall be as follows, except where NCDOT or railroad specifications super cede, and in such cases, those shall be considered the minimum requirements.

Casing Pipe <u>Diameter</u>	Minimum Wall Thickness <u>(Roadways)</u>	Minimum Wall Thickness <u>(Railways)</u>
10"	0.188	0.188
12"	0.188	0.251
16"	0.250	0.312
18"	0.250	0.313
20"	0.250	0.375
24"	0.250	0.407
30"	0.312	0.469
36"	0.375	--

Carrier pipe within casing shall be ductile iron pipe supported by spiders at both the bell and spigot of each joint of pipe. The piping shall be restrained joints method approve by The Town of Pittsboro or Engineer of Record.

All crossings of Town streets shall be by dry bore and jack method in order to minimize pavement cuts and maintenance problems. Crossing of streams and/or creeks shall also be by bore and jack method. Variations with extenuating circumstances may be granted by the Town of Pittsboro Utilities Director or Engineer.

- C. **Pipe Fittings:** Pipe fittings shall conform to AWWA C153 for compact fittings. Fittings shall be mechanical joint in accordance with AWWA C111. Fittings shall be ductile iron with a minimum working pressure rating of 250 psi.

Fittings shall be cement mortar lined and seal coated in accordance with AWWA C104. Fittings shall have an outside coating of bituminous material that is maintained through storage, handling and installation. Fittings shall not be installed without a complete and thorough bituminous coat. Two (2) forms of restraints will be required.

At the discretion of the Town of Pittsboro, Meg-a-lug retainer glands may be accepted in certain instances when joint restraint is required.

- D. **Gate Valves:** Gate valves shall be resilient wedge type in accordance with AWWA C509 with full interior and exterior fusion bonded epoxy coating in accordance with AWWA C550. Resilient wedge coating shall be in accordance with ASTM D2000. Gate valves shall be mechanical joint per AWWA C111. Gate valve bodies shall be ductile iron with O-ring stem seals above and below the thrust collar and O-rings between the stuffing box, bonnet and body. Gate valves shall be open-left, non-rising stem with a 2-inch operating nut. Valves shall have 200 psi minimum working pressure and 500 psi hydrostatic test pressure.

This specification shall also apply for tapping valves except that tapping valves shall include a tapping ring and flanged connection to the tapping sleeve/saddle.

- E. **Butterfly Valves:** Valves 16-inch and larger shall be butterfly valves. Butterfly valves shall be Class 150B in accordance with AWWA C504. Butterfly valves shall have 90 degrees' rotation from full open to full shut. Butterfly valves shall have adjustable mechanical stops, bronze or stainless steel seating rings and Buna-N or Buna-S valve seats. Valve stuffing box and bearing hub shall be integrally cast with the valve body. The shaft shall be stainless steel and the shaft bearings shall be heavy duty bronze. Shaft bearings shall be self-lubricating with fully adjustable thrust bearings. Butterfly valve operators shall be worm gear type in a waterproof gear box, open left, with a 2-inch square operating nut.

Butterfly valves shall be shipped to the site fully assembled. Butterfly valves selected for use shall be obtained from manufacturers that fully warrant the satisfactory performance of the assembled valve and operator.

Butterfly valves shall be installed in a precast concrete manhole with cast iron frame and cover with "WATER" "Town of Pittsboro, and Town seal" cast in the cover. Manholes and manhole construction shall meet the standards set forth in the Sanitary Sewer Standard Specification. The manhole shall be sealed and watertight and grading shall promote drainage away from the manhole and prevent flooding of the manhole. The manhole shall be adequately sized to accommodate the valve assembly and permit room for maintenance and repairs.

- F. **Tapping Sleeves and Valves:** Tapping sleeves shall be ductile iron, 2-piece bolted sleeve with flanged outlet for new branch connection. Sleeve shall have mechanical-joint ends with rubber gaskets or sealing rings in sleeve body. Ductile iron sleeves shall bear an exterior protective bituminous coating.

Stainless steel fully-gasketed sleeves will also be accepted. When stainless steel sleeves are used, all metal parts including bolts and flange shall be stainless steel.

Tapping sleeves used shall be appropriate to the size and material of pipe being tapped and possess a flange appropriate for the tapping machine and tapping valve to be employed. Flanges shall be Class 125 (pressure rating 250 psi) in accordance with AWWA C115. Shall be tested hydrostatically tested up to 200-psi for thirty (30) minutes before a tap is made. Tapping sleeves shall NOT be air tested.

- G. **Valve Boxes:** Valve boxes shall be of close-grained gray cast iron and adjustable. The word "Water" shall be cast in the lid. Valve boxes shall be cast domestically, bearing the manufacturer's name and "**USA**" in the casting. Valve boxes shall be painted with a protective bituminous coating before being shipped from the factory. Contractor to provide a 3/8" to 5/8" hole just below lid for locate wire bolt attachment OR as approved by the Town.

For valve box and manhole adjustment procedures refer to Section 2, Infrastructure and Utility Construction. No valve box, meter box, manhole or clean-out shall fall in sidewalks, ramps, or curb/gutter.

- H. **Fire Hydrants:** Fire hydrants shall be Mueller Centurion in accordance with AWWA C502. Fire hydrants shall be provided with two 2.5-inch nozzles and one 4.5-inch nozzle and caps with chains for each nozzle. Fire hydrants shall have 5.25-inch main valve opening, compression type, designed to close with line pressure. Fire hydrants shall have sealed lubrication chambers with O-ring seals to protect operating threads from the waterway and anti-friction rings for ease of operation. Hydrant-to-base flange seating shall be bronze to bronze. Fire hydrants shall bear a breakaway traffic flange between the upper and lower hydrant barrel. Operating nuts shall be bronze, 1.5-inch pentagonal, counterclockwise opening.

In distribution mains, fire hydrants shall be spaced such that all structures fall within a 500-foot radius of at least one fire hydrant.

In transmission mains, fire hydrants shall be placed a minimum of every 2000 feet along the length of the transmission piping. Fire hydrants on transmission piping shall be placed at the high points on the route to allow for air release.

- I. **Air Release Valves:** Air release valves shall be shall be Crispin or an approved equal, manufactured in accordance with AWWA C512. Air release valves shall provide automatic escape of entrained air while the water main is in service. Air

release valves shall be suitable for minimum operating pressure of 150 psi or the designed operating pressure of the water system, whichever is greater.

Air release valves shall be properly sized using manufacturer's guidelines; that is, water main size, flowrate, pipe grade and the required air release rate shall be considered in sizing of each air release valve.

Air release valve inlets shall be NPT screwed or ANSI Class 125 flanged. Valve bodies shall be cast iron; floats and trim shall be stainless steel with Buna-N seats. The ARV outlet orifice shall be finished with a breather pipe one-foot-tall with a downward-turned elbow to prevent trash from entering the outlet orifice.

Air release valves shall be installed at the high points along the transmission mains. Air release valves shall not be installed in distribution piping.

Air release valves shall be installed in a manhole and shall include a valve to allow for removal/repair of the air release valve. Connection to the main shall include a tapping saddle. Piping used for air release valve installation shall be SCH 40 brass, threaded NPT.

Air release valves shall be installed in a precast concrete manhole with cast iron frame and cover with "WATER" "Town of Pittsboro, and Town seal" cast in the cover. Manholes and manhole construction shall meet the standards set forth in the Sanitary Sewer Standard Specification. The manhole shall be sealed and watertight and grading shall promote drainage away from the manhole and prevent flooding of the manhole. The manhole shall be adequately sized to accommodate the valve assembly and permit room for maintenance and repairs.

- J. **Blow-off Assemblies:** Blow-off assemblies shall be installed at the terminus of dead-end sections of water mains. Blow-off assemblies shall be constructed from a restrained, mechanical joint plug tapped 2-inch NPT. A gate valve of equivalent size to the water main shall be installed immediately upstream of the mechanical cap. A 2-inch gate valve shall be installed near the blow-off assembly to operating the blow-off.

Piping downstream of the mechanical cap shall be 2-inch SCH 40 brass pipe threaded NPT, or an approved equal piping. PVC pipe shall not be allowed in blow-off assembly construction.

Valves, bends and fittings shall be properly and thoroughly restrained with concrete blocking and rodding as needed. The blow-off spout shall be tapped 2-inch NPT

and a 2-inch cap shall be provided. A 2-inch threaded union with an ample section of brass piping with a 90-degree elbow at one end shall be provided to the Town of Pittsboro to connect to the blow-off assembly to divert water when in operation.

- K. **Water Service Appurtenances:** Water services shall be 1- inch minimum. Pipe for water services 1- inch through 1 ½ -inch shall be type “K” soft copper. Fittings shall be copper-compatible brass.

All service connections 1 1/2-inch diameter and smaller shall incorporate a corporation stop as a shut off valve at the water main.

On 2-inch diameter services, in addition to the corporation stop at the water main, a threaded end gate valve in accordance with Specification Section 01.D. shall be installed a curb stop. Valve shall be fitted with a valve box extended to grade.

Tapping/service saddles shall be selected for compatibility with the host pipe. Saddles for PVC pipe shall possess ample width for distribution of clamping pressure and shall be of hinge-less design with two (2) fastening nuts on each side of the saddle body (Ford S70 or approved equal). Service connections to PVC pipe shall be made with tapping saddles.

Saddles for ductile iron pipe shall be of the double strap, hinge-less design, possessing two (2) fastening nuts on each side of the saddle body (Ford 202B or approved equal).

Saddle construction shall be of 85-5-5-5 brass conforming to AWWA C800. Saddle bosses shall have AWWA standard tapered threads compatible with the corporation cock used and incorporating a Buna-N rubber gasket.

Corporation stops shall be all brass 85-5-5-5 construction conforming to AWWA C800; unions shall be three-piece copper to copper. Threads shall be AWWA standard taper. Outlets shall be IP threads with a brass compression fitting. Corporation stops shall be compatible with the tapping saddle. Corporation stops for direct taps may be used on ductile iron pipe per the table in the Execution and Installation section.

Copper meter setters shall be used; meter yokes or “straight piping” shall not be allowed. Meter setters for all line sizes shall be minimum 7” in height and shall provide 6” clearance from the bottom of the meter box and 6” clearance below the meter box lid. Meter setters shall accommodate Neptune radio read type meters.

Meter setters (Ford 70 Series or an approved equal) shall have an angle valve on the inlet end and a check valve on the outlet end. Angle valve and check valve shall be of same manufacturer as meter setter, assembled and supplied as one unit. Angle valve shall be all bronze, ball valve type with lock wings. Check valves shall have a dual check assembly.

All parts and materials used in water services shall be of one manufacturer and possess compatible connectors and threads and be of materials compatible with all other water service parts and materials.

Meter boxes shall include a domestic produced solid cast iron lid (without flip-to-read hatch) manufactured for Radio-Read applications (2-inch hole in lid for radio antennae). Cast iron meter boxes shall be supplied of sufficient size to allow for 6 inches' clear space both above and below the meter. Generally, this requires an 18-inch deep box.

- L. **Meters:** Meters shall be Neptune radio read type, possessing radio read output consistent with that used by the Town of Pittsboro at the time of installation. The Town of Pittsboro supplies and installs Neptune, radio read meters up to 1-inch. Meters larger than 1- inch shall be provided by the Owner.

Meters 1- inch through 1½-inch shall be displacement type and shall conform to AWWA C700. The main case shall be of bronze or lead-free copper alloy construction with frost protection features. The measuring chamber shall be of bronze, copper alloy or synthetic polymer construction. Registers shall be magnetic drive, direct reading in U.S. gallons. Meters shall be of the rotating disc, positive displacement type.

Meters provided and installed shall possess a minimum one-year manufacturer warranty. Supplier/manufacturer shall repair or replace any meter parts that become defective under normal wearing conditions within one year of the date of installation of the meter without charge to the Town of Pittsboro.

- M. **Larger Meters:** Service meters 2-inch and larger shall be Neptune radio read conforming to AWWA C702. Meters shall be compound type with operating ranges adequate for metering the expected high and low flows at the service. Meters shall include turbine type and disc type magnetically driven registers.

Meters shall be installed in a precast concrete meter vault, adequately sized for the meter and all appurtenances, that is, minimum 18-inch clearance between vault walls and all working parts of the meter and appurtenances, including 18-inch clearance for all flange bolts. The meter assembly shall include gate valves upstream and downstream of the meter and a valve bypass line to allow the meter to be isolated/removed for calibration and repairs. The meter vault shall be constructed so that flooding of the vault will not occur.

REFER TO TOWN APPROVED STANDARD DETAIL FOR VAULT INSTALLATION AND DRAINAGE REQUIREMENT.

Manufacturer's recommendations for screens, backflow prevention, etc. shall be included. The full assembly shall be supported from the vault floor at least 12 inches by concrete pedestals or pillars beneath the spool pieces. The vault shall include an aluminum access hatch, such as by Halliday Products, sized adequately for removal of the meter. The access hatch shall possess an integral extruded aluminum channel frame incorporating a continuous concrete anchor and a 1-1/2-inch drainage coupling.

Where the vault lies within road right-of-way or may otherwise be purposely or inadvertently driven upon, a traffic-rated vault lid and door shall be provided.

N. Polyethylene wrap, locator tape, and tracer wire: Refer to Section 2 Utility Construction of the Town Pittsboro Standard Specifications

O. Backflow Prevention, and Pressure Release Valve Assembly: Units shall be installed and tested per the requirements set forth in the T.O.P Chapter 25, Utilities Ordinance, Article VI Cross Connections between a Private Supply and The Town of Pittsboro Water System.

P. Vertical Realignment of all Piping Material: All piping material shall be restrained, blocked, and anchored per the Town of Pittsboro approved detail, or per plan detail. Anchoring, and trust blocks shall be formed, and poured to the provided dimensions.

Q. PVC Pipe: PVC Pipe shall not be exposed to direct ultraviolet radiation (sunlight) for more than 30 days, whether the time is continuous or cumulative. PVC pipe shall be protected from direct ultraviolet radiation for any time of exposure exceeding 30 days. PVC pipe that has been discolored by exposure to ultraviolet radiation is unacceptable.

02. INSTALLATION AND EXECUTION: The Owner or Contractor shall provide all materials, labor, tools, equipment and incidentals required for excavation, installation, backfilling and testing of water mains and associated appurtenances shown on approved plans. All waterlines shall be sized as a minimum in accordance with the current NCAC Title 15A and the Town of Pittsboro waterline size requirements. Waterlines must be looped where practical as determined by the Town Engineer, Utilities Director or designee. All dead-end lines shall have a fire hydrant, or the ability to be flushed.

1. Pipe Installation: Potable water main piping shall be installed in accordance with AWWA C600. Pipe shall be installed on reasonably consistent grade and straight alignments, and all joints shall be properly fitted. All pipe and appurtenances

shall be placed in trenches with suitable equipment to prevent damage to materials. Pipe and appurtenances shall not be dropped into the trench. Damaged or defective materials shall be permanently marked and removed from the project.

All foreign matter or dirt shall be removed from pipe and fittings. Pipe interior shall be clean. Pipe that cannot be swabbed clean shall not be used. Materials with evidence of oil, tar or grease shall be permanently marked and removed from the project. Chlorine powder or tablets shall not be placed in pipe during installation.

Pipe jointing shall be accomplished according to manufacturer requirements. Bell and spigot shall be cleaned and lubricated before jointing. Pipe installation shall progress with bell ends facing the laying direction. Manufacturer's maximum allowable joint deflection shall not be exceeded.

Pipe cutting for inserting valves, fittings or closure pieces shall be square, neat and properly chamfered according to manufacturer requirements.

During installation, electrical continuity shall be maintained of the tracer wire between valves. If a wire is cut or otherwise requires splicing, the ends of the wire shall be bared, twisted together and connected with an electrical "twist cap".

While backfilling the reclaim water main trench, locator tape shall be placed 24 inches above pipe. Locator tape shall bear the words: "Warning – Potable Water Main Below".

2. PVC pipe shall be installed in accordance with AWWA C605. In the Town of Pittsboro PVC pipe shall be bedded on four (4") inches of on #78M from to one (1') foot above pipe from Luck Stone quarry or equivalent as approved by the Town. Or at a minimum and approval by the Town, all PVC pipe shall be installed at a Type 4 laying condition as specified by AWWA C605 for depth of installation from three (3') feet to ten (10") feet measured from the top of the pipe. The Type 4 laying condition requires the pipe to be bedded on a minimum of 4-inches of select granular material that will conform to the bottom of the pipe. Select granular material shall consist of Class 1 or Class 2, well-graded sand, gravel, crushed gravel, crushed stone or crushed slag composed of hard, tough and durable particles, and shall contain no more than 10 percent by weight of material passing a 0.075 mm (No. 200) mesh sieve and no less than 95 percent by weight passing the 25 mm (1 inch) sieve as defined by ASTM D2321. Pipe laying on a flat bottom trench is unacceptable.

Class 1 or Class 2 embedment material shall be compacted to the top of the pipe at 95% or greater Proctor density. Careful attention shall be placed on compacting embedment under the haunches of the pipe to prevent any potential voids. When using mechanical compactors, avoid contact with the pipe. When compacting over the pipe crown, a minimum cover of at least 8-inches or more in conformance with the manufacturer's requirements shall be maintained over the

top of the pipe prior to compacting. The maximum embedment sizing shall be limited to materials passing a 3/4-inch sieve for angular materials or 1-1/2-inches for rounded rock. Embedment materials consisting of select material or native soils shall be well drained, granular, and free of rocks and other foreign materials and shall be selected and placed to prevent gouges, crimping, or puncture of pipe, joints or appurtenances.

3. For all other pipe material, the trench bottom shall be prepared with minimum 4-inch thickness of #78M bedding stone and bell holes shall be prepared in the bedding. The #78M shall be placed to spring line (encompassing the haunches), and to a foot above pipe. The material type shall be from Luck Stone quarry or equivalent as approved by the Town.
- A. **Relation of Water Mains to Other Piping:** Lateral separation from reclaim water and/or sanitary sewer shall be minimum 10 feet, outside to outside. If this separation cannot be obtained, then the water and reclaim water and/or sewer mains shall be installed in separate trenches with the bottom of the water main at least 18 inches above the top of the sewer main.

When a water main must cross over a reclaim water and/or sewer main, the bottom of the water main shall be at least 18 inches above the top of the sewer main. If this separation cannot be obtained while maintaining the required cover, both the water and reclaim water and/or sewer mains shall be ductile iron pipe, with joints equivalent to water main standards, for 10 feet on each side of the point of crossing. A joint of water main pipe shall be centered at the point of crossing.

When a water main must cross under a reclaim water and/or sewer main, both the water and reclaim water and/or sewer mains shall be ductile iron pipe, with joints equivalent to water main standards, for 10 feet on each side of the point of crossing. A section of water main pipe shall be centered at the point of crossing. Vertical separation between the top of the water main and the bottom of the reclaim water and/or sewer main shall be minimum 18 inches.

When a water main crosses over or under a storm sewer, vertical separation between the pipes shall be minimum 18 inches unless both pipes are ductile iron or encased in concrete for 10 feet either side of the crossing.

B. Setting Valves and Valve Boxes:

Valves shall be installed on all branches from feeder mains and hydrants according to the following schedule: four (4) valves at crosses; three (3) valves at tees; one valve on each hydrant branch and elsewhere as

When a loop section of water line is connected back into the feeder main within a distance of 200 feet or less, only one valve will be required in the feeder main. In all cases where new water mains are connected to an existing water distribution line, valves shall be located at all end points and at intermediate

points throughout the new system extension to assure testing requirements can be met without interfering with the operation of the existing system. Testing standards when connecting to an existing system may require that 4 valves ultimately be located at crosses, 3 valves at tees, etc. beyond the minimum standard to assure adequate testing can be achieved. In such cases, the valves shall be shown on the plan drawings and included in the testing plan submitted by the Engineer of record.

Where no water line intersections are existing, a main line valve shall be installed at every 100 feet per 1-inch diameter main up to a maximum distance of 2000 feet between valves.

Valve Spacing Schedule

Main Size	Maximum Spacing
6"	600'
8"	800'
12"	1200'
16"	1600'

All valves shall be restrained to the main line or other fittings or appurtenances within close proximity. Valves shall be properly located, operable and at the correct elevation. All valves and reducers shall be rodded to the tee or cross if one is located within 10 feet as shown in the Details. If valves or reducers are located more than 10 feet from a fitting and cannot be rodded, wedge action retainer glands or concentric ring restrained valves will be required. All valve installations utilizing wedge action retainer glands or concentric ring restrained connections shall be restrained on both sides of the valve and include sufficient pipe restraint to allow the valve to operate under dead end pressures without movement. The maximum depth of the valve nut shall be 5 feet without an extension kit. When valve extension kits are used, they must be manufactured by the same company which manufactured the valve

Valves shall be set at locations shown in approved plans. Valve to pipe connections shall be mechanical joint. A cast iron valve box shall be installed, accurately centered over the valve operating nut. Valve boxes shall be installed to the project finished grade. When not in pavement, the valve box shall be protected with a precast concrete donut. The donut shall be dug into the ground approximately two inches so the donut is level, fully flush with the ground and even with the top of the valve box. Valve boxes in paved sections shall be

finished flush with final grade and shall be supported at the top with a poured concrete collar at least 2-1/2 feet in diameter.

For valve box and manhole adjustment procedures refer to Section 2, Infrastructure and Utility Construction. **No valve box, meter box, manhole or clean-out shall fall in sidewalks, ramps, or curb/gutter.**

- D. **Setting Fittings:** Fittings shall be installed in the locations shown in approved plans. Fittings shall be mechanical or restrained joint and shall be properly and tightly installed per manufacturer's requirements. Slip joint fittings shall not be allowed. Adequate thrust restraint shall be employed as shown in plans and as described in these specifications.
- E. **Setting Fire Hydrants:** Fire hydrants shall be set where shown on approved plans. Pipe for hydrant leg shall be ductile iron regardless of pipe material used on the main. The hydrants shall be set upon a bed of compacted crushed stone at least 36 inches' square by 12 inches deep. When backfilling, washed stone or pea gravel shall be placed around the hydrant and above the drain holes so that the hydrant will properly drain when not in use. The hydrant and hydrant leg gate valve shall be securely restrained to the main line using an approved MJ fitting assembly. A concrete thrust block shall be placed behind the hydrant tee and hydrant assembly. No bells allowed in section of piping between valve, and hydrant, or shall be restrained. The hydrant assembly shall include restrained with MJ fitting at the tee, gate valve and the hydrant assemble. A 6-inch gate valve shall be installed on the hydrant leg within 10 feet of the hydrant, and restrained with a thrust block.

Fire hydrants shall be set such that the hydrant base is flush with the project final grade.

- F. **Reaction Blocking:** All water main fittings shall be installed with thrust restraint. Reaction blocking shall be transit-mixed concrete of minimum 2500 psi 28-day compressive strength placed in adequate quantities for the size and shape of fitting being installed. Reaction blocking shall be formed and poured such that mechanical joint bolts remain accessible. The blocking shall be backed by firm solid earth. Where manufactured joint restraint is used, concrete blocking shall be used only as recommended by the joint restraint manufacturer. All blocking shall be formed, and poured per the provided dimensions **NOT** over formed, and poured. The concrete shall be given twenty-four (24) to cure prior to backfill and compaction.
- G. **Service Connections:** Service connections on PVC pipe shall be made using tapping saddles. Direct taps are NOT allowed on ductile iron pipe Taps shall be made at a 45-degree angle from vertical on the same side of the pipe as the

service. Service line shall be Type K copper tubing, buried a minimum of 2 feet. Pipe bends shall be smooth, not crimped. Crimped pipe shall be rejected.

Connections larger than 2-inch shall be made using a tapping sleeve and valve.

Service connections are not allowed on water mains larger than 12-inch except with the permission of the Town of Pittsboro.

Meter boxes shall be set flush with finished grade at the Town right-of-away line, with a 3-inch minimum depth of washed stone in the base of the meter box. If grade changes are made during the project, meter boxes shall be adjusted to final grade.

Meter setters and meter shall be centered in the meter box with the meter setter plumb and the meter face facing straight up. The meter setter shall be installed such that the meter face is 6 inches below the meter box lid.

H. **Water Main Flushing:** Please refer to Town Pittsboro Specification 2. Prior to pressure testing, disinfecting and placing any water main into service, the water mains shall be flushed with adequate velocity to remove sediment from the lines as follows:

Flushing: All mains shall be flushed with adequate velocity to remove remaining sediment. A line velocity of at least 5 feet per second must be reached to obtain adequate scour for cleaning. Discharge shall be to a suitable point that will not result in flooding, erosion or flow into the sanitary sewer system.

The Town of Pittsboro reserves the right to have contractor employee a "pig" after three (3) failed bacteriological samples.

I. **Pressure Testing Water Mains:**

Hydrostatic Testing: Town inspections staff must be present for all pressure tests with at least a forty-eight (48) hour notice. Pressure testing may be made before or after backfilling, but backfilling must be completed before allowance testing. If the pipe is center-loaded, a visual inspection for leaks may be made along the pipe line while the test section is under test pressure, and all visible leaks repaired. However, if mechanical compaction is to be used in the backfilling operations as spelled out in AWWA C-600, the tests shall not be made until the backfilling is completed and compacted. Backfill and compaction for the full distance encompassed by restrained/welded joints shall be completed prior to testing. All connections, blow offs, hydrants and valves shall be tested with the

main as far as is practicable. Hydrostatic testing shall not begin until the pipe has been filled with water for at least 24 hours to allow for air venting.

Pressure Testing: Unless otherwise noted in the contract documents, the minimum prescribed test pressure shall be at least 200 psi for lines smaller than 16 inches and 150 psi for lines 16 inches or larger, not to exceed 5 psi over the minimum prescribed test pressure, as measured at the lowest end of the section under test. The duration of each pressure test shall be at least 2 hours, during which time the test section shall not drop below the minimum prescribed test pressure. If the pressure in the pipe test section has not stabilized by the end of the testing period, a hydrostatic retest will be required. Each section of a new line between sectionalizing valves or between the last sectionalizing valve and the end of the project shall be tested separately as required in AWWA C-600, and/or as modified in these specifications, except that any such section less than 500 feet in length may be tested with the adjacent section, if both sections of line have the same pipe class rating. No section greater than 1/2 mile in total pipe length shall be tested without special written permission of the Engineer.

Testing Allowance/Makeup Water: Makeup water volume shall be determined after the pressure test has been satisfactorily completed and all backfilling and compaction has been completed to top of trench. Testing allowance shall be defined as the maximum quantity of makeup water necessary to be supplied into the pipe line section under test to restore the ending test pressure to the beginning test pressure, after the pipe line has been filled with water and all air expelled. The Contractor shall furnish the necessary apparatus and assistance to conduct the test.

The duration of each makeup water test shall be at least 2 hours. To pass the allowance testing, the quantity of makeup water from the pipe line shall not exceed the makeup water quantity allowed by the following formula, from AWWA C-600:

$$M = \frac{SD \sqrt{P}}{148,000}$$

M = testing Allowance (makeup water), in gallons per hour.

S = length of pipe tested, in feet

D = nominal diameter of pipe, in inches.

P = test pressure of the pipe being tested

Should the test on any section of the pipe line require more makeup water than allowed by the above formula, the Contractor shall locate and repair the defective pipe, fittings, or joint until the makeup water volume is within the specified

allowance. All repairs and retests, if required, shall be made at the Contractor's expense. Connections to the existing pipelines or existing valves shall not be made until after that section of new construction has satisfactorily passed the hydrostatic tests.

Ductile iron pipe used in conjunction with ACP will be tested to the ACP standards, unless otherwise directed by the Engineer of Record.

High pressure systems of all ductile iron pipe will be tested in accordance with AWWA C-600, Section 4.1. Pressure tests will not be considered acceptable and will not be approved without a representative of the Town of Pittsboro present. 48-hour notice shall be given to the Town inspector prior to pressure testing.

The Contractor shall pre-test all water mains before requesting pressure test observation from the Town of Pittsboro with a minimum 48-hour notification. No pressure tests will be observed without the Contractor's first pre-testing the water mains.

Excessive site visits will not be tolerated. In the event that more than two site visits are required for a segment of water main to pass pressure testing, the Town of Pittsboro shall bill the Owner for the additional visits at a rate of \$105 per hour.

- J. **Disinfecting Water Mains and Other Appurtenances:** Disinfection of new potable water supply system components shall be in accordance with the North Carolina Department of Environment, and Natural Resources, Rules Governing Public Water Systems, NCAC Title 15A, Subchapter 18C Section .1003 and the requirements of AWWA C651. Town of Pittsboro staff must be present at the time of disinfection of public water mains with at least a forty-eight (48) hour notice. Preventing Reverse Flow: Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Check valves may be used to accomplish this but not required at this time.

Water mains shall not be placed in service until all final submittals are provided and the Town of Pittsboro has approved the project for service. It is the responsibility of the Owner/Contractor to coordinate water main disinfection with the submittal of close-out materials.

All water mains shall be thoroughly flushed prior to disinfecting. The Town of Pittsboro reserves the right to require "pigging" of lines if necessary.

Disinfection shall be performed by pumping a solution of HTH and water (potable water obtained from the metered connection) into the new water mains (and services) so that a chlorine residual concentration of at least 50 milligrams per

liter (50 ppm) remains in the lines. The preferred point of application of the chlorinating agent is at the beginning of the pipe line extension or any valve section of it and through a corporation stop inserted in the top of the newly laid pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap on the pressure side of the gate valve controlling the flow into the pipe line extension. The chlorine solution shall be pumped in at a constant rate so that a uniform distribution is produced in the lines. Valves and hydrants shall be adequately exercised to aid in uniformly distributing the chlorine solution. The Owner/Contractor **shall** demonstrate to the Town's Inspector, or Utility Operator that 50 ppm is at the beginning and ending line segments under test at the beginning of the twenty-four (24) hour period. The Owner/Contractor **shall** demonstrate to the Town's Inspector, or Utility Operator that 10 ppm is at the beginning and ending line segments under test at the ending of the twenty-four (24) /forty-eight (48) hour period

The chlorine solution shall remain in the lines for a minimum of 24 hours and a maximum of 48 hours at which time the residual concentration shall be no less than 10 ppm. Residual chlorine levels shall be demonstrated to be at least 10 ppm or the Town shall require the lines to be re-chlorinated before bacteriological testing is conducted.

At the end of the contact period and prior to bacteriological testing, the chlorine solution shall be thoroughly flushed from the water mains to no more than the normal chlorine residual in the distribution system. Flushing shall occur at hydrants and/or service connections and discharge shall be to a suitable point that will not result in flooding, erosion or flow into the sanitary sewer system

Extreme care shall be taken to ensure that high-concentration chlorine solution does not enter existing water mains. Preventing Reverse Flow: Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Check valves may be used to accomplish this but not required at this time

- K. **Bacteriological Sampling:** After water mains have been disinfected and flushed, the Owner/Contractor shall collect samples for turbidity and bacteriological analysis for each section of pipe tested. At least one sample shall be collected for every 1000 feet of water main. Sample collection shall be performed under the direct supervision of the Town of Pittsboro or a certified laboratory and shall follow proper chain of custody procedures. Samples shall be collected at locations determined by the Town of Pittsboro. Samples shall be analyzed by a certified laboratory meeting the certification requirements of North Carolina Department of Environmental Quality (DEQ), and Division of Water Resources (DWR).

If a bacteriological test fails, the line segment may be retested once. If the second test fails, the line shall be re-flushed, re-chlorinated and retested as outlined above.

Certified laboratory reports shall be submitted to the Town of Pittsboro. Final project approval will not be given without submittal of certified laboratory reports.

Refer to Standard Section 2, Infrastructure and Utility Construction, for trench, and backfilling and valve box and manhole adjustment procedures.